

Where We Stand on Seismic Regulation

This is the third CRE article about comments filed on the National Science Foundation's draft Programmatic Environmental Impact Statement ("DPEIS") for NSF's offshore and overseas seismic activities.¹ This third article discusses comments on the use of the so-called Southall Criteria to regulate seismic.

Summary

We believe that any significant change from the seismic regulation now required in the Gulf of Mexico is unnecessary to protect marine mammals or other species. We also believe that any significant change (*e.g.*, required use of acoustic models) would significantly increase the expense, delay, burden and uncertainty of seismic exploration. There is no evidence of a problem sufficient to justify this increase in expense, delay, burden and uncertainty.

The Southall Criteria are infeasible with regard to regulation of seismic behavioral effects, and they should not be used to regulate those effects.

Discussion

We understand that there are different positions on the federal regulation of seismic. There are some who may have a different interpretation of the science and available evidence. We invite anyone who disagrees with the positions and interpretations taken in our three articles to write us explaining why you disagree. Please use our Ocean Zoning Interactive Public docket at <http://www.thecre.com/creipd> to comment. We will publish any comments on our websites. To facilitate comment, and before discussing the Southall Criteria, we summarize below CRE's position on several important seismic issues. These issues are discussed in detail in our three articles.

- Longstanding federal government regulation of oil and gas seismic in the Gulf of Mexico and elsewhere is adequate to protect whales and other species from any significant adverse effect from seismic. No further regulation of seismic is necessary. The MMS/BOEMRE mitigation requirements applied in the GoM now and for decades are sufficient.

- The proprietary acoustic models used in the DPEIS are unnecessary and should not be required. We agree with the American Petroleum Institute that proprietary models should not be used unless they are absolutely necessary. If they are used, then the models' applications should

¹ CRE's first two articles are available online by going to <http://www.thecre.com/archives/index.html> ,

clicking on "2011 Archive," then clicking on "Who's Right about Seismic Models?" and/or "SPL vs. SEL."

be subject to external peer review before use.² The peer review panels should comply with OMB's Final Information Quality Bulletin for Peer Review.³

- The acoustic models used in the DPEIS cannot monitor or predict compliance with an SPL regulatory metric, and most if not all US regulation of seismic is based on an SPL metric.

- Any regulatory change from SPL to an SEL regulatory metric should not be proposed and addressed in a limited context like the DPEIS. Instead, a proposed change to SEL should be addressed in the context of NMFS' Acoustic Criteria proceeding that began in 2005 and has not yet been completed.⁴

- We believe that any change from SPL to SEL is unnecessary to protect marine mammals or other species. As discussed below, we also believe that any change to SEL, and any use of the Southall Criteria, are infeasible for the regulation of marine mammal behavioral effects. Consequently, other regulatory approaches such as context exposure should be considered if there is a move away from current regulation.

- Considering the lack of confidence and precision in any of the computer based assessments of acoustic impact, it is difficult to imagine how layers of additional impacts associated with other marine sounds (shipping, etc.) would be anything other than even less accurate; thus, we do not see calls for synergistic and cumulative effects to be either viable or practical.

- In sum, we believe that any significant change from the seismic regulation now required in the GoM is unnecessary to protect marine mammals or other species. We also believe that any significant change (*e.g.*, required use of acoustic models) would significantly increase the expense, delay, burden and uncertainty of seismic exploration with little or no compensating benefit to the animals.

The Southall Criteria are Infeasible to Regulate Behavioral Effects

The published report on the Southall Criteria explains the origin and purpose of the criteria as follows:

² API September 12, 2008 comments on EPA's CREM guidance, available online at http://insideepa.com/index.php?option=com_iwpfile&file=/dir_08/epa2008_1446a.pdf

³ Available online at <http://www.whitehouse.gov/sites/default/files/omb/memoranda/fy2005/m05-03.pdf>

⁴ See USGS IHA Application to NMFS, pages 23, 95 (May 27, 2010), available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/usgs_arctic_aha_application2010.pdf, for a discussion of the NMFS 2005 proceeding.

“A group of experts in acoustic research from behavioral, physiological, and physical disciplines was convened over a several year period. The purpose of this panel was to review the expanding literature on marine mammal hearing and on physiological and behavioral responses to anthropogenic sound, and to propose exposure criteria for certain effects. The group employed all available relevant data to predict noise exposure levels above which adverse effects on various groups of marine mammals are expected.”⁵

Pages 3-4 of joint industry comments on the DPEIS recommended use of the Southall Criteria and their SEL metric:

“1. Noise exposure criteria

We applaud NSF for considering the Southall et al. (2007) noise exposure criteria and including estimates of exposure using this criterion in the DPEIS. In our view, Southall et al. (2007) is the best available peer-reviewed scientific paper on noise exposure criteria and associated metrics. Southall et al. provides valuable information to assist in risk assessment of the potential for physical harm to individual animals during seismic operations. The criteria proposed by Southall et al. can and should help inform whether there is a risk of physical harm to animals both during regular operation and soft-start of a source array.

The current NMFS guidelines for Level A harassment under the MMPA are based on the root-mean-square (rms) sound pressure metric. ‘However, there is now scientific evidence that suggests that auditory effects of transient sound on marine mammals are better correlated with the amount of received energy than with the level of strongest pulse’ (DPEIS, page 2-47). Therefore, we strongly recommend the use the Southall et al. noise exposure criteria, which uses a sound exposure level (SEL) metric or at least development of a criteria based on SEL and not rms.

If the Industry Commenters are recommending use of the Southall Criteria to regulate behavioral effects on marine mammals, then we disagree with them on this issue. If industry is saying that they prefer SEL to SPL for physical injury, then we say that such a change should be addressed in a more considered way, NOT hidden in an NSF DPEIS.

There are two regulatory classes of adverse seismic effect on marine mammals: physical harm (*e.g.*, ear injury) and behavioral effects (*e.g.*, avoidance of the sound source). The Southall

⁵ Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations, Southall et al., AQUATIC MAMMALS, Vol 33, No 4 (2007), available online at http://thecre.com/pdf/Aquatic%20Mammals%2033%204_FINAL1.pdf

Criteria's standards for avoiding physical harm are based on an SEL metric and are generally higher than the SPL numbers currently used to regulate seismic.

The Criteria and the experts generating them have much more difficulty producing numbers to protect against behavioral effects on marine mammals. The experts admit that the data base is often unreliable and that they are unable to identify "broadly applicable, quantitative criteria for behavioral disturbance in response to multiple-pulse and nonpulse sounds." To be fair, we will quote the Southall report itself at some length on this very serious limitation with regard to seismic behavioral effects:

"One challenge in developing behavioral criteria is to distinguish a significant behavioral response from an insignificant, momentary alteration in behavior. For example, the startle response to a brief, transient event is unlikely to persist long enough to constitute significant disturbance. Even strong behavioral responses to single pulses, other than those that may secondarily result in injury or death (e.g., stampeding), are expected to dissipate rapidly enough as to have limited long-term consequence."

Consequently, upon exposure to a single pulse, the onset of significant behavioral disturbance is proposed to occur at the lowest level of noise exposure that has a measurable transient effect on hearing (i.e., TTS-onset). We recognize that this is not a behavioral effect per se, but we use this auditory effect as a *de facto* behavioral threshold until better measures are identified. Lesser exposures to a single pulse are not expected to cause significant disturbance, whereas any compromise, even temporarily, to hearing functions has the potential to affect vital rates through altered behavior.

For other anthropogenic sound types (multiple pulses, nonpulses), we conducted an extensive review of the available literature but were unable to derive explicit and broadly applicable numerical threshold values for delineating behavioral disturbance.

We did develop a quantitative scoring paradigm that numerically ranks, as a severity scaling, behavioral responses observed in either

field or laboratory conditions. We applied this approach to the appropriate behavioral data for multiple pulses and nonpulses. Some of these data suffer from poor statistical power, limited information on received sound levels and background noise, insufficient measurements of all potentially important contextual variables, and/or insufficient controls. Some such data are analyzed here solely for illustrative purposes. Most behavioral studies suffered from at least some of these problems.”

“The inability to identify broadly applicable, quantitative criteria for behavioral disturbance in response to multiple-pulse and nonpulse sounds is an acknowledged limitation.”⁶

These behavioral effects limitations and other problems have led experts to recommend the use of exposure context to regulate lower exposures. These lower exposures are generally the ones involved in behavioral effects regulation:

“*SEL* now seems not to be the silver bullet we were hoping it would be. Jim Finneran reported that *SEL* is appropriate only at fairly high exposures, and that context might be more appropriate at lower exposures”⁷

The Southall Criteria and accompanying report are a very useful compilation and analysis of research on seismic marine mammal effects up to the date of the report (2007). They do not, however, provide the basis for regulating seismic behavioral effects on marine mammals. In addition to problems discussed above, the Southall behavioral-effects criteria are inherently flawed because they attempt to be based on a dose response relationship, and there is none:

“[I]t has become clear that *exposure context* is a better index of behavioral response than is the dose-response relationship. Researchers looked for a dose-response relationship for decades but never found one. Bill Ellison has pushed the idea of context ever since SURTASS LFA Phase 2 when a sound source outside the gray whale migratory corridor failed to elicit the same response as a source directly in the corridor. The context of the

⁶ *Id.*, pages 413-414.

⁷ Trip Report: Cork, Ireland Conference on the Effects of Noise on Aquatic Life, Roger Gentry, August 31, 2010, available online at http://www.iagc.org/attachments/contentmanagers/1010/Gentry_JIP_doc_SummaryEffectsNoise_Conf_VF_2010_08_31.pdf

exposure (source placement) was more important than the magnitude of the exposure. Rebecca Dunlop reported how the Australian team has made context a central feature in our humpback study. [The JIP was seen to be at the cutting edge in this context issue]. Brandon Southall is including context in the Navy's attempts to measure noise effects on toothed whales in Southern California. Both studies involve a large number of possibly explanatory variables. This new development since Nyborg from exposure magnitude to exposure context represents a paradigm shift in our thinking."⁸

Given these flaws and limitations, the Southall Criteria are infeasible with regard to regulation of seismic behavioral effects, and they should not be used to regulate those effects.

⁸ *Id.*