

**Open Water Peer Review Panel
Monitoring Plan Recommendations Report
for Hilcorp Shallow Geohazard and Strudel Scour Survey**

April 2014

The Open Water Peer Review Panel (hereinafter referred to as the Panel) reviewed Hilcorp's Marine Mammal Monitoring Plan (4MP) for its proposed shallow geohazard and strudel scour survey in 2015 in Foggy Island Bay, Beaufort Sea, Alaska. Additional information regarding the proposed survey was provided directly by Hilcorp and its contractors on the first day of the Panel meeting. To conduct its review, the National Marine Fisheries Service's Office of Protected Resources (PR) provided the Panel with specific questions to answer (identified below in bold), as well as additional guidance based on the general monitoring requirements outlined in the implementing regulations of the Marine Mammal Protection Act (MMPA) (see Appendix). The following report summarizes Hilcorp's proposed activities, answers the specific questions provided by PR, and provides additional recommendations as appropriate.

Summary of Activities:

Hilcorp intends to conduct a shallow geohazard and strudel scour survey in Foggy Island Bay during the 2015 open water season, from 1 July to 30 September. The activities proposed in Hilcorp's application for an Incidental Harassment Authorization (IHA) are to conduct a sonar survey using side scan sonar, magnetometer, multibeam echosounder, and sub-bottom profiler, over an area proposed for construction of a subsea pipeline to Hilcorp's Liberty Field. The purpose of the proposed survey is to evaluate the existence and location of archaeological resources, potential geologic hazards on the seafloor and in the shallow subsurface, and to investigate strudel scours and ice gouges.

The survey area would encompass approximately 6.5 km² along the proposed pipeline corridor. Water depths in the proposed survey area range from 0.9 to 6.1 m (3 to 20 ft). Survey lines will encompass a 300 m corridor around the centerline along the length of the 600 m proposed pipeline and would cover approximately 483 km (300 miles), not including turns and cross-lines. The survey is expected to take approximately 45 days to complete, with 34 days (or less) of actual survey time. Hilcorp plans to use a single source vessel with the echosounder and side scan sonar mounted to the hull and the magnetometer and sub-bottom profiler deployed from the vessel. The source characteristics of the proposed geophysical survey equipment are provided in Table 2 of Hilcorp's incidental harassment authorization. Hilcorp indicated at the Panel meeting that it is also considering use of an alternative multibeam echosounder, the Norbit iWBMSb. Hilcorp would use the side scan sonar and magnetometer in the first pass of the survey, and the multibeam echosounder and sub-bottom profiler in the second pass; the single beam echosounder would only be used as necessary in shallower water.

The 4MP proposed by Hilcorp (Section 13 of the IHA application) consists of vessel-based protected species observers (PSOs) and passive acoustic monitoring. No sound source verification (SSV) studies were proposed. Based on a SSV study conducted by Warner and McCrodan (2011) of similar equipment in the Chukchi Sea, Hilcorp estimated for sub-bottom

profilers, the distance to the 190 and 180 dB re 1 μ Pa thresholds would be less than 30 m and the distance to the 160 dB re 1 μ Pa threshold would be 30 m. Hilcorp has therefore proposed to implement standard mitigation measures (ramp-up, power down, and shutdown) when marine mammals are detected within a more conservative safety zone of 50 m during use of sub-bottom profilers. Hilcorp determined that the operating frequencies of the other proposed equipment were outside the hearing range of all marine mammals. To monitor the proposed safety zone, Hilcorp would deploy two PSOs on the source vessel, one of which would stand watch during daylight operations.

Hilcorp proposed to conduct acoustic monitoring using two Autonomous Multichannel Acoustic Recorders (AMAR) at distances of 500 m and 5,000 m from the offshore end of the survey line. The AMARs would record at 64 kHz for up to 90 days and would be capable of recording marine mammal sounds as well as ambient and anthropogenic noise.

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?

At the Panel meeting, Hilcorp identified its objectives for vessel-based visual monitoring as follows¹:

- Ensure that disturbance to marine mammals and subsistence hunts is minimized and all permit stipulations are followed,
- Document the effects of the proposed survey activities on marine mammals, and
- Collect data on the occurrence and distribution of marine mammals in the study area during survey activities.

The objectives for passive acoustic monitoring were identified as follows:

- Document ambient noise conditions
- Examine the spatial and temporal distribution of marine mammals based on acoustic detections of their vocalizations, and
- Characterize the long-range propagation of sounds produced during the geohazard survey.

The Panel believed that the objectives for both vessel-based and passive acoustic monitoring were appropriate. However, for reasons outlined in Section II below, the Panel determined that Hilcorp's monitoring plan could be enhanced to obtain the information necessary to accomplish these objectives.

¹ The objectives of vessel-based monitoring identified in the written 4MP were to provide information on the numbers of marine mammals potentially affected by the survey activities and facilitate real time mitigation to prevent impacts to marine mammals by industrial sounds or activities.

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

Vessel-based visual monitoring

The Panel agreed that the objective of real-time mitigation of potential disturbance of marine mammals would be met through visual monitoring. However, the Panel was concerned that there may also be behavioral effects resulting from the use of single and multi-beam echosounders and side-scan sonar that may warrant real-time mitigation to avoid disturbance, and recommended that a more detailed discussion of the available literature on potential effects from all proposed sound sources be included in Hilcorp's application. The Panel also recommended that Hilcorp include additional information regarding the signal bandwidth of single and multi-beam echosounders and side-scan sonar, in particular source levels for frequencies below 160 kHz. The Panel was concerned that acoustic energy below 160 kHz might be substantial and result in behavioral impacts. Hilcorp may be able to obtain that information from the equipment manufacturer, through direct measurements, or from measurements from other projects conducted in the Arctic using similar equipment. If the echosounders or sonar show significant acoustic energy below 160 kHz, Hilcorp should expand monitoring for marine mammals and implement mitigation measures for single and multi-beam echosounders and side-scan sonar, as appropriate, within the same 50-m safety zone proposed for sub-bottom profilers.

Although two observers will be deployed on the source vessel, only one observer will be on watch at any given time. That observer's primary responsibility is to detect marine mammals that may be in the safety zone so that mitigation measures can be implemented as necessary. The observer's ability to detect marine mammals within the safety zone at night or during times of poor visibility is limited, and therefore does not allow Hilcorp to fully implement mitigation measures as may be needed during such times. Having only a single observer stand watch also limits the observer's ability to monitor animals for any extended length of time in order to determine the effect of the proposed survey activities on marine mammals. Also, as noted in previous panel reports, data collected by vessel-based PSOs on the occurrence and distribution of marine mammals in the project area during survey activities may be limited to only those animals detected at the surface, without benefit of a correction factor to account for animals not available for detection or missed by the observer and thereby not providing an accurate estimate of total takes. For those reasons, Hilcorp's ability to address the objective of documenting "the effects of the proposed survey activities on marine mammals" will be limited.

Acoustic monitoring

Acoustic monitoring using the proposed AMARs should be effective at meeting the objective of documenting ambient noise conditions around the project area. AMARs may also be useful in the detection of marine mammals in the project area, depending on the location of the vocalizing marine mammals relative to the AMAR. However, the deployment of only two AMARs would not be sufficient to adequately examine the spatial and temporal distribution of marine mammals based on acoustic detections of their vocalizations.

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?

Visual monitoring

The Panel recommended that Hilcorp limit operations at night or during periods of low visibility so that marine mammals do not enter the safety zone undetected. Also, to the extent possible, Hilcorp should consider deploying an additional observer on the source vessel such that at least two observers are on watch during all daylight hours. This would increase the probability that animals in the safety zone are detected and that information on behavioral responses is recorded. Hilcorp should specify that the delay for ramp-up and after a shut-down should be 15 minutes for species with short dive durations (small odontocetes and pinnipeds) and 30 minutes for species with longer dive durations (mysticetes and large odontocetes, including beluga whales). Finally, the Panel recommended that monitoring for marine mammals also be conducted during non-survey activities to assist in the collection of baseline information from which to analyze the effects of the proposed activities.

Acoustic monitoring

The Panel recommended that Hilcorp deploy a third AMAR and arrange the AMARs in a triangular array, as depicted in Figure 1. This configuration could be used not only during the proposed 2015 survey but also during subsequent activities at the project site to enhance the quality of information on ambient noise levels needed for long-term construction and production/operational planning and assessment of associated effects. The Panel recommended that since AMARs would likely be deployed for only a short time (60-90 days), the AMAR deployed at 500 m should be a high-frequency AMAR. The other two, deployed at 5000 m, could be regular AMARs. The deployment of three AMARs would enhance Hilcorp's ability to examine the spatial and temporal distribution of marine mammals as well as movement patterns in the project area.

The Panel recommended that additional sound source information from the various active acoustics equipment proposed for the survey be obtained by maneuvering the source vessels over the high frequency AMARs. The Panel also recommended that Hilcorp use the AMARs to collect data on cumulative sound exposure level over 24 hours (cSEL₂₄), in particular during the use of the two sub-bottom profilers. Finally, the Panel recommended that Hilcorp conduct the survey starting closest to shore and proceeding offshore to avoid any potential "herding" effect of marine mammals into shallow waters, as was implicated in a mass stranding of melon whales off Madagascar during a multi-beam echosounder survey (Southall et al. 2013).

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?

See recommendations under Section III.

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 recommended that the following be included in Hilcorp's 90-day and/or comprehensive report:

- To ensure the accurate classification of vocalizations by species, Hilcorp should ground-truth the data collected by AMARs in consultation with biologists experienced in arctic species vocalizations, and include error rates for automatic detections.
- In addition, Hilcorp should collaborate with other entities collecting data on marine mammal vocalizations in the Beaufort Sea to improve auto-detection and manual capabilities for identifying species in which acoustic data are limited or lacking (e.g., spotted seals).
- Information from high frequency acoustic recordings should be included in the reports to provide a better understanding of source levels and other acoustic characteristics of the active acoustics survey equipment, such as spectral content, and received levels in RMS dB, SEL, dB peak to peak and 1/3 octave bands.

Other comments regarding Hilcorp's application

- Hilcorp's proposed survey activities have the potential to affect both the Beaufort Sea and the Chukchi Sea stock of beluga whales; hence, information on both stocks, including population abundance and take estimates, should be included for both stocks.
- The bowhead whale population size should be updated to reflect the most recent abundance estimate (16,892 in 2011, Givens et al. 2013).
- The use of the 2014 ASAMM data may not be appropriate for use in estimating densities because those data have yet to be verified.
- PSOs are not trained by NMFS; however, they are approved by NMFS before deployment.

References

- Givens, G.H., S.L. Edmondson, J.C. George, R. Suydam, R.A. Charif, A. Rahaman, D. Hawthorne, B. Tudor, R.A. DeLong, and C.W. Clark. 2013. Estimate of 2011 abundance of the Bering-Chukchi-Beaufort seas bowhead whale population. Rep. Int. Whal. Comm., Paper SC/65a/BRG01. Cambridge, UK.
- Southall, B.L., T. Rowles, F. Gulland, R.W. Baird, and P.D. Jepson. 2013. Final report of the Independent Scientific Review Panel investigating potential contributing factors to a 2008 mass stranding of melon-headed whales (*Peponocephala electra*) in Antsohihy, Madagascar.
- Warner, G., and A. McCrodan. 2011. Underwater Sound Measurements. Chapter 3 in K.G. Hartin, L.N. Bisson, S.A. Case, D.S. Ireland, and D. Hannay. (eds.) Marine mammal monitoring and mitigation during site clearance and geotechnical surveys by Statoil USA

E&P Inc. in the Chukchi Sea, August–October 2011: 90-day report. LGL Rep. P1193. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Statoil USA E&P Inc., National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 202 pages, plus appendices.

Appendix

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.

Figure 1

