

Open Water Peer Review Panel Monitoring Plan Recommendations Report

After discussion and review of TGS's Marine Mammal Monitoring Plan (4MP) for its proposed Marine 2D Seismic Program in the Chukchi Sea, Alaska, panel members have answered the questions below set forth by the National Marine Fisheries Service's Office of Protected Resources (OPR) and provide the following recommendations. Answers to, and recommendations based on, the specific questions were developed using the general monitoring requirements outlined in the Marine Mammal Protection Act (MMPA) implementing regulations and further guidance provided by OPR, which were included in the Instruction document and have been copied into this document below the questions.

Summary of Activity:

TGS intends to conduct a 2D seismic survey in the Chukchi Sea during the open water season of 2013. They propose to conduct surveys along approximately 9,600 km of predetermined lines in Alaskan and international waters. They intend to begin surveys sometime between 15 July and 5 August. Seismic operations would likely occur on 35 days, over a 45- to 60-day period in Alaska, and another 33 days of seismic operations in international waters. The actual number of days of seismic operations will depend on ice and weather conditions. Two vessels are planned to be used, a seismic source vessel, which will tow the airgun array and a single 8,100 m long hydrophone streamer, and a smaller vessel that will be used to visually search for marine mammals and scout for ice and other hazards in front of the source vessel. The airgun array will have a total discharge volume of 4,100 in³ and seismic shots will occur approximately every 10 seconds.

The 4MP proposed by TGS (Section 13 of the IHA application) consists of one primary monitoring approach: vessel-based protected species observers (PSOs). They also intend to conduct sound source verification (SSV) of the seismic array prior to the commencement of the survey. Results from the SSV will be used to modify the size of the safety and behavioral radii, if needed. The main purpose of the 4MP is to mitigate the potential for harmful impacts that project activities might have on marine mammals and the availability of those subsistence resources to North Slope communities. PSOs on the two vessels will record all marine mammals sighted. At least two PSOs will be on duty on the source vessel (TGS clarified there will be two observers on duty even through the IHA application states one) during seismic operations and during all 30-minute periods prior to and during ramp up of the airgun array. At least one PSO will be on duty on the scout vessel.

No acoustic or aerial survey monitoring was proposed by TGS in their IHA application. During discussions with the peer review panel, TGS expressed willingness to consider other monitoring approaches that might be implemented during the seismic survey.

Questions

I. Will the applicant's stated objectives effectively further the understanding of the impacts of their activities on marine mammals and

otherwise accomplish the goals stated below? If not, how should the objectives be modified to better accomplish the goals below?

TGS listed their objectives as “the vessel based monitoring will provide” (section 13.1.1):

- 1) the foundation for real-time mitigation as required by the permitting agencies;
- 2) information necessary to estimate the number of “takes” of marine mammals that must and will be reported to NMFS or USFWS;
- 3) information necessary to evaluate the impact of activities authorized by the IHA and LOA on marine mammals and local subsistence activities;
- 4) marine mammal distribution, movement, and behavioral data in the survey area when seismic activities are taking place or not.

Objective 1: The peer review panel agreed that the objective of vessel-based monitoring to implement mitigation measures to prevent or limit Level A takes is appropriate. This objective will likely not provide a further understanding of the impacts of their activities on marine mammals.

Objectives 2-3: These two objectives are appropriate; however, the monitoring plan will not provide the information necessary to accomplish the objectives (see Section II, below, for additional details).

Objective 4: This final objective is also appropriate; however, the monitoring plan will not provide the information necessary to accomplish this objective (see Section II, below, for additional details).

II. Can the applicant achieve the stated objectives based on the methods described in the plan?

Objective 1: The peer review panel agreed that vessel-based monitoring will provide the monitoring foundation that will allow for some real-time mitigation, namely the implementation of ramp downs or shut downs if a marine mammal is observed within a safety radius or is about to enter one. Concerns were expressed by panel members about limitations of PSOs to monitor the entire safety zones, even in the best conditions, due to the distance to the safety radii. PSOs will have the ability to monitor only some portions of the safety zones. During inclement weather or darkness, limitations of PSOs further increase and they will not be able to effectively monitor the safety zones.

Objectives 2-3: These two objectives will not be achievable using PSOs. The proposed approach to meet each of these objectives may provide some information that is useful in assessing some of the potential impacts of the activities on marine mammals, but only on those animals that surface close to the vessels. The radii where behavioral impacts may occur include the 160 dB NMFS Level B harassment radius, and the radius to 120 dB. Even though the 120 dB zone is currently not required to be monitored by NMFS, available data suggest that bowhead whales (Blackwell et al., 2013) and perhaps belugas respond to industrial sounds at considerable distances or at these low levels of received sound from the source. For TGS’s proposed 2D

seismic operations, the 160 dB and 120 dB radii are much larger than the safety radii: the 160 dB radii are 9.6 to 18 km, depending on the depth (Table B-2 of the IHA application), and the 120 dB radius may be several hundred kilometers (Appendix C. Tables 5, 6, and 7). PSOs will not be able to adequately monitor either of these behavioral zones. PSOs on the scout vessel will only be able to monitor a small portion of the 160 dB zone, but potential impacts from the scout vessel on marine mammals may create biases in the sighting data. Because of the limitations of PSOs and the sensitivity of some marine mammal species in the Chukchi Sea to industrial sounds, objectives 2 and 3 cannot be accomplished.

Objective 4: Similar to objectives 2 and 3, this final objective cannot be accomplished, except within the visual sighting distance of the PSOs stationed on the source and scout vessels. Some information can be gathered on the distribution, movements and behaviors of marine mammals seen by PSOs. Those sightings can be compared between times with an active airgun array and times without. However, limitations in the ability of PSOs to monitor in the far-field, possible biases in the distribution, movements, and behavior of animals seen in the near-field, and the likely low number of sightings, dictate that the objective will not be met except within the very small portion of the survey area that can be observed at any time by PSOs. Consequently, the data should not be used to derive baseline estimates of marine mammal density.

III. Are there technical modifications to the proposed monitoring techniques and methodologies proposed by the applicant that should be considered to better accomplish their stated objectives?

TGS proposed only vessel-based monitoring. As stated above, there are considerable limitations to the ability of PSOs to monitor the full extent of the safety and behavioral zones. One technical modification to improve this technique is to increase the number of PSOs on duty. Additional observers, up to a point, will increase the probability of a marine mammal being observed. This in turn will increase TGS's ability to more successfully accomplish their objectives, but only marginally.

TGS did not state how they planned to operate the scout vessel for marine mammal monitoring. Recognizing that the scout vessel may be needed for other duties, the panel recommends it survey in front of the source vessel as much as possible. The scout vessel should help to monitor the safety zones for marine mammals that might be about to enter a zone where a ramp down might be needed, and to monitor the 160 dB zone in front of the source vessel as much as possible. The scout and source vessel should be in constant communication to relay marine mammal sightings and potential or need for a ramp down.

The panel discussed with TGS their approach for estimating the "takes by harassment" of marine mammals in the Chukchi Sea that were included in the IHA application. Some panel members expressed concern that the estimates may be biased low. In particular, the beluga take request was only 324 animals, despite the fact that two stocks of belugas move through the Chukchi Sea during the autumn migration that overlaps with TGS's planned activities. There may be 50,000 or more belugas moving through the Chukchi Sea and it seems feasible that more belugas than estimated will be harassed. This concern was expressed because of the large acoustic footprint of TGS's operations combined with the possibility of belugas being highly sensitive to

anthropogenic sounds. The panel recommends that TGS re-evaluate their take estimates for belugas, and possibly bowhead whales.

TGS also suggested that when the mitigation airgun was operating they could extend the interval between shots from ~12 seconds to 40-60 seconds. This would reduce the total amount of acoustic energy being put into the Chukchi Sea. Even though there are no data regarding the efficacy of this mitigation measure, the panel agreed it would be an advisable approach to reduce the amount of anthropogenic sounds in the Chukchi Sea.

Finally, TGS offered to use the program DISTANCE to estimate the density of marine mammals seen during visual observations. The panel reiterates its concern about the usefulness of data from vessel-based monitoring, but was supportive of improving the quality of data from PSOs.

IV. Are there techniques not proposed by the applicant (i.e., additional monitoring techniques or methodologies) that should be considered for inclusion in the applicant's monitoring program to better accomplish their stated objectives?

TGS's 2D seismic survey will have a large spatial and temporal footprint in the Chukchi Sea. Sounds from the airgun array will travel considerable distances and the survey will occur through the open water season. It is not clear whether TGS will operate for more than one season.

The panel is mindful of the fact that the activities proposed here generally have a smaller temporal acoustic footprint in any given location than exploratory drilling or possible development; however, the acoustic footprint of the seismic survey is extremely large compared to drilling. Seismic surveys seem likely to continue into the future and may lead to production in the Chukchi Sea. Therefore, it is important to obtain a rigorous scientific baseline for understanding marine mammal distribution, density, behavior, and potential for harassment from industrial activities. The panel was concerned that the current monitoring plan does not propose to adequately address any impacts of the seismic operation outside of the immediate area within 1-2 km of the source vessel. With these issues in mind, a number of recommendations were suggested by members of the panel that would help in obtaining more scientifically rigorous baseline information, and in assessing potential effects over both the near- and far-field areas surrounding the proposed activity.

In order to improve the monitoring plan, the following should be implemented:

- Acoustic monitoring: TGS should incorporate passive acoustic monitoring into their 4MP. Bottom mounted passive acoustic recorders may be the most appropriate method. They will not provide real-time monitoring, but data can be analyzed after the field season to better understand marine mammal use of the survey area during and after the survey and to possibly better understand impacts. ConocoPhillips, Shell and Statoil have a suite of broadly distributed acoustic recorders in the Chukchi Sea. Portions of this suite extend to approximately 72° N. TGS's proposed seismic survey extends as far north as

75° or 76°N in portions of the Chukchi Sea. The panel recommends that TGS collaborate with the other industrial operators in the Chukchi Sea by deploying additional instruments to the north and west of the current and planned suite of recorders. These instruments should be deployed prior to the commencement of seismic surveys. Because of lingering ice at the northernmost lines, TGS might need to deploy the northern acoustic recorders as the seismic survey moves to the north and west. They should be deployed for as long as possible. Some of those instruments could be retrieved once TGS returns to the south, and some could record throughout the year and be recovered the following year. These data would be particularly valuable for meeting the four objectives.

- Real-time acoustic monitoring: Another approach that TGS should consider is to deploy a real-time, passive acoustic monitoring device that is linked by satellite (i.e., Iridium) phone. This instrument would help ensure that acoustic data are collected and retrieved. One possible downside of bottom founded acoustic recorders is they may not be retrievable late in the season if sea ice extends to the south or forms quickly in the late autumn. Real-time recorders should not preclude the use of bottom mounted instruments but should be used to enhance data collection.
- Aerial surveys to evaluate distributions of whales near the seismic vessel: Oil and geophysical companies, including TGS, have expressed concerns related to the safety of manned aerial surveys. NMFS is flying aerial surveys in the Chukchi Sea, although they do not cover the entire seismic area proposed by TGS. Data from the NMFS surveys may be useful for accomplishing some of the objectives stated by TGS. The panel recommends that TGS collaborate with NMFS to use the aerial survey data for assessing marine mammal distribution, relative abundance, behavior, and possible impacts relative to seismic surveys.

TGS should also investigate the possibility of using unmanned aerial systems to survey for marine mammals in offshore areas. Ideally, this system would be operated off either the scout or source vessel. Communication protocols should be agreed upon with NMFS to reduce the possibility of conflict with manned aerial survey aircraft.

- New technologies: Consider new technologies (i.e., underwater vehicles, gliders, satellite monitoring, etc.) to conduct far-field monitoring.
- Collaboration: Collaborate with other organizations operating in the Chukchi Sea. The goal of this collaboration would be to reduce the industrial footprint of operations but increase the monitoring footprint. Visual and acoustic data should be shared to improve understanding of impacts from single and multiple operations and efficacy of mitigation measures.

V. What is the best way for an applicant to present their data and results (formatting, metrics, graphics, etc.) in the required reports that are to be submitted to NMFS (i.e., 90-day report and comprehensive report)?

The panel thinks it is important that the required reports are useful summaries and interpretations of the results of the various elements of the monitoring plan, as opposed to merely regurgitations of the raw results. The reports should represent an initial level of summary or interpretation of the efficacy, measurements, and observations rather than raw data or fully processed analyses. A clear summary timeline and spatial (map) representation or summary of operations and important observations should be given. A complete characterization of the acoustic footprint resulting from various activity states should be provided. Any and all mitigation measures (e.g., operational shutdowns if they occur) should be summarized. Additionally, an assessment of the efficacy of the monitoring methods should be provided. Finally, TGS should collaborate with other industrial operators in the Chukchi Sea to integrate and synthesize monitoring results as much as possible. This last approach will be essential for making progress on assessing cumulative impacts from all activities.

Literature Cited

Blackwell, S.B., C.S. Nations, T.L. McDonald, C.R. Greene, Jr., A.M. Thode, M. Guerra, and A.M. Macrander. 2013. Effects of airgun sounds on bowhead whale calling rates in the Alaskan Beaufort Sea. *Marine Mammal Science* DOI: 10.1111/mms.12001.

Monitoring Plan Requirements

The MMPA implementing regulations generally indicate that each Incidental Harassment Authorization (IHA) applicant's monitoring program should be designed to accomplish one or more of the following: document the effects of the activity (including acoustic) on marine mammals; document or estimate the actual level of take as a result of the activity (in this case, seismic surveys or exploratory drilling programs); increase the knowledge of the affected species; or increase knowledge of the anticipated impacts on marine mammal populations. As additional specific guidance beyond that provided in the MMPA regulations, NMFS further recommends that monitoring measures prescribed in MMPA authorizations should be designed to *accomplish or contribute to one or more of the following top-level goals*:

(a) An increase in our understanding of the likely occurrence of marine mammal species in the vicinity of the action, i.e., presence, abundance, distribution, and/or density of species.

(b) An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammal species to any of the potential stressor(s) associated with the action (e.g., sound, explosive detonation, or expended materials), through better understanding of one or more of the following: 1) the action itself and its environment (e.g., sound source characterization, propagation, and ambient noise levels); 2) the affected species (e.g., life history or dive patterns); 3) the likely co-occurrence of marine mammal species with the action (in whole or part) associated with specific adverse effects, and/or; 4) the likely biological or behavioral context of exposure to the stressor for the marine mammal (e.g., age class of exposed animals or known pupping, calving or feeding areas).

(c) An increase in our understanding of how individual marine mammals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

(d) An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: 1) the long-term fitness and survival of an individual; or 2) the population, species, or stock (e.g., through effects on annual rates of recruitment or survival).

(e) An increase in our understanding of the effectiveness of mitigation and monitoring measures.

(f) A better understanding and record of the manner in which the authorized entity complies with the incidental take authorization and incidental take statement.

(g) An increase in the probability of detecting marine mammals (through improved technology or methodology), both specifically within the exclusion zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals.