



MARINE MAMMAL COMMISSION

17 November 2016

Dr. Jill Lewandowski, Chief
Division of Environmental Assessment
Office of Environmental Programs
Bureau of Ocean Energy Management
45600 Woodland Road, VAM–OEP
Sterling, VA 20166

Dear Dr. Lewandowski:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Bureau of Ocean Energy Management's (BOEM) draft programmatic environmental impact statement (DPEIS) regarding proposed geological and geophysical (G&G) activities on the Gulf of Mexico (GoMex) Outer Continental Shelf (OCS; 81 Fed. Reg. 67380). The DPEIS is associated with the letter of authorization (LOA) application that BOEM will submit to the National Marine Fisheries Service (NMFS). The Commission commented on the notice of intent to prepare the PEIS in its 9 July 2013 letter.

Background

In the DPEIS, BOEM investigated the impacts of multiple G&G activities on the GoMex OCS in the Western, Central, and Eastern Planning Areas during a 10-year period. G&G surveys are conducted to (1) obtain data for hydrocarbon and mineral exploration and production; (2) aid in siting of oil and gas structures and facilities, renewable energy structures and facilities, and pipelines; (3) locate and monitor the use of potential sand and gravel resources for development; (4) identify possible seafloor or shallow-depth geologic hazards; and (5) locate potential archaeological resources and benthic habitats that should be avoided. BOEM included seven alternatives¹ in its DPEIS but did not identify a Preferred Alternative. Those alternatives included—

- Alternative A—Pre-Settlement Alternative as of June 2013;
- Alternative B—Settlement Agreement Alternative as of June 2013 and February 2016;
- Alternative C—Alternative A plus additional mitigation measures;
- Alternative D—Alternative C plus marine mammal shut-down measures²;
- Alternative E—Alternative C plus reduced activity levels: Alternatives E1 and E2 include a 10 and 25 percent reduction, respectively, in deep-seismic, multi-client activities;
- Alternative F—Alternative C plus area closures; and

¹ See the DPEIS for more details.

² Except for bow-riding delphinids.

- Alternative G—No new activities: BOEM would cease issuing/renewing permits for G&G activities and approving/reauthorizing G&G surveys under exploration or development plans³, and NMFS would not authorize incidental taking of marine mammals under the Marine Mammal Protection Act (the MMPA), which is NMFS's No Action Alternative.

Take estimation and impact assessment

Both acoustic modeling of 3-D sound propagation based on six different G&G survey types and animat modeling of animal movement scaled to the appropriate density were used to estimate the numbers of marine mammal takes. In recent months, NMFS's new acoustic guidance for Level A harassment has been finalized but unfortunately has yet to be incorporated into BOEM's take estimation process. The new cumulative sound exposure level (SEL_{cum}) thresholds have decreased and the weighting functions have changed both in shape and amplitude from those previously analyzed in support of the DPEIS⁴, which were from Finneran and Jenkins (2012). As noted by BOEM, those differences⁵ account for a total threshold change of -22 dB for low-frequency cetaceans exposed to seismic surveys, which would increase both the impact area and the numbers of takes. The peak sound pressure level (SPL_{peak}) threshold⁶ also decreased for low-frequency cetaceans. BOEM indicated that similar, but not as pronounced, effects are observed based on the revised SEL_{cum} thresholds for non-impulsive sources as well. BOEM stated that it intends to review the guidelines further and work with NMFS regarding how to apply the new thresholds. The Commission advocates the use of best available science, especially for programmatic environmental compliance documentation that includes EISs and LOA applications. Thus, the Commission recommends that BOEM revise its Level A harassment take estimates and associated mitigation zones based on NMFS's new acoustic thresholds prior to finalizing the PEIS and submitting its LOA application to NMFS.

In addition, BOEM used two different types of thresholds to estimate the numbers of Level B harassment takes—one based on NMFS's unweighted SPL_{rms} threshold and the other based on a probability of response scale for M-weighted SPL_{rms} thresholds⁷ adapted from Wood et al. (2012; see Table 6 in Appendix D). However, BOEM did not stipulate which thresholds ultimately were to be used to estimate the total numbers of marine mammal takes. Further, BOEM has not provided summary tables that either stipulate the total numbers of takes estimated to occur on a yearly basis for the six survey types combined or the total numbers of takes that are associated with each of the seven alternatives—the latter issue is further compounded because some of the alternatives include reductions in activity levels and implementation of time-area closures, neither of which appear to be incorporated into modeling results for the various marine mammal species in Appendix D. All of these issues make it very difficult for both the public and the Commission to evaluate the appropriateness of the alternatives and have a clear understanding of the total estimated takes for each marine mammal species or stock. The Commission therefore is unsure how BOEM assigned

³ Thus, G&G activities would be phased out, fulfilling the No Action Alternative.

⁴ NMFS's old root-mean-square sound pressure level (SPL_{rms}) thresholds (180 and 160 dB re 1 μ Pa) were used in the analysis as well.

⁵ For mid- and high-frequency cetaceans, BOEM noted that the combination of the threshold and weighting function changes would generally reduce the number of estimated Level A harassment takes for a seismic survey.

⁶ Thresholds for mid- and high-frequency cetaceans either remain unchanged or increase by a few dB.

⁷ Different scales and thresholds were used for beaked whales compared to all other species.

significance criteria⁸ to evaluate the overall level of impact for the various stressors under the seven alternatives.

The Commission is concerned that BOEM's approach is neither accurate nor transparent and runs counter to the guidance provided in the National Environmental Policy Act (NEPA) implementing regulations. Section 1502.8 of the regulations states that EISs shall be written in plain language and may use appropriate graphics so that decision makers and the public can readily understand them. The Commission believes that BOEM has not met this directive under NEPA and recommends that BOEM specify (1) which Level B harassment threshold it intends to use and (2) the total numbers of marine mammals that could be taken by both Level A and B harassment incidental to G&G surveys under each of the seven alternatives in its final PEIS and the Preferred Alternative in its LOA application.

Model caveats

Throughout the DPEIS, BOEM noted as part of its model caveats that it and NMFS do not believe that every exposure to sound results in a 'take' as defined in section 101(a)(5)(A) or (D) of the MMPA. BOEM therefore indicated that exposure estimates delineated in the DPEIS are not the same as a 'take' or an injury to an animal. Multiple mischaracterizations seem to be present in these assertions. First, taking requiring authorization under section 101(a)(5)(A) and (D) of the MMPA is not limited to taking by injury. While only taking by harassment (Level A and B harassment) can be authorized under section 101(a)(5)(D), taking under section 101(a)(5)(A) can include taking by harassment, serious injury, and mortality. The vast majority of the takes authorized by NMFS under sections 101(a)(5)(A) and (D) of the MMPA are for Level B harassment, which is based on the potential to disturb not to injure a marine mammal or marine mammal stock. The current structure of BOEM's statement sounds as though it is considering only takes by injury.

Second, the main objective of modeling the numbers of exposures based on certain sound thresholds is to estimate the overall numbers of takes of the various species. The only time in which an exposure above those thresholds would not be considered a take is when the likelihood of such exposure has been reduced due to presumed effectiveness of mitigation measures or assumed avoidance (or aversion as noted in Appendix D) by certain species. That is a strategy that the Navy has used multiple times to reduce take estimates and with which the Commission disagrees. However, Appendix D noted that mitigation effectiveness is influenced by the ability to detect animals within the exclusion zone, which is based on the species' dive profile and surfacing behavior, weather conditions, and observational platforms. Because weather conditions are unknown beforehand and detection probabilities are difficult to predict, mitigation effectiveness is not included in the exposure estimates. Further, Appendix D recognized that aversion is a context-dependent behavioral response affected by energetic and reproductive state, social behavior, and health status of individuals. Since too little is known about the factors that lead marine mammals to avoid sound sources, aversive behavior also was not included in the exposure estimates. Given that neither 'reduction' was included in the exposure estimates nor presumably would be included post-processing, it is unclear why BOEM believes that the exposure estimates would not equate to estimated takes. It also is unclear if NMFS agrees with the model caveats stated throughout the

⁸ Including nominal, minor, moderate, and major—see Chapter 4 of the DPEIS.

DPEIS. Since NMFS is a cooperating agency on the DPEIS, it would be prudent for BOEM to ensure that NMFS agrees with those caveats.

If both BOEM and NMFS believe that the exposure estimates are unreasonably high and not reflective of a reasonable estimate of the total numbers of animals that potentially could be taken, that concern could have been addressed by incorporating some measure of uncertainty in the exposure or take estimates. Appendix D discussed uncertainties associated with both acoustic and animal modeling that were analyzed via various test case scenarios. However, it does not appear that those data have been used to the fullest extent, if at all. Because BOEM has not provided summary tables that delineate the total numbers of marine mammals that could be taken by both Level A and B harassment, the intent of BOEM's assertions regarding exposures and takes remains uncertain.

The point BOEM may have been attempting to convey in its model caveat sections is that every estimated exposure or take is not necessarily realized in practice. That is, for example, all 500,000 takes of sperm whales estimated by the model may not occur. This can be because the total number and type of seismic surveys used to derive the take estimates does not occur or does not occur in the proposed timeframe or area. If that is what was intended by BOEM, the DPEIS should be amended accordingly to state that point more clearly. Thus, the Commission recommends that BOEM, prior to finalizing the PEIS and submitting its LOA application to NMFS, consult with NMFS regarding BOEM's assertion that exposures do not equate to estimated takes under section 101(a)(5)(A) of the MMPA and clarify what it intended in making those assertions throughout the DPEIS. Uncertainty can be incorporated in the take estimates through reporting of probability distributions or confidence intervals, and a single take number could be authorized based on the median or mean number of estimated takes.

Preferred Alternative

Given that neither the Commission nor the public can review meaningfully the impact assessment, judge the appropriateness of the various alternatives, or decipher how BOEM intends to interpret takes, suggesting a Preferred Alternative is completely impractical. The range of alternatives appears to be suitable and includes various measures to reduce impacts on marine mammals including implementing shut-down procedures, using both visual and passive acoustic monitoring, implementing time-area closures, and reducing the overall level of activity. However, it appears that no single alternative currently includes all of those measures, which the Commission believes would be a more appropriate approach for BOEM to take.

For example, Appendix K investigated the cumulative and chronic effects of various activities primarily on the Bryde's whale's communication space based on some of the alternatives. That assessment highlighted how certain locations are noisier than others (specifically Site 5, deep offshore waters east of Mississippi Canyon), which can cause the greatest change in Bryde's whale available communication space and greatly reduce the listening area for the various functional hearing groups. Appendix K also underscored how closures at certain sites, which resulted in redistribution rather than actual reduction of the activities, led to increased levels of sound. BOEM should evaluate all such factors when determining its Preferred Alternative. Accordingly, the Commission recommends that BOEM incorporate marine mammal shut-down procedures, visual and passive acoustic monitoring, overall activity reduction (rather than redistribution), and

appropriate time-area closures in its Preferred Alternative to maximize the mitigation value for those species that are believed to warrant the greatest protection, including sperm whales, Bryde's whales, and bay, sound, and estuarine stocks of bottlenose dolphins.

Cumulative and chronic effects

As indicated herein, Appendix K delved into the loss in listening area and change in communication space primarily for Bryde's whales that are likely to result from the proposed activities. However, section 2.3.2 in Appendix K indicated that the top 10 percent of the greatest pulse exposures were removed from those analyses. Given that SEL_{cum} exposures are dominated by the source pulses generated closest to the receiver from spatially distributed and moving sound sources, inclusion of those pulses in a chronic effects assessment during a one-year period was considered unrepresentative and more relevant for assessing acute effects. The Commission is not convinced that that is a valid assumption and suspects those pulses would not be filtered out by the animal receiving them. Thus, those pulses invariably would contribute to the overall reduction in listening area and communication space. It also would be helpful to be able to compare the full dataset with the reduced dataset to distinguish how much those 'acute' effects add to the overall chronic exposure of the animal. Therefore, the Commission recommends that BOEM re-estimate the various listening area and communication space parameters based on the entire dataset rather than removing the greatest 10 percent of pulse exposures.

In addition, BOEM indicated that the chronic effects assessment was intended to ensure consideration of the longer-term and wider-ranging noise effects from the various sources and to augment the more traditional analysis of acute effects (i.e., Level A and B harassment). However, beyond presenting the results and the various associated caveats in section 4.14 of the DPEIS, BOEM has not fully described what, if anything, it plans to do with the results of that assessment. The Commission believes the chronic effects assessment should inform BOEM's selection of a Preferred Alternative. More specifically, given that take estimates for sperm whales are in some cases two orders of magnitude greater than for Bryde's whales, it would be prudent to investigate the sperm whale's communication space as well. That analysis should incorporate the assumption that the acoustic field produced by airguns above 1 kHz is stochastic and thus the airgun array is effectively omnidirectional. For certain locations, such as sites 5 and 6 where sperm whales are known to occur in greater numbers and which have reasonably flat bathymetries, a normal mode or BELLHOP model could be used to analyze the data much more quickly than using the full 3-D parabolic equation-based model, particularly as the higher-frequencies and lower effective source levels involved reduce the effective propagation range of concern. Other alternatives that have yet to be formalized could be analyzed in a similar manner. Thus, the Commission recommends that BOEM assess the communication space parameters for sperm whales under the various alternatives and any new alternatives to inform its selection of a Preferred Alternative. A substantial portion of this analysis can be performed with simplified (and much more rapid) acoustic modeling by focusing on regions with relatively flat bathymetry. The Commission also notes that incorporating figures for selected sites and functional hearing groups would allow the analysis to be more comprehensible than using the current multitude of tables.

Lowest practicable source level (LPSL)

As part of the June 2013 settlement, BOEM enlisted an expert panel to investigate the use of LPSL to both acquire the necessary subsurface target data and minimize horizontal propagation of sound that may affect marine mammals. Given the complexity of seismic surveys, the panel determined that it would not be reasonable or practicable to develop such metrics. Essentially, there is no one-size-fits-all survey design. The Commission agrees that LPSL is not feasible but believes that a better criterion than LPSL may involve determining how much acoustic energy is ‘wasted’—that is, how much energy radiates laterally⁹ instead of penetrating the ocean floor. Instead of implementing a prescriptive restriction on seismic surveys, a more reasonable regulatory approach may be to require industry operators to measure and report the horizontal leakage of the various array configurations by analyzing the ratio of the sound intensity directly below the array to the intensity at the critical angle¹⁰, essentially a ‘waste ratio’. Basic array theory suggests that there are a variety of ways to reduce this horizontal ‘sidelobe’ leakage below 200 Hz, which includes increasing the number of towed strings (while reducing the volume of individual airguns) and shortening the spacing between the airguns. Further, if airguns could be designed to have more reproducible signatures above 500 Hz, the horizontal leakage also might be reduced. The Commission recommends that BOEM require industry operators to measure and report the horizontal leakage of their various airgun arrays and investigate options to minimize horizontal sound leakage from those array configurations. Once sufficient data are obtained to inform a baseline distribution of the waste ratios, BOEM could set a threshold¹¹ for the operators to meet based on the median of those ratios.

The Commission appreciates the opportunity to provide comments on BOEM’s DPEIS. Please contact me if you have questions concerning the Commission’s recommendations or rationale.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

cc: Jolie Harrison, National Marine Fisheries Service

⁹ Energy that either propagates laterally or is emitted at horizontal angles less than or equal to the critical angle of the ocean floor, which then reflects back into the water column and propagates laterally—this is referred to herein as ‘horizontal leakage’.

¹⁰ Which is a function of site-specific sediment composition.

¹¹ Which may differ for the various types of surveys or other factors.

References

- Finneran, J.J., and A.K. Jenkins. 2012. Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis. SPAWAR Marine Mammal Program, San Diego, California, 64 pages.
- Wood, J., B.L. Southall, and D.J. Tollit. 2012. PG&E offshore 3D seismic survey project EIR—Marine mammal technical report. SMRU Ltd, University of St. Andrews, Scotland. 124 pages.