



MARINE MAMMAL COMMISSION

11 October 2012

Mr. P. Michael Payne, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Mr. Payne:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the Lamont-Doherty Earth Observatory, in cooperation with Pacific Gas and Electric Company (PG&E), seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act to take small numbers of marine mammals by harassment. The taking would be incidental to a marine geophysical survey to be conducted in the vicinity of a nuclear power plant near Morro Bay, California. The Commission also has reviewed the National Marine Fisheries Service's 19 September 2012 notice (77 Fed. Reg. 58256) announcing receipt of the application and proposing to issue the authorization, subject to certain conditions.

RECOMMENDATIONS

The Marine Mammal Commission recommends that the National Marine Fisheries Service—

- require PG&E and the Observatory to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals for the mitigation airgun using a model that incorporates site-specific information—if the exclusion and buffer zones and numbers of takes are not re-estimated, require them to provide a detailed justification explaining the rationale for basing the exclusion and buffer zones for the mitigation airgun on modeling results based on measurements made in the Gulf of Mexico;
- provide greater assurance that no more than small numbers of each marine mammal species in the area will be taken and that, for each species or stock, the overall impact will be negligible by basing its determinations on (1) the estimated mean number of individuals of each species in the area that may be taken plus some measure of uncertainty for each species or (2) the estimated maximum number of each species in the survey area that may be taken;
- provide a clear justification for concluding that, in this authorization, taking as much as 15 to 26 percent of a species or stock constitutes small numbers and develop a policy that sets forth the criteria for determining what constitutes “small numbers” for the purpose of authorizing incidental takes of marine mammals by working independently or jointly with the Fish and Wildlife Service and Marine Mammal Commission;
- revise its mitigation measures by (1) retaining the requirement for a 15-minute halt to airgun operations if a small odontocete or pinniped enters the exclusion zone but is not observed

- outside the exclusion zone, (2) requiring a halt to airgun operations based on the maximum dive times when mysticetes or large odontocetes enter the exclusion zone, and (3) eliminating the option to resume airgun operations after 8 minutes if the sound source is moving and the marine mammal has not been observed outside the exclusion zone;
- provide additional justification for its preliminary determination that the proposed vessel-based monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion and buffer zones—such justification should (1) identify those species that it believes can be detected with a high degree of confidence using visual monitoring only under the expected environmental conditions, (2) describe detection probability as a function of distance from the vessel, (3) describe changes in detection probability under various sea state and weather conditions and light levels, and (4) explain how close to the vessel marine mammals must be for observers to achieve high nighttime detection rates;
 - require PG&E and the Observatory to (1) report the number of marine mammals that were detected acoustically and for which a power-down or shut-down of the airguns was initiated, (2) specify if such animals also were detected visually, (3) compare the results from the two monitoring methods (visual versus acoustic) to help identify their respective strengths and weaknesses, and (4) use that information to improve mitigation and monitoring methods for future authorizations; and
 - work with the National Science Foundation to analyze existing data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys.

RATIONALE

PG&E is funding Lamont-Doherty Earth Observatory to conduct a geophysical survey offshore from the Diablo Canyon Power Plant in central California. The company would use the survey results to evaluate earthquake rupture geometries, earthquake displacements, fault interactions, and fault evolution near the power plant. The incidental harassment authorization would be issued to both PG&E and the Observatory for a one-year period. They expect to conduct additional surveys possibly in the next two years to complete the project.

The applicants are planning to conduct the 2012 survey during the period from 15 November to 31 December. The survey would be conducted in waters up to 400 m deep and would involve approximately 1,418 km of tracklines. The Observatory would use the R/V *Marcus G. Langseth* to conduct the survey and would tow a 36-airgun array (nominal source levels 236 to 265 dB re 1 μ Pa (peak-to-peak)) at 9 m depth. However, at any given time, only 18 airguns would be in operation with a maximum discharge volume of 3,300 in³—hence, in effect, the Observatory will be using an 18-airgun array. The vessel also would tow four 6-km hydrophone streamers. In addition, the Observatory would deploy up to 90 geophones onshore along a 9-km portion of Morro Strand. The Observatory also would operate a 10.5–13 kHz multibeam echosounder and a 3.5 kHz sub-bottom profiler continuously throughout the survey. In addition, it would use a gravimeter, magnetometer, four other vessels, and a twin-engine aircraft. The additional vessels would serve as platforms for marine mammal monitoring and deployment of equipment, as well as managing vessel traffic around the survey. The aircraft would monitor the survey area before, during, and after the

survey to detect marine mammals in the area, assess their behavior, and identify behavioral changes that might have occurred in response to the survey.

The Service preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 25 species of marine mammals and that any impact on the affected species would be negligible. The Service does not anticipate any take of marine mammals by death or serious injury. It also believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of the proposed mitigation and monitoring measures. Those measures include monitoring exclusion and buffer zones and using power-down, shut-down, and ramp-up procedures. Night-time operations would be restricted to areas in which marine mammal abundance is considered low. The operators would shutdown the airguns immediately if and when a North Pacific right whale is sighted, regardless of the distance from the *Langseth*. Ramp-up procedures would not be initiated until the right whale has not been seen at any distance for 30 minutes. Although the Commission considers the probability of sighting a right whale to be extremely low, it appreciates the extra caution that would be taken by PG&E and the Observatory to minimize takes of this species by the geophysical survey.

In addition, PG&E and the Observatory have scheduled the survey to avoid the harbor seal and California sea lion pupping and breeding seasons, the peak gray whale migration period, and the peak harbor porpoise calving season. To address concerns regarding impacts to harbor porpoises, PG&E and the Observatory would (1) implement an extended initial ramp-up during the first transect line, (2) ensure that airgun operations begin during daylight hours, (3) conduct in-situ sound measurements to verify and adjust, if necessary, the proposed exclusion and buffer zones, (4) use protected species observers approved by the National Marine Fisheries Service and placed on two vessels (in addition to the *Langseth*) to monitor marine mammals, (5) fund the use of passive acoustic devices (i.e., C-PODS and moored hydrophones) to detect harbor porpoise responses to the survey, and (6) fund agency personnel to monitor the surrounding beaches for evidence of newly stranded marine mammals. They also would fund (1) aerial surveys for large whales before, during (weekly), and after the geophysical survey and (2) the use of additional passive acoustic devices (i.e., HARP) near the Monterey Bay National Marine Sanctuary to detect large whale responses to the survey. The National Marine Fisheries Service and U.S. Fish and Wildlife Service would conduct aerial monitoring of harbor porpoises, other small cetaceans, and sea otters (the last being covered under a separate authorization issued by the Fish and Wildlife Service).

The Service has proposed an adaptive management approach for this authorization. During the two-month survey period, the Service would evaluate survey effects on a regular basis, amend the survey plan to address issues that might arise, and—if necessary—suspend the survey. The Service could suspend the survey if (1) aerial surveys or acoustic monitoring devices indicate that moderate or large numbers of harbor porpoises leave their core habitat area, (2) harbor porpoises exhibit unusual behavior (e.g., a large, tight group of 50–100 individuals are observed rafting in an unusual area), (3) a mass stranding (i.e., two or more animals strand simultaneously other than female-calf pairs) occurs or animals are observed milling nearshore, (4) two cetaceans in one day, three in one week, or five or more pinnipeds in one week newly strand (dead or alive) in the area, (5)

a single marine mammal strands with evidence of acoustic trauma, or (6) a marine mammal is struck by a vessel participating in the survey.

The Commission commends the Service for proposing to supplement the commonly required mitigation and monitoring measures and proposing to include an adaptive management process as a condition of the authorization. It encourages the Service to require such measures and processes in other proposed incidental harassment authorizations. That being said, the Commission has additional concerns about this proposed authorization.

Uncertainty in exclusion and buffer zones for the mitigation airgun

Exclusion zones define the area in which marine mammals are sufficiently close to a sound source that they may be injured (i.e., taken by Level A harassment) or killed. Buffer zones delineate the area in which marine mammals are close enough to a sound source that they may be disturbed to the extent that they change their natural behavioral patterns (i.e., taken by Level B harassment). Both zones are established based on the generation and propagation of sound from the source and general assumptions about the effects on marine mammals or responses of marine mammals to sounds with varying characteristics (e.g., frequency, impulse versus continuous), the latter being based on limited observations of marine mammal responses under known conditions.

In 2007–2008, the Observatory conducted sound propagation studies using airgun arrays from the R/V *Langseth* (Tolstoy et al. 2009) and used results from those studies to create a model of sound propagation for estimating exclusion and buffer zones. However, that model was based on a particular set of environmental conditions, and variation in such conditions is known to affect the manner in which sound propagates through the ocean. Indeed, Tolstoy et al. (2009) not only noted that results vary with environmental conditions but also used that variation as justification for measuring sound propagation at multiple locations. The National Science Foundation subsequently followed that example in its preparation of a programmatic environmental impact statement for geophysical surveys by modeling sound propagation under various environmental conditions. Furthermore, Tolstoy et al. (2009) acknowledged that sound propagation is not only variable, but also dependent on water depth, bathymetry, and tow depth of the array. The Observatory has acknowledged that its model overestimates actual received sound levels in deep water (>1,000 m) and underestimates actual received sound levels in shallow water (<50 m). The model also does not allow for bottom interactions, which may have substantial effects on sound propagation in shallow and intermediate (up to 400 m) waters. Such shortcomings raise questions about the utility of the model for estimating received sound levels at certain distances and for establishing exclusion and buffer zones.

In preparation for the proposed survey, PG&E and the Observatory used that model to estimate exclusion and buffer zones for the single mitigation airgun. In contrast, it had Greeneridge Science, Inc., use a range-dependent acoustic propagation model and local environmental parameters (i.e., sound speed profiles, bathymetry, and water depth) to establish the exclusion and buffer zones for the 18-airgun array. On numerous occasions the Commission has recommended that the Service or the Observatory estimate exclusion and buffer zones using either empirical measurements made at the survey site or model predictions based on environmental parameters

from the proposed survey site. The Commission acknowledges that such a model was used for the 18-airgun array and that the Service proposed to require PG&E and the Observatory to conduct in-situ sound studies to verify those zones. However, the Commission is unsure why the applicants used a model derived from Gulf of Mexico data for the mitigation airgun rather than a model based on site-specific parameters as was done for the 18-airgun array. To address this shortcoming, the Marine Mammal Commission recommends that the National Marine Fisheries Service require PG&E and the Observatory to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals for the mitigation airgun using a model that incorporates site-specific information. If the exclusion and buffer zones and numbers of takes are not re-estimated, the Marine Mammal Commission recommends that the Service require PG&E and the Observatory to provide a detailed justification explaining the rationale for basing the exclusion and buffer zones for the mitigation airgun on modeling results based on measurements made in the Gulf of Mexico.

Uncertainty in take estimates

The Service requires take estimates in each application for an incidental harassment authorization. The estimates provide a basis for ensuring that the proposed activity will not have more than a negligible impact on the affected species or stocks and that only small numbers of marine mammals are taken. Take estimates are often, if not generally, associated with considerable uncertainty. If, for any given species or stock, the error in the take estimate is relatively symmetrical, then a small numbers or negligible impact determination that is based on the expected (e.g., mean) abundance or density without accounting for uncertainty serves the purpose of the Marine Mammal Protection Act about one-half of the time. That is, if the estimated take is an unbiased indicator of the actual take and the error around that expected value is symmetrical, then the actual number of takes will be greater than the expected number about half the time and less than the expected number half the time. If the Service makes its small numbers or negligible impact determinations based on the expected number of takes but does not account for the associated uncertainty, then its assurance of a negligible impact affecting only small numbers of animals is sufficient for the purpose of the Act about 50 percent of the time.

For the proposed survey, PG&E and the Observatory estimated the expected numbers of takes using the size of the buffer zone (and associated ensonified areas) and estimates of marine mammal densities from previous marine mammal and geophysical surveys. The density data were obtained in the same area and during the same season as proposed for the survey. However, the applicants did not account for any specific uncertainty (i.e., standard deviation, standard error, coefficient of variation) in those densities. Instead, they simply increased their take estimates by 25 percent to account for survey lines that may need to be surveyed twice, equipment testing, and repeated exposures of individual animals. The Observatory should account for equipment testing, the possibility of exposing individuals repeatedly, and the need to resurvey certain areas, but doing so is not the same as accounting for uncertainty in the density estimates.

Although PG&E and the Observatory estimated minimum, maximum, and mean densities for the majority of the species that may be taken, they used only the mean densities to estimate expected takes. The Service appears to have done the same. Neither the applicants nor the Service appears to have given due consideration to the error around the take estimates. If, for example, the

Observatory and the Service expect 1,000 takes to occur, the judgment as to whether that level of taking is negligible could depend heavily on whether the uncertainty in that number was small (e.g., ± 5 takes) or large (e.g., ± 500 takes). Furthermore, both the estimated number of takes and the error associated with that estimate should reflect the behavior of the species and stocks that may be taken (e.g., do they form large social, foraging, or reproductive groups, or vary their habitat use patterns by season). To address this concern, the Marine Mammal Commission recommends that the National Marine Fisheries Service provide greater assurance that no more than small numbers of each marine mammal species in the area will be taken and that, for each species or stock, the overall impact will be negligible by basing its determinations on (1) the estimated mean number of individuals of each species in the area that may be taken plus some measure of uncertainty for each species or (2) the estimated maximum number of each species in the survey area that may be taken.

Small numbers and negligible impact determinations for harbor porpoises

The Service originally indicated that up to 59 percent of the individuals in the Morro Bay harbor porpoise stock could be taken incidental to the proposed survey. It increased that estimate to 74 percent after accounting for the possibility of surveying some track lines twice, testing equipment, and repeatedly exposing individual animals. Those percentages were based on the mean take estimate and the best abundance estimate (N_{best}) for the stock and would have been greater—perhaps substantially so—if the Service had based them on a maximum take estimate (or something akin to a maximum estimate, such as the 95th percentile), minimum abundance estimate (N_{min}), or both. But regardless of how they were estimated, they raise the important question of how the Service can best determine whether the number of porpoises that might be taken during the course of the survey and associated activities constitutes “small numbers,” as required under the Marine Mammal Protection Act.

Through communications with the Service, the Commission has learned that the applicants have decided to limit their efforts to one of two survey boxes that they were going to survey in 2012. By doing so, they have effectively reduced the expected number of takes to something on the order of 15 to 26 percent of the stock’s abundance, depending on the take and abundance values used. Clearly, this is a substantial decrease in the number of takes and the expected portion of the stock to be taken. Still, it is not clear that 15 to 26 percent of a stock constitutes small numbers. Defining what constitutes small numbers is undoubtedly a difficult task, particularly in view of the distinction drawn by the court that “small numbers” and “negligible impact” are not the same thing and the former cannot be defined on the basis of the latter—that is, they are separate standards.

The Commission recognizes that defining “small numbers” is difficult and that there may not be a readily available solution that would apply to the wide variety of marine mammal stocks managed by the Service. Perhaps the best approach to resolve the issue would be for the Service to develop a clear working definition of “small numbers,” provide that definition to the public for review and comment, and then adopt a final definition (as modified on the basis of public comments) by regulation or in a policy directive. An alternative would be for the National Marine Fisheries Service, Fish and Wildlife Service, and Commission to form a task force to develop an appropriate working definition that could then be submitted for public review and comment. Until such a definition is developed, the Service will need to provide a justification for its judgments

regarding “small numbers” of marine mammal species taken by various human activities. With that need in mind, the Marine Mammal Commission recommends that, to the best of its ability, the National Marine Fisheries Service provide a clear justification for concluding that, in this authorization, taking as much as 15 to 26 percent of a species or stock constitutes small numbers. Because defining “negligible impact” also is warranted and the suggested approaches for defining “negligible impact” would be similar to those for defining “small numbers,” the Commission further recommends that the Service, working independently or jointly with the Fish and Wildlife Service and Marine Mammal Commission, develop a policy that sets forth the criteria for determining what constitutes “small numbers” and “negligible impact” for the purposes of authorizing incidental takes of marine mammals.

Mitigation and monitoring measures

The *Federal Register* notice stated that PG&E and the Observatory would monitor the area near the survey vessel for at least 30 minutes prior to the initiation of, during, and for 30 minutes after cessation of airgun operations. The notice also stated that when airguns have been powered down because a marine mammal has been detected near or within a proposed exclusion zone, airgun activity would not resume until the marine mammal is outside the exclusion zone (i.e., the animal is observed to have left the exclusion zone or has not been seen or otherwise detected within the exclusion zone for 15 minutes in the case of small odontocetes and pinnipeds and 30 minutes in the case of mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales) or the vessel has transited beyond the original 180-dB re 1 μ Pa exclusion zone after an 8-minute period.

The Commission has recommended a pause time of at least 15 minutes for small odontocetes and pinnipeds because their dive times are shorter and generally fall within that limit. However, it does not believe that 30 minutes is sufficient for some mysticetes and large odontocetes because they may remain submerged for periods far exceeding 30 minutes. Blainville’s beaked whales dive to considerable depths (> 1,400 m) and can remain submerged for nearly an hour (Baird et al. 2006, Tyack et al. 2006). In addition, observers may not detect marine mammals each time they return to the surface, especially cryptic species such as beaked whales and kogiids, which are difficult to detect even under ideal conditions. Barlow (1999) found that “[a]ccounting for both submerged animals and animals that are otherwise missed by the observers in excellent survey conditions, only 23 percent of Cuvier’s beaked whales and 45 percent of *Mesoplodon* beaked whales are estimated to be seen on ship surveys if they are located directly on the survey trackline.” Thus, at least for certain species, visual monitoring alone is not adequate to detect all marine mammals within the exclusion and buffer zones.

However, the proposed 8-minute pause for transiting vessels effectively eliminates the need for airgun interruptions of 15 and 30 minutes in most instances because the sound source is expected to be constantly moving when the survey is being conducted. The rationale for the pause appears to be that the vessel (or sound source) has moved and therefore has traveled outside the boundary of the exclusion zone where it was when the animal was first sighted. This approach fails to take into account the fact that the animal also may be moving. In fact, the animal’s position often is not known because it spends much of its time under the surface where it is not visible and it may

not be sighted when it does come to the surface. Depending on the speed and heading of the vessel and the speed and heading of the marine mammal, the latter clearly may remain in the exclusion zone and may be exposed to dangerous sound levels when airgun operations resume. In short, the Service's rationale for allowing resumption of the airguns after 8 minutes appears to be based on the assumption that the animal is either not moving or is moving in a direction different from that of the ship. Although that assumption may be correct in some cases, it just as easily may be wrong and may put the animal at unnecessary risk. For example, Miller et al. (2009) observed that no sperm whale changed direction to avoid seismic activity at distances of 1–13 km from the vessel, and most whales continued to travel on a course parallel to the sound source. Therefore, unless the marine mammal is sighted leaving or outside the exclusion zone, it does not make sense to resume airgun operations after a shorter period of time based on an unsupported assumption that observed animals would be clear of the exclusion zone after 8 minutes have elapsed.

In addition, the Service indicated that it would not require implementation of ramp-up procedures for the full array after an extended power down because those procedures (1) would not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone and (2) would not reduce the potential for take. Again, the Commission disagrees with the Service's reasoning. The primary purpose of ramp-up procedures is not to increase the observer effectiveness, but rather to alert any marine mammals in the area and give them an opportunity to move away from the airgun array before its impulsive sound may harm them. If they do so, then—in fact—ramp-up procedures would reduce the potential for injurious take, which is its intended purpose.

To address these concerns, the Marine Mammal Commission recommends that the National Marine Fisheries Service revise its mitigation measures by (1) retaining the requirement for a 15-minute halt to airgun operations if a small odontocete or pinniped enters the exclusion zone but is not observed outside the exclusion zone, (2) requiring a halt to airgun operations based on the maximum dive times when mysticetes or large odontocetes enter the exclusion zone, and (3) eliminating the option to resume airgun operations after 8 minutes if the sound source is moving and the marine mammal has not been observed outside the exclusion zone. The Commission would welcome a meeting to discuss how best to determine maximum dive times of various marine mammal species using the best available science.

In addition, as discussed in the Commission's previous letters commenting on similar activities by this and other applicants, visual monitoring is not effective during periods of bad weather or at night, especially when the radius of the exclusion zone is approximately 1 km. Although the *Federal Register* notice indicated that multiple vessels would be used for monitoring and that, on average, observers can monitor to the horizon (i.e., 10 km), it is unclear how PG&E and the Observatory expect to see cryptic species (i.e., harbor porpoises and beaked whales) and smaller pinnipeds (i.e., harbor seals) at those distances even in good weather during daylight hours. Aerial surveys would be conducted to supplement vessel-based monitoring, but it appears that those surveys would occur only on a weekly basis. Furthermore, PG&E and the Observatory used Barlow et al. (2009) as the basis for the majority of the density estimates. Those data yielded effective strip widths ranging from 0.78–4.61 km depending on the species. Those distances are much less than PG&E and the Observatory's assumed sighting distance of 10 km. Therefore, the Marine Mammal

Commission recommends that, prior to issuing the requested authorization, the National Marine Fisheries Service provide additional justification for its preliminary determination that the proposed vessel-based monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion and buffer zones. At a minimum, such justification should (1) identify those species that it believes can be detected with a high degree of confidence using visual monitoring only under the expected environmental conditions, (2) describe detection probability as a function of distance from the vessel, (3) describe changes in detection probability under various sea state and weather conditions and light levels, and (4) explain how close to the vessel marine mammals must be for observers to achieve high nighttime detection rates. If such information is not available, the Service and the applicant should conduct the studies needed to describe the efficacy of existing monitoring methods and develop alternative or supplemental methods to address current shortcomings.

The *Federal Register* notice also stated that the applicant would conduct vessel-based passive acoustic monitoring to augment visual monitoring during daytime operations and at night to help detect, locate, and identify marine mammals that may be present. The Commission supports the use of passive acoustic monitoring for this purpose but also considers it important to keep in mind the limitations of such monitoring. As the Commission has noted in previous correspondence, and as the Service acknowledges, passive acoustic monitoring is effective only when marine mammals are vocalizing constantly or often and it is less effective when they are vocalizing irregularly or only occasionally. In addition, the effectiveness of passive acoustic monitoring will depend on the operator's ability to locate a vocalizing marine mammal and determine whether it is within the power-down or shut-down radius or in a position such that the ship's movement will place it within the power-down or shut-down radius. To shed light on these concerns, the Marine Mammal Commission recommends that the National Marine Fisheries Service require PG&E and the Observatory to (1) report the number of marine mammals that were detected acoustically and for which a power-down or shut-down of the airguns was initiated, (2) specify if such animals also were detected visually, (3) compare the results from the two monitoring methods (visual versus acoustic) to help identify their respective strengths and weaknesses, and (4) use that information to improve mitigation and monitoring methods for future authorizations.

Effectiveness of ramp-up procedures

Although the effectiveness of ramp-up procedures has yet to be verified empirically, the Service would continue to require PG&E and the Observatory to monitor, document, and report observations during all ramp-up procedures. Such data will provide a stronger scientific basis for determining the effectiveness of, and deciding when to implement, this particular mitigation measure. The National Science Foundation has indicated that monitoring data from past surveys are being compiled into a single database. The Commission supports that effort by the Foundation. After the data are compiled and quality control measures have been completed, the Marine Mammal Commission recommends that the National Marine Fisheries Service work with the National Science Foundation to analyze those data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys. International researchers also are trying to determine the impacts of seismic airguns and the effectiveness of ramp-up procedures, primarily on humpback whales, during specific life history stages. However, the results of those studies are not

yet available and even when they become so, their applicability to other species may be limited. In the interim, the Commission continues to believe that the Service should continue to require data collection and analysis to assess the effectiveness of ramp-up procedures, given that those procedures are considered a substantial component of the mitigation measures.

Please contact me if you have questions about the Commission's recommendations or rationale.

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

Cc: Jana Affonso, U.S. Fish and Wildlife Service, Region 8 Ecological Services
Lilian Carswell, U.S. Fish and Wildlife Service, Southern Sea Otter Recovery and Marine Conservation Coordinator

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