United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

AUG 2 8 2007

Ms. Susan Childs
Shell Offshore Inc.
3601 C Street, Suite 1334
Anchorage, Alaska 99503

Dear Ms. Childs:

Your August 20, 2007, request to extend OCS Permit 07-04 for 3D geophysical operations in the Beaufort Sea through November 30, 2007, is granted. All provisions and requirements of the permit will be applicable to the extension.

Sincerely,

Rance R. Wall
Regional Supervisor
Resource Evaluation

United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

JUL 13 2007

Ms. Susan Childs
Shell Offshore Inc.
3601 C Street, Suite 1334
Anchorage, Alaska 99503

Dear Ms. Childs:

Your application dated November 22, 2006, requests a Federal permit to conduct geophysical operations on certain Outer Continental Shelf (OCS) lands. The activity is in the Beaufort Sea area as shown on the map accompanying your application. Your application specified WesternGeco will be your service providing company, and will conduct the subject operations using the vessels described in the Operation Plan. Operations are proposed to begin on or after July 13, 2007, and will be completed on or before October 31, 2007. The proposed program is a 3D marine seismic acquisition using airguns as an energy source.

Your application states that Shell Offshore Inc. has requested an Incidental Harassment Authorization (IHA) from National Marine Fisheries Service (NMFS) for whales and pinnipeds, and an LOA from U.S. Fish and Wildlife Service (USFWS) for polar bears and walrus. The MMS will require a copy of the IHA and LOA permits prior to conducting seismic operations. The IHA from NMFS and the LOA from USFWS are in place to resolve subsistence-related concerns and to insure that impacts to marine mammals are not significant. The procedures outlined in this authorization represent a good faith effort on the part of Shell Offshore Inc. to avoid conflict with subsistence activities which may be conducted during a portion of the time proposed for this seismic operation.

OCS Permit 07-04 is hereby granted to conduct geophysical exploration operations on the OCS in the area and manner described in the application. A detailed track map of planned operations must be submitted to this office prior to the start of seismic operations. All operations are subject to the enclosed stipulations (see Enclosure) and approved Permit for Geophysical Exploration for Mineral Resources on the OCS. In all cases, the specific mitigating measures identified in the NMFS IHA and USFWS LOA will apply and will take precedence over any MMS requirements, where applicable, including protocols for monitoring programs.

The information contained in the following paragraphs should be evaluated before initiating operations and appropriate action taken:

Endangered bowhead whales may occur in the Chukchi Sea during operations. Bowhead whales pass through the area on their fall migration back to the Bering Sea. They begin to leave

Canadian Beaufort Sea waters in August and September and travel west through the southern Beaufort Sea into the Chukchi Sea. Other marine mammals that may appear in the project vicinity include beluga whales, spotted, bearded and ring seals, gray whales, polar bears, and walrus.

The Endangered Species Act (ESA) states there shall be no activity conducted which might jeopardize the continued existence of an endangered species or result in the destruction or adverse change of habitat of such species. In addition, the Marine Mammal Protection Act (MMPA) provides there shall be no unauthorized take of marine mammals. "Take" means to harass, hunt, capture, collect, kill, or attempt to harass, hunt, capture, collect of kill any marine mammals. Whenever whales or marine mammals are encountered in the project vicinity, Shell Offshore Inc. and its contractors should exercise precautions to assure that activities are not in violation of the provisions of the MMPA or the ESA.

Further information on the identification and occurrence of endangered whales or marine mammals in the proposed area of operations and the provisions and penalties of the ESA and the MMPA are available. This information may be obtained from the

U.S. Fish and Wildlife Service
Alaska Region
1011E.Tudor Road
Anchorage, AK 99503
Telephone (907) 786-3467

And from the

National Marine Fisheries Service
Federal Building, Room C-554
Anchorage, AK 99513
Telephone (907) 271-5006

This permit is effective from the date of approval until October 31, 2007, or the completion of the survey, whichever occurs earlier. Please be advised that this office requires a weekly report of daily operations. Daily reports may be substituted for this requirement. We will require a completion report within 30 days following cessation of field operations.

Sincerely,

Rance R. Wall
Regional Supervisor
Resource Evaluation

3 Enclosures

Minerals Management Service (MMS), Alaska OCS Region
Seismic Survey G&G Permit Stipulations for Permit 07-04

- No solid or liquid explosives shall be used without specific approval.
- Operations shall be conducted in a manner to ensure that they will not cause pollution, cause undue harm to aquatic life, create hazardous or unsafe conditions, or unreasonably interfere with other uses of the area. Any difficulty encountered with other uses of the area or any conditions that cause undue harm to aquatic life, pollution, or could create a hazardous or unsafe condition as a result of the operations under this permit shall be reported to the Regional Supervisor/Resource Evaluation. Serious or emergency conditions shall be reported without delay.
- Operators must maintain a minimum spacing of 15 miles between the seismic-source vessels for separate operations. The MMS must be notified by means of the weekly report whenever a shut down of operations occurs in order to maintain this minimum distance.
- Permit applicants shall use the lowest sound levels feasible to accomplish their data-collection needs.
- Vessels and aircraft should avoid concentrations or groups of whales. At all times, operators should conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than 1,000 feet when within 500 lateral yards of groups of whales. Helicopters may not hover or circle above such areas or within 500 lateral yards of such areas.
- When weather conditions do not allow a 1,000-foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000-foot altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet because of weather conditions, the operator must avoid known whale-concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.
- When a vessel is operated near a concentration of whales, the operator must take every precaution to avoid harassment of these animals. Therefore, vessels should reduce speed when within 300 yards of whales and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group.
- Vessel operators should avoid multiple changes in direction and speed when within 300 yards of whales. In addition, operators should check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers (or screws) are engaged.

- Small boats should not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to whales.
- When any Permittee becomes aware of the potentially harassing effects of operations on endangered whales, or when any Permittee is unsure of the best course of action to avoid harassment of endangered whales, every measure to avoid further harassment should be taken until the National Marine Fisheries Service (NMFS) is consulted for instructions or directions. However, human safety will take precedence at all times over the guidelines and distances recommended herein for the avoidance of disturbance and harassment of endangered whales.
- Seismic-survey operators shall notify MMS, NMFS, and U.S. Fish and Wildlife Service (FWS) in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals and other wildlife resources.
- Seismic cables and airgun arrays must not be towed in the vicinity of fragile biocenoses (e.g. the Boulder Patch, kelp beds), unless MMS determines the proposed operations can be conducted without damage to the fragile biocenoses. Seismic-survey and support vessels shall not anchor in the vicinity of fragile biocenoses as identified by MMS or may be discovered by the operator during the course of their operations, unless there is an emergency situation involving human safety and there are no other feasible sites in which to anchor at the time. Permittees must report to MMS any damage to fragile biocenoses as a result of their operations.
- To help avoid causing bird collisions with seismic survey and support vessels, all vessels will minimize operations that require high-intensity work lights, especially within the 20-m-bathymetric contour. High-intensity lights will be turned off in inclement weather when the seismic vessel is not actively conducting surveys to minimize the potential for adverse impacts to marine birds; however, navigation lights, deck lights, and interior lights could remain on for safety.
- All bird-vessel collisions shall be documented. Minimum information will include species, date/time, location, weather, and operational status of the survey vessel when the strike occurred. Photographs would be helpful to confirm species identification. The FWS does not recommend the treatment/transport of injured or dead birds due to the concerns about avian influenza. Bird collision information will be sent to MMS within 72 hours.

The monitoring and mitigation measures, which follow, are related to the requirements of the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). However, mitigation and monitoring requirements defined in any NMFS (the Federal agency having MMPA management authority for cetaceans and pinnipeds, less Pacific walrus) and FWS (the Federal agency having MMPA management authority for Pacific walrus, polar bear, and sea otter) incidental take authorizations (ITA) and/or Letters of Authorization (LOA) obtained by the seismic survey operator will have precedence over any related measures listed below.

- **Exclusion Zone** – A 160/170 dB isopleth exclusion zone from the seismic-survey sound source shall be free of marine mammals before the survey can begin and must remain free of marine mammals during the survey. The purpose of the exclusion zone is to protect marine mammals from Level B harassment (behavioral change). The 160 dB (Level B Harassment–behavioral change) applies to cetaceans and the Pacific walrus and the 170 dB (Level B Harassment-behavioral change) applies to pinnipeds, other than Pacific walrus. This exclusion zone applies in all cases where ITA's and/or LOA's are not issued; however, if they are issued, the exclusion zone specified in them will take precedence over the MMS-identified exclusion zone. The ITA-designated exclusion zone is designed to protect marine mammals from Level A harassment (injury). Typically, the 180 dB (Level A Harassment–injury) applies to cetaceans and the Pacific walrus and the 190 dB (Level A Harassment-injury) applies to pinnipeds, other than Pacific walrus.
- **Monitoring of the Exclusion Zone** – Individuals (marine mammal biologists or trained observers) shall monitor the area around the survey for the presence of marine mammals to maintain a marine mammal-free exclusion zone and monitor for avoidance or take behaviors. Visual observers monitor the exclusion zone to ensure that marine mammals do not enter the exclusion zone for at least 30 minutes prior to ramp up, during the conduct of the survey, or before resuming seismic-survey work after shut down. The NMFS will set specific requirements for the monitoring programs and observers.
- **Shut Down/Power Down** – The survey shall be suspended until the exclusion zone is free of marine mammals. All observers shall have the authority to, and will, instruct the vessel operators to immediately stop or de-energize the airgun array whenever a marine mammal is seen within the exclusion zone or to power down to a sound level where the marine mammal is no longer in the exclusion zone. If the airgun array is completely powered down for any reason during nighttime or poor sighting conditions, it shall not be re-energized until daylight or whenever sighting conditions allow for the exclusion zone to be effectively monitored from the source vessel and/or through other passive acoustic, aerial, or vessel-based monitoring.
- **Ramp Up** – Ramp up is the gradual introduction of sound to deter marine mammals from potentially damaging sound intensities and from approaching the exclusion zone. This technique involves the gradual increase (usually 5-6 dB per 5-minute increment) in emitted sound levels, beginning with firing a single airgun and gradually adding airguns over a period of at least 20-40 minutes, until the desired operating level of the full array is obtained. Ramp-up procedures may begin after observers ensure the absence of marine mammals for at least 30 minutes. Ramp-up procedures shall not be initiated at night or when monitoring the exclusion zone is not possible. A single airgun operating at a minimum source level can be maintained for routine activities, such as making a turn between line transects, for maintenance needs or during periods of impaired visibility (e.g., darkness, fog, high sea states), and does not require a 30-minute clearance of the exclusion zone before the airgun array is again ramped up to full output.
- **Field Verification** – Before conducting the survey, the operator shall verify the radii of the exclusion zones within real-time conditions in the field. This provides for more accurate exclusion-zone radii rather than relying on modeling techniques before entering

the field. Field-verification techniques must be consistent with NMFS-approved guidelines and procedures. When moving a seismic-survey operation into a new area, the operator shall verify the new radii of the exclusion zones by applying a sound-propagation series.

- **Reporting Requirements** –Operators must report immediately any shut downs/power downs due to a marine mammal entering the exclusion zones and provide the regulating agencies and MMS with information on the frequency of occurrence and the types and behaviors of marine mammals (if possible to ascertain) entering the exclusion zones.

Federal Emergency Contact Information
2007 Open Water Seismic Programs

MMS: Pete Sloan is the contact for MMS. Rance Wall is the alternate.

Pete Sloan: Work 907-334-5328
Home 907-337-9705
Cell 907-382-1134

Rance Wall: Work 907-334-5321
Home 907-622-2414
Cell 907-250-1840

NMFS: Brad Smith is the contact for NMFS.

Brad Smith Work 907-271-3023
Home 907-248-4211
Cell 907-830-0220

USFWS: Craig Perham is the contact for FWS

Craig Perham: Work 907-786-3810
Fax 907-786-3816

Please note: MMS must be notified of all instances as well as the agency having regulatory responsibility.

FINDING OF NO SIGNIFICANT IMPACT

Minerals Management Service
Geological and Geophysical (G&G) Permit Application (PA) 07-04
Shell Offshore, Inc. (SOI)

Beaufort Sea OCS: Deep Penetration Seismic Survey

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, the Department of the Interior, Minerals Management Service (MMS) prepared an environmental assessment (EA) for the subject G&G permit. The EA assessed the potential environmental impacts of SOI's proposed activities in the Beaufort Sea, which include conducting deep penetration marine-streamer 3D seismic surveys and implementing a marine mammal mitigation and monitoring plan.

In accordance with Council on Environmental Quality regulations and guidelines, the PA 07-04 EA focused on analyzing the potential for adverse and significant impacts of those activities on environmental resources and identifying mitigation measures to avoid and/or minimize those impacts. The following more prominent issues and concerns were identified:

- Protection of subsistence resources and the Inupiat culture and way of life.
- Risks of oil spills and their potential impacts on area fish and wildlife resources.
- Disturbance to bowhead whale migration patterns.
- Impacts of seismic operations on marine fish reproduction, growth, and development.
- Harassment and potential harm of wildlife, including marine mammals and marine birds, by vessel operations and movements.
- Impacts on water and air quality.
- Changes in the socioeconomic environment.
- Impacts to threatened and endangered species.
- Impacts to marine mammals.
- Incorporation of traditional knowledge in the decision-making process.
- Effectiveness and feasibility of marine mammal monitoring and other mitigation and monitoring measures.

The results of the Endangered Species Act (ESA) consultation indicated that the U.S. Fish and Wildlife Service (FWS) concurred through informal consultation that there will be no adverse impacts on threatened, endangered, or candidate species under their jurisdiction and the National Marine Fisheries Service (NMFS) stated that the activities associated with seismic surveys in the Beaufort Sea may adversely affect but not jeopardize the continued existence of any species listed under the Endangered Species Act that are under the jurisdiction of the NMFS.

The Marine Mammal Protection Act (MMPA) requires that authorized activities have no unmitigable adverse impact on subsistence uses of marine mammals; therefore, MMPA-related mitigation and monitoring requirements would ensure that impacts to marine mammals will be negligible and that there will be no unmitigable impacts to subsistence uses. Implementation of a conflict avoidance-type agreement with the Alaska Eskimo Whaling Commission and the affected villages' Whaling Captains Association will further ensure that there will not be significant social or economic impacts on the coastal inhabitants of the Chukchi Sea, i.e., potential adverse impact on subsistence marine mammal harvest activities will be avoided. If SOI fails to secure a CAA or other type of agreement, then the NMFS will develop conflict avoidance measures to ensure that there are no unmitigatable impacts on marine mammal subsistence activities.

Under the auspices of the MMPA, the NMFS has received an application from SOI and WesternGeco for an incidental harassment authorization (IHA) to take small numbers of marine mammals, by harassment, incidental to conducting marine geophysical programs, including deep penetration seismic surveys in the Beaufort Sea OCS. MMS is aware that SOI has also applied to the FWS, under the MMPA, for a letter of authorization (LOA) for the incidental take of polar bears and to intentionally take polar bears by hazing under certain circumstances for the 2007 open water season. To ensure compliance with the MMPA, MMS is requiring SOI to obtain the said "authorizations" before commencing MMS-permitted seismic survey activities.

Implementing the following mitigation measures fulfill MMS's statutory mission and responsibilities and the stated purpose and need for the proposed action (to issue geophysical exploration permits for seismic surveys that are technically safe and environmentally sound) while considering environmental, technical, and economic factors:

- No solid or liquid explosives shall be used without specific approval.
- Operations shall be conducted in a manner to ensure that they will not cause pollution, cause undue harm to aquatic life, create hazardous or unsafe conditions, or unreasonably interfere with other uses of the area. Any difficulty encountered with other uses of the area or any conditions that cause undue harm to aquatic life, pollution, or could create a hazardous or unsafe condition as a result of the operations under this permit shall be reported to the Regional Supervisor/Resource Evaluation. Serious or emergency conditions shall be reported without delay.
- Operators must maintain a minimum spacing of 15 miles between the seismic-source vessels for separate operations. The MMS must be notified by means of the weekly report whenever a shut down of operations occurs in order to maintain this minimum distance.
- Permit applicants shall use the lowest sound levels feasible to accomplish their data-collection needs.
- Vessels and aircraft should avoid concentrations or groups of whales. Operators should, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency,

should aircraft be operated at an altitude lower than 1,000 feet when within 500 lateral yards of groups of whales. Helicopters may not hover or circle above such areas or within 500 lateral yards of such areas.

- When weather conditions do not allow a 1,000-foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000-foot altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet because of weather conditions, the operator must avoid known whale-concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.
- When a vessel is operated near a concentration of whales, the operator must take every precaution to avoid harassment of these animals. Therefore, vessels should reduce speed when within 300 yards of whales and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group.
- Vessel operators should avoid multiple changes in direction and speed when within 300 yards of whales. In addition, operators should check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers (or screws) are engaged.
- Small boats should not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to whales.
- When any Permittee becomes aware of the potentially harassing effects of operations on endangered whales, or when any Permittee is unsure of the best course of action to avoid harassment of endangered whales, every measure to avoid further harassment should be taken until the NMFS is consulted for instructions or directions. However, human safety will take precedence at all times over the guidelines and distances recommended herein for the avoidance of disturbance and harassment of endangered whales.
- Seismic-survey operators shall notify MMS, NMFS, and FWS in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals and other wildlife resources.
- Seismic cables and airgun arrays must not be towed in the vicinity of fragile biocenoses (e.g. the Boulder Patch, kelp beds), unless MMS determines the proposed operations can be conducted without damage to the fragile biocenoses. Seismic-survey and support vessels shall not anchor in the vicinity of fragile biocenoses as identified by MMS or may be discovered by the operator during the course of their operations, unless there is an emergency situation involving human safety and there are no other feasible sites in which to anchor at the time. Permittees must report to MMS any damage to fragile biocenoses as a result of their operations.
- To help avoid causing bird collisions with seismic survey and support vessels, all vessels will minimize operations that require high-intensity work lights, especially within the 20-m-bathymetric contour. High-intensity lights will be turned off in inclement weather when the seismic vessel is not actively conducting surveys to

minimize the potential for adverse impacts to marine birds; however, navigation lights, deck lights, and interior lights could remain on for safety.

- All bird-vessel collisions shall be documented. Minimum information will include species, date/time, location, weather, and operational status of the survey vessel when the strike occurred. Photographs would be helpful to confirm species identification. The FWS does not recommend the treatment/transport of injured or dead birds due to the concerns about avian influenza. Bird collision information will be sent to MMS within 72 hours.

The monitoring and mitigation measures, which follow, are related to the requirements of the MMPA and ESA. However, mitigation and monitoring requirements defined in any NMFS (the Federal agency having MMPA management authority for cetaceans and pinnipeds, less Pacific walrus) and FWS (the Federal agency having MMPA management authority for Pacific walrus, polar bear, and sea otter) incidental take authorizations (ITA) and/or LOA obtained by the seismic survey operator will have precedence over any related measures listed below.

- **Exclusion Zone** – A 160/170 dB isopleth exclusion zone from the seismic-survey sound source shall be free of marine mammals before the survey can begin and must remain free of marine mammals during the survey. The purpose of the exclusion zone is to protect marine mammals from Level B harassment (behavioral change). The 160 dB (Level B Harassment–behavioral change) applies to cetaceans and the Pacific walrus and the 170 dB (Level B Harassment-behavioral change) applies to pinnipeds, other than Pacific walrus. This exclusion zone applies in all cases where ITAs and/or LOAs are not issued; however, if they are issued, the exclusion zone specified in them will take precedence over the MMS-identified exclusion zone. The ITA-designated exclusion zone is designed to protect marine mammals from Level A harassment (injury). Typically, the 180 dB (Level A Harassment–injury) applies to cetaceans and the Pacific walrus and the 190 dB (Level A Harassment-injury) applies to pinnipeds, other than Pacific walrus.
- **Monitoring of the Exclusion Zone** – Individuals (marine mammal biologists or trained observers) shall monitor the area around the survey for the presence of marine mammals to maintain a marine mammal-free exclusion zone and monitor for avoidance or take behaviors. Visual observers monitor the exclusion zone to ensure that marine mammals do not enter the exclusion zone for at least 30 minutes prior to ramp up, during the conduct of the survey, or before resuming seismic-survey work after shut down. The NMFS will set specific requirements for the monitoring programs and observers.
- **Shut Down/Power Down** – The survey shall be suspended until the exclusion zone is free of marine mammals. All observers shall have the authority to, and will, instruct the vessel operators to immediately stop or de-energize the airgun array whenever a marine mammal is seen within the exclusion zone or to power down to a sound level where the marine mammal in no longer in the exclusion zone. If the airgun array is completely powered down for any reason during nighttime or poor sighting conditions, it shall not be re-energized until daylight or

whenever sighting conditions allow for the exclusion zone to be effectively monitored from the source vessel and/or through other passive acoustic, aerial, or vessel-based monitoring.

- **Ramp Up** – Ramp up is the gradual introduction of sound to deter marine mammals from potentially damaging sound intensities and from approaching the exclusion zone. This technique involves the gradual increase (usually 5-6 dB per 5-minute increment) in emitted sound levels, beginning with firing a single airgun and gradually adding airguns over a period of at least 20-40 minutes, until the desired operating level of the full array is obtained. Ramp-up procedures may begin after observers ensure the absence of marine mammals for at least 30 minutes. Ramp-up procedures shall not be initiated at night or when monitoring the exclusion zone is not possible. A single airgun operating at a minimum source level can be maintained for routine activities, such as making a turn between line transects, for maintenance needs or during periods of impaired visibility (e.g., darkness, fog, high sea states), and does not require a 30-minute clearance of the exclusion zone before the airgun array is again ramped up to full output.
- **Field Verification** – Before conducting the survey, the operator shall verify the radii of the exclusion zones within real-time conditions in the field. This provides for more accurate exclusion-zone radii rather than solely relying on modeling techniques before entering the field. When moving a seismic-survey operation into a new area, the operator shall verify the new radii of the exclusion zones by applying a sound-propagation series.
- **Reporting Requirements** –Operators must report immediately any shut downs/power downs due to a marine mammal entering the exclusion zones and provide the regulating agencies and MMS with information on the frequency of occurrence and the types and behaviors of marine mammals (if possible to ascertain) entering the exclusion zones.

Based on MMS's examination of the available information in the PA 07-04 EA and from information obtained from previous public input on seismic-survey-related NEPA documents, the MMS finds that no significant adverse affects (40 CFR 1508.27) on the quality of the human environment would occur from SOI's (PA 07-04) proposed seismic survey operations in the Beaufort Sea during the 2007 open water season. Therefore, an environmental impact statement is not required and MMS is issuing this Finding of No Significant Impact (FONSI).

Deborah Cranswick
Chief – Environmental Assessment Section

7/13/07
Date

Cleve Cowles
Regional Supervisor – Leasing and Environment

7/13/07
Date

ENVIRONMENTAL ASSESSMENT
July 12, 2007

Minerals Management Service (MMS)
Geological and Geophysical (G&G) Permit Application (PA) 07-04
Shell Offshore, Inc. (SOI)

Beaufort Sea OCS: Deep Penetration Seismic Survey

The purpose of our review is to: (1) environmentally evaluate SOI's proposed 2007 open water season, deep-penetration seismic survey operations in the Beaufort Sea; (2) determine if any significant adverse affects (40 CFR 1508.27) on the quality of the human environment would occur; (3) determine if further National Environmental Policy Act (NEPA) analysis is required; and, (4) identify mitigation measures (if any) to be incorporated into the G&G permit (PA 07-04) MMS Resource Evaluation is considering issuing to SOI.

Description of SOI's (PA 07-04) Proposed Seismic Survey Operation

Information about SOI's (PA 07-04) proposed seismic survey operation in the Beaufort Sea was obtained from their: (1) G&G permit application, dated November 21, 2006; (2) Incidental Harassment Authorization (IHA) application to the National Marine Fisheries Service (NMFS), dated November 22, 2006; and (3) Marine Mammal Monitoring and Mitigation Plan, dated February 7, 2007. Information was also obtained from NMFS's *Notice of receipt of application and proposed incidental take authorization; request for comments. (Notice)* (FR Vol. 72, No. 109/Thursday, June 7, 2007/Notices, pages 31553 to 31568). Also used as background information, was SOI's exploratory drilling plan (EP), located at http://www.mms.gov/alaska/ref/PublicInfo/Shell_BF/BF.HTM and MMS's environmental assessment of that plan.

The purpose of the subject permit application is for SOI to collect geophysical information in the Mid and Eastern Beaufort Sea Outer Continental Shelf (OCS) for the use in evaluating the potential for hydrocarbon accumulations and making decisions related to leasing and further exploration (hereinafter referred to as the "proposed activities"). The proposed activities are authorized under the OCS Lands Act and are regulated under 30 CFR 251 (Geological and Geophysical Explorations of the Outer Continental Shelf). The MMS is mandated to preserve, protect, and develop oil and natural gas resources in the OCS in a manner which is consistent with the need (a) to make such resources available to meet the Nation's energy needs as rapidly as possible, and (b) to balance orderly energy resource development with protection of the human, marine, and coastal environments.

The proposed activities include a three-dimensional (3D) seismic survey for exploration purposes in the Beaufort Sea Program Area, but will not include any site clearance or

shallow hazard surveys[1]. However, site clearance and shallow hazard surveys will be conducted contemporaneously with SOI's 3D deep seismic survey program in the Beaufort Sea. The goal of the survey is to gather seismic data over approximately 750 square miles in the Beaufort Sea Program Area. In general, however, seismic acquisition will take place on OCS waters averaging greater than 40 meter depths and well offshore from the Alaska coast.

As sea ice conditions allow, the M/V *Gilivar* (the seismic source vessel) and M/V *Kilabuk*, or similar ice-class vessel, will transit from the Chukchi Sea in early-to-mid August to start work on their deep seismic survey operation in the mid and eastern Beaufort Sea.[2] SOI will focus their activities in OCS waters on their leases beginning east of the Coville River delta to east of the village of Kaktovik. Within this area, SOI has acquired four separate groups of lease blocks, totaling 85 leases. Seismic acquisition is planned until early October, unless ice conditions permit work to continue longer. The M/V *Kilabuk* will serve as a resupply, fueling support of acoustic and marine mammal monitoring, and general support (e.g. retrieve and repair equipment and provide search and rescue) vessel. The M/V *Peregrine* or similar vessel will be used to ferry people and supplies from nearshore docking sites (i.e., West Dock, Oliktok Dock, and possibly Barrow) during crew changes, and support the marine mammals monitoring and mitigation program (4MP). All of SOI's vessels will operate so as not to conflict with the bowhead subsistence whale hunts by Barrow, Kaktovik, and Nuiqaut.

The energy source for the 3D seismic survey will be three identical tuned Bolt-gun sub-arrays operating at 2,000 psi, air pressure towed behind the seismic source vessel. The airgun arrays are expected to generate a total sound source of approximately 3,147 cubic inches and its overall dimensions are 49 feet long and 52.5 feet wide. The receivers will be 6 to 8 hydrophone cables, each approximately 6,000 meters long, spaced about 100 meters apart, and towed behind the seismic source vessel. Operations would be conducted around the clock, except for downtime due to weather, ice-conditions, repairs, etc.

Environmental Review

The MMS has offered the public and stakeholders numerous and continuing opportunities to provide input on issues, concerns, alternatives, and mitigation related to seismic surveying for our consideration in preparing this EA.

The MMS and NMFS prepared a programmatic environmental assessment (PEA) on seismic surveying in the Arctic OCS for the 2006 open water season. The draft PEA was published for public review and comment and a final PEA and Finding of No Significant Impact (FONSI) were posted on the MMS website.

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[1] Under separate cover, MMS is currently evaluating SOI's G&G Permit application (07-09) to conduct site clearance and shallow hazard surveys associated with their Beaufort Sea lease blocks.

[2] Under separate cover, MMS is currently evaluating SOI's G&G Permit application (07-03) to conduct open water, deep seismic surveys in the Chukchi Sea in 2007.

The MMS has reviewed new information available since the completion of the PEA. This information includes preliminary results from the 2006 marine mammal monitoring program; stakeholder input at the three NMFS open-water meetings (October 2006, May 2007, and June 2007); comments received on the draft environmental impact statement (EIS) for Proposed Chukchi Sea Sale 193 and Seismic Surveying Activities at the November and December 2006 public hearings and via written comments; comments received in response to the November 2006, Notice of Intent to prepare the Programmatic Seismic Survey (PEIS); comments received at the public hearings on the draft PEIS held in April 2007; and written comments received to date on draft PEIS.

Applications for geological and geophysical permits for seismic surveying operations in the Arctic OCS in the 2007 open-water season, including PA 07-04, are posted on the MMS website at http://www.mms.gov/alaska/re/recentgg/recentgg.htm and are available for public review and comment. The MMS provided written notification of these permit applications to the North Slope Borough and potentially affected Tribes and communities.

Issues and concerns associated with seismic-survey operations similar to what SOI (PA 07-04) is proposing have been documented by the scientific community, in government publications, and at scientific symposia. Based on the information obtained from the aforementioned sources, the following more prominent issues and concerns have been identified:

- Protection of subsistence resources and the Inupiat culture and way of life.
- Risks of oil spills and their potential impacts on area fish and wildlife resources.
- Disturbance to bowhead whale migration patterns.
- Impacts of seismic operations on marine fish reproduction, growth, and development.
- Harassment and potential harm of wildlife, including marine mammals and marine birds, by vessel operations and movements.
- Impacts on water and air quality.
- Changes in the socioeconomic environment.
- Impacts to threatened and endangered species.
- Impacts to marine mammals.
- Incorporation of traditional knowledge in the decision-making process.
- Effectiveness and feasibility of marine mammal monitoring and other mitigation and monitoring measures.

Specifically, the following resource categories/issues were evaluated in greater detail: fish/fishery resources, marine birds, threatened and endangered species, marine mammals, subsistence-harvest patterns, sociocultural systems, environmental justice, and archaeological resources.

Attachment 1 is a comparison of SOI's (PA 07-04) seismic survey operational features with the range of seismic survey features environmentally evaluated in the *Final Programmatic Environmental Assessment (*2006 PEA*) Arctic Ocean Outer Continental*

Shelf Seismic Surveys-2006" (OCS EIS/EA, MMS 2006-038), which resulted in a FONSI, and based on that comparison, SOI's seismic survey activities are within the scope of activities covered by our previous NEPA analyses, Endangered Species Act Section 7 consultation, Marine Mammal Protection Act (MMPA) coordination with NMFS and Fish and Wildlife Service (FWS), and our essential fish habitat consultation with NMFS. No further coordination with the State of Alaska State Historic Protection Officer is required because SOI is not proposing ocean-bottom-cable seismic survey operations.

The MMPA requires that authorized activities have no unmitigable adverse impact on subsistence uses of marine mammals; therefore, MMPA-related mitigation and monitoring requirements would ensure that impacts to marine mammals will be negligible and that there will be no unmitigable impacts to subsistence uses. Implementation of a conflict avoidance-type agreement with the Alaska Eskimo Whaling Commission and the affected villages' Whaling Captains Association will further ensure that there will not be significant social or economic impacts on the coastal inhabitants of the Chukchi Sea, i.e., potential adverse impact on subsistence marine mammal harvest activities will be avoided. If SOI fails to secure a conflict avoidance-type agreement then the NMFS will develop conflict avoidance measures to ensure that there are no unmitigatable impacts on marine mammal subsistence activities.

Under the auspices of the MMPA, the NMFS has received an application from SOI and WesternGeco for an IHA to take small numbers of marine mammals, by harassment, incidental to conducting marine geophysical programs, including deep penetration seismic surveys in the Beaufort Sea OCS. MMS is aware that SOI has also applied to the FWS, under the MMPA, for a letter of authorization (LOA) for the incidental take of polar bears and to intentionally take polar bears by hazing under certain circumstances for the 2007 open water season. To ensure compliance with the MMPA, MMS is requiring SOI to obtain the said "authorizations" before commencing MMS-permitted seismic survey activities.

Along with its IHA application, SOI also submitted its proposed mitigation and monitoring plan which includes: (1) timing and locating seismic activities to avoid interference with the annual fall bowhead hunts; (2) configuring the airgun arrays to maximize the proportion of energy that propagates downward and minimizes horizontal propagation; (3) limiting the size of the seismic energy source to only that required to meet the technical objectives of the seismic survey; and, (4) conducting pre-season modeling and early season field assessments to establish and refine (as necessary) the appropriate 180 dB and 190 dB safety zones, and other radii relevant to behavioral disturbances.

SOI plans to use marine mammal monitors onboard the seismic vessel to monitor the 190 and 180 dB safety radii for pinnipeds and cetaceans, respectively. SOI also plans to monitor the 160 dB disturbance zone with marine mammal observers onboard the support vessel and/or by conducting aerial surveys. Mitigation (i.e., power down or shut down of the airgun array) will be implemented if a group of 12 or more bowhead or gray whales

enter the 160 db zone. Because SOI will be operating in the Beaufort Sea after September 1, SOI anticipates the need to also aerially monitor the 120 dB zone in that region. Aerial surveys during the late August-October period will be designed to ensure that large aggregations of mother-calf bowheads do not approach to within the 120 dB radius from the active seismic operation.

SOI will model and estimate the safety and disturbance zones based on the specifications for the array. Those measurements will be used until direct measurements are available early during the seismic survey. An acoustics contractor will perform the direct measurements of the received levels of underwater sound versus distance and direction for the airgun arrays using calibrated hydrophones. The acoustic data will be analyzed as quickly as reasonably practicable in the field and used to verify (and if necessary adjust) the safety distances. Other mitigation measures to be implemented by SOI will include ramp ups, power downs, and shut downs.

Potential cumulative impacts in the Beaufort Sea may be associated with SOI's other seismic surveys and drilling operations. SOI is proposing to drill four OCS exploration wells at the Sivulliq prospect in the 2007 open water season. No other oil and gas company is expected to conduct any deep seismic surveys, shallow hazard and site clearance surveys, and exploration drilling in the Beaufort Sea OCS during the 2007 open water season.

SOI will use two floating drilling units operating simultaneously. Drilling operations will be supported by two ice breakers. Additional support vessels will be staged between the drilling units to provide near immediate on-site oil spill response capability in the unlikely event of a spill. If time allows, SOI may also construct well cellars (holes dug or drilled in to the sea floor to depths of approximately 30-40 feet deep during the 2007 open water season.

SOI's EP explains that operations would be conducted in a manner that is consistent with the lease terms, including two special MMS stipulations: No. 4 Industry Site-Specific Bowhead Whales-Monitoring Program, and No. 5 Conflict Avoidance Mechanisms to Protect Subsistence Whaling and other Subsistence Activities. To address the potential cumulative, noise-generating impact of their various operations, SOI is negotiating with the local bowhead subsistence whalers and NMFS to identify a 10-day period (between August 25 and September 19) in which SOI would temporarily shut down their seismic survey and drilling operations.

SOI expects to begin their exploratory drilling around mid-July and finish by November 1. Shallow hazard and site clearance seismic surveys are scheduled to begin around July 20 and finish before exploration drilling concludes.

There are multiple studies on noise from deep seismic operations, drilling operations from the *Kulluk,* and from drillships similar to the *Frontier Discoverer.* SOI's IHA marine mammal monitoring plan explains that the objectives of the planning monitoring are to: (1) measure the distances from the various sound sources to broadband received

levels of 190, 180, 160, and 120 dB, and (2) to measure the radiated vessel sounds vs. distance for the source and support vessels. The measurements will be made at the beginning of specific activities. For the drilling operation, a subsequent mid-season assessment will be conducted to measure sound propagation from combined drilling operations during "normal" operations.

In 2006, the State of Alaska, Division of Oil and Gas conducted two lease sales in state waters of the Beaufort Sea. The Beaufort Sea Areawide 2006 sale, conducted on March 1, 2006, sold 62 tracts totaling approximately 204 million acres. The Beaufort Sea Areawide 2006A sale, conducted on October 25, 2006, sold 13 tracts totaling approximately 33 million acres. No State of Alaska lease sales are scheduled to occur in the Chukchi Sea, nor are any State deep seismic survey permits scheduled to be issued for the Beaufort or Chukchi seas. However, the State has issued two 2007 permits for conducting geophysical technical surveys in State waters near Point Thompson. State mitigation measures and lessee advisories for the Beaufort Sea can be found at: http://www.dog.dnr.state.ak.us/oil/products/publications/beaufortsea/bsaw2006/bs_2006mits.pdf.

Findings

The NMFS preliminarily determined in their *Notice* that the impact of SOI conducting seismic surveys in the Beaufort Sea in 2007 will have no more than a negligible impact on marine mammals and that there will not be any unmitigable adverse impact to subsistence communities, provided NMFS mitigation measures are implemented by SOI. As a result of NMFS's preliminary determinations, they propose to issue an IHA to SOI for conducting a seismic survey in the Beaufort Sea in 2007.

The MMS prepared an environmental assessment on SOI's exploration activities in the Beaufort Sea, which included a cumulative analysis of their 2007 open water seismic survey season. The entire NEPA analysis developed a mitigation plan and resulted in a FONSI. An approval letter from MMS, dated February 15, 2007, was sent to SOI regarding their EP activities, which included a list of stipulations. The subject letter can be found at: http://www.mms.gov/alaska/ref/PublicInfo/Shell_BF/BF.HTM. A major factor in MMS's finding was that a final IHA from NMFS and a LOA from FWS is required before drilling operations commence. Therefore, with the issuance of the IHA and LOA, there will be negligible impacts to the bowhead whales and other marine mammals and no unmitigable impacts to the availability of subsistence resources. SOI is also required to implement a marine mammal monitoring program for their drilling operations and have agreed to shut down drilling for up to 10 days during the bowhead whale subsistence hunt.

MMS has found that SOI's (PA 07-04) proposed activities are within the range of seismic survey activities and potential environmental impacts evaluated in the 2006 PEA and other NEPA documents. The 2006 PEA considered a range of alternatives before: 1) identifying Alternative 6 and its associated mitigation and monitoring measures as the agency's Selected Alternative (see Section V of the 2006 PEA for a description of the

Selected Alternative and the associated mitigation measures); 2) making a FONSI; and 3) determining that there was no need to prepare an EIS. The FONSI concluded that seismic surveys could result in adverse but not significant effects. Even with SOI's exploratory drilling operations, cumulative impacts of the 2007 open water season in the Beaufort Sea are not likely to exceed those described in the 2006 PEA and MMS's EP environmental assessment.

In review of SOI's PA 07-04 and committed mitigation measures and monitoring plan, and by incorporating MMS mitigation measures (Attachment 2), we have determined that: (1) no significant adverse affects (40 CFR 1508.27) on the quality of the human environment would occur from SOI's seismic survey activities as proposed in their G&G permit application (PA 07-04); and, (2) no further NEPA analysis of SOI's (PA 07-04) proposed seismic survey activities in the Beaufort Sea is required.

MMS's mitigation measures (Attachment 2): (1) represent those that are under the jurisdiction of MMS; (2) complement those measures likely to be included in NMFS and FWS incidental take authorizations (ITA) and/or LOAs; and (3) address concerns from local, state, and federal agencies, non-governmental agencies, Alaska Native Tribes, and the general public. The prerequisite mitigation measure of obtaining an IHA or LOA from NMFS and/or FWS will assure that no unmitigatable impacts on marine mammal subsistence activities will occur. Furthermore, we acknowledge and endorse that mitigation and monitoring requirements in the NMFS and FWS authorizations under the MMPA will have precedence over any marine-mammal-related G&G permit requirements.

Attachment 1. The following table compares the key features of the proposed activities in the SOI's G&G permit application (PA 07-04) for deep penetration seismic survey activities in the Beaufort Sea OCS with the scope of seismic survey activities environmentally assessed in the 2006 PEA/FONSI.

Factor	2006 PEA Scenario	Shell Offshore, Inc. Proposed Seismic Survey Activities (PA 07-04)
Area	Chukchi Sea OCS Beaufort Sea OCS	Beaufort Sea OCS
Survey type	2D/3D streamer ocean-bottom-cable high resolution, site-clearance	3D streamer
Seismic survey season.	July 1 to December 31, 2006	~Aug. 20 to November 1
Number of seismic surveys being conducted simultaneously	4 deep penetration	1 deep penetration
Number of seismic source vessels	1 - 2 seismic source vessels per seismic survey	1 seismic source vessel
Source arrays	1 - 3 source arrays	1 source array
Airgun array size	1,800 - 4,000 cubic inches	3,147 cubic inches
Receiver streamers (3D seismic)	4 - 12 streamer-receiver cables, each 3 - 8 kilometers long	6 - 8 streamer-receiver cables, each ~6 kilometers long
Streamer array width (3D seismic)	400 - 900 meters	600 - 800 meters
Streamer buoyancy	liquid paraffin or solid/gel	liquid paraffin (isopar)
Support vessels	Up to 3 per survey (including crew boats, supply boats, monitoring vessels, icebreakers)	Two support vessels – one is a supply/ice management/marine mammal monitoring vessel and the other is for crew changes and resupplies.
Aircraft	Fixed-wing aircraft and helicopters	Sikorsky S-61 helicopter for emergency rescue/evacuation and search and rescue services.
Restrictions:		
Ledyard Bay	Except for emergencies, no seismic survey vessel, support boats, or operations will be allowed in the Ledyard Bay critical eider habitat	Not applicable.
Spring lead system in the Chukchi Sea	No seismic survey operations before July1 without prior authorization from the National Marine Fisheries Service.	Not applicable.

Attachment 2: Recommended mitigation and monitoring requirements to be included in SOI's G&G Permit 07-04, Beaufort Sea OCS deep penetration seismic survey.

Implementing the following mitigation measures fulfill MMS's statutory mission and responsibilities and the stated purpose and need for the proposed action (to issue geophysical exploration permits for seismic surveys that are technically safe and environmentally sound) while considering environmental, technical, and economic factors:

- No solid or liquid explosives shall be used without specific approval.
- Operations shall be conducted in a manner to ensure that they will not cause pollution, cause undue harm to aquatic life, create hazardous or unsafe conditions, or unreasonably interfere with other uses of the area. Any difficulty encountered with other uses of the area or any conditions that cause undue harm to aquatic life, pollution, or could create a hazardous or unsafe condition as a result of the operations under this permit shall be reported to the Regional Supervisor/Resource Evaluation. Serious or emergency conditions shall be reported without delay.
- Operators must maintain a minimum spacing of 15 miles between the seismic-source vessels for separate operations. The MMS must be notified by means of the weekly report whenever a shut down of operations occurs in order to maintain this minimum distance.
- Permit applicants shall use the lowest sound levels feasible to accomplish their data-collection needs.
- Vessels and aircraft should avoid concentrations or groups of whales. Operators should, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than 1,000 feet when within 500 lateral yards of groups of whales. Helicopters may not hover or circle above such areas or within 500 lateral yards of such areas.
- When weather conditions do not allow a 1,000-foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000-foot altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet because of weather conditions, the operator must avoid known whale-concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.
- When a vessel is operated near a concentration of whales, the operator must take every precaution to avoid harassment of these animals. Therefore, vessels should reduce speed when within 300 yards of whales and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group.
- Vessel operators should avoid multiple changes in direction and speed when within 300 yards of whales. In addition, operators should check the waters

immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers (or screws) are engaged.

- Small boats should not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to whales.
- When any Permittee becomes aware of the potentially harassing effects of operations on endangered whales, or when any Permittee is unsure of the best course of action to avoid harassment of endangered whales, every measure to avoid further harassment should be taken until the National Marine Fisheries Service (NMFS) is consulted for instructions or directions. However, human safety will take precedence at all times over the guidelines and distances recommended herein for the avoidance of disturbance and harassment of endangered whales.
- Seismic-survey operators shall notify MMS, NMFS, and U.S. Fish and Wildlife Service (FWS) in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals and other wildlife resources.
- Seismic cables and airgun arrays must not be towed in the vicinity of fragile biocenoses (e.g. the Boulder Patch, kelp beds), unless MMS determines the proposed operations can be conducted without damage to the fragile biocenoses. Seismic-survey and support vessels shall not anchor in the vicinity of fragile biocenoses as identified by MMS or may be discovered by the operator during the course of their operations, unless there is an emergency situation involving human safety and there are no other feasible sites in which to anchor at the time. Permittees must report to MMS any damage to fragile biocenoses as a result of their operations.
- To help avoid causing bird collisions with seismic survey and support vessels, all vessels will minimize operations that require high-intensity work lights, especially within the 20-m-bathymetric contour. High-intensity lights will be turned off in inclement weather when the seismic vessel is not actively conducting surveys to minimize the potential for adverse impacts to marine birds; however, navigation lights, deck lights, and interior lights could remain on for safety.
- All bird-vessel collisions shall be documented. Minimum information will include species, date/time, location, weather, and operational status of the survey vessel when the strike occurred. Photographs would be helpful to confirm species identification. The FWS does not recommend the treatment/transport of injured or dead birds due to the concerns about avian influenza. Bird collision information will be sent to MMS within 72 hours.

The monitoring and mitigation measures, which follow, are related to the requirements of the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). However, mitigation and monitoring requirements defined in any NMFS (the Federal agency having MMPA management authority for cetaceans and pinnipeds, less Pacific walrus) and FWS (the Federal agency having MMPA management authority for Pacific walrus, polar bear, and sea otter) incidental take authorizations (ITA) and/or Letters of

Authorization (LOA) obtained by the seismic survey operator will have precedence over any related measures listed below.

- **Exclusion Zone** – A 160/170 dB isopleth exclusion zone from the seismic-survey sound source shall be free of marine mammals before the survey can begin and must remain free of marine mammals during the survey. The purpose of the exclusion zone is to protect marine mammals from Level B harassment (behavioral change). The 160 dB (Level B Harassment–behavioral change) applies to cetaceans and the Pacific walrus and the 170 dB (Level B Harassment-behavioral change) applies to pinnipeds, other than Pacific walrus. This exclusion zone applies in all cases where ITAs and/or LOAs are not issued; however, if they are issued, the exclusion zone specified in them will take precedence over the MMS-identified exclusion zone. The ITA-designated exclusion zone is designed to protect marine mammals from Level A harassment (injury). Typically, the 180 dB (Level A Harassment–injury) applies to cetaceans and the Pacific walrus and the 190 dB (Level A Harassment-injury) applies to pinnipeds, other than Pacific walrus.
- **Monitoring of the Exclusion Zone** – Individuals (marine mammal biologists or trained observers) shall monitor the area around the survey for the presence of marine mammals to maintain a marine mammal-free exclusion zone and monitor for avoidance or take behaviors. Visual observers monitor the exclusion zone to ensure that marine mammals do not enter the exclusion zone for at least 30 minutes prior to ramp up, during the conduct of the survey, or before resuming seismic-survey work after shut down. The NMFS will set specific requirements for the monitoring programs and observers.
- **Shut Down/Power Down** – The survey shall be suspended until the exclusion zone is free of marine mammals. All observers shall have the authority to, and will, instruct the vessel operators to immediately stop or de-energize the airgun array whenever a marine mammal is seen within the exclusion zone or to power down to a sound level where the marine mammal in no longer in the exclusion zone. If the airgun array is completely powered down for any reason during nighttime or poor sighting conditions, it shall not be re-energized until daylight or whenever sighting conditions allow for the exclusion zone to be effectively monitored from the source vessel and/or through other passive acoustic, aerial, or vessel-based monitoring.
- **Ramp Up** – Ramp up is the gradual introduction of sound to deter marine mammals from potentially damaging sound intensities and from approaching the exclusion zone. This technique involves the gradual increase (usually 5-6 dB per 5-minute increment) in emitted sound levels, beginning with firing a single airgun and gradually adding airguns over a period of at least 20-40 minutes, until the desired operating level of the full array is obtained. Ramp-up procedures may begin after observers ensure the absence of marine mammals for at least 30 minutes. Ramp-up procedures shall not be initiated at night or when monitoring the exclusion zone is not possible. A single airgun operating at a minimum source level can be maintained for routine activities, such as making a turn between line transects, for maintenance needs or during periods of impaired

visibility (e.g., darkness, fog, high sea states), and does not require a 30-minute clearance of the exclusion zone before the airgun array is again ramped up to full output.

- **Field Verification** – Before conducting the survey, the operator shall verify the radii of the exclusion zones within real-time conditions in the field. This provides for more accurate exclusion-zone radii rather than solely relying on modeling techniques before entering the field. When moving a seismic-survey operation into a new area, the operator shall verify the new radii of the exclusion zones by applying a sound-propagation series.
- **Reporting Requirements** –Operators must report immediately any shut downs/power downs due to a marine mammal entering the exclusion zones and provide the regulating agencies and MMS with information on the frequency of occurrence and the types and behaviors of marine mammals (if possible to ascertain) entering the exclusion zones.