

Power-down Procedures

Vessel-based observers will monitor marine mammals near the seismic vessel during daylight and for 30 minutes prior to start up during darkness throughout the program. Airgun operations will be suspended immediately when marine mammals are observed within, or about to enter, designated safety zones where there is a potential for injury (based on the 180- and 190-dB criteria). The power-down procedure should be accomplished within several seconds or a single seismic "ping" of the determination being made that a marine mammal is within or about to enter the safety zone.

Restart Procedures

After a power-down of the airguns, the observer(s) will maintain watch to determine when the animal is outside the safety radius. Airgun transmissions can commence/ resume after the mammal(s) is observed to have left the safety zone or 15 minutes (for small odontocetes and pinnipeds) or 30 minutes (for mysticetes/large odontocetes (sperm, pygmy sperm, dwarf sperm, beaked, and bottlenose whales)) from the last visual detection of the mammal(s) within the safety zone. Once the safety zone is clear of marine mammals, the observer will advise that restart procedures can commence.

A 30-minute pre-ramp-up observation period must be conducted after a shutdown (but not after power-down) of the array for a length of time greater than it would take a seismic vessel to travel the distance to the 160-dB isopleth at the time of shutdown. For example, traveling at 4.0 knots (4.0 nm/hr), the Ewing would need about 1 hr to reach that isopleth while operating the 10-gun array and 1.25 hrs when using the 12-gun array. For this cruise, the IHA requires the 30-minute observation period to take place after a shut-down of 1 hour or more. The "ramp-up" procedure will then be followed.

Ramp-up Procedure

L-DEO will use the standard "ramp-up" (soft-start) procedure when the airgun arrays begin operating after a period without any airgun operations as specified in this paragraph. From a shut-down, ramp-up will begin with the smallest gun in the array that is being used (80 in3 for the 10- and 12-gun arrays), and guns will be added in a sequence such that the source level of the array will increase at a rate no greater than 6 dB per 5-minutes for a total ramp-up duration of approximately 18–20 min (10–12 gun arrays). Under

normal operational conditions (vessel speed 4–5 knots), a ramp-up would be required after a "no shooting" period lasting 2 minutes or longer. At 4 knots, the source vessel would travel 247 m (810 ft) during a 2-minute period. If the towing speed is reduced to 3 knots or less, as sometimes required when maneuvering in shallow water (not a factor in Hess Deep), ramp-up is required after a "no shooting" period lasting 3 minutes or longer. At towing speeds not exceeding 3 knots, the source vessel would travel no more than 277 m (909 ft) in 3 minutes. These procedures would require modification if the normal seismic shot interval were more than 2 or 3 min, but that is not expected to occur during the Hess Deep project.

Course Alteration

If a marine mammal is detected outside its safety radius and, based on its position and relative motion, is likely to enter the safety radius, alternative ship tracks will be plotted against anticipated mammal locations. The vessel's direct course and/or speed will be changed to avoid the marine mammal entering the safety radius, but in a manner that also minimizes the effect to the planned science objectives. The marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure that the marine mammal does not approach within the safety radius. If the mammal appears likely to enter the safety radius, further mitigative actions will be taken, i.e., either further course alterations or power-down of the airguns. The Ewing is required to adopt this mitigation measure during the Hess Deep seismic survey program provided that doing so will not compromise operational safety requirements.

Marine Mammal Monitoring

L-DEO will conduct marine mammal monitoring during its seismic program in the Hess Deep in order to verify that the taking of marine mammals, by harassment, incidental to conducting the seismic survey will have a negligible impact on marine mammal stocks and to ensure that these harassment takings are at the lowest level practicable.

A minimum of two marine mammal observers will be onboard the *Ewing* to monitor marine mammals near the seismic vessel. Observers will watch for marine mammals during all daylight periods with seismic shooting, and for at least 30 minutes prior to any start-up of airgun operations after shutdown. At least one observer must have previous observation experience. Prior to seismic operations commencing, observers must complete a 1-day training/refresher

course on marine mammal monitoring procedures, given by a contract employee experienced in vessel-based seismic monitoring projects. The *Ewing* is considered a suitable platform for marine mammal observations. The observer's eye level will be approximately 11 m (36 ft) above sea level when stationed on the bridge, allowing for good visibility within a 210° arc for each observer. Airgun operations will be suspended and the source powered-down whenever marine mammals are observed within, or about to enter, designated safety zones.

Observers will be on duty in shifts of duration no longer than 4 hours. The second observer will also be on watch part of the time, including the 30-minute periods preceding startup of the airguns and during ramp ups. Use of two simultaneous observers will decrease the potential that marine mammals near the source vessel will be missed. Bridge personnel that are additional to the dedicated observers will also assist in detecting marine mammals and implementing mitigation requirements, and before the start of the seismic survey will be given proper instruction for observing and reporting marine mammals and sea turtles.

Observers will not normally be on duty during ongoing seismic operations at night; bridge personnel will watch for marine mammals during this period and will immediately call for the airguns to be powered down and the stand-by observer will be notified if marine mammals are observed in or about to enter the safety radii. However, if the airguns are started up at night after a shutdown duration of 1 hour or greater, two observers will monitor for marine mammals within the safety radii for 30 minutes prior to beginning ramp-up using night vision devices (NVDs), although NMFS notes that past experience has shown that NVDs are of limited value for this purpose. If the complete safety radii are not visible for at least 30 minutes prior to ramp-up in either daylight or nighttime, ramp-up may not commence unless the seismic source has maintained an SPL of at least 180 dB during the interruption of seismic survey operations. While the 30-minute observation period is only required prior to commencing seismic operations following an extended shut down period, if ramp-up procedures must be performed at night, the two observers must be on duty 30 minutes prior to the start of seismic shooting and during the ramp-up procedures.

The observer(s) will watch for marine mammals from the bridge, the highest practical vantage point on the vessel. The observer(s) will systematically scan