Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017 Addendum

Prepared by

LGL LIMITED
environmental research associates

Prepared for

PETRO-CANADA

April 2009
LGL Project No. SA993

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Prepared by

LGL Limited
environmental research associates
388 Kenmount Road
Box 13248, Stn. A.
St. John's, NL
A1B 4A5

Tel: 709-754-1992
jchristian@lgl.com
www.lgl.com

Prepared for

Petro-Canada
235 Water Street
St. John's, NL
A1C 1B6

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Preface

This Addendum provides responses to reviewer comments on the version of the Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017 submitted to the C-NLOPB in December 2008. Reviewer comments addressed in this Addendum were provided to Petro-Canada by the C-NLOPB on 12 March 2009.

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GENERAL COMMENTS

The Environmental Assessment does not provide enough detailed information to consider this an independent document. It is acknowledged that the established practice is to cross-reference previous assessments as a means of streamlining, but the document should be able to stand alone. Furthermore, there are several sections that do not provide any information whatsoever, which forces the reviewer to look at many separate documents in order to gain an appreciation of the topic at hand. This obviously results in extra review time and causes unnecessary frustration. Section 5.2 of the November 19, 2009 Scoping Document states "*Where applicable, information may be summarized from existing environmental assessment reports for the Jeanne d'Arc Basin*". A summary of the pertinent information would be preferable, with a cross-reference to additional documentation if required. For example, in the species profile section, a brief description of the habitat within the study area, life history characteristics of any species present and general stock assessment information would be sufficient to determine whether there are any potential issues regarding fish and fish habitat.

It is possible to create pdf documents that have bookmarks in the table of contents to easily select a specific chapter or section, similar to a document map. It would be appreciated if the referenced documents were created using this feature as scrolling through countless pages of multiple documents is both cumbersome and time consuming for a reviewer.

Response:

The difficulties associated with reviewing the document are noted and fully understood. Sufficient information coupled with cross-references to supplementary information will be provided in future EAs.

Air Emissions

There are no major concerns with this Petro-Canada drilling project from an air emissions point of view. The GHG emission estimates provided appear reasonable and are in line with recent estimates from other drilling projects. However, it would be useful to provide estimates of CAC emissions from diesel power generation, flaring and well testing. The proponent mentions that GHGs are reported to the C-NLOPB as per the OWTG. The OWTG also require reporting of VOC emissions to the C-NLOPB so these should also be estimated.

Response:

Estimated CAC emissions (i.e., NOx, CO, VOCs, TPM, PM10, PM2.5 and SOx) for drilling operations relating to diesel power generation, flaring and well testing are provided in the table below. Estimated emissions are calculated using emission factors included in the United

States Environmental Protection Agency AP-42 (USEPA 1995) and the Canadian Association of Petroleum Producers NPRI Guidelines (CAPP 2007).

CAC	Emissions (Tonnes)	
	Diesel Combustion	Oil Flare and Gas Flare Venting
NOx	458.9633	0.841
CO	98.8697	4.573
VOCs	36.4257	0.643
TPM	32.2627	1.602
PM10	32.2627	1.602
PM2.5	32.2627	1.602
SOx	0.1616	N/A

SPECIFIC COMMENTS

Comment #1 - Section 3.6.3.3 Evaluation, pg. 16 - What does DG2 refer to in the following statement "Changes that influence the technical conditions for the operational TFM plan will be limited after DG2 is completed?"

Response:

DG2 is a typo and should have read PG2. PG2 refers to Terra Nova Field well L98-1Y, which is the third well in the 2009 Petro-Canada drilling program. L98-1Y is a re-enter, side-track, re-drill and completion that will be a Terra Nova oil producer. It is unrelated to the 2009 exploration drilling program.

Comment #2 - Section 4.1.1 Geology, pg. 24 - Although this information is similar to that provided in previous documents, a summary would be useful to give a general indication of the existing environment. Furthermore, there is no mention of sea bottom conditions in this section, which again would be useful.

Response:

As indicated in one of the responses to General Comments, sufficient information coupled with cross-references to supplementary information will be provided in future EAs.

Comment #3 - Section 4.2 Climatology, pg. 26. Comment #3a - The description of the climate and the analysis of the MSC50 dataset is generally very well done, but measured weather and wave data were not used effectively to give a full understanding of the climatology, especially of the extremes. The details were summarized from Appendix 1 (Oceans 2008) of the EA of StatoilHydro's Exploration and Appraisal/Delineation Drilling Program for Offshore Newfoundland, 2008-2016 by LGL 2008. Most of the recommendations made by this reviewer on the physical environmental conditions and effects of the physical environment of the StatoilHydro's EA were not followed, in the subsequent preparation of this EA for Petro-Canada.

The report makes insufficient use of the more than 10 years nearly-continuous record of weather and wave measurements from platforms in the Northern Grand Banks, contained in industry archives, and in a more limited set in government archives (Fisheries and Oceans, for wave measurements) or university archives (ICOADS: International Comprehensive Ocean Atmosphere Dataset) (Woodruff et al. 1995, Worley et al. 2005).

There is no analysis of frequency and severity of icing accumulation due to freezing spray or to freezing precipitation, even though it is noted as a hazard in Section 7.1 Effects of the Environment on the Project.

Response 3a:

An analysis of freezing precipitation and freezing spray would be useful and will be provided in the future EAs. Inclusion of results of such analysis in this EA Addendum would not change the results of the assessment provided in the EA.

Comment 3b - Mean wind speed maps for January and July from the Quikscat dataset were presented, which is useful. However, it would be of value to present extreme wind speed information from Quikscat as well, both as climatology and as validation of measured and modelled data in recent extreme storms (e.g., see Cardone et al. 2004 and Chelton et al. 2005). The URL for the Quikscat maps is given but a reference should be provided as well. The legend for these maps indicates the wind speeds are in knots, but the captions say that they are in m/s.

Response 3b:

Presentation of extreme wind speeds from the Quikscat database would not significantly improve wind speed statistics already calculated using the MSC50 database which is considered to be of high quality.

Comment 3c - The URL for the Quikscat maps is given but a reference should be provided as well. The legend for these maps indicates the wind speeds are in knots, but the captions say that they are in m/s.

Response 3c:

Noted and will be included in future EAs.

Comment 3d - There are N. Atlantic maps for monthly mean wind wave height and significant wave height estimates for the months of January and July. The reference is Gulev (1998) but the reference section correctly indicates Gulev and Hasse (1998). The text should indicate that these analyses are based on wave observations from voluntary observing ships, and give some indication of the quality.

Response 3d:

The reference Gulev (1998) should be changed to Gulev and Hasse (1998). It is not possible to give an indication of the quality because of the differences between ship observing programs.

Comment 3e - There was little description of climate variability or trend in the EA, other than some discussion of trends in tropical cyclones, even though the end of the proposed drilling program extends about 20 years beyond the end of the analyzed climate data. Note that recent work shows increases in 20-yr counts of winter (JFM) cyclones from 1958-77 to 1982-2001 over Newfoundland and eastern Labrador and adjacent waters (Wang et al. 2006a and 2006b). Wang and Swail (2002) found increasing trends in higher percentile modelled wave heights in July to December off Nova Scotia and the Island of Newfoundland. It is recommended that the MSC50 data at a representative point be analyzed for trend and interdecadal variability, and that the results are related to relevant seasonal atmospheric circulation indices such as the North Atlantic Oscillation and the El Nino Southern Oscillation (e.g., see Eichler and Higgins 2006).

Response 3e:

This work could be provided in future EAs which involve long time frames. Inclusion of results of such analysis in this EA Addendum would not change the results of the assessment provided in the EA.

Comment #4 - Section 4.2.1 Data Sources and 4.2.2 Winds, pgs. 29-36. Comment 4a - The chief sources are the MSC50 wind and wave hindcast dataset and the ICOADS dataset composed of observations from ships, platforms, and buoys. As noted in the report, the collection of wind observations in ICOADS is inhomogeneous, coming from ships and platforms with different observing methods and measurement heights. However, no attempt was made to homogenize the winds through adjusting to a standard height, using available information about anemometer heights from platforms in the area.

Response 4a:

Based on operational experience, Oceans Ltd. does not agree with the reviewer that wind observations can be successfully adjusted to a standard height using available information about anemometer heights, and that any attempt to do so would introduce errors into the dataset. It is Oceans' opinion that presentation of the platform data is best left as is, thereby giving the operator an idea of what winds the rig may experience at the top of the derrick. Data from the MSC50 dataset was developed for Environment Canada taking into consideration the observations from the platforms and is considered to be of high quality. Therefore, these data should be sufficient to provide the operator with an idea of the 10-metre winds.

Comment 4b - It would be helpful to note those platforms which have reported in each region, such as the Erik Raude in Region 3. There are relatively long weather records in Region 2 from the Hibernia GBS, and the Henry Goodrich and GSF Grand Banks semi-submersibles.

Response 4b:

Weather observations from offshore platforms could have be included in the report and will be in future EAs. Inclusion of these observations in this EA Addendum would not change the results of the assessment provided in the EA.

Comment 4c - The quality control method for the ICOADS used the standard trimming flags, which are overly restrictive for extreme winds. Their use would exclude valid extreme winds from many storms. For example, the maximum wind speed for February is given as 38.1 m/s (ICOADS, Region 2, Table 4.5) but the Hibernia GBS reported 49.4 m/s and the Henry Goodrich reported 52.5 m/s on 11 February 2003. Examination of the ICOADS reports in this area show many instances of valid extreme winds from the Hibernia GBS and other platforms with trimming flags that would result in their exclusion. Adjusting these platform winds for measurement height would be helpful in a comparison with MSC50 winds.

Response 4c:

The trimming flags may be restrictive for extreme winds; however, trimming flags were set at 3.5 standard deviations which include 99.95% of all observations. The analysis could be done with a larger trimming flag (4.5 SD's); however, a quick analysis shows this still would not include the observations mentioned above. Another option would be to have no trimming flags; howeve,r this could possibly introduce bad data into the dataset.

Comment 4d - It is important to adjust wind speeds for measurement height to a standard reference level. Winds measured on platforms at elevations of 80 to 140 m would be up to 25% stronger than equivalent winds at 10 m in neutral atmospheric stability conditions. These prevail frequently in the fall and winter months. The difference would be greater in stable conditions, which prevail frequently in the late spring and early summer months. The simplest adjustment method uses a log profile formula and assumes neutral stability (e.g., see Cardone et al. 2004 and references therein). More sophisticated methods are available that account for atmospheric stability using the air and sea temperature. One example is the program developed by Walmsley (1988) which also uses of the air temperature measurement height.

Response 4d:

Based on operational experience, Oceans Ltd. does not agree with the reviewer that wind observations can be successfully adjusted to a standard height using available information about anemometer heights, and that any attempt to do so would introduce errors into the

dataset. It is Oceans' opinion that presentation of the platform data is best left as is, thereby giving the operator an idea of what winds the rig may experience at the top of the derrick. Data from the MSC50 dataset was developed for Environment Canada taking into consideration the observations from the platforms and is considered to be of high quality. Therefore, this data should be sufficient to provide the operator with an idea of the 10-metre winds.

Comment 4e - While it may be necessary to use the standard or enhanced trimming flags for ships, the platform observations are generally of better quality. It would be of more value to analyze platform weather measurements only, where they are available – particularly in Region 2, rather than have the inhomogeneity and error increased by including observations from passing ships. The influence of the many platform winds, not adjusted for height, in the ICOADS Region 2 monthly mean wind speeds statistics (Table 4.3), show up with values typically about 2 m/s greater than the MSC50 values.

Response 4e:

Statistics for each platform could have been provided but these data would be as is without any adjustments made to 10 metres.

Comment 4f - Furthermore, analysis of the platform wind measurements required for helicopter operations, available in industry archives, would give valuable information on one or two minute averaging interval values and gusts.

Response 4f:

An analysis of 2-minute winds from aviation observations could have been included; however, these statistics would not significantly differ from statistics presented from the Manmar data. Furthermore, in many cases, gustiness is platform-dependent and data from one platform should not be used for design criteria for other platforms.

Comment 4g - The wave measurements from wave riders near the offshore platforms are available separately from the ICOADS, from Fisheries and Oceans Canada. Combined together in Region 2, for example, these form a nearly continuous record since 1999. These are an important data source but were not mentioned. It is recommended that these data be analyzed and presented.

Response 4g:

Oceans agrees that these data could have been incorporated into the report and they will be in future EAs. Inclusion of these data in this EA Addendum would not change the results of the assessment provided in the EA.

Comment #5 - Section 4.2.3 Waves & Section 4.2.8 Wind and Wave Extreme Value Analysis, pgs. 37-48 & 57-65. Comment 5a - The wave climate is derived entirely from the MSC50, even though there are nearly continuous measurements of significant wave height and peak wave period in this area since 1999, especially for Region 2. There is no comparison of monthly maxima with recent extreme measurements.

Response 5a:

A discussion of monthly maxima with extreme measurements could have been incorporated into the report and they will be in future EAs. Inclusion of these data in this EA Addendum would not change the results of the assessment provided in the EA.

Comment 5b - The extreme value wind analysis includes tables for one hour, 10 minute, and one minute means. However, the 10 minute and one minute means are derived using standard factors from the MSC50 modeled one hour means. It would be of value to analyze 10 minute and one or two minute wind speed measurements collected in support of helicopter operations, to validate and perhaps improve on these adjustment factors.

Response 5b:

This would fall into the category of a research project and is not necessary for EA purposes. In addition, without further research, it is uncertain whether adjustment factors developed using wind speeds at anemometer heights could be applied to winds at 10-metres.

Comment #6 - Section 4.2.5 Precipitation & Section 4.2.6 Visibility, pgs. 51-56 - Similar comments made for the relatively long term wind measurements in Region 2 apply to observations of precipitation and visibility. The climate quality would be better and the estimate of error reduced if platform measurements were analyzed separately from the ship observations.

Response:

Due to the enhanced quality of the platform data, precipitation and visibility observations could have been analyzed separately from the ICOADS dataset and they will be in future EAs. Inclusion of these data in this EA Addendum would not change the results of the assessment provided in the EA.

Comment #7 - Section 4.3.1 General Description of the Major Currents, pg. 67 - In the first paragraph it states that "there are no measurements closer to the surface at this location" as captured by BIO in 1981. It should be noted that data may be available for more recent observations closer to the study site as part of oil spill trajectory modeling for Terra Nova and Hibernia.

Response:

Thereare no current data available from the oil industry for the deep water south of Flemish Cap. The majority of the current data collected by the oil industry is near the drilling sites for purposes of design and operational needs. Additional data are collected by Hibernia along the route between Hibernia and St. John's.

Comment #8 - Section 4.3.2 Currents in the Project Area, pg. 68 - The same description was written in LGL 2008. The following comment was provided in the previous EA and is believed to be still relevant: "The authors used archived temperature and salinity data at BIO and omitted all of the T-S data recorded by NWAFC trawl mounted CTDs that is archived at NWAFC and at MEDS. Consequently, only a small fraction of available data was captured".

Response:

There was no additional data analysis carried out for this EA. However, its inclusion would not change the results of effects assessment in the EA.

Comment #9 - Section 4.4 Ice and Icebergs, pgs. 80-81 - More recent data for sea ice is available and should be incorporated into this analysis.

Response:

It is noted that the inclusion of more recent sea ice data in the EA would have been preferable. However, its inclusion would not change the results of effects assessment in the EA. Inclusion of additional figures in response to Comment #10 below provides additional sea ice information.

Comment #10 - Section 4.4.1 Sea Ice, pg. 80 - The proponent may want to add the following figures of record maximum and minimum sea ice extents for the Grand Banks region.

Response:

Figures 1 and 2 represent the record maximum and minimum sea ice extents for the Grand Banks Region.

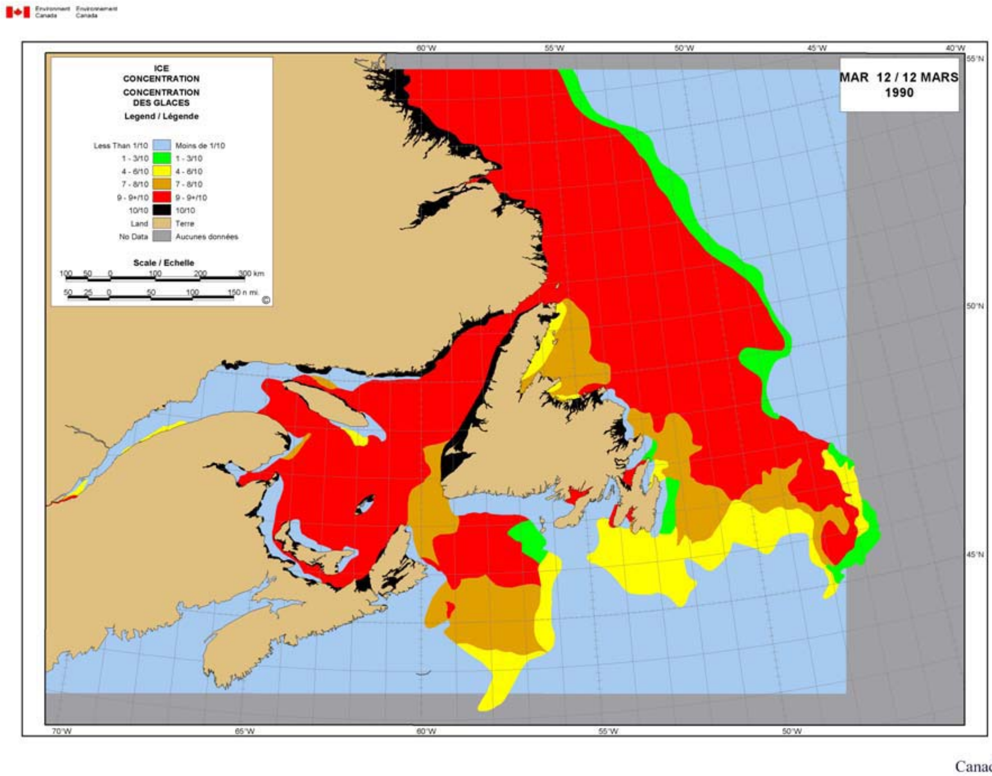

Figure 1. Record Maximum Sea Ice Extent for the Grand Banks Region, 1990.

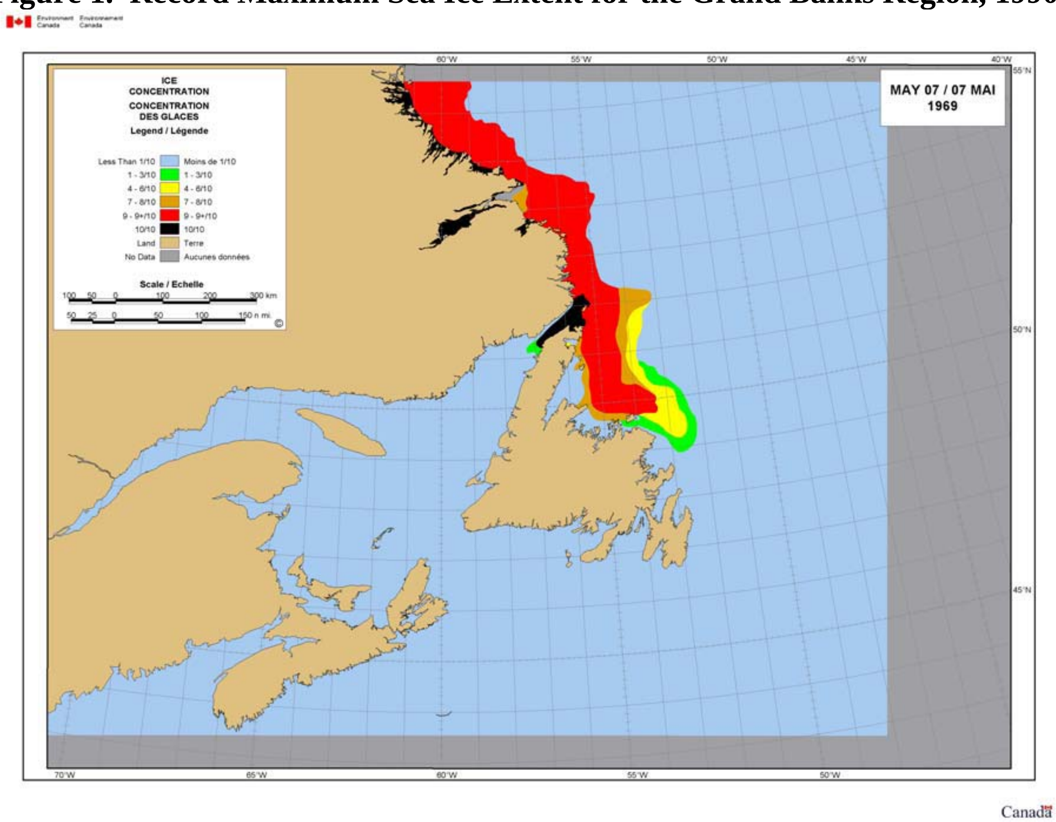

Figure 2. Record Minimum Sea Ice Extent for the Grand Banks Region, 1969.

Comment #11 - Section 4.4.2 Icebergs, pg. 81 - Change word: "This process produces a structure quite different from sea ice."

Response:

Noted. This information will be captured in future EAs.

Comment #12 - Section 4.4.2.1 Iceberg distribution, pg. 81, 1st Para - Note that maximum iceberg years tend to coincide with peak sea ice years because sea ice serves to protect icebergs from wave erosion and melt as they drift southwards from the Labrador Sea to the Grand Banks. In 1984, the year with the highest number of bergs recorded, the average sea ice coverage for the season was above normal (see figure below).

Response:

Noted. This information will be captured in future EAs.

Comment #13 - Section 4.4.2.1 Iceberg distribution, pg. 81, 2nd Para - Rephrase for clarity: Icebergs are observed drifting south of 48°N from March through to September, with the highest numbers occurring in July (based on long-term averages of data compiled by PAL from 1989 to 2007).

Response:

Noted. This information will be captured in future EAs.

Comment #14 - Section 4.4.2.1 Iceberg distribution, pg. 81, 2nd Para - "… three years have been completely ice free." Which ones?

Response:

The inclusion of this information would not change the results of effects assessment in the EA.

Comment #15 - You may want to include some of the additional iceberg distribution statistics for the last 5 years as shown in the following table.

Response:

Additional iceberg distribution statistics, based on daily CIS iceberg charts, 2004-2008, are provided in the following table.

Year	Date of Initial Iceberg Crossing South of 49ºN	Maximum Southern Extent (ºN)	Date of Maximum Southern Extent	Maximum Eastern Extent (ºW)	Date of Maximum Eastern Extent	Date that Iceberg Limit Retreated North of 49ºN
2004	March 18	42	Various times between June 25 and July 26	41	June 30-July 3	August 12
2005	February 15	46.5	April 24-25	47.5	March 30-April 7 May 2-14	June 3
2006	March 29 August 5	48	May 30 August 9-12	46.6	August 8-10	May 31 August 13
2007	March 2	43	July 8-13	45	June 27-July 17	September 4
2008	February 9	41.3	May 29 –June 13	42.5	May 16-17	August 12

Source: Canadian Ice Services.

Comment #16 - Section 4.4.2.2 Iceberg Size Distribution, pg. 82 - Quantify small, medium and large icebergs. Small icebergs have heights of 5-15 m and lengths of 15-60 m (where the dimensions refer to the portion above water). Medium icebergs have heights of 16-45 m and lengths of 61-120 m. Large icebergs have heights of 46-76 m and lengths of 121-200 m.

Response:

Agreed. Iceberg size should have been quantified in the EA and will be captured in future EAs.

Comment #17 - Section 4.4.2.4 Iceberg Mass, pg. 83 - Add: Ice islands (very large, flat, tabular icebergs) sometimes reach the Grand Banks. Ice island masses can be significantly greater than those of regular icebergs, reaching billions of tonnes. In summer 2008, such an ice island broke off the Petermann Glacier in northwest Greenland and drifted south into Baffin Bay, where it was tagged with a beacon. At the time it was tagged, it was ~8+km long, 20+ km^2, had a draft of 50-55 m, and massed 1 billion tonnes. It passed Cape Dyer at the southern end of Baffin Island on January 29, 2009, at which time it measured 5km long and 13.75 km^2. This ice island may reach the Grand Banks in the summer 2009 season. The Petermann ice island can be tracked using the sailwx.info ship tracker. The beacon # is 47557.

Response:

Agreed. Information on ice islands should have been included in the EA and will be captured in future EAs.

Comment #18 - Section 5.2.1.2 Benthic, pg. 85 - The second paragraph suggests that the benthic species assessment is based on sampling conducted in 1976. There should be supplemental information to support this from other EEM programs.

Response:

These EEM data were referred to in the cross-reference to the new drill centre EA. Future EA documents will provide sufficient summary information supplemented by cross-referenced sources of additional information.

Comment #19 - Section 5.2.1.2 Benthic, pgs. 86-87 - The reference to Subsection 4.1.2.2 holds no merit unless it contains the relevant information.

Response:

Agreed. The reference to subsection 4.1.2.2 should not have been included.

Comment #20 - Section 5.2.2 Profiles of Commercially-Important Species, pg. 88 - Although it mentions that Atlantic cod is one of "…the main commercial species caught during regular stratified random bottom trawl surveys on the Flemish Cap" there is no detailed information provided.

Response:

Future EAs will definitely provide sufficient summary information supplemented by cross-referenced sources of additional information.

Comment #21 - Section 5.2.2 Profiles of Commercially-Important Species, pgs. 88-90 - Although the current "accepted" practice is cross-referencing materials from past assessments, at least some basic information regarding the life history characteristics of various species should be provided. American plaice, redfish and roughhead grenadier are good examples of the level of detail required.

Response:

Future EAs will provide sufficient summary information supplemented by cross-referenced sources of additional information.

Comment #22 - Section 5.2.2.1 Snow Crab, pg. 88 - Although catch values for 2006 are discussed, more recent data (2007) should also be provided.

Response:

The following text refers to snow crab resource assessment in 2007 (DFO 2008).

In the offshore area of NAFO Division 3L, both effort and landings in the snow crab commercial fishery have increased between 2001 and 2007; however, the commercial CPUE has declined during the same period. Based on the fall research vessel survey in 2007, exploitable biomass increased slightly between 2006 and 2007 but still remains low relative to previous years. Recruitment is expected to increase over the next several years.

In NAFO Division 3NO, the commercial snow crab fishery has been concentrated along the shelf edge. Landings in 2007 were about 28% lower than in 2004. CPUE remained relatively steady between 2004 and 2006 before decreasing in 2007. Exploitable biomass and recruitment on snow crab in 3NO are uncertain.

Comment #23 - Section 5.4.1.1 Seabird Survey Effort in the Study Area, pg. 110 - Another source of seabird observation data is Environment Canada's Eastern Canadian Seabirds at Sea (ECSAS) program. This program has conducted over 4000 surveys covering 7800 km of ocean track in the study area since 2006. This would considerably enhance the seabird data presented. This information is available by contacting Dave Fifield at David.Fifield@ec.gc.ca or (709) 772-3425 and should be included in future EA's for this area.

Response:

Noted. This information will be captured in future EAs.

Comment #24 - Section 5.4.1.2 & Section 5.4.1.4 Seabird Distributions in the Study Area, pgs. 114-117 - In both these sections, the authors refer to densities in the two last sentences of the paragraphs. The values presented are not densities, but are merely counts of birds sighted per linear kilometer, or relative abundances and should be indicated as such. The proponent should be aware that densities could be computed if they moved to using distance sampling methods which also have the added bonus of addressing detectability. A copy of the recommended protocol is attached.

Response:

We fully agree. The text should refer to counts of birds sighted per linear kilometre, NOT densities.

Comment #25 - Table 5.12, pg. 112 - The categories of Common, Uncommon, Scarce, and Very Scarce should be quantified.

Response:

Based on presently available information, it is not possible to quantify these types of qualitative categories which provide an indication of relative abundance.

Comment #26 - Table 5.15, pg. 117 - Under Procellariidae, the p in Storm-Petrels should be capitalized.

Response:

Noted. This will be corrected in future EAs.

Comment #27 - Section 5.6 Sea Turtles, pg. 128 - The following statement: "Sea turtles are probably not common in the study but are important to consider because of their threatened or endangered status…" may not be accurate since there is evidence that sea turtles are common within the study area according to McAlpine et al. (2000).

McAlpine, D.F. M.C. James, J. Lien and S.A. Orchard. 2000. Status and conservation of marine turtles in Canadian waters. *In:* Seaburn, C.N.L. and C. Bishop (eds). 2001. Conservation and Status of Reptiles in Canada. Herpetological Conservation 3. Society for the Conservation of Amphibians and Reptiles.

On page 2 of this report it states:

"…leatherbacks (and juvenile loggerheads) may be seasonally common in Canadian and international waters beyond the shelf break over the southern Grand Banks and Newfoundland Basin. There is now good evidence that eastern Canadian waters inshore from the continental shelf margin are also within the regular range of significant numbers of migrating leatherbacks and this area should be considered <u>important seasonal foraging habitat for the species</u>."

Response:

Noted. This information will be captured in future EAs.

Comment #28 - Section 5.7.1 Profiles of *SARA* Schedule 1 – and COSEWIC-Listed Species, pgs. 131-139 - Similar to comments made on Section 5.2.2, more information is required in the species profiles to ascertain the life history characteristics of these species. A brief summary would be useful similar to the roundnose grenadier description.

Response:

Future EAs will provide sufficient summary information supplemented by cross-referenced sources of additional information.

Comment #29 - Section 5.7.1.20 Bluefin Tuna, pg. 137 – Do you mean "dive to depths of 500 to 1000 m"?

Response:

Yes, it should read as '500-1,000 m', NOT as '500-100 m'.

Comment #30 - Section 5.8 Sensitive/Special Areas, pg. 139 - An important omission is the absence of any reference to the Ecologically and Biologically Significant Areas (EBSAs) identified by DFO Science Branch as part of Integrated Management Planning for the Placentia Bay/Grand Banks Large Ocean Management Area http://www.dfo-mpo.gc.ca/csas/Csas/DocREC/2007/RES2007_052_e.pdf. Four EBSAs are located within the project study area and EL 1089 is partially located within the Northeast Shelf and Slope EBSA. The Sensitive/Special Areas sub-section 4.1.6 in the recent (December 2008) HMDC screening report is an example of a recent document that includes references to EBSAs.

Response:

Four of the Ecologically and Biologically Significant Areas (EBSAs) identified within the Placentia Bay-Grand Banks Large Ocean Management Area (LOMA) occur either partially or entirely within the Project Study Area (see DFO 2007). Only one occurs partially within the Project Area. The four EBSAa are:

1. ***Northeast Shelf and Slope;***
2. ***Lilly Canyon-Carson Canyon;***
3. ***Virgin Rocks; and***
4. ***Southeast Shoal and Tail of the Banks.***

The Northeast Shelf and Slope is the EBSA which occurs partially within the Project Area. Three of the four EBSAs occurring within the Study Area, except Southeast Shoal and Tail of the Banks, have low 'total ranks' (range of 5.50 to 6.50). The Southeast Shoal and Tail of the Banks EBSA has the highest 'total rank' of all EBSAs within the Placentia Bay-Grand Banks LOMA (33.50). The depleted species identified in the Southeast Shoal and Tail of the Banks EBSA includes Atlantic cod, American plaice, capelin and leatherback sea turtles. Northern and spotted wolffishes were indicated as the depleted species in the Northeast Shelf and Slope EBSA, the one partially occurring within the Project Area. Atlantic cod and American plaice were also the depleted species of the Virgin Rocks EBSA. None were indicated for the Lilly

Canyon-Carson Canyon EBSA. More information regarding the Placentia Bay-Grand Banks LOMA management area science-based conservation objectives can be found in DFO (2007).

Comment #31 - Section 7.1 Effects of the Environment on the Project, 7.1.1 Physical Environment, pg. 151 - This section is very short and general. There were no specifics on typical limiting environmental conditions for each platform type, such as maximum wave crest height for jack-up platforms, or of wave height and period combinations for semi-submersibles. There was no mention of possible seasonal limits on the operation of any of the platform types, in relation to the seasonal frequency of occurrence of important thresholds. This section would be improved if it included description of actions that would be taken for each platform type and mooring system, in the event of a forecast of limiting threshold conditions, and the length of forecast lead time that would be required.

Response:

Limiting environmental conditions, such as wave crest height and period combinations, are generally rig-specific and are not able to be provided unless the drilling installation has been identified. Basically each drill rig will have its own unique:

- ***design environmental limits;***
- ***operating environmental limits;***
- ***station keeping design and operating limits (moored/DP/self-elevating, etc.); and***
- ***work task and equipment design and operating limit (e.g., run casing, BOP, crane limits, etc.).***

Seasonal and environmental limits for drilling installations can typically only be identified after performing operational limit analysis within the design environment for a specific rig type. These limits will then be defined in operational procedures and/or documents for the installation and specific control procedures will be outlined to ensure the risks are effectively managed. Depending on the risk, operational controls may be put in place that describe requirements ranging from personal protective equipment, revised operating practices, shutting down drilling operations to down manning the installation. In 1999, an operational limit analysis was completed for the Henry Goodrich MODU to better understand seasonal limits for the installation. The environmental design limits of the Henry Goodrich MODU, the drilling installation to be used for Petro-Canada's 2009 exploration drilling well are included in the following table (Transocean 2008).

Environmental Condition	Limit
Maximum Wave Height	**33.53 metres**
Significant Wave Height	**16.76 metres**
Significant Wave Height (while drilling)	**8.5 metres**
Average Zero Up-Crossing Wave Period	**14 to 20 seconds**
Average Wind Speed (1 minute sustained)	**110 knots**
Gust Wind Speed (3 seconds average)	**110 knots**
Maximum Current Speed (tidal)	**1.55 knots**
Maximum Current Speed (wind)	**1.55 knots)**
Total Current Speed (at surface)	**2.5 knots**
Minimum Operation Water Depth	**61 metres**
Maximum Operation Water Depth	**1,524 metres**
Minimum Daily Mean Temperature	**-10°C**
Maximum Air Temperature	**38°C**
Minimum Sea Temperature (below surface)	**-2°C**
Minimum Sea Temperature (surface)	**0°C**
Maximum Sea Temperature (surface)	**15°C**
Ice Load (while drilling)	**500 metric tonnes**

Prior to accepting any installation, it will be reviewed to ensure that it is suitable for the Project's operating environment and that it has all required certifications from appropriate regulatory authorities.

Comment #32 - Section 7.1.1 Physical Environment, pg. 151, 3rd Para - Quantify "most of the year": The project area is generally sea ice free from May through to February. The project area is generally iceberg-free from September through to February.

Response:

Noted. Addition of this information does not change the results of effects assessment in the EA.

Comment #33 - Section 7.2.2 Potential Effects of Routine Activities on VECs, pg. 163 – Since there is a potential for two rigs to be operating simultaneously, there will be added noise from the additional rig, traffic and activities if this does occur. The statement "…the assessment of the residual effects of the various routine activities associated with the concurrent drilling of two wells does not differ from the assessment of the residual effects of the same activities associated with the drilling of only one well at a time" needs to be qualified. It should be noted that noise would increase substantially if two units were deployed simultaneously.

Response:

The text should have read that the 'significance rating' results of the assessment of the effects of project-related noise on the various VECs do not differ between the 'one well' and the 'two concurrent wells' scenarios.

Comment #34 - Section 7.2.2.4 Project Residual Effects, pg. 183 - This section mentions the release of stranded birds such as Storm-Petrels. It should be noted that the release of stranded birds should be carried out following the standard protocol (CWS & Petro Canada).

Response:

Noted. Petro-Canada offshore assets, including operated drilling installations, and other vessels under contract to Petro-Canada in the waters off Newfoundland and Labrador are permitted by the Canadian Wildlife Service to salvage and release live sea birds under Permit LS 2379, Temporary Rehabilitation Permit - Live Seabirds (CWS 2009). The Permit specifies handling procedures for live and dead sea birds.

Comment #35 - Section 7.2.2.4 Cumulative Effects, pg. 183 - Increases in the number of drilling platforms have the potential to have cumulative light attraction effects on seabirds. Although there is little data available on the geographical extent of area affected by lights, the potential effect on birds is something that should be mentioned in this section.

Response:

The interaction of seabirds and lights was indicated in Table 7.14 and the assessment and determination of significance was included in Tables 7.15 and 7.16. Cumulative effects of lights from multiple drilling platforms are possible if the same birds encounter them. However, cumulative effects of lights from more than one well on seabirds would still be predicted as not significant as there is no information to suggest otherwise.

Comment #36 - Section 7.2.2.5 Marine Mammals and Sea Turtles, pg. 184 - There is no mention of noise in the description of the effects assessment. It is understood that there has been discussions in previous documents; however, it would be useful to at least mention some of these here. More information is required to support the assertion of not significant as reported on page 189 and Table 7.18.

Response:

Noise is indicated as a project activity that would interact with marine mammals and sea turtles in Tables 7.14, 7.17 and 7.18. More summary information coupled with cross-referencing to supplementary information will be provided in future EAs.

Comment #37 - Section 8.1.4.1 Historical Statistics for Extremely Large and Very Large Spills, pg. 208 - In Table 8.2, the title should read 1970-2001 as the source is from Gulf 1981, updated in 2001. More recent information would need to be presented if the title were to remain unchanged.

Response:

Noted. We are not aware of the occurrence of any 'very large' blowout spills since the latest one indicated in the table (i.e., 1992).

Comment #38 - Section 8.1.5.2 Calculated Probability of Blowout During Petro-Canada's Proposed Nine-Year Exploration Drilling Program, pg. 212 - Table 8.4 should be updated to incorporate more recent figures; data from 2005 does not need to be a forecast.

Response:

Blowout and spillage data relating to the US federal offshore wells will be updated as the data become readily available.

Comment #39 - Section 8.1.6.3 Calculated Frequencies for Petro-Canada's Proposed Nine-Year Exploration Drilling Program, pg. 215 - This assumption regarding the direct comparability of the US GOM and NLOA seems counterintuitive. The duration of the sample size would suggest that there should be more spills during the longer time frame, which would result in a higher probability compared to that of the NLOA experience.

Response:

The possible reasons for the discrepancies in probability between GOM and NLOA are provided in the last paragraph in Section 8.1.6.3.

Comment #40 - Section 8.2.2 Modelling in Support of Petro-Canada's 2002 Drilling EA, pg. 217 - The information provided in this section does not adequately represent the results obtained from the study. The same level of detail as provided in Section 8.2.1 should be presented, which would enable the reviewer to make an informed comparison.

Response:

The following provides more details on the modelling performed in support of Petro-Canada's 2002 drilling EA:

As indicated in the EA, details of the results of 2002 modelling for Petro-Canada are available in the Flemish Pass Exploration Drilling Program EA (Sections 3.1.2 and 3.2.3, and Appendices C and E in Petro-Canada 2002). One of the release locations used in the above-surface blowout, subsea blowout, and batch spill fate and behaviour modeling (i.e., Tuckamore) occurs in the Flemish Pass portion of the proposed Petro-Canada Study Area. Three of the release locations used in the spill trajectory modelling for Petro-Canada occur in the proposed Study Area Area; Gambo near the western border of the Project Area, Mizzen in

the northern Flemish Pass and Annieopsquatch in the southern Flemish Pass. Only Gambo occurs within the Project Area of this EA. Its coordinates are 46º 19.88'N, 48º 39.85'W.

For the above-surface blowout fate and behaviour modelling at Tuckamore (flow of 5,000 m^3/day crude oil and 177 m^3 gas/ m^3 oil), the predicted initial slick was wider and thinner in winter compared to summer. Slicks were predicted to completely disperse in 4 to 6 days and persistence of oil was predicted to be similar in both seasons. The maximum dispersed oil concentrations predicted for the Tuckamore above-surface blowout ranged from 0.57 to 0.81 ppm, the highest being in winter. Dispersed oil was predicted to diffuse to 0.1 ppm in 9 to 12 hours at which point the cloud width would be 740 to 960 m. Time to 0.1 ppm and cloud width would be highest in summer. Dispersed oil clouds were predicted to travel 8 (summer) to 12 (winter) km before concentrations dropped to 0.1 ppm.

For the subsea crude oil blowout fate and behaviour modelling at Tuckamore (flow of 5,000 m^3/day crude oil and 177 m^3 gas/ m^3 oil), the predicted slick behaviour did not vary by season. Slicks forming along the rise paths of the oil were predicted to disperse naturally within a maximum of 188 hours at the thickest part nearest the source and a minimum of 8 to 9 hours at the thinnest part furthest from source. The predicted maximum oil concentrations in the water column were estimated to be approximately 0.2 ppm in the vicinity of the thickest part of the slick and 0.08 ppm under the thinnest parts. Dispersed oil concentrations under the thick part of the slick were predicted to drop to 0.1 ppm within 3 to 6 hours at which time the dispersed oil cloud width would approximate 618 m and distance travelled by the dispersed oil cloud would range from 5 to 9 km.

Results of the batch diesel spill modelling at Tuckamore (10 bbl and 100 bbl spill scenarios) indicated that slick survival would be highest in summer (25 to 34 hours and that evaporation would be highest in summer. Peak in-water oil concentrations would range from 1.0 to 3.6 ppm but this concentration would decrease to 0.1 ppm within 10 to 42 hours.

None of the spill trajectory modelling results for releases at Gambo, Mizzen or Annieopsquatch indicated any oil contact with the Newfoundland coast. The spill probability areas associated with the Gambo release location were the largest of the three release locations while those associated with the Mizzen release location were smallest. Spill probability areas predicted for the Annieopsquatch release location were intermediate in size compared to the other two release locations.

Comment #41 - Section 8.7.3 Commercial Fisheries, pg. 232 - The third paragraph refers to the company's response to an oil spill for the fishing industry; however, the proponent's name is incorrect.

Response:

It is noted that the proponent's name should be corrected to read "Petro-Canada.".

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