

similar cumulative sound metric, Leq, for an entire year. This is not scientifically justified and leads to overestimates of takes by tens or even hundreds of thousands of takes, both Level A and Level B.

Because we do not have a specific recovery function to offer yet, BOEM has not included ANY recovery in their model, whereas a model consistent with best available science should include at the very least a recovery function consistent with human and other mammalian hearing. Absence of a recovery function is likely adding another 10 to 100 fold over-estimation to Level A take.

Thresholds for Level B take have been difficult to derive, although more and more publications have offered data and a proposed threshold function: most of these papers are not cited or reviewed in the EIS, or in the reference used by the Phase II model (Appendix D), which is an unpublished contract report to a California utility company (Wood et al 2012). Wood et al (2012) also presents a potential conflict of interest, since the author of Appendix H (Brandon Southall) is also a co-author of the Wood et al (2012) report. The industry is sponsoring a review of the behavioral effects literature, but that review will not be published in time to inform the current PEIS.

In any case, the Wood et al recommendation was a step function of increasing behavioral response at increasing exposure levels, and in this respect Wood et al (2012) is similar to other Level B risk assessments like the US Navy Programmatic EISs (2009; 2014, draft 2017). All recognize that out of a given group of animals, a few will respond at low levels, with increasing recruitment up to an exposure level that approaches thresholds for TTS and PTS. BOEM also applied the outdated NMFS 1995 Level B threshold of 160 dB SPLrms.

The outcome of applying any of these thresholds is the generation of tens of thousands to millions of Level B takes in which the vast majority of “takes” are transitory disturbances that last hours or a day or two and have no impact at all on foraging success, breeding success, growth, health or any other biologically meaningful metric. The hypothetical possibility that cessation of feeding for a day or movement a few miles from the source, or a change in vocal behavior “might” lead to biologically meaningful consequences means that the model calculations are treated as “takes” under MMPA even though all acknowledge that exposures don’t equal takes and takes do not equal meaningful effects. The development of the PCOD model, and population of that model with data, confirm that behavioral disturbance from sound needs to be reduced to a “biologically significant” number that is a fraction of the counted exposures; anywhere from a conservative 1% to a more realistic 0.001% or less. In other words, estimates of thousand to millions of takes in the model are like to result in fewer than 1 to 1000 takes with actual biological consequences. These numbers, spread across large areas like the Gulf and multiple species are mathematically too low to result in a population level consequence from Level B takes (e.g. elevation of baseline mortality, decrease in baseline fecundity). This is consistent with history, where more than five decades of regular geophysical survey effort all over the globe has not generated any evidence that observed behavioral responses to the sound has any biological consequence.

Calculation of grossly inflated Level B take numbers in the GOM DPEIS is not consistent with current best information, and greatly over-estimates the consequences for the stocks of marine mammals being managed.

Finally, behavioral aversion was not applied to this model, even though a preliminary Phase I model showed that even small amounts of aversive greatly affected both Level A and Level B takes. If

behavioral aversion is a trigger for Level B take then it cannot subsequently be omitted from modeling of Level A takes, since the low level exposures that trigger aversion will reduce the likelihood of higher levels of exposure.

Additional aspects of threshold assessment that may lead to over-prediction of takes include:

- Conservative thresholds for low frequency whales. Current conservative thresholds for whales increase the estimated Level A and Level B takes for these species by some 4 to 10 times over best available science predictions. Arguments for unreasonable precaution in the face of uncertainty are not consistent with mammalian auditory biology in general.
- JASCO applied novel uses of weighting functions, using outdated M1 weighting functions from Southall et al (2007) on SPL thresholds, where weighting functions should not be applied.
- Kogia are considered to have the same hearing thresholds as porpoises, even though they are unrelated and the evidence for high sensitive is based largely on data about Kogia vocal behavior and some inconsistent evoked potential audiometry.
- Modifications to beaked whale Level B thresholds unique to this EIS are applied without justification other than precaution.

#### Mitigation.

BOEM allowed no reduction in the estimated take for mitigation. This is a highly over-conservative assumption, justified by the relatively little data available on mitigation effectiveness, together with the likely variability in mitigation effectiveness between mitigation service providers, types of marine species present, monitoring conditions and other variables. Some analysis on page D-151 suggests ranges of observer mitigation effectiveness from near zero to over 70%. One cannot require mitigation and at the same time treat it as if it provides no reduction in takes. BOEM needs to come up with some metric for the benefits from required mitigation. A variety of other possible mitigations have been proposed in the GOM DPEIS, ranging from alternative source technologies and active acoustic mitigation to time/area closures, vessel separation schemes, and reduced quantities of geophysical survey effort of 10-25%. At least two of the suggested mitigation measures, vessel separation (Table ES-1; page 1-10; page 2-10; B-32; page 2-38; and D-162-163) and shutdowns for dolphins approaching vessels or bowriding (p. 2-24) offer the possibility of actually increasing takes through expansion of ensonified areas (vessel separation), or extremely high increases in shutdowns with associated prolongation of survey effort (and sound exposure) to achieve survey completion (an estimated 35-40% increase).