

safety radii is not visible for 30 minutes prior to ramp-up in either daylight or nighttime, ramp-up may not commence unless at least one airgun has maintained an SPL of at least 180 dB (rms) during the interruption of seismic survey operations. This latter IHA condition ensures that marine mammals will have sufficient opportunity to move away from the track of the Ewing prior to receiving high dB levels. The combination of the two conditions ensures, to the greatest extent practicable, that no mammals will be within the appropriate safety zones whenever the airguns are turned on, either in daylight or nighttime.

However, it is noted that at times, pinnipeds and even some small cetaceans will actively approach a vessel during transmissions (the vessel itself moving forward at about 3–5 knots) from the side of the vessel or the stern, meaning that the animal is voluntarily approaching a noise source that is increasing in strength as the animal gets closer. Experience indicates that pinnipeds will come from great distances to scrutinize seismic-reflection operations. Seals have been observed swimming within airgun bubbles only 10 m (33 ft) away from active arrays. Also, Canadian scientists, who were using a high-frequency seismic system that produced sound frequencies closer to pinniped hearing than those used by the Ewing, describe how seals frequently approached close to the seismic source, presumably out of curiosity. Therefore, because at least pinnipeds indicated no adverse behavioral reaction to seismic noise, NMFS has concluded that the above-mentioned mitigation requirement is reasonable because the bridge-watch will be concentrating on marine mammals approaching the vessel from the bow. Also, the night-vision ability of the trained bridge-watch staff will be better than observers elsewhere on the vessel where normal ship-board lighting is more likely. Finally, an observer is still required to be on standby, meaning his/her presence would be in the vicinity of the bridge and is not precluded from conducting observations during night-time.

*Comment 7:* The Commission notes that there is no discussion on why nighttime operations are considered necessary.

*Response:* The daily cost to the Federal government to operate the Ewing is approximately \$33,000–\$35,000/day, or approximately \$350,000 for this 10-day research cruise (Ljunngren, pers. comm. May 28, 2003). If the Ewing is prohibited from operating during nighttime, the 10-day

trip would require an additional 3–5 days, or up to \$105,000–175,000 more, depending upon average daylight at the time of the work.

Therefore, because NMFS has determined that the safety zone must be visible during ramp-up, and because once the Ewing is underway and ramp-up completed, mammals will have sufficient notice of a vessel approaching (at least one hour) to avoid the approaching array if the sounds are annoying, NMFS determined that it is neither practical nor necessary to limit seismic operations to daylight hours since marine mammals are unlikely to be injured. Finally, with an extension of the time needed to complete the work if limited to daylight only operations, ship time would likely be limited for scheduled future research projects, possibly resulting in the utilization of alternative vessels.

*Comment 8:* The Commission notes that it is unclear whether vessel-based passive acoustic monitoring will be conducted as an adjunct to visual monitoring during daytime and particularly during nighttime operations to detect, locate, and identify marine mammals, and, if not, why not.

*Response:* The passive acoustical monitoring equipment that was used onboard the Ewing during the 2003 Gulf of Mexico (GOM) Sperm Whale Seismic Study (SWSS), is not the property of L-DEO or the Ewing, and therefore is not available for the Hess Deep cruise. As a result of this comment, L-DEO is evaluating the scientific results of the passive sonar from the SWSS trip to determine whether it is practical to incorporate into future seismic research cruises. NMFS expects a report on this analysis within 90 days of completion of the SWSS cruise.

*Comment 9:* The Commission asks whether conducting monitoring for at least 30 minutes prior to the planned start of airgun operations during the day and at night is sufficient, particularly for detecting the presence of species that make long dives.

*Response:* A 30-minute observation period is practical and NMFS believes it is unnecessary to lengthen this period considering that the ramp-up period will increase SPLs at a rate no greater than 6 dB per 5-minutes for a total ramp-up duration of approximately 18–20 min for the 10–12 gun arrays. Also, while some whale species may dive for up to 45 minutes, it is unlikely that the ship's bridge watch would miss a large whale surfacing from its previous dive if it is within a mile or two of the vessel.

## *Endangered Species Act (ESA) Concerns*

*Comment 10:* The CBD believes that NMFS and NSF have not yet completed consultation under section 7 of the ESA. As this research voyage will impact endangered species, including blue and sperm whales, the CBD expects that NMFS and NSF will complete consultation prior to authorizing this action and will forward a copy of the resulting documentation to the CBD.

*Response:* NMFS has completed consultation on this action and has forwarded a copy of the Biological Opinion, the NSF EA, and the L-DEO application to the CBD as requested in its letter.

## **Mitigation**

For the seismic operations in the Hess Deep, a 12-gun array with a total volume of 3705 in3 and a 10-gun array of 3050 in3 will be used. The airguns comprising these arrays will be spread out horizontally, so that the energy from the array will be directed mostly downward. The directional nature of the two alternative airgun arrays to be used in this project is an important mitigating factor, resulting in reduced sound levels at any given horizontal distance than would be expected at that distance if the source were omnidirectional with the stated nominal source level. Also, the use of the 10- or 12-gun array of 3,050 or 3,705 in3 rather than the largest airgun array that the L-DEO's source vessel can deploy (20 airguns totaling almost 8,600 in3) is another significant mitigation measure.

## *Safety Radii*

Modeled results for the 10- and 12-gun arrays indicate that the 180-dB (re 1  $\mu$ Pa (rms)) isopleths (i.e., the current potential injury threshold for cetaceans) are 830 and 880 m (2,723 and 2,887 ft), respectively. The radii around the 10- and 12-gun arrays corresponding to the 190 dB (re 1  $\mu$ Pa (rms)) isopleths (the current potential injury threshold for pinnipeds), are estimated as 250 and 300 m (820 and 984 ft), respectively. A calibration study was conducted prior to this survey to determine the actual radii corresponding to each sound level. These actual radii will be implemented for this study. Until then, or if those measurements appear defective, L-DEO will use a precautionary 1.5 times the 180-dB and 190-dB radii predicted by the model as the safety radii. Under those circumstances, the safety radii for cetaceans would be 1,245 and 1,320 m (4,085 and 4,331 ft), respectively, for the 10- and 12-gun arrays, and the safety radii for pinnipeds would be 375 and 450 m (1,230 and 1,476 ft), respectively.