

**CRE WHITE PAPER:
THE NATIONAL MARINE FISHERIES SERVICE (“NMFS”)
SHOULD REGULATE SEISMIC UNDER THE MARINE MAMMAL
PROTECTION ACT (“MMPA”) IN A TWO-TIER MANNER**

EXECUTIVE SUMMARY

NMFS should implement the MMPA for seismic in the following two-tier manner. The first tier should be implemented immediately for all requests for Incidental Harassment Authorizations (“IHAs”). The second tier should be implemented as soon as possible through the development and promulgation of 5-year rules.

Tier I (for individual IHAs issued before final rules are published)

- *Use Line Transect Analysis to estimate exposures including: (1) the number of line miles (or line kilometers) traversed, (2) estimated radial distance to the edge of a safety, impact, or exclusion zone; and (3) the densities of marine mammals present. No models should be used to estimate exposures before the models meet Data Quality Act (“DQA”) guidelines; before they meet Council for Regulatory Environmental Modeling (“CREM”) guidelines; and before they pass external peer review. No models should be used before they have been demonstrated to be more reliable than the currently approved and used methodology: Line Transect Analysis*
- *Use average density numbers to estimate marine mammal exposures to seismic. Do not use maximum density numbers.*
- *Explain that **exposure** to seismic does not necessarily equate to **harassment** and a **taking** under the MMPA. Explain that “simple exposure to sound, or brief reactions that do not disrupt behavioral patterns in a potentially significant manner, do not constitute harassment or ‘taking’. By potentially significant, we mean ‘in a manner that might have deleterious effects to the well-being of individual marine mammals or their populations.’”¹ Factor this explanation into NMFS’ use and discussion of Line Transect Analysis. Also factor into exposure analysis the fact that whales do not sit still and therefore do not get the full dose of sound on every shot.*

¹ The quoted language is from the Request by the University of Texas for an Incidental Harassment Authorization to Allow the Incidental Take of Marine Mammals during a Low-Energy Marine Seismic Survey in the Northeast Pacific Ocean, June–July 2008, pages 86-87, available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/utig_iha.pdf, (hereinafter cited as UT IHA).

- *Regulate at 180 dB and 500 meters unless and until other levels are shown DQA compliant and necessary. These standards have been consistently applied in the Gulf of Mexico and elsewhere without harm to marine mammals.*
- *Require Passive Acoustic Monitoring (“PAM”) if and when it is demonstrated to be accurate and reliable after public comment on the issue.*

Tier II (for rules)

- *Replace Line Transect Analysis with the Acoustic Integration Model (“AIM”) when AIM is DQA compliant, meets CREM guidelines, and passes external peer review.*
- *Only use propagation models that are shown to be DQA compliant, shown to be CREM compliant, and which pass external peer review. Use results of the current multi-million dollar research effort on this issue and on the dB level issue. M-weighting should be used. M-weighting is a filtering algorithm that de-emphasizes frequencies which an animal of concern cannot hear, or hears only weakly.*
- *Use average density numbers to estimate marine mammal exposures to seismic. Do not use maximum density numbers.*
- *Explain that **exposure** to seismic does not necessarily equate to **harassment** and a **taking** under the MMPA. Explain that “simple exposure to sound, or brief reactions that do not disrupt behavioral patterns in a potentially significant manner, do not constitute harassment or ‘taking’. By potentially significant, we mean ‘in a manner that might have deleterious effects to the well-being of individual marine mammals or their populations.’”² Also factor into exposure analysis, and into any models used, the fact that whales do not sit still and therefore do not get the full dose of sound on every shot.*
- *Incorporate dose response into AIM in a manner which complies with the DQA, which complies with the CREM guidelines, and which passes external peer review.*
- *Regulate at 180 and 500 meters until and unless other levels are shown DQA compliant and necessary.*
- *Require PAM if and when it is demonstrated to be accurate and reliable.*

² UT IHA, pages 86-87, available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/utig_iha.pdf.

BACKGROUND

Academia and the oil and gas industry have been conducting seismic surveys in the Gulf of Mexico (“GOM”) and elsewhere for decades. There is no evidence that these seismic surveys have harmed marine mammals. The GOM seismic surveys have to comply with mitigation provisions imposed by the Minerals Management Service (“MMS”). These provisions require shutdown when marine mammals come within 500 meters of the seismic vessel. The 500 meter safety radius is based on a 180 dB ensonified zone.

On September 29, 2004, MMS petitioned NMFS to publish Take regulations under the MMPA for seismic operations in the GOM.

NMFS is developing a draft EIS and proposed Take rules for GOM seismic. The EIS for the rules is being prepared by NMFS’ contractor, Marine Acoustics, Inc. (“MAI”). MAI intends to use its proprietary AIM to estimate marine mammal seismic exposures in the GOM.

LINE TRANSECT ANALYSIS IS THE STATUS QUO FOR ESTIMATING EXPOSURES

MMS has regulated GOM seismic for years without problems. MMS does not use a model to estimate seismic exposures. Instead, MMS applies Line Transect Analysis. This analysis estimates marine mammal exposures to seismic by using:

- the number of line miles (or line kilometers) traversed;
- the estimated radial distance to the edge of a safety, impact, or exclusion zone; and
- and the densities of marine mammals present.

This approach to exposure analysis is support by extensive MMS NEPA review.³

NMFS also uses Line Transect Analysis to estimate seismic exposures of marine mammals. For example, in 2006 NMFS issued an IHA to Conoco Phillips Alaska, Inc., for open water seismic data

³ See, e.g., Geological and Geophysical Exploration for Mineral Resources on the Gulf of Mexico Outer Continental Shelf. Final Programmatic Environmental Assessment, *available online at* <http://www.gomr.mms.gov/PDFs/2004/2004-054.pdf>; Gulf of Mexico OCS Oil and Gas Lease Sales: 2007-2012, Western Planning Area Sales 204, 207, 210, 215, and 218, Central Planning Area Sales 205, 206, 208, 213, 216, and 222, Final Environmental Impact Statement , OCS EIS/EA, MMS 2007-018, *available online at* <http://www.gomr.mms.gov/PDFs/2007/2007-018-Vol11.pdf>; and Gulf of Mexico OCS Oil and Gas Lease Sale 224, Eastern Planning Area, Final Supplemental Environmental Impact Statement OCS EIS/EA, MMS 2007-060, *available online at* <http://www.gomr.mms.gov/PDFs/2007/2007-060.pdf>.

acquisition in the Chukchi Sea during the summer and fall of 2006. NMFS based marine mammal seismic exposure estimates “upon line miles of survey effort, animal density and the calculated zone of influence (ZOI).”⁴ NMFS described Line Transect Analysis as a “valid” method of estimating exposures. NMFS also stated that exposure estimates based on Line Transect Analysis are “conservative,” and that the seismic operations “may actually affect far fewer animals.”⁵

The following recent NMFS IHA’s also use Line Transect Analysis for offshore seismic:

- 2008 UT IHA for seismic surveys of methane vents in northeastern Pacific Ocean;⁶
- 2008 ASRC Open Water Seismic Survey in Chukchi Sea, AK;⁷
- L-DEO’s seismic operations in the Eastern Tropical Pacific Ocean;⁸
- L-DEO’s seismic operations in Central America;⁹
- Scripps’ seismic operations in Northeast Pacific Ocean;¹⁰
- Shell’s Arctic seismic program;¹¹
- Scripps’ seismic operations in the Northeast Indian Ocean;¹²

⁴ 71 FR 43112, 43121 (July 31, 2006).

⁵ *Id.*

⁶ Available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/utig_iha.pdf.

⁷ 73 FR 22922, 22928 (April 28, 2008), available online at <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr73-22922.pdf>.

⁸ Pages 63-64 of EA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/ldeo_etp_ea.pdf.

⁹ Pages 93-94 of EA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/ldeo_centralamerica_ea.pdf.

¹⁰ Pages 51-54 of EA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/scripps_nep_ea.pdf.

¹¹ Pages 15-17 of IHA application available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/shell_arctic_seismic_iha_app.pdf.

¹² Pages 60-61 of EA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/scripps_indianocean_ea_draft.pdf.

- Shell's Beaufort Sea drilling program;¹³
- ConocoPhillips' seismic operations in Cook Inlet Alaska;¹⁴
- Union Oil's seismic operations in Cook Inlet, Alaska;¹⁵
- L-DEO's Acoustic Calibration & Seismic Testing Program in the Northern Gulf of Mexico ¹⁶
- 2006 Conoco Phillips' Open-Water Seismic Survey in the Chukchi Sea;¹⁷
- 2006 GXT's Seismic Surveys off Alaska;¹⁸ and
- 2006 Shell's Seismic Surveys off Alaska.¹⁹

We could provide more example of NMFS' use of Line Transect Analysis to estimate marine mammal seismic exposures, but in the interests of brevity we won't.

Line Transect analysis is not limited to marine mammals counts. "Line transect sampling methods are commonly used by biologists to estimate population density."²⁰ Line Transect Analysis is taught in

¹³ Pages 12-17 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/soi_iha.pdf.

¹⁴ Pages 15-17 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/cookinlet_conocophillips_iha.pdf.

¹⁵ Pages 19-21 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/cookinlet_unionoil_iha.pdf.

¹⁶ Pages 50-55 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/cookinlet_unionoil_iha.pdf.

¹⁷ Pages 11-15 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/iha_cpai.pdf.

¹⁸ Pages 25-37 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/gxt_iha.pdf.

¹⁹ Pages 12-17 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/iha_shell_beaufortsea.pdf; and pages 12-18 of IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/iha_shell_chukchi.pdf.

²⁰ Combining Population Density Estimates in Line Transect Sampling Using the Kernal Method, Gerard, P. et al., [Journal of Agricultural, Biological & Environmental Statistics](#), Volume 7, Number 2, 1 June 2002 , pp. 233-242(10).

universities.²¹ It has been used to estimate densities for everything from residue present on soil surface for conservation tillage,²² to fox feces in Norway.²³

Line Transect analysis should continue to be used to regulate seismic unless and until NMFS develops a model which is more accurate, which is DQA compliant, which meets CREM standards, and which passes external peer review.

**NMFS SHOULD NOT USE AIM BEFORE IT MEETS CREM AND DQA GUIDELINES
AND BEFORE AIM PASSES EXTERNAL PEER REVIEW**

AIM “is a software package whose primary use is to develop specific application models which [are] used to predict the average number of marine mammals which would be exposed to sound levels above a given threshold.”²⁴ AIM is proprietary to MAI.

In contrast to the ubiquitous and successful use of Line Transect Analysis, we have found no instances where NMFS or MMS used the AIM to estimate marine mammal exposures from oil and gas seismic operations.²⁵

²¹ E.g., Fish & Wildlife Population Ecology, *Lab 6: Line Transect*, University of Idaho, available online at <http://www.cnr.uidaho.edu/wlf448/lab5line.htm>.

²² Wollenhaupt, N., Estimating Residue: Line Transect Method, University of Missouri Extension, available online at <http://extension.missouri.edu/explore/agguides/agengin/g01570.htm>.

²³ Fuglei, e. et al., Spatial Distribution of *Echinococcus multilocularis*, Svalbard, Norway, *Emerging Infectious Diseases Journal*, CDC (Jan. 2008), available online at <http://www.cdc.gov/eid/content/14/1/73.htm>.

²⁴ Summary Report: Review of Acoustic Integration Model (AIM) 25-27 September, 2006 Washington, D.C., Cordue et al. (December 11, 2006)(“*Peer Review Report*”), at page 1, available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/lfa_aim_review.pdf

²⁵ The Navy has used AIM for IHAs for Surveillance Towed Array Sensor System Low Frequency Active Sonar. E.g., Navy IHA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/lfa_app.pdf. AIM has also been used to estimate exposures incidental to the continued operation of a low frequency sound source operated by Scripps for acoustic thermometry. 66 FR 43442 (August 17, 2001). AIM has also been used by MMS to estimate exposures from explosive removal of old oil and gas rigs. LOA available online at http://www.nmfs.noaa.gov/pr/pdfs/permits/application_rig_removal_gulf.pdf.

NMFS sponsored a peer review of AIM's use for a "Draft EIS for Gulf of Mexico Seismic Surveys," 72 FR 46846, 46860 (Aug. 21, 2007). The referenced EIS is the draft EIS in response to MMS' petition for oil and gas seismic take rules for the GOM.

External peer review of aim was necessary because "continued use of the model to provide acoustic exposure and impact predictions for regulatory assessment purposes requires that the model be reviewed independently, so that NOAA and other federal agencies can comply with the Data Quality Act."²⁶

NMFS' Data Quality Act guidelines are available online at <http://www.sefsc.noaa.gov/iqa/iqa.jsp>. Among other quality standards, the DQA guidelines require that information disseminated by NMFS be accurate and reliable. NMFS' DQA website explains that the agency's compliance with the DQA guidelines is "crucial," and that Agency staff have to create "Information Quality Act Pre-dissemination Review & Documentation Forms."²⁷

During their peer review of AIM, NMFS asked the Peer Review Panel for their opinion on whether "AIM correctly implements the models and data upon which it is based; whether animal movements are adequately simulated; and whether AIM meets the Council for Regulatory Monitoring (CREM) guidelines for model development and evaluation."²⁸

The Peer Review Panel was unable to approve AIM for several reasons. One reason is the absence of sufficient data to determine whether AIM's exposure and Take estimates are accurate and reliable. In the Panel's own words:

"In short, the quality of predictions resulting from AIM depends on research in a variety of areas that is ongoing."²⁹

The Peer Review Panel discusses and describes the missing and necessary data throughout its report.³⁰ Until the ongoing research generates these data, AIM cannot be judged accurate, reliable and compliant with the Data Quality Act.

²⁶ *Peer Review Report* at 17-18.

²⁷ See <http://www.sefsc.noaa.gov/iqa/iqa.jsp>.

²⁸ *Peer Review Report* at 1. The CREM draft guidelines for validation, acceptance and use of regulatory models are available online at http://cfpub.epa.gov/crem/knowledge_base/knowledge_base.cfm#model_guidance.

²⁹ *Peer Review Report* at 52-53.

³⁰ See, e.g., *Peer Review Report* at 1, 6-7, 9, 11-12, 38-39, 40, 61, 62-63, 109.

The Peer Review Panel's concern is consistent with the recent article *Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations*, Southall et al., *Aquatic Mammals*, 33 (4) (2007) ("*Southall*").³¹

The *Southall* article repeatedly emphasizes problems in the current database.³² For example:

- “To assess and quantify adverse behavioral effects of noise exposure, a metric for the impact such changes might have on critical biological parameters such as growth, survival, and reproduction is needed. Behavioral disturbances that affect these vital rates have been identified as particularly important in assessing the significance of noise exposure (NRC, 2005). Unfortunately, as Wartzok et al. (2004) pointed out, no such metric is currently available, and it is likely to take decades of research to provide the analytical framework and empirical results needed to create such a metric, if one in fact is ultimately even viable.”

Southall at page 446.

- “There is an urgent need for better and more extensive data on behavioral responses to sound, including measurement of the specific acoustic features of exposures and consideration of previous experience with the sound and all relevant contextual variables. The current behavioral exposure criteria are quite limited in several ways.”

Southall at page 477.

Inadequate data are not the only problem with AIM.

The Peer Review Panel recommended more and better sensitivity and uncertainty analyses for AIM. In the panel's own words:

“The CREM guidelines go into quite some detail on the types of uncertainty and sensitivity analyses which are required for an application model to meet the guidelines. There are few restrictions within AIM which would prevent suitable analyses being

³¹ Available online at http://thecre.com/pdf/Aquatic_Mammals_33_4_FINAL.pdf

³² See, e.g., *Southall* at pages 413, 414, 436, 446, 477. The *Southall* article also cautions on page 17 against its use in a regulatory context: “our exposure criteria were derived without regard for policy decisions of the U.S. or any nation and should therefore not be assumed to correspond with regulatory categories or definitions of effect.”

performed. However, it is abundantly clear that these analyses have not been performed in applications to date.”³³

In other words, AIM does not meet the CREM guidelines for models, and AIM should not be used by federal regulatory agencies before it does.

Finally, the Peer Review Panel emphasized that consistency with the CREM guidelines would have to be demonstrated for each application of AIM. No single, general peer review of AIM is sufficient for any specific application.³⁴

NMFS should not base either 5-year rules or IHAs on AIM before the model meets the CREM and DQA guidelines. Instead, NMFS should use Line Transect Analysis to regulate seismic effects on marine mammals unless and until AIM or some other model is shown to be more accurate, DQA Compliant, CREM Guideline Compliant, and approved by external peer review.

**USE AVERAGE DENSITY NUMBERS TO ESTIMATE EXPOSURES,
NOT MAXIMUM DENSITY NUMBERS**

NMFS’ Ken Hollingshead recently signed a Declaration that was filed by the Government in the case *Native Village of Point Hope v. Minerals Management Service*.³⁵ Mr. Hollingshead’s Declaration stated, “Using maximum density estimates [of marine mammals] is problematic as it tends to inflate harassment take estimates to an unreasonable high number and is not based on empirical science....As such, NMFS prefers to use the average density numbers....”³⁶

Mr. Hollingshead is correct. All IHAs or rules regulating seismic should reiterate his statement and use average density estimates to regulate rather than maximum density estimates.

**ALL IHAS AND ANY DOSE RESPONSE FACTOR SHOULD REFLECT THE PRINCIPLE
THAT EXPOSURE TO SEISMIC DOES NOT NECESSARILY EQUATE TO
HARASSMENT AND A TAKING UNDER THE MMPA**

The UT IHA application states principles that should be part of all seismic IHAs and all seismic rules:

³³ *Peer Review Report* at pages 11-12.

³⁴ *Peer Review Report* at page 1.

³⁵ Declaration in support of Opposition to Motion for Preliminary Injunction, signed and dated May 27, 2008, available at http://thecre.com/pdf/Hollingshead%20_%20Dec%20_%20scan.pdf

³⁶ *Id.*, page 5, para. 9.

“...a simple change in a marine mammal’s actions does not always rise to the level of disruption of its behavioral patterns. ... If the only reaction to the [human] activity on the part of the marine mammal is within the normal repertoire of actions that are required to carry out that behavioral pattern, NMFS considers [the human] activity not to have caused a disruption of the behavioral pattern, provided the animal’s reaction is not otherwise significant enough to be considered disruptive due to length or severity. Therefore, for example, a short-term change in breathing rates or a somewhat shortened or lengthened dive sequence that are within the animal’s normal range and that do not have any biological significance (i.e., do not disrupt the animal’s overall behavioral pattern of breathing under the circumstances), do not rise to a level requiring a small take authorization.” (NMFS 2001, p. 9293). Based on this guidance from NMFS (2001) and the National Research Council (NRC 2005), we assume that simple exposure to sound, or brief reactions that do not disrupt behavioral patterns in a potentially significant manner, do not constitute harassment or “taking”. By potentially significant, we mean “in a manner that might have deleterious effects to the well-being of individual marine mammals or their populations.”³⁷

NMFS should modify AIM to include a dose response component. Any dose response component for seismic should be consistent with the principles stated above. Any IHAs based on Line Transect Analysis should also be consistent with these principles.

NMFS SHOULD REQUIRE PAM IF AND WHEN PAM IS DEMONSTRATED TO BE ACCURATE AND RELIABLE

Seismic safety radii have traditionally been monitored by visual observers on board the seismic vessel. Visual monitoring is problematic at night or at other times of poor visibility.

NMFS previously questioned the use of Passive Acoustic Monitoring (PAM) to supplement visual observations of marine mammals. We recommend that NMFS publicly review the current science and data on PAM. If after reviewing and responding to public comment on this issue, NMFS concludes that PAM can under specified circumstances be accurate and reliable, then NMFS should require PAM to supplement visual monitoring in both IHAs and 5-Year rules.

REGULATE AT 180 dB, AND REQUIRE A 500 METER SAFETY RADIUS, UNLESS AND UNTIL OTHER LEVELS ARE SHOWN DQA COMPLIANT AND NECESSARY

MMS requires that GOM seismic operators implement safety radii. These radii are established on the basis of sound levels emanating from the seismic vessel. In the GOM, MMS

³⁷ UT IHA, at pages 86-87.

uses 500 meters as the boundary level for the radii. This radius is assumed to mark the 180 dB ensonified zone. Beyond 500 meters, sound levels are assumed to drop below 180 dB. Seismic operations must cease when marine mammals are observed to enter the 500 meter radius.

There is no recorded harm to marine mammals from seismic using the 500 meter radius.

Industry is conducting a multi-million dollar research effort on the safety radius/dB issue. The 500 meter radius and 180 dB levels should be retained unless and until this research effort demonstrates that another safety radius or dB level is DQA compliant and necessary.

Conclusion

NMFS should implement MMPA requirements for GOM seismic in the two-Tier manner described above.