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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 217

[Docket No. 140912776-6553-02]

RIN 0648-BE53

Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Seismic Surveys in Cook Inlet, Alaska

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: NMFS is issuing regulations governing related Letters of Authorization (LOAs) in response to a request from Apache Alaska Corporation (Apache) for authorization to take marine mammals, by harassment, incidental to its oil and gas exploration seismic survey program in Cook Inlet, Alaska**.** This action will put the applicant into compliance with the Marine Mammal Protection Act (MMPA) and minimize impacts to marine mammals in Cook Inlet.

DATES: Effective August 19, 2016 through July 20, 2021.

ADDRESSES: An electronic copy of the application, containing a list of references used in this document, and the associated Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) may be obtained by writing to the address specified above, telephoning the contact listed below (see **FOR FURTHER INFORMATION CONTACT**), or visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm*. Documents cited in this notice

may also be viewed, by appointment, during regular business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Sara Young, Office of Protected Resources, NMFS, (301) 427-8484.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. NMFS has defined "negligible impact" in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: "any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption

of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment]."

Summary of Request

On July 11, 2014, NMFS received a complete application from Apache requesting authorization for the take of nine marine mammal species incidental to an oil and gas exploration seismic program in Cook Inlet, AK, over the course of 5 years. On February 23, 2015, NMFS published a notice in the **Federal Register** of our proposal to issue regulations and subsequent LOAs with preliminary determinations (80 FR 9510). The filing of the notice initiated a 30-day public comment period, which was then extended by 15 days. The comments and our responses are discussed later in this document.

The activity will occur for approximately 8-9 months annually over the course of a 5-year period between August 2016 and July 2021. In-water airguns will be active for approximately 2-3 hours during each of the slack tide periods. There are approximately four slack tide periods in a 24-hour period; therefore, airgun operations will be active during approximately 8-12 hours per day, if weather conditions allow. The following specific aspects of the activity are likely to result in the take of marine mammals: seismic airgun operations. Take, by Level B Harassment only, of individuals of nine species or stocks of marine mammals is anticipated to result from the specified activity.

Description of the Specified Activity

Overview

Apache has acquired over 850,000 acres of oil and gas leases in Cook Inlet since 2010 with the primary objective to explore for and develop oil and gas resources in Cook Inlet. Apache will conduct oil and gas seismic surveys in Cook Inlet, Alaska, in an area that

encompasses approximately 5,684 km^2 (2,195 mi^2) of intertidal and offshore areas. This area is slightly larger than that shown in Apache's MMPA application and corresponds with the request contained in their Biological Assessment and Figure 1 in this document, which is also available at: *http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas.htm#apache2020*. Vessels will lay and retrieve nodal sensors on the sea floor in periods of low current, or, in the case of the intertidal area, during high tide over a 24-hour period. In deep water, a hull or pole mounted pinger system will be used to determine the exact location of the nodes. The two instruments used in this technique are a transceiver (operating at 33-55kHz with a maximum source level of 188 dB re 1 µPa at 1 meter) and a transponder (operating at 35-50kHz with a maximum source level of 188 dB re 1 µPa at 1 meter). The majority of the sound energy produced by this project is from the seismic airgun array, for which Apache will use two synchronized vessels. Each source vessel will be equipped with compressors and 2,400 cubic inch (in^3) airgun arrays. Additionally, one of the source vessels will be equipped with a 440 in^3 shallow water source array, which can be deployed at high tide in the intertidal area in less than 1.8 m (6 ft) of water. The two source vessels do not fire the airguns simultaneously; rather, each vessel fires a shot every 24 seconds, leaving 12 seconds between shots.

The operation will utilize two source vessels, three cable/nodal deployment and retrieval operations vessels, a mitigation/monitoring vessel, a node re-charging and housing vessel, and two small vessels for personnel transport and node support in the extremely shallow waters in the intertidal area. Water depths for the program will range from 1-128 m (0-420 ft).

Seismic surveys are designed to collect bathymetric and sub-seafloor data that allow the evaluation of potential shallow faults, gas zones, and archeological features at prospective exploration drilling locations. In the spring of 2011, Apache conducted a seismic test program to

evaluate the feasibility of using new nodal (no cables) technology seismic recording equipment for operations in Cook Inlet. This test program found and provided important input to assist in finalizing the design of the 3D seismic program in Cook Inlet (the nodal technology was determined to be feasible).

Apache began seismic onshore acquisition on the west side of Cook Inlet in September 2011 and offshore acquisition in May 2012 under an Incidental Harrassent Authorization (IHA) issued by NMFS for April 30, 2012, through April 30, 2013 (77 FR 27720, May 11, 2012). Apache continued seismic data acquisition for approximately 3 months in spring and summer 2014 in compliance with an IHA issued on March 4, 2014 (79 FR 13626, March 11, 2014). Apache reported a total of 29 level B harassment exposures from the 2014 IHA comprising beluga whales, humpback whales, harbor seals, and harbor porpoises, which was well within the scope of their authorization.

Dates and Duration

Apache will conduct offshore/transition zone seismic operations for approximately 8 to 9 months in offshore areas in open water periods from March 1 through December 31 annually over the course of 5 years. During each 24-hour period, seismic support activities may be conducted throughout the entire period; however, in-water airguns will only be active for approximately 2-3 hours during each of the slack tide periods. There are approximately four slack tide periods in a 24-hour period; therefore, airgun operations will be active during approximately 8-12 hours per day, if weather conditions allow. Two airgun source vessels will work concurrently on the spread, acquiring source lines approximately 12 km (7.5 mi) in length. Apache anticipates that a crew can acquire approximately eight of these 12km lines per day, assuming a crew can work 8-12 hours per day. Thus, the actual survey duration each year will

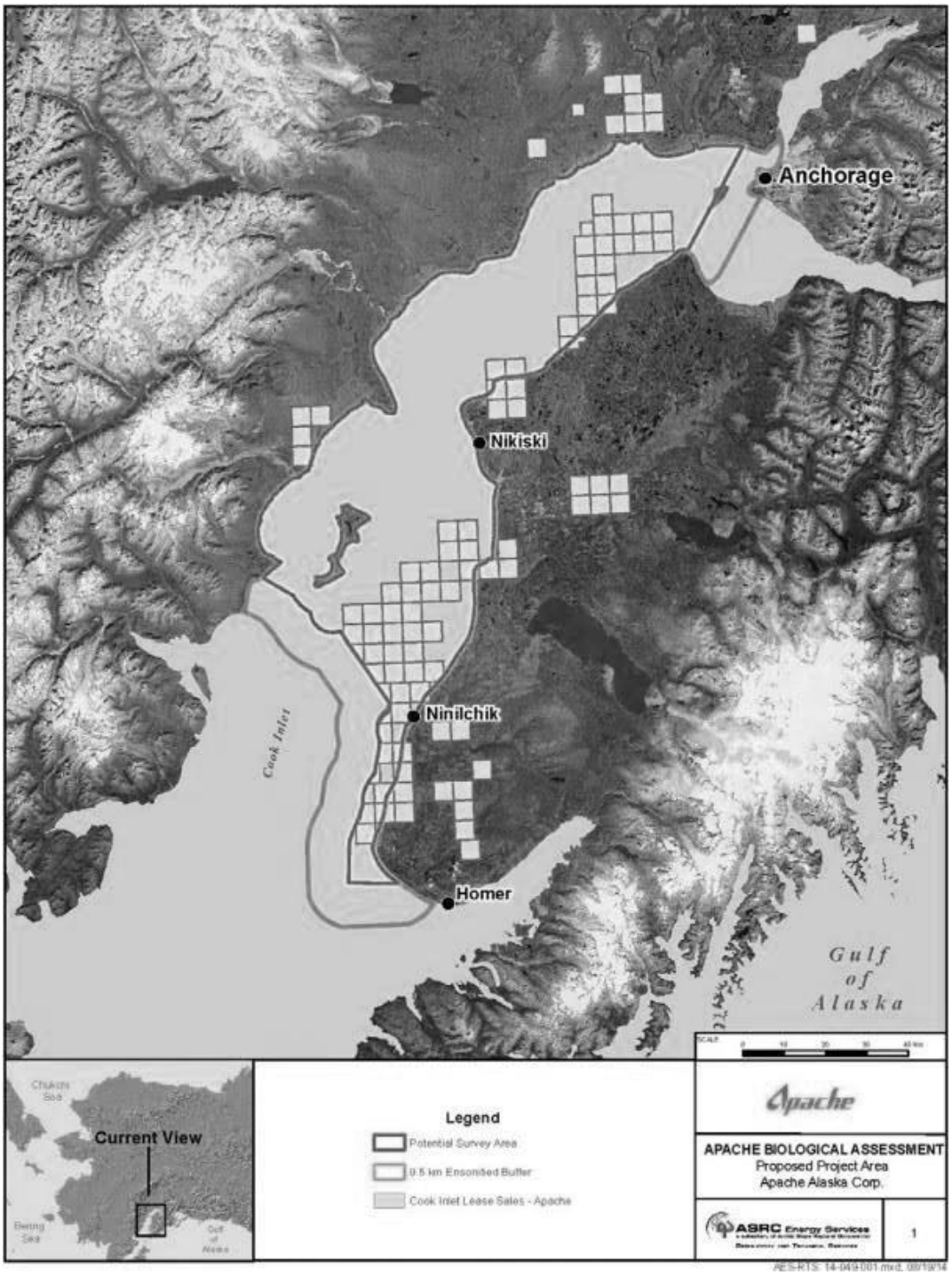
take approximately 160 days over the course of 8 to 9 months. The vessels will be mobilized out of Homer or Anchorage with resupply runs occurring multiple times per week out of Homer, Anchorage, or Nikiski.

Specified Geographic Region

Each phase of the Apache program would cover land, intertidal transition zone, and marine environments in Cook Inlet, Alaska. However, only the portions occurring in the intertidal zone and marine environments have the potential to take marine mammals. The land-based portion of the program would not result in sound levels that would rise to the level of a marine mammal take.

The location of Apache's acquisition plan is depicted in Figure 1 in this document. The total seismic survey data acquisition locations encompass approximately 5,684 km^2 (2,195 mi^2) of intertidal and offshore areas. This area is approximately 18% larger than the area contained in Apache's MMPA application. The additional area for seismic survey data acquisition considered in this rule is located in northern Cook Inlet near the Susitna Delta region and was considered in both the proposed and final rule. Apache will only operate in a portion of the entire survey area between March 1 and December 31 each year. There are numerous factors that influence the survey areas, including the geology of the Cook Inlet area, other permitting restrictions (i.e., commercial fishing, Alaska Department of Fish and Game refuges), seismic imaging of leases held by other entities with whom Apache has agreements (e.g., data sharing), overlap of sources and receivers to obtain the necessary seismic imaging data, and general operational restrictions (ice, weather, environmental conditions, marine life activity, etc.). Water depths for the program will range from 1-128m (0-420 ft).

Figure 1. Project Area for Apache's 2016-2021 3D Seismic Survey Program



Detailed Description of Activities

The Notice of Proposed Rulemaking (80 FR 9510, February 23, 2015) contains a full detailed description of the 3D seismic survey, including the recording system, sensor positioning, and seismic source. That information has not changed and is therefore not repeated here.

Comments and Responses

A Notice of Proposed Rulemaking was published in the **Federal Register** on February 23, 2015 (80 FR 9510) for public comment. NMFS received a request for extension of the public comment period from the Natural Resource Defense Council on March 2, 2015. NMFS granted a 15-day extension to the public comment period, which ended on April 9, 2015. During the 45-day public comment period, NMFS received fourteen comment letters from the following: the State of Alaska Department of Natural Resources (AK DNR); the Alaska Chamber; the All American Oil Field; the Alaska Oil and Gas Association (AOGA); the Chugach Alaska Corporation; Cook Inlet Regional Inc. (CIRI); the International Fund for Animal Welfare (IFAW); the Resource Development Council (RDC); Natural Resource Defense Council (NRDC); the Marine Mammal Commission (MMC); the public law class of the Vermont Law School (VLS); and three private citizens.

All of the public comment letters received on the Notice of Proposed Rulemaking (80 FR 9510, February 23, 2015) are available on our website at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm*. Following is a summary of the public comments and NMFS' responses.

Comment 1: One private citizen requested that we deny issuance of the IHA because marine mammals would be killed as a result of the survey.

Response: This activity is not expected to result in the death of any marine mammal

species, and no such take is authorized. Extensive analysis of the proposed 3D seismic survey was conducted in accordance with the MMPA, Endangered Species Act (ESA), and National Environmental Policy Act (NEPA). We analyzed the impacts to marine mammals (including those listed as threatened or endangered under the ESA), to their habitat (including critical habitat designated under the ESA), and to the availability of marine mammals for taking for subsistence uses. The MMPA analyses revealed that the activities would have a negligible impact on affected marine mammal species or stocks and would not have an unmitigable adverse impact on the availability of marine mammals for taking for subsistence uses. The ESA analysis concluded that the activities likely would not jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat. The NEPA analysis concluded that there would not be a significant impact on the human environment.

Comment 2: One private citizen requests that NMFS conduct research before and after the Apache survey activity to determine effects on wildlife.

Response: NMFS agrees that pre- and post-activity monitoring is essential to analyze effects of the activity and gather crucial information. Therefore, NMFS is requiring Apache to conduct a pre and post-activity monitoring period of 30 minutes to assess movement of marine mammals into and out of the ensonified area. Apache also conducts monitoring efforts when sound sources are not in use which can provide additional context to the observations made during periods when the active sound sources are in use.

Comment 3: The Resource Development Council, AK DNR, Alaska Chamber, All American Oilfield, AOGA, Chugach Alaska Corporation, and CIRI wrote letters in support of NMFS' issuance of 5-year regulations to Apache.

Response: After careful evaluation of all comments and the data and information

available regarding potential impacts to marine mammals and their habitat and to the availability of marine mammals for subsistence uses, NMFS has issued the final regulations to Apache to take marine mammals incidental to conducting a 3D seismic survey program in Cook Inlet for the period August 2016 to July 2021.

Comment 4: The MMC and NRDC recommend that NMFS defer issuance of the regulations until such time as NMFS can, with reasonable confidence, support a conclusion that the activities would affect no more than a small number of Cook Inlet beluga whales and have no more than a negligible impact on the population. The MMC recommends that NMFS defer issuance until we have better information on the cause or causes of ongoing decline of the population and a reasonable basis for determining that authorizing additional takes would not contribute to or exacerbate that decline. The MMC continues to believe that any activity that may contribute to or that may worsen the observed decline should not be viewed as having a negligible impact on the population. NRDC urges NMFS to defer issuance of the rule, citing a letter dated Jan 13, 2014, from the MMC stating that NMFS has been unable to rule out cumulative disturbance associated with a broad suite of activities occurring in the Inlet, including oil and gas development, as a contributor to the decline of Cook Inlet beluga whales. Instead of issuing five-year regulations NRDC suggests that NMFS issue a one-year IHA.

Response: In accordance with our implementing regulations at 50 CFR 216.104(c), we use the best available scientific evidence to determine whether the taking by the specified activity within the specified geographic region will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for subsistence uses.

Based on the scientific evidence available, NMFS determined that the impacts of the 3D

seismic survey program, which are primarily from acoustic exposure, would meet these standards. Moreover, Apache proposed and NMFS has required in the regulations a rigorous mitigation plan to reduce impacts to Cook Inlet beluga whales and other marine mammals to the lowest level practicable, including measures to power down or shutdown airguns if any beluga whale is observed approaching or within the Level B harassment zone and restricting activities within a 10 mi (16 km) radius of the Susitna Delta from April 15 through October 15, which is an important area for beluga feeding and calving in the spring and summer months. This shutdown measure is more restrictive than the standard shutdown measures typically applied, and combined with the Susitna Delta exclusion (minimizing adverse effects to foraging), is expected to reduce both the scope and severity of potential harassment takes, ensuring that there are no energetic impacts from the harassment that would adversely affect reproductive rates or survivorship.

Our analysis indicates that issuance of these regulations will not contribute to or worsen the observed decline of the Cook Inlet beluga whale population. Additionally, the ESA Biological Opinion determined that the issuance of an IHA is not likely to jeopardize the continued existence of the Cook Inlet beluga whales (or the western distinct population segment of Steller sea lions) or destroy or adversely modify Cook Inlet beluga whale critical habitat. The Biological Opinion also outlined Reasonable and Prudent Measures and Terms and Conditions to reduce impacts, which have been incorporated into the IHA. Therefore, based on the analysis of potential effects, the parameters of the seismic survey, and the rigorous mitigation and monitoring program, NMFS determined that the activity would have a negligible impact on the population. The impacts from other past and ongoing anthropogenic activities are incorporated into the negligible impact analysis via their impacts on the environmental baseline (*e.g.*, as

reflected in the density/distribution and status of the species, population size and growth rate, and ambient noise). Cumulative effects were also addressed in the EA and related Finding of No Significant Impact and Biological Opinion prepared for this action. Those documents, as well as the Alaska Marine Stock Assessments and the most recent abundance estimate for Cook Inlet beluga whales (Shelden *et al.*, 2015), are part of NMFS' Administrative Record for this action, and provided the decision maker with information regarding other activities in the action area that affect marine mammals, an analysis of cumulative impacts, and other information relevant to the determination made under the MMPA.

Moreover, the seismic survey would take only small numbers of marine mammals relative to their population sizes. The number of belugas likely and authorized to be taken represents less than 9.6% of the population. NMFS used a method that incorporates density of marine mammals overlaid with the anticipated ensonified area to calculate an estimated number of takes for belugas, which was estimated to be less than 10% of the stock abundance, which NMFS considers small. In addition to this quantitative evaluation, NMFS has also considered qualitative factors that further support the "small numbers" determination, including: (1) The seasonal distribution and habitat use patterns of Cook Inlet beluga whales, which suggest that for much of the time, only a small portion of the population would be potentially subjected to impacts from Apache's activity, as most animals are concentrated in upper Cook Inlet; and (2) the mitigation requirements, which provide spatio-temporal limitations that avoid impacts to large numbers of animals feeding and calving in the Susitna Delta and limit exposures to sound levels associated with Level B harassment. Based on all of this information, NMFS determined that the number of beluga whales likely to be taken is small. See response to Comment 4 and our small numbers analysis later in this document for more information about the small numbers

determination for beluga whales and the other marine mammal species.

NMFS has made the necessary findings to issue the 5-yr regulations for Apache's activities. Nonetheless, NMFS agrees that caution is appropriate in the management of impacts on this small resident beluga population with declining abundance and constricted range. Accordingly, NMFS will issue annual LOAs, as appropriate, instead of a single 5-year LOA option. This will allow the agency to determine annually, in consideration of Apache monitoring reports and any other new information on impacts or Cook Inlet belugas (or other affected species), whether the level of taking will be consistent with the findings made for the total taking allowable under these 5-year regulations before issuing an LOA. Annual LOAs will also allow for, if necessary and appropriate, a public comment period. Additionally, this rule contains an adaptive management provision that allows for the modification of mitigation or monitoring requirements at any time (in response to new information) to ensure the least practicable adverse impact on the affected species and maximize the effectiveness of the monitoring program. We also note the MMPA and NMFS' implementing regulations allow for an LOA to be withdrawn or suspended, as appropriate, if, after notice and opportunity for public comment, we determine that the taking allowed is having, or may have, more than a negligible impact on the species or stock (among other circumstances). 16 U.S.C. 1371(a)(5)(B); 50 CFR 216.106(e).

Comment 5: The MMC recommends that NMFS develop a policy that sets forth clear criteria and/or thresholds for determining what constitutes "small numbers" and "negligible impact" for the purpose of authorizing incidental takes of marine mammals. The MMC understands that NMFS has been working on developing a policy and would welcome an opportunity to discuss this policy further before it is finalized.

Response: NMFS is in the process of developing both a clearer policy to outline the

criteria for determining what constitutes "small numbers" and an improved analytical framework for determining whether an activity will have a "negligible impact" for the purpose of authorizing takes of marine mammals. We fully intend to engage the MMC in these processes at the appropriate time.

Comment 6: The NRDC pointed by reference to the other proposed activities in Cook Inlet during the 2015 open water season. The NRDC, the MMC, and one private citizen note that NMFS must address the cumulative effects of activities in Cook Inlet on Cook Inlet beluga whales and whether the cumulative impacts of all the activities are having "either individually or in combination" a greater than negligible impact on marine mammals.

Response: Neither the MMPA nor NMFS' implementing regulations specify how to consider other activities and their impacts on the same populations when conducting a negligible impact analysis. However, consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into the negligible impact analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the density/distribution and status of the species, population size and growth rate, and ambient noise). In addition, cumulative effects were addressed in the EA and Biological Opinion prepared for this action. The cumulative effects section of the EA has been expanded from the draft EA to discuss potential effects in greater detail. These documents, as well as the Alaska Marine Stock Assessments and the most recent abundance estimate for Cook Inlet beluga whales (Shelden *et al.*, 2015) are part of NMFS' Administrative Record for this action, and provided the decision maker with information regarding other activities in the action area that affect marine mammals, an analysis of cumulative impacts, and other information relevant to the determination made under the MMPA.

Comment 7: The NRDC states that NMFS failed to account for survey duration in the estimation of beluga whale takes and that NMFS based beluga takes using a predictive habitat density model (Goetz *et al*., 2012) that is based on data from summer months and confined to summer distribution when belugas are generally concentrated in the Upper Inlet, even though activity could occur year round. One private citizen also suggests that NMFS did not improve upon take estimation used in a previous IHA for Apache, which was found arbitrary and capricious.

Response: The numerical estimation of take for beluga whales does consider survey duration in the calculation. The Goetz *et al*. (2012) model is the best available data for beluga density in Cook Inlet. The method used by NMFS to estimate take uses that data to estimate the number of belugas taken. This is done by multiplying the density of the area surveyed on a given day by the area ensonified on that day of surveying to yield the number of belugas that were likely exposed during that day of surveying. This is then added to the next day of surveying and so forth in an additive model until the number of 30 belugas is reached. If the number of 30 belugas is reached using this calculation before Apache has completed their 160 days of proposed surveying, survey activity must cease. Additionally, if they finish their 160 days without reaching the limit of 30 belugas their activity must still cease. The model, by being additive in nature for each day of surveying, accounts for the duration of the survey, as well as capturing a more specific density value than using an Inlet-wide density estimate.

Moreover, the model (or other numerical methods for estimating take) does not take into consideration the rigorous mitigation protocols that will be implemented by Apache, which will likely reduce the number of actual Level B harassment takes of Cook Inlet beluga whales. As mentioned previously, the rule contains a condition restricting Apache's airgun operations within

10 mi (16 km) of the mean higher high water line of the Susitna Delta from April 15 through October 15. During this time, a significant portion of the Cook Inlet beluga whale population occurs in this area for feeding and calving. This setback distance includes the entire 160 dB radius of 5.9 mi (9.5 km) predicted for the full airgun array plus an additional 4.1 mi (6.5 km) of buffer, thus reducing the number of animals that may be exposed to Level B harassment thresholds during this important time. Apache is also required to shut down the airguns if any beluga whale is sighted approaching or entering the Level B harassment zone to avoid take. NMFS used the Goetz *et al.* (2012) model, which incorporates many years of NMML data collection and is considered the best available source of density estimation, with consideration of all of the mitigation measures required to be implemented, to authorize 30 beluga whale takes. This approach is reasonable and does not contradict available science and data of beluga whale distribution and local abundance during the period of operations. While the data used to create the model is from beluga surveys conducted in summer months, the majority of Apache's operations occur in summer months. Finally, unlike the take estimates for NMFS' 2012 IHA, which were found to be erroneous because they did not include a correction factor for the raw beluga survey data, the beluga take estimates in this rule making use the most current information in a predictive beluga habitat model to estimate how many belugas are likely to occur in the area that Apache plans to survey.

Comment 8: The NRDC states that in the case of marine mammals other than beluga whales, NMFS repeated past errors associated with its use of raw NMML survey data. Cited errors in the density calculations include the failure to incorporate correction factors for missed marine mammals in the analysis and the failure to fully account for survey duration by multiplying densities (which are calculated on an hourly basis) by the number of survey days but

not the number of hours in a day.

Response: Correction factors for marine mammal surveys, with the exception of beluga whales, are not available for Cook Inlet. The primary purpose and focus of the NMFS aerial surveys in Cook Inlet for the past decade has been to monitor the beluga whale population. Although incidental observations of other marine mammals are noted during these surveys, they are focused on beluga whales. With the exception of the beluga whale, no detailed statistical analysis of Cook Inlet marine mammal survey results has been conducted, and no correction factors have been developed for Cook Inlet marine mammals. The only published Cook Inlet correction factor is for beluga whales. Developing correction factors for other marine mammals would have required different survey protocols and consideration of unavailable data such as Cook Inlet marine mammal detection rates, tidally-influenced, daily and seasonal movement patterns, with subsequent detailed statistical analyses of these data. For example, other marine mammal numbers are often rounded to the nearest 10 or 100 during the NMFS aerial survey; resulting in unknown observation bias. Therefore, the data from the NMFS surveys are the best available, and number of animals taken are still likely overestimated because of the assumption that there is a 100% turnover rate of marine mammals each day.

Survey duration was appropriately considered in the estimations by multiplying density by area of ensonification by number of survey days. NMFS does not calculate takes on an hourly basis, and, additionally, the multiple hours surveyed within a day are reflected in the area of ensonification, which considers the distance Apache can move within a day and is therefore larger than what would be covered in one hour. Additionally, as NMFS has used the density estimate from NMFS aerial surveys, multiplied by the area ensonified per day, multiplied by the number of days, this calculation produces the number of instances of exposure during the seismic

survey. This is likely an overestimate of individuals taken by Level B harassment, as a single individual can be exposed on multiple days over the course of the survey, especially when a small seismic patch is shot over a period of multiple days. While protected species observers (PSOs) cannot detect every single animal within the Level B harassment zone, monitoring reports from similar past activities indicate that sightings did not exceed calculated projected take.

Comment 9: The NRDC commented that NMFS underestimated the size of Apache's impact area by: (1) Using an outdated and incorrect threshold for behavioral take; and (2) disregarding the best available evidence on the potential for temporary and permanent threshold shift on mid- and high-frequency cetaceans and on pinnipeds. The NRDC also commented that it is irrational for NMFS to proceed with outdated acoustic thresholds when NMFS has developed a more appropriate method, stressing that take should not be authorized until the revision of acoustic thresholds for Level B take is complete.

Response: The comment that NMFS uses an outdated and incorrect threshold for behavioral takes does not include any specific recommendations. NMFS uses 160 dB (rms) as the exposure level for estimating Level B harassment takes by non-continuous sound for most species in most cases. This threshold was established for underwater impulse sound sources based on measured avoidance responses observed in whales in the wild. Specifically, the 160 dB threshold was derived from data for mother-calf pairs of migrating gray whales (Malme *et al*., 1983, 1984) and bowhead whales (Richardson *et al*., 1985, 1986) responding to seismic airguns (*e.g.*, impulsive sound source). We acknowledge there is more recent information bearing on behavioral reactions to seismic airguns, but those data only illustrate how complex and context-dependent the relationship is between the two, in some cases suggesting that animals have been

disturbed at lower levels and in others showing a lack of response when exposed to levels above 160dB. See 75 FR 49710, 49716 (August 13, 2010) (IHA for Shell seismic survey in Alaska). Accordingly, it is not a matter of merely replacing the existing threshold with a new one. NOAA is working to develop more sophisticated guidance for determining impacts from acoustic sources, including information for determining Level B harassment thresholds. Due to the complexity of the task, any guidance will require a rigorous review that includes internal agency review, public notice and comment, and additional external peer review before any final product is published. In the meantime, and taking into consideration the facts and available science, NMFS determined it is reasonable to use the 160 dB threshold for estimating takes of marine mammals in Cook Inlet by Level B harassment. However, we discuss the science on this issue qualitatively in our analysis of potential effects to marine mammals.

The comment that NMFS disregarded the best available evidence on the potential for temporary and permanent threshold shift on mid- and high-frequency cetaceans and on pinnipeds does not contain any specific recommendations. We acknowledge there is more recent information available bearing on the relevant exposure levels for assessing temporary and permanent hearing impacts. (See, *e.g.*, NMFS' **Federal Register** notice (78 FR 78822, December 27, 2013) for NMFS' draft guidance for assessing the onset of permanent and temporary threshold shift.) Again, NMFS will be issuing guidance, but that process is not complete, so we did not use it to assign new thresholds for calculating take estimates for hearing impacts. However, we did consider the information, and it suggests the current 180 dB (for cetaceans) and 190 dB (for pinnipeds) thresholds are appropriate. See 75 FR 49710, 49715, 49724 (August 13, 2010) (IHA for Shell seismic survey in Alaska; responses to comment 8 and comment 27). Moreover, the required mitigation is designed to ensure there are no exposures at

levels thought to cause hearing impairment, and further, for belugas, and groups of killer whales and harbor porpoises in the project area, mitigation measures are designed to reduce or eliminate exposures to Level B harassment thresholds as well.

Comment 10: The NRDC comments that the proposed mitigation measures fail to meet the MMPA's "least practicable adverse impact" standard. The NRDC provides a list of approximately eight measures that NMFS "failed to consider or adequately consider."

Response: NMFS provided a detailed discussion of proposed mitigation measures and the MMPA's "least practicable impact" standard in the notice of the proposed IHA (80 FR 9510, February 23, 2015), which are repeated in the "Mitigation" section of this notice. The measures that NMFS allegedly failed to consider or adequately consider are identified and discussed below:

1. Use of quieting technologies, such as vibroseis and gravity gradiometry, to reduce or eliminate the need for airguns, and delaying seismic acquisition in higher density areas until the alternative technology of marine vibroseis becomes available: Apache requested takes of marine mammals incidental to the seismic survey operations described in the rulemaking application, which identified airgun arrays as the technique Apache would employ to acquire seismic data. It would be inappropriate for NMFS to change the specified activity and it is beyond the scope of the request for takes incidental to Apache's operation of airguns and other active acoustic sources.

Apache knows of no alternative available technology scaled for industrial use that is reliable enough to meet the environmental challenges of operating in Cook Inlet. Apache is aware that many prototypes are currently in development, and may ultimately incorporate these new technologies into their evaluation process as the technologies become commercially viable.

However, none of these technologies are currently ready for use on a large scale in Cook Inlet. As this technology is developed, Apache will evaluate its utility for operations in the Cook Inlet environment.

2. Required use of the lowest practicable source level in conducting airgun activity: Apache determined that the 2400 in^3 array is the minimum source level needed to provide the data required for Apache's operations.

3. Seasonal exclusions around river mouths, including early spring (pre-April 14) exclusions around the Beluga River and Susitna Delta, and avoidance of other areas that have a higher probability of beluga occurrence: NMFS has required a 10-mile (16 km) exclusion zone around the Susitna Delta (which includes the Beluga River) in this regulation. This mitigation mirrors a measure in the Incidental Take Statement for the 2012 and 2013 Biological Opinions. Seismic survey operations involving the use of airguns will be prohibited in this area between April 15 and October 15. In both the MMPA and ESA analysis, NMFS determined that this date range is sufficient to protect Cook Inlet beluga whales and the critical habitat in the Susitna Delta. While data indicate that belugas may use this part of the inlet year round, peak use occurs from early May to late September. NMFS added a 2-week buffer on both ends of this peak usage period to add extra protection to feeding and calving belugas. NMFS also expanded the exclusion zone to start from the mean higher high water line to the mean lower low water line. (In addition, the Alaska Department of Fish and Game (ADF&G) prohibits the use of airguns within 1 mi (1.6 km) of the mouth of any stream listed by the ADF&G on the Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes. See additional explanation in "Mitigation Measures Considered but not Required" section, later in this document.)

4. Limitation of the mitigation airgun to the longest shot interval necessary to carry out its intended purpose: This general comment contained no specific recommendations. Apache requires shot intervals of 50m at a speed of 2-4 knots to obtain the information from their survey. However NMFS has added a mitigation measure that Apache reduce the shot interval for the mitigation gun to one shot per minute.

5. Immediate suspension of airgun activity, pending investigation, if any beluga strandings occur within a distance of 19km (two times the 160dB isopleth) the survey area: If NMFS becomes aware of any live beluga strandings, Apache will be notified and required to shutdown if the stranding event is within 19km (two times the 160 dB isopleth) of Apache's operations until the circumstances of the stranding are reviewed. The regulation also requires Apache to immediately cease activities and report unauthorized takes of marine mammals, such as live stranding, injury, serious injury, or mortality. NMFS will review the circumstances of Apache's unauthorized take and determine if additional mitigation measures are needed before activities can resume to minimize the likelihood of further unauthorized take and to ensure MMPA compliance. Apache may not resume activities until notified by NMFS. Separately, the regulation includes measures to be implemented if injured or dead marine mammals are sighted and the cause cannot be easily determined. In those cases, NMFS will review the circumstances of the stranding event while Apache continues with operations.

6. Establishment of a larger exclusion zone for beluga whales that is not predicated on the detection of whale aggregations or cow-calf pairs: Both the proposed rule notice and the issued regulations contain a requirement for Apache to delay the start of airgun use or shutdown the airguns if a beluga whale is visually sighted or detected by passive acoustic monitoring approaching or within the 160-dB disturbance zone until the animal(s) are no longer present

within the 160-dB zone. The measure applies to the sighting of any single beluga whale, not just sightings of groups or cow-calf pairs.

7. Identifying compensatory mitigation such as habitat restoration to be undertaken by industry within the Inlet: NMFS is issuing an Authorization for incidental take of marine mammals for Apache's seismic survey program. NMFS is required to consider the practicability of implementation of the measure as well as proven or likely effectiveness of the measure. NMFS is not currently aware of literature demonstrating the effectiveness of habitat restoration on mitigating the effects of airgun noise. Additionally, NMFS considers effects to beluga habitat to be primarily acoustic and temporary in nature, which is difficult to mitigate.

8. Creating quiet zones in highly important habitat: NMFS agrees that reduction of noise in habitat known to be essential for marine mammals is also area that should be targeted for measures to reduce noise. This principle is incorporated through the exclusion zone of the Susitna Delta, ensuring that airgun noise is not prevalent within this section of Critical Habitat Area 1 for Cook Inlet belugas.

Comment 11: The MMC suggests that NMFS work with Apache to explore the possibility of fixed passive acoustic monitoring. The NRDC echoed support for the use of passive acoustic monitoring techniques, moorings, and unmanned aerial systems.

Response: The passive acoustic monitoring plan for Apache Alaska Corporation's 2012 survey anticipated the use of a bottom-mounted telemetry buoy to broadcast acoustic measurements using a radio-system link back to a monitoring vessel. Although a buoy was deployed during the first week of surveying under the 2012 IHA, it was not successful. Upon deployment, the buoy immediately turned upside down due to the strong current in Cook Inlet. After retrieval, the buoy was not redeployed and the survey used a single omni-directional

hydrophone lowered from the side of the mitigation vessel. During the entire 2012 survey season, Apache's PAM equipment yielded only six confirmed marine mammal detections, one of which was a Cook Inlet beluga whale. The single Cook Inlet beluga whale detection did not, however, result in a shutdown procedure.

Additionally, Joint Base Elmendorf-Fort Richardson, the National Marine Mammal Laboratory, and Alaska Department of Fish &Game conducted a 2012 study (Gillespie *et al.*, 2013) to determine if beluga whale observations at the mouth of Eagle River corresponded with acoustic detections received by a PAMBuoy data collection system. The PAMBuoy data collection system was deployed in the mouth of Eagle River from 12-31 August 2012. This study was a trial period conducted with one hydrophone at the mouth of the river. Overall, it was successful in detecting beluga whale echolocation clicks and whistles, but PAM systems in this location may be limited due to: interactions with ice and debris, transmission distance limitations, detection distance limitations, and masking due to non-target sound sources. In addition, acoustic detections may be largely duplicative of daylight visual observations, the system cost is not trivial, and mooring of buoys can be a challenge in this environment of extreme tides. However, despite these challenges with PAM in certain circumstances, there is still value in exploring its use and it is not logistically impractical for this project and, therefore, Apache will be deploying a passive acoustic monitoring system for use during nighttime operations.

Comment 12: The MMC requested clarification regarding Authorizations sought by Apache and SAE and inquired if these Authorizations were for the same project. The MMC recommends that NMFS encourage SAE and other applicants proposing to conduct seismic surveys in Cook Inlet in 2015 to collaborate on those surveys and, to the extent possible, submit

a single application seeking authorization for incidental harassment of marine mammals.

In a similar comment, the NRDC expressed concern over the number of activities proposed in the same area for the same season referencing applications for: Furie, Bluecrest, Buccaneer, and Apache.

Response: We agree and have encouraged Apache to cooperate with other interested parties to minimize the impacts of new seismic surveys in the region. Apache has told NMFS that their proposed activities are a separate project from that of SAE. SAE has also withdrawn their request for an IHA in 2016. Apache will continue its discussions with other operators in Cook Inlet to find opportunities to joint venture in oil and gas operations, including seismic data acquisition. In addition, NMFS will do what it can to encourage such collaborations when they result in a reduction in disturbance to protected species or their habitats.

NMFS is currently aware of one additional proposal for seismic exploration in Cook Inlet for 2016. Additionally, there are applications submitted for one geophysical survey and one test well drilling operation, which is proposed for a site much farther south than any of the above mentioned operations.

Comment 13: Both the NRDC and the MMC comment that authorization should not be issued until the Cook Inlet Beluga Whale Take Recovery Plan is finalized and published.

Response: The Cook Inlet Beluga Whale Recovery Plan is still under development and currently available in published draft form. It is not necessary to have the Recovery Plan finalized to authorize Apache's activity, as NMFS is still able to make a negligible impact determination for beluga whales using the best available information. NMFS will continue to work with Apache to focus mitigation and monitoring efforts to cover some of the focus points highlighted in the Draft Recovery Plan as appropriate.

Comment 14: The MMC comments that various applicants in the Cook Inlet region have used differing density estimates for calculating take of marine mammal species in the Inlet and that all applicants should use the same densities.

Response: The density estimates used for the 2015 SAE IHA and in the Final Rule for Apache, specifically for harbor porpoises and killer whales, are the best available science at this time. The data are from NMFS aerial surveys over a ten year period (2000-2012). NMFS is working with applicants to incorporate these density estimates into future applications and take authorizations. However, for harbor seals, which are known to have clustered distrubutions, density estimates and derived take estimation may vary based on action area boundaries, site-specific knowledge of abundance, density, seasonality, or other qualities that could allow for a more nuanced assessment of the density in a given location.

Comment 15: The MMC comments that Apache should be required to investigate and report on detection probabilities from various observation platforms for differing sea states and light conditions.

Response: NMFS acknowledges that collecting detection probabilities from various platforms under different conditions would be very useful information and could better inform monitoring reports by discerning how many animals were likely taken. However, constructing a study to investigate detection probabilities requires a great deal of planning and many more observers than are involved in this survey. NMFS would like to work with the MMC to discuss how best to conduct this work and refine detection probabilities for seismic surveys.

Comment 16: The NRDC comments that the effective dates in the proposed rule suggest a curtailing of public review in violation of the Administrative Procedure Act in that they do not allow for NMFS to sufficiently review and address public comments before the rule's proposed

date of effectiveness.

Response: The date provided in the proposed rule was the date proposed by the applicant originally for this work. NMFS has had ample time to review and address public comments prior to making its determinations for this rule and the effective dates have been adjusted accordingly. The dates of effectiveness for the rule have shifted since the proposed rule publication, giving NMFS adequate time to review and respond to public comment submitted by the close of public comment on April 9, 2015.

Comment 17: The MMC comments that the use of turnover factors for take estimation in the proposed rule is inappropriate. The MMC requests that NMFS use the same density x daily ensonified area x number of days formula used for previous authorizations. The MMC also notes that if NMFS uses a turnover factor that it should consult the literature to create a more biologically relevant turnover factor than that derived from Wood *et al.* (2012). The MMC also recommends that NMFS re-evaluate the necessary determinations with the new take estimates.

Response: After reviewing public comment submissions, NMFS decided to adjust the method used to estimate take in Cook Inlet. NMFS removed the use of turnover factors from Wood *et al.* (2012) completely from take estimation. The daily ensonified area x number of survey days x density method was used for all species to calculate the number of instances of exposure except for belugas, harbor seals, humpback whales, and Steller sea lions. Using sighting reports collected by the Alaska region, NMFS has determined that given the distribution of Steller sea lions in Cook Inlet, it is unlikely that more than 20 individuals will be taken during the course of one year. Similarly, while several humpbacks are reported in Cook Inlet each year, it is unlikely that Apache will expose more than two humpbacks during their surveying each year.

For Cook Inlet belugas, NMFS derived a method to ensure that Apache take no more than 30 belugas annually, which is approximately 10 percent of the population. Using the Goetz *et al.* (2012) habitat model, Apache will calculate the possible take (density from the model x the area surveyed that day) for each day and sum the possible take across days until 30 is reached. When the take per day summed amounts to 30, Apache must cease surveying for the season. As an additional measure, and to account for a sudden sighting of a large group of belugas, Apache will also cease surveying if 30 belugas are visually observed to enter the 160dB harassment zone.

For harbor seals, it is likely the daily ensonified area produces an overestimate of individuals taken, as described in more details in the Estimated Take section. NMFS applied the survey method used by Apache, patch shooting, and applied the number of days required to shoot a patch to estimate the number of days an animal at a given haulout could be exposed. This is an average of 3 days, but no more than 5. When this factor is applied to the estimate of instances of exposures by using the ensonified daily area method, the number of exposed individual seals can be more reasonably estimated and is much lower than the number of instances of exposure, at 6,438. This number is appropriately reduced even further as individuals could be exposed at multiple patches. Separately, NMFS then considered the harbor seal densities alongside monitoring reports from Apache's work in 2012. NMFS looked at the monitoring reports from Apache's aerial surveys in June and used correction factors from the literature to determine the number of seals in the water. This number was also multiplied to match the number of Apache's proposed survey days (160) to yield a number of 8,250 instances of take, notably lower than 24,279. Additionally, in their 147 days of surveying, Apache reported sightings of 285 seals. While it is understood that visual observations likely underestimate the actual number of exposures, as all seals in the 160dB range are not visible, it is worth noting that

the number of visual estimates is 131 times smaller than the calculated number of exposures using the daily ensonified area method. These methods are discussed in greater detail in the Takes Estimation section of this document, but in summary we concluded that not more than 25% of the population of harbor seals would be taken. The daily ensonified method results in an estimate of 24, 279 instances of exposure, but this is likely an over-estimation of the number of instances of exposure and also does not represent the number of unique individuals in the population taken during the course of the survey. As explained in the Negligible Impact Determination and Small Numbers sections below, NMFS is able to make the necessary determinations for all species using the new take estimation methodology.

Comment 18: Both the NRDC and MMC commented that the use of figures for the survey area was unclear and it was difficult to determine if the project area was expanded after the Federal Register Notice of Receipt of Apache's Application (79 FR 45428) .

Response: NMFS acknowledges that the figure used was unclear. The analysis in the proposed rule, however, was for the action area being considered, which did not change between the proposed and final rule.

Comment 19: NRDC commented that NMFS did not take higher densities of beluga whales in the Upper Inlet into account when making a negligible impact determination, analyzing mitigation requirements, or adopting a cap to allow Apache geographic flexibility during the survey. The MMC also commented that the analysis did not take into account the expanded survey area in the Upper Inlet.

Response: NMFS believes that increased density of beluga whales in the Upper Inlet is taken into account, despite the geographic flexibility allowed by Apache. The area ensonified each day will be multiplied by the applicable 1 km^2 grid cell densities taken from the Goetz *et al*.

(2012) paper. The modeling in this paper clearly demonstrates a higher density of belugas in the Upper Inlet. Therefore, using these densities accounts for area of high beluga density in the Upper Inlet. Additionally, NMFS has created an exclusion zone within 10 miles of the Susitna River Delta, an area of known importance for belugas in the summer, to ensure that Apache's activity does not interfere with such an important area. When considering these things in combination, NMFS was able to make a negligible impact determination. NMFS also clarifies that while an ambiguous figure was used, Apache is not proposing to expand the survey beyond what was analyzed in the proposed rule.

Comment 20: The NRDC commented that the number of takes in the regulatory text and Table 5 of the preamble were different.

Response: NMFS acknowledges the discrepancy and points to Table 5 of the preamble for the correct take estimates. However, because methodology has been altered between the issuance of the proposed rule and the final rule due to public comment and analysis of monitoring reports and sightings information, these take tables have changed.

Comment 21: The MMC comments that NMFS should clarify if Apache should be requesting take of humpback whales, minke whales, and Dall's porpoises. Furthermore, NMFS should work with applicants to determine which species should be included in authorizations.

Response: Apache did not request take of humpback whales, minke whales, and Dall's porpoises. However, because they have been sighted during Apache's previous surveying, NMFS has decided to authorize Level B harassment for small numbers of minke whales and Dall's porpoise. Additionally, take of humpback whales was analyzed in the Biological Opinion, due to the number of reported sightings of humpback whales in Cook Inlet in summer 2015.

Comment 22: The MMC requests that NMFS periodically reconvene the Cook Inlet

Beluga Whale Recovery Team (CIBWRT) and related working groups to prioritize research and monitoring recommendations as well as other recovery plan items.

Response: The determination of whether and when to reconvene the COBWRT is outside of the scope of this authorization. However, NMFS plans to incorporate recommendations from the Cook Inlet Beluga Whale Recovery Plan as appropriate into monitoring and mitigation requirements after the recovery plan is finalized through the adaptive management provisions of the rule.

Comment 23: The MMC recommends that NMFS restrict all seismic activity occurring in Critical Habitat Area 1 to the time between October 15th and April 15th to minimize impacts to belugas using this seasonally vital habitat.

Response: Given the seasonal nature of beluga concentrations, and their tendency to congregate in areas near Knik Arm and Turnagain Arm in the summer months, NMFS believes that the Susitna River Delta exclusion zone of 10 nmi from the MLLW line between the Susitna and Beluga Rivers is sufficient closure to protect beluga use of that portion of their critical habitat during times of high use.

Comment 24: The NRDC recommends that NMFS require seismic operators to contribute to a comprehensive monitoring plan to better understand beluga distribution, individual effects, and cumulative effects of human activities on beluga whales.

Response: NMFS believes that seismic operators have a substantial amount of information to contribute to our understanding of Cook Inlet beluga distribution, particularly through monitoring reports. It is also crucial to better understand individual and cumulative effects of human activities on belugas. NMFS is working to compile and analyze monitoring reports across all authorized activities to analyze effectiveness of mitigation and inform further

monitoring plans for future Authorizations. We plan to develop a comprehensive monitoring plan for Cook Inlet concurrently with the development of the Environmental Impact Statement on the Issuance of Take Authorizations in Cook Inlet, Alaska (79 FR 61616).

Comment 25: One private citizen commented that Apache should pay a large sum of money to a superfund to mitigate damage from the project by buying land for conservation easements or funding alternative energy research. This commenter also states that the only effective way to mitigate serious impacts is to remove airguns from sensitive environmental areas, cap activities by region and year, and promote alternative energies.

Response: Where applicable, Apache has already proposed to implement certain measures mentioned above. The mandatory seasonal closure of the Susitna Delta from April 15-October 15 annually removes airguns from a portion of essential habitat at time of high use for belugas. The mitigation and monitoring in this rule represent the most effective and practicable means of reducing the impacts of Apache's activities on the affected marine mammal populations and their habitat. The purchase of land is not applicable to ensuring the least practicable adverse impact for this activity under the MMPA.

Comment 26: One private citizen commented that the extended timeline of the project did not receive feedback from the community. There were also several comments included that referenced environmental impacts of drilling by Apache.

Response: The public comment period, which was extended from 30 to 45 days, provided reasonable time for interested parties to submit public comment regarding the proposed regulations and many such comments were received by NMFS. NMFS would like to reiterate that the petition for regulations relates to seismic surveying by Apache in Cook Inlet and that no portion of these regulations pertains to drilling activities.

Comment 27: IFAW comments that the effects of noise from seismic activity contribute to problems between vessels and whales, including ship strike and entanglement.

Response: NMFS is aware that ship strikes and entanglements can occur in locations where whales and certain human activities co-exist. However, NMFS is not aware of any studies that demonstrate seismic noise increases the likelihood of these occurrences. NMFS is unaware of any entanglements or ship strikes that have occurred from seismic operations in Cook Inlet. IFAW did not provide citations for NMFS to delve further into these claims.

Comment 28: The public law class of VLS comments that a mass stranding event, similar to the 2008 stranding in Madagascar, could reduce beluga numbers by one third.

Response: NMFS does not believe that a mass stranding similar to that off Madagascar in 2008 could occur from the proposed seismic survey considered in the rulemaking for Apache. There are several distinctions between the survey in Madagascar and Apache's survey: equipment type, type of environment, and species of cetacean considered. The Madagascar stranding was secondarily associated with multibeam echosounder use, not a seismic survey, operating at a different frequency than that of airguns and conducting operations in a different manner that was specifically problematic for the species and environment present. Additionally, the mammals that stranded were melon headed whales, which have a large average group size and are deep divers, and those particular animals incurred secondary health problems from their extended time spent stranded following their initial behavioral response to the sound exposure. Lastly, the type of surveying proposed by Apache has been conducted fairly consistently in Cook Inlet under IHAs, and has not caused mass strandings of Cook Inlet belugas or other Cook Inlet marine mammal species.

Comment 29: The public law class of VLS comments that allowing take for the proposed

activity is a mismanagement of ESA protections for endangered belugas.

Response: NMFS disagrees. This rulemaking is undertaken pursuant to the MMPA, not the ESA. However, because we proposed to authorize take of ESA-listed species, including Cook Inlet belugas, consultation under section 7 of the ESA is required. The Biological Opinion for this activity concluded jeopardy was not likely, and therefore the take associated with this rule is considered allowable under the MMPA and ESA.

Description of Marine Mammals in the Area of the Specified Activity

The marine mammal species under NMFS's jurisdiction that could occur near operations in Cook Inlet include four cetacean species: beluga whale (*Delphinapterus leucas*), humpback whale (*Megaptera noveangliae*), killer whale (*Orcinus orca*), harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli)*, minke whale (*Balaenoptera acutorostrata*), and gray whale (*Eschrichtius robustus*) and two pinniped species: harbor seal (*Phoca vitulina richardsi*) and Steller sea lions (*Eumetopias jubatus*). The marine mammal species that is likely to be encountered most widely (in space and time) throughout the period of the planned surveys is the harbor seal. While killer whales, humpback whales, minke whales, Dall's porpoise, and gray whales as well as Steller sea lions have been sighted in upper Cook Inlet, their occurrence is considered rare in that portion of the Inlet.

Of the nine marine mammal species likely to occur in the marine survey area, Cook Inlet beluga whales, Central North Pacific humpback whales, and Steller sea lions are listed as endangered under the ESA (Steller sea lions are divided into two distinct population segments (DPSs), an eastern and a western DPS; the relevant DPS in Cook Inlet is the western DPS). The eastern DPS was recently removed from the endangered species list (78 FR 66139, November 4, 2013).

Table 1. Table of stocks expected to occur in the project area.

Species	Stock	ESA/MMPA status[1]; Strategic (Y/N)	Stock abundance (CV, N_{min}, year of most recent abundance survey)[2]	Relative occurrence in Cook Inlet; season of occurrence
Humpback whale	Central North Pacific	E/D;Y	7,469 (0.095;5,833;2000)	Occasionally seen in Lower Inlet, summer, rare in upper inlet
Gray whale	Eastern North Pacific	-; N	19,126 (0.071; 18,017; 2007)	Rare migratory visitor; late winter
Killer whale	Alaska Resident Gulf of Alaska, Aleutian Island, Bering Sea Transient	-;N -:N	2,347 (N/A; 2,084; 2009) 345 (N/A; 303; 2003)	Occasionally seen in Lower Cook Inlet
Beluga whale	Cook Inlet	E/D;Y	312 (0.10; 280; 2012)	Use upper Inlet in summer and winter and lower inlet primarily in winter: annual
Minke whale	Alaska	-;N	1,233 (0.034;N/A;2003)	Infrequently occur but reported year-round
Dall's porpoise	Alaska	-:N	106,000[3] (0.20; N/A; 1991)	Infrequently found in Lower Inlet
Harbor porpoise	Gulf of Alaska	-;Y	31,046 (0.214; 25,987; 1998)	Widespread in the Inlet: annual (less in winter)
Steller sea lion	Western DPS	E/D;Y	79,300 (N/A; 45,659; 2012)	Primarily found in lower Inlet, rare in upper inlet
Harbor seal	Alaska – Cook Inlet	-;N	22,900 (0.053; 21,896; 2006)	Frequently found in upper and lower inlet ; annual (more in northern Inlet in summer)

[1]Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR (see footnote 3) or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
[2]CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable. For certain stocks of pinnipeds, abundance estimates are based upon observations of animals (often pups) ashore multiplied by some correction factor derived from knowledge of the specie's (or similar species') life history to arrive at a best abundance estimate; therefore, there is no associated CV. In these cases, the minimum abundance may represent actual counts of all animals ashore.
[3]Because there is such little data regarding Dall's porpoises in Alaska, these population numbers refer to the Gulf of Alaska portion of the Alaska stock only.

Pursuant to the ESA, critical habitat has been designated for Cook Inlet beluga whales and Steller sea lions. The action falls within critical habitat designated in Cook Inlet for beluga whales but is not within critical habitat designated for Steller sea lions. On April 11, 2011, NMFS announced the two areas of beluga whale critical habitat (76 FR 20180) comprising 7,800 km^2 (3,013 mi^2) of marine habitat. Designated beluga whale Critical Habitat Area 1 consists of 1,909 km^2 of Cook Inlet, north of Three Mile Creek and Point Possession. Critical Habitat Area

1 contains shallow tidal flats or mudflats and mouths of rivers that provide important areas for foraging, calving, molting, and escape from predators. High concentrations of beluga whales are often observed in these areas from spring through fall. Critical Habitat Area 2 consists of 5,891 km^2 located south of Critical Habitat Area 1 and includes waters between Critical Habitat area 1 and 60^o 15' North Latitude as well as nearshore areas along western Cook Inlet and Kachemak Bay. Critical Habitat Area 2 consists of known fall and winter foraging and transit habitat for beluga whales, as well as spring and summer habitat for smaller concentrations of beluga whales. Approximately 711 km^2 of Apache's 5684 km^2 seismic survey area is in the designated beluga whale Critical Habitat Area 1 and approximately 4,200 km^2 is in the designated beluga whale Critical Habitat Area 2.

There are several species of mysticetes that have been observed infrequently in lower Cook Inlet, including minke whale (*Balaenoptera acutorostrata*) and fin whale (*Balaenoptera physalus*). Because of their infrequent occurrence in the location of seismic acquisition, they are not included in this rule. Sea otters also occur in Cook Inlet. However, sea otters are managed by the U.S. Fish and Wildlife Service and are therefore not considered further in this rule.

Beluga Whale (Delphinapterus leucas)

Cook Inlet beluga whales have not made significant progress towards recovery since they were listed as endangered in 2008. Data indicate that the Cook Inlet population of beluga whales has been decreasing at a rate of 0.6 percent annually between 2002 and 2012 (Allen and Angliss, 2014). One review of the status of the population indicated that there is an 80% chance that the population will decline further (Hobbs and Shelden, 2008).

Cook Inlet beluga whales reside in Cook Inlet year-round, although their distribution and density changes seasonally. Factors that are likely to influence beluga whale distribution within

the inlet include prey availability, predation pressure, sea-ice cover and other environmental factors, reproduction, sex and age class, and human activities (Rugh *et al*., 2000; NMFS 2008). Seasonal movement and density patterns as well as site fidelity appear to be closely linked to prey availability, coinciding with seasonal salmon and eulachon concentrations (Moore *et al*., 2000). For example, during spring and summer, beluga whales are generally concentrated near the warmer waters of river mouths where prey availability is high and predator occurrence is low (Huntington 2000; Moore *et al.*, 2000). During the winter (November to April), belugas disperse throughout the upper and mid-inlet areas, with animals found between Kalgin Island and Point Possession (Rugh *et al.*, 2000). During these months, there are generally fewer observations of beluga whales in the Anchorage and Knik Arm area (NMML 2004; Rugh *et al.*, 2004).

Beluga whales use several areas of the upper Cook Inlet for repeated summer and fall feeding. The primary hotspots for beluga feeding include the Big and Little Susitna rivers, Eagle Bay to Eklutna River, Ivan Slough, Theodore River, Lewis River, and Chickaloon River and Bay (NMFS, 2008). Availability of prey species appears to be the most influential environmental variable affecting Cook Inlet beluga whale distribution and relative abundance (Moore *et al*., 2000). The patterns and timing of eulachon and salmon runs have a strong influence on beluga whale feeding behavior and their seasonal movements (Nemeth *et al*., 2007; NMFS, 2008). The presence of prey species may account for the seasonal changes in beluga group size and composition (Moore *et al*., 2000). Aerial and vessel-based monitoring conducted by Apache during the March 2011 2D test program in Cook Inlet reported 33 beluga sightings. One of the sightings was of a large group (~25 individuals on March 27, 2011) of feeding/milling belugas near the mouth of the Drift River. If belugas are present during the late summer/early fall, they are more likely to occur in shallow areas near river mouths in upper Cook Inlet. For example, no

beluga whales were observed in Trading Bay during Apache's 2D SSV conducted in September 2011, likely because during that time of year they were primarily located in the upper regions of Cook Inlet.

Humpback Whale (Megaptera novaeangliae)

Although there is considerable distributional overlap in the humpback whale stocks that use Alaska, the whales seasonally found in lower Cook Inlet are probably of the Central North Pacific stock. Listed as endangered under the ESA, this stock has recently been estimated at 7,469, with the portion of the stock that feeds in the Gulf of Alaska estimated at 2,845 animals (Allen and Angliss 2014). The Central North Pacific stock winters in Hawaii and summers from British Columbia to the Aleutian Islands (Calambokidis *et al*.,1997), including Cook Inlet.

Humpback use of Cook Inlet is largely confined to lower Cook Inlet. They have been regularly seen near Kachemak Bay during the summer months (Rugh *et al*., 2005a), and there is a whale-watching venture in Homer capitalizing on this seasonal event. There are anecdotal observations of humpback whales as far north as Anchor Point, with recent summer observations extending to Cape Starichkof (Owl Ridge 2014). Humpbacks might be encountered in the vicinity of Anchor Point if seismic operations were to occur off the point during the summer. In 2013, Apache encountered a humpback and calf in the ensonified area during seismic operations.

Killer Whales (Orcinus orca)

In general, killer whales are rare in upper Cook Inlet. Transient killer whales are known to feed on beluga whales, and resident killer whales are known to feed on anadromous fish (Shelden *et al*., 2003). The availability of these prey species largely determines the likeliest times for killer whales to be in the area. Between 1993 and 2004, 23 sightings of killer whales were reported in the lower Cook Inlet during aerial surveys by Rugh *et al*. (2005). Surveys

conducted over a span of 20 years by Shelden *et al*. (2003) reported 11 sightings in upper Cook Inlet between Turnagain Arm, Susitna Flats, and Knik Arm. No killer whales were spotted during surveys by Funk *et al*. (2005), Ireland *et al.* (2005), Brueggeman *et al.* (2007a, 2007b, 2008), or Prevel Ramos *et al*. (2006, 2008). Eleven killer whale strandings have been reported in Turnagain Arm, six in May 1991 and five in August 1993. NMFS aerial survey data spanning 13 years conducted in June each year have reported sightings ranging from 0 to 33 whales in a single year, although these surveys extend beyond the action area of Apache's survey. Sightings data can be found in Table 5 of Apache's application. Therefore, very few killer whales, if any, are expected to approach or be in the vicinity of the action area.

Harbor Porpoise (Phocoena phocoena)

Previously estimated density for harbor porpoises in Cook Inlet is 7.2 per 1,000 km^2 (Dahlheim *et al*., 2000), suggesting that only a small number use Cook Inlet. Data from NMFS aerial surveys (Table 5 in Apache's application) flown annually in June from 2000-2012 sighted anywhere from 0 to 100 porpoises in a single season. The densities derived from this data range from 0 to 0.014 animals per km^2. Harbor porpoise have been reported in lower Cook Inlet from Cape Douglas to the West Foreland, Kachemak Bay, and offshore (Rugh *et al*., 2005). Small numbers of harbor porpoises have been consistently reported in upper Cook Inlet between April and October, but more recent observations have recorded higher numbers (Prevel Ramos *et al.*, 2008). Prevel Ramos *et al*. (2008) reported 17 harbor porpoises from spring to fall 2006, while other studies reported 14 in the spring of 2007 (Brueggeman *et al*., 2007) and 12 in the fall of 2007 (Brueggeman *et al*., 2008). During the spring and fall of 2007, 129 harbor porpoises were reported between Granite Point and the Susitna River; however, the reason for the increase in numbers of harbor porpoise in the upper Cook Inlet remains unclear and the disparity between

this result and past sightings suggests that it may be an anomaly. The spike in reported sightings occurred in July, which was followed by sightings of 79 harbor porpoises in August, 78 in September, and 59 in October 2007. It is important to note that the number of porpoises counted more than once was unknown, which suggests that the actual numbers are likely smaller than those reported. In 2012, Apache marine mammal observers recorded 137 sightings of 190 estimated individuals; a similar count to the 2007 spike previously observed. In addition, recent passive acoustic research in Cook Inlet by the Alaska Department of Fish and Game and the National Marine Mammal Laboratory have indicated that harbor porpoises occur in the area more frequently than previously thought, particularly in the West Foreland area in the spring (NMFS 2011); however overall numbers are still unknown at this time.

Dall's Porpoise (Phocoenoides dalli)

Dall's porpoise are widely distributed throughout the North Pacific Ocean including Alaska, although they are not found in upper Cook Inlet and the shallower waters of the Bering, Chukchi, and Beaufort Seas (Allen and Angliss 2014). Compared to harbor porpoise, Dall's porpoise prefer the deep offshore and shelf slope waters. The Alaskan population has been estimated at 83,400 animals (Allen and Angliss 2014), making it one of the more common cetaceans in the state. Dall's porpoise have been observed in lower Cook Inlet, including Kachemak Bay and near Anchor Point (Owl Ridge 2014), but sightings there are rare. There is a remote chance that Dall's porpoise might be encountered during seismic operations along the Kenai Peninsula.

Minke Whale (Balaenoptera acutorostra)

Minke whales are the smallest of the rorqual group of baleen whales reaching lengths of up to 35 feet. They are also the most common of the baleen whales, although there are no

population estimates for the North Pacific, although estimates have been made for some portions of Alaska. Zerbini *et al*. (2006) estimated the coastal population between Kenai Fjords and the Aleutian Islands at 1,233 animals.

During Cook Inlet-wide aerial surveys conducted from 1993 to 2004, minke whales were encountered only twice (1998, 1999), both times off Anchor Point 16 miles northwest of Homer. A minke whale was also reported off Cape Starichkof in 2011 (A. Holmes, pers. comm.) and 2013 (E. Fernandez and C. Hesselbach, pers. comm.), suggesting this location is regularly used by minke whales, including during the winter. Recently, several minke whales were recorded off Cape Starichkof in early summer 2013 during exploratory drilling conducted there (Owl Ridge 2014). There are no records north of Cape Starichkof, and this species is unlikely to be seen in upper Cook Inlet. There is a chance of encountering this whale during seismic operations along the Kenai Peninsula in lower Cook Inlet.

Gray Whale (Eschrichtius robustus)

Numbers of gray whales in Cook Inlet are small compared to the overall population (18,017 individuals). However, Apache marine mammal observers recorded nine sightings of nine individuals (including possible resights of the same animals) from May-July 2012. Of those sightings, seven were observed from project vessels, and two were observed from land-based observation stations. The eastern North Pacific gray whales observed in Cook Inlet are likely migrating to summer feeding grounds in the Bering, Chukchi, and Beaufort Seas, though a small number feed along the coast between Kodiak Island and northern California (Matkin, 2009; Carretta *et al.*, 2014). NMFS aerial surveys flown annually in June have not sighted a gray whale during survey season since 2001. Occurrences in the seismic survey area (especially in the upper parts of the Inlet) are expected to be low.

Two species of pinnipeds may be encountered in Cook Inlet: harbor seal and Steller sea lion.

Harbor Seal (Phoca vitulina)

Harbor seals inhabit the coastal and estuarine waters of Cook Inlet. Historically, harbor seals have been more abundant in lower Cook Inlet than in upper Cook Inlet (Rugh *et al*., 2005a,b). Harbor seals are non-migratory; their movements are associated with tides, weather, season, food availability, and reproduction. The major haulout sites for harbor seals are located in lower Cook Inlet, and their presence in the upper inlet coincides with seasonal runs of prey species. For example, harbor seals are commonly observed along the Susitna River and other tributaries along upper Cook Inlet during the eulachon and salmon migrations (NMFS, 2003). During aerial surveys of upper Cook Inlet in 2001, 2002, and 2003, harbor seals were observed 24 to 96 km (15 to 60 mi) south-southwest of Anchorage at the Chickaloon, Little Susitna, Susitna, Ivan, McArthur, and Beluga Rivers (Rugh *et al*., 2005). NMFS aerial surveys flown in June have reported sightings ranging from 956 to 2037 harbor seals over the course of surveys from 2000 to 2012. Apache aerial observers recorded approximately 900 harbor seals north of the Forelands in 2012 (Lomac-MacNair *et al.*, 2013). Moreover, preliminary reports from Apache's 2014 vessel, aerial, and land observations suggest harbor seals may be more abundant north of the Forelands than previously understood. During the 2D test program in March 2011, two harbor seals were observed by vessel-based PSOs. On March 25, 2011, one harbor seal was observed approximately 400 m (0.2 mi) from the *M/V Miss Diane*. At the time of the observation, the vessel was operating the positioning pinger, and PSOs instructed the operator to implement a shut-down. The pinger was shut down for 30 minutes while PSOs monitored the area and re-started the device when the animal was not sighted again during the 30 minute site

clearing protocol. No unusual behaviors were reported during the time the animal was observed. The second harbor seal was observed on March 26, 2011, by vessel-based PSO onboard the *M/V Dreamcatcher* approximately 4,260 m (2.6 mi) from the source vessel, which was operating the 10 in^3 airgun at the time. NMFS and Apache do not anticipate encountering large aggregations of seals (the closest known haulout site to the action area is located on Kalgin Island, which is approximately 22 km [14 mi] south of the McArthur River), but we do expect to see individual harbor seals (Boveng *et al.*, 2011); especially during large fish runs in the various rivers draining into Cook Inlet.

Important harbor seal life functions, such as breeding and molting may occur within portions of Apache's survey area in June and August, but the co-occurrence is expected to be minimal. From November through January, harbor seals leave Cook Inlet to forage in Shelikof Strait (Boveng *et al.*, 2007).

Steller Sea Lion (*Eumetopia jubatus*)

Two separate stocks of Steller sea lions are recognized within U.S. waters: an eastern DPS, which includes animals east of Cape Suckling, Alaska; and a western DPS, which includes animals west of Cape Suckling (NMFS, 2008). Individuals in Cook Inlet are considered part of the western DPS, which is listed as endangered under the ESA.

Regional variation in trends in Steller sea lion pup counts in 2000-2012 is similar to that of non-pup counts (Johnson and Fritz, 2014). Overall, there is strong evidence that pup counts in the western stock in Alaska increased (1.45 percent annually). Between 2004 and 2008, Alaska western non-pup counts increased only 3%: eastern Gulf of Alaska (Prince William Sound area) counts were higher and Kenai Peninsula through Kiska Island counts were stable, but western Aleutian counts continued to decline. Johnson and Fritz (2014) analyzed western Steller sea lion

population trends in Alaska and noted that there was strong evidence that non-pup counts in the western stock in Alaska increased between 2000 and 2012 (average rate of 1.67 percent annually). However, there continues to be considerable regional variability in recent trends across the range in Alaska, with strong evidence of a positive trend east of Samalga Pass and strong evidence of a decreasing trend to the west (Allen and Angliss, 2014).

Steller sea lions primarily occur in lower, rather than upper Cook Inlet and are rarely sighted north of Nikiski on the Kenai Peninsula. NMFS aerial surveys conducted in June 2000-2012, primarily in lower Cook Inlet, indicated presence of 0 to 104 Steller sea lions. Haul-outs and rookeries are located near, but outside of Cook Inlet at Gore Point, Elizabeth Island, Perl Island, and Chugach Island (NMFS, 2008). No Steller sea lion haul-outs or rookeries are located in the vicinity of the seismic survey. Furthermore, no sightings of Steller sea lions were reported by Apache during the 2D test program in March 2011. During the 3D seismic survey, one Steller sea lion was observed from the *M/V Dreamcatcher* on August 18, 2012, during a period when the air guns were not active. Although Apache has requested takes of Steller sea lions, Steller sea lions would be rare in the action area during seismic survey operations.

Apache's application contains more information on the status, distribution, seasonal distribution, and abundance of each of the species under NMFS jurisdiction mentioned in this document. Please refer to the application for that information (see ADDRESSES). Additional information can also be found in the NMFS Stock Assessment Reports (SAR). The Alaska 2014 SAR is available on the Internet at: *http://www.nmfs.noaa.gov/pr/sars/pdf/ak2013_final.pdf*.

Potential Effects of the Specified Activity on Marine Mammals

This section includes a summary and discussion of the ways that components (*e.g.*, seismic airgun operations, vessel movement) of the specified activity, including mitigation, may

impact marine mammals. The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative analysis of the number of individuals that are expected to be taken by this activity. The "Negligible Impact Analysis" section will include the analysis of how this specific activity will impact marine mammals and will consider the content of this section, the "Estimated Take by Incidental Harassment" section, the "Mitigation" section, and the "Anticipated Effects on Marine Mammal Habitat" section to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks.

Operating active acoustic sources, such as airgun arrays, has the potential for adverse effects on marine mammals. The majority of anticipated impacts would be from the use of acoustic sources.

Acoustic Impacts

When considering the influence of various kinds of sound on the marine environment, it is necessary to understand that different kinds of marine life are sensitive to different frequencies of sound. Based on available behavioral data, audiograms have been derived using auditory evoked potentials, anatomical modeling, and other data. Southall *et al.* (2007) designate "functional hearing groups" for marine mammals and estimate the lower and upper frequencies of functional hearing of the groups. The functional groups and the associated frequencies are indicated below (note that animals are less sensitive to sounds at the outer edge of their functional range and most sensitive to sounds of frequencies within a smaller range somewhere in the middle of their functional hearing range):

• Low frequency cetaceans (13 species of mysticetes): functional hearing is estimated to occur between approximately 7 Hz and 30 kHz;

• Mid-frequency cetaceans (32 species of dolphins, six species of larger toothed whales, and 19 species of beaked and bottlenose whales): functional hearing is estimated to occur between approximately 150 Hz and 160 kHz;

• High frequency cetaceans (eight species of true porpoises, six species of river dolphins, Kogia, the franciscana, and four species of cephalorhynchids): functional hearing is estimated to occur between approximately 200 Hz and 180 kHz;

• Phocid pinnipeds in Water: functional hearing is estimated to occur between approximately 75 Hz and 100 kHz; and

• Otariid pinnipeds in Water: functional hearing is estimated to occur between approximately 100 Hz and 40 kHz.

As mentioned previously in this document, nine marine mammal species (seven cetacean and two pinniped species) are likely to occur in the seismic survey area. Of the four cetacean species likely to occur in Apache's project area, one is classified as a low-frequency cetacean (gray whale), two are classified as mid-frequency cetaceans (i.e., beluga and killer whales), and one is classified as a high-frequency cetacean (i.e., harbor porpoise) (Southall *et al.*, 2007). Of the two pinniped species likely to occur in Apache's project area, one is classified as a phocid (i.e., harbor seal), and one is classified as an otariid (i.e., Steller sea lion). A species functional hearing group is a consideration when we analyze the effects of its exposure to different frequencies of sound.

1. Potential Effects of Airgun Sounds on Marine Mammals

The effects of sounds from airgun pulses might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing threshold shifts, and non-auditory effects (Richardson *et al.*, 1995). As outlined in previous

NMFS documents, the effects of noise on marine mammals are highly variable, often depending on species and contextual factors (based on Richardson *et al*., 1995).

Tolerance: Numerous studies have shown that pulsed sounds from air guns are often readily detectable in the water at distances of many kilometers. Numerous studies have also shown that marine mammals at distances more than a few kilometers from operating survey vessels often show no apparent response. That is often true even in cases when the pulsed sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. In general, pinnipeds and small odontocetes (toothed whales) seem to be more tolerant of exposure to air gun pulses than baleen whales. Although various toothed whales, and (less frequently) pinnipeds have been shown to react behaviorally to airgun pulses under some conditions, at other times, mammals of both types have shown no overt reactions. Weir (2008) observed marine mammal responses to seismic pulses from a 24 airgun array firing a total volume of either 5,085 in^3 or 3,147 in^3 in Angolan waters between August 2004 and May 2005. Weir recorded a total of 207 sightings of humpback whales (n = 66), sperm whales (n = 124), and Atlantic spotted dolphins (n = 17) and reported that there were no significant differences in encounter rates (sightings/hr) for humpback and sperm whales according to the airgun array's operational status (i.e., active versus silent).

Behavioral Disturbance: Marine mammals may behaviorally respond when exposed to anthropogenic noise. These behavioral reactions are often shown as: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where noise sources are located; and/or flight responses

(*e.g.*, pinnipeds flushing into water from haulouts or rookeries).

The biological significance of many of these behavioral disturbances is difficult to predict. The consequences of behavioral modification to individual fitness can range from none up to potential changes to growth, survival, or reproduction, depending on the context, duration, and degree of behavioral modification. Examples of behavioral modifications that could impact growth, survival or reproduction include: Drastic changes in diving/surfacing/swimming patterns that lead to stranding (such as those associated with beaked whale strandings related to exposure to military mid-frequency tactical sonar); longer-term abandonment of habitat that is specifically important for feeding, reproduction, or other critical needs, or significant disruption of feeding or social interaction resulting in substantive energetic costs, inhibited breeding, or prolonged or permanent cow-calf separation.

The likelihood and severity of behavioral disturbance from anthropogenic noise depends on both external factors (characteristics of noise sources and their paths) and the receiving animals (hearing, motivation, experience, demography, context of the exposure) and is also difficult to predict (Southall *et al*., 2007).

Toothed whales. Few systematic data are available describing reactions of toothed whales to noise pulses. However, systematic work on sperm whales (Tyack *et al*., 2003) has yielded an increasing amount of information about responses of various odontocetes to seismic surveys based on monitoring studies (*e.g.*, Stone, 2003; Smultea *et al*., 2004; Moulton and Miller, 2005). Stone *et al.* (2003) reported reduced sighting rates of small odontocetes during periods of shooting during seismic surveys with large airgun arrays. Moulton and Miller (2004) also found that the range of audibility of seismic pules for mid-sized odontecetes was largely underestimated by models.

Seismic operators and marine mammal observers sometimes see dolphins and other small toothed whales near operating airgun arrays, but, in general, there seems to be a tendency for most delphinids to show some avoidance of seismic vessels operating large airgun systems. However, some dolphins seem to be attracted to the seismic vessel and floats, and some ride the bow wave of the seismic vessel even when large arrays of airguns are firing. Nonetheless, there have been indications that small toothed whales sometimes move away or maintain a somewhat greater distance from the vessel when a large array of airguns is operating than when it is silent (*e.g.*, Goold, 1996a,b,c; Calambokidis and Osmek, 1998; Stone, 2003). The beluga may be a species that (at least in certain geographic areas) shows long-distance avoidance of seismic vessels. Aerial surveys during seismic operations in the southeastern Beaufort Sea recorded much lower sighting rates of beluga whales within 10–20 km (6.2-12.4 mi) of an active seismic vessel. These results were consistent with the low number of beluga sightings reported by observers aboard the seismic vessel, indicating that belugas may avoid seismic operations at distances of 10–20 km (6.2-12.4 mi) (Miller *et al*., 2005).

Captive bottlenose dolphins and beluga whales exhibit changes in behavior when exposed to strong pulsed sounds similar in duration to those typically used in seismic surveys (Finneran *et al*., 2002, 2005). However, the animals tolerated high received levels of sound (pk–pk level >200 dB re 1 μPa) before exhibiting aversive behaviors.

Observers stationed on seismic vessels operating off the United Kingdom from 1997 - 2000 have provided data on the occurrence and behavior of various toothed whales exposed to seismic pulses (Stone, 2003; Gordon *et al*., 2004). Killer whales were found to be significantly farther from large airgun arrays during periods of shooting compared with periods of no shooting. The displacement of the median distance from the array was approximately 0.5 km

(0.3 mi) or more. Killer whales also appear to be more tolerant of seismic shooting in deeper water (illustrating another example of the importance of context in predicting responses).

Reactions of toothed whales to large arrays of airguns are variable and, at least for delphinids, seem to be confined to a smaller radius than has been observed for mysticetes. However, based on the limited existing evidence, belugas should not necessarily be grouped with delphinids in the "less responsive" category.

Pinnipeds. Pinnipeds are not likely to show a strong avoidance reaction to the airgun sources used. Visual monitoring from seismic vessels has shown only slight (if any) avoidance of airguns by pinnipeds and only slight (if any) changes in behavior. Monitoring work in the Alaskan Beaufort Sea during 1996–2001 provided considerable information regarding the behavior of Arctic ice seals exposed to seismic pulses (Harris *et al*., 2001; Moulton and Lawson, 2002). These seismic projects usually involved arrays of 6 to 16 airguns with total displacement volumes of 560 to 1,500 in^3. The combined results suggest that some seals avoid the immediate area around seismic vessels. In most survey years, ringed seal sightings tended to be farther away from the seismic vessel when the airguns were operating than when they were not (Moulton and Lawson, 2002). However, these avoidance movements were relatively small, on the order of 100 m (328 ft) to a few hundreds of meters, and many seals remained within 100–200 m (328–656 ft) of the trackline as the operating airgun array passed by. Seal sighting rates at the water surface were lower during airgun array operations than during no-airgun periods in each survey year except 1997. Similarly, seals are often very tolerant of pulsed sounds from seal-scaring devices (Mate and Harvey, 1987; Jefferson and Curry, 1994; Richardson *et al*., 1995a). However, initial telemetry work suggests that avoidance and other behavioral reactions by two other species of seals, grey and harbor seals, to small airgun sources may at times be

stronger than evident to date from visual studies of pinniped reactions to airguns (Thompson *et al*., 1998). Even if reactions of the species occurring in the activity area are as strong as those evident in the telemetry study, reactions are expected to be confined to relatively small distances and durations, with no long-term effects on pinniped individuals or populations.

Masking: Masking is the obscuring of sounds of interest by other sounds, often at similar frequencies. Marine mammals use acoustic signals for a variety of purposes, which differ among species, but include communication between individuals, navigation, foraging, reproduction, avoiding predators, and learning about their environment (Erbe and Farmer, 2000; Tyack, 2000). Masking, or auditory interference, generally occurs when sounds in the environment are louder than, and of a similar frequency to, auditory signals an animal is trying to receive. Masking is a phenomenon that affects animals trying to receive acoustic information about their environment, including sounds from other members of their species, predators, prey, and sounds that allow them to orient in their environment. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations.

Masking occurs when anthropogenic sounds and signals (that the animal utilizes) overlap at both spectral and temporal scales. For the airgun sound generated from the seismic surveys, sound will consist of low frequency (under 500 Hz) pulses with extremely short durations (less than one second). Lower frequency man-made sounds are more likely to affect detection of potentially important natural sounds such as surf and prey noise, or communication calls for low frequency specialists. There is little concern regarding masking near the sound source due to the brief duration of these pulses and relatively longer silence between air gun shots (approximately 12 seconds). However, at long distances (over tens of kilometers away), due to multipath propagation and reverberation, the durations of airgun pulses can be "stretched" to seconds with

long decays (Madsen *et al*., 2006), and shorter intervals between pulses, although the intensity of the sound is greatly reduced.

This could affect communication signals used by low frequency mysticetes when they occur near the noise band and thus reduce the communication space of animals (*e.g.*, Clark *et al*., 2009) and cause increased stress levels (*e.g.*, Foote *et al*., 2004; Holt *et al*., 2009); however, few baleen whales are expected to occur within the action area. Marine mammals are thought to be able to compensate for masking by adjusting their acoustic behavior by shifting call frequencies, and/or increasing call volume and vocalization rates. For example, blue whales were found to increase call rates when exposed to seismic survey noise in the St. Lawrence Estuary (Di Iorio and Clark, 2010). The North Atlantic right whales (*Eubalaena glacialis*) exposed to high shipping noise increase call frequency (Parks *et al*., 2007), while some humpback whales respond to low-frequency active sonar playbacks by increasing song length (Miller *et al*., 2000). Additionally, beluga whales have been known to change their vocalizations in the presence of high background noise possibly to avoid masking calls (Au *et al*., 1985; Lesage *et al*., 1999; Scheifele *et al*., 2005). Although some degree of masking is inevitable when high levels of manmade broadband sounds are introduced into the sea, marine mammals have evolved systems and behavior that function to reduce the impacts of masking. Structured signals, such as the echolocation click sequences of small toothed whales, may be readily detected even in the presence of strong background noise because their frequency content and temporal features usually differ strongly from those of the background noise (Au and Moore, 1988, 1990). The components of background noise that are similar in frequency to the sound signal in question primarily determine the degree of masking of that signal.

Redundancy and context can also facilitate detection of weak signals. These phenomena

may help marine mammals detect weak sounds in the presence of natural or manmade noise. Most masking studies in marine mammals present the test signal and the masking noise from the same direction. The sound localization abilities of marine mammals suggest that, if signal and noise come from different directions, masking would not be as severe as the usual types of masking studies might suggest (Richardson *et al*., 1995). The dominant background noise may be highly directional if it comes from a particular anthropogenic source such as a ship or industrial site. Directional hearing may significantly reduce the masking effects of these sounds by improving the effective signal-to-noise ratio. In the cases of higher frequency hearing by the bottlenose dolphin, beluga whale, and killer whale, empirical evidence confirms that masking depends strongly on the relative directions of arrival of sound signals and the masking noise (Penner *et al*., 1986; Dubrovskiy, 1990; Bain *et al*., 1993; Bain and Dahlheim, 1994). Toothed whales and probably other marine mammals as well, have additional capabilities besides directional hearing that can facilitate detection of sounds in the presence of background noise. There is evidence that some toothed whales can shift the dominant frequencies of their echolocation signals from a frequency range with a lot of ambient noise toward frequencies with less noise (Au *et al*., 1974, 1985; Moore and Pawloski, 1990; Thomas and Turl, 1990; Romanenko and Kitain, 1992; Lesage *et al*., 1999). A few marine mammal species are known to increase the source levels or alter the frequency of their calls in the presence of elevated sound levels (Dahlheim, 1987; Au, 1993; Lesage *et al*., 1993, 1999; Terhune, 1999; Foote *et al*., 2004; Parks *et al*., 2007, 2009; Di Iorio and Clark, 2009; Holt *et al*., 2009).

These data demonstrating adaptations for reduced masking pertain mainly to the very high frequency echolocation signals of toothed whales. There is less information about the existence of corresponding mechanisms at moderate or low frequencies or in other types of

marine mammals. For example, Zaitseva *et al*. (1980) found that, for the bottlenose dolphin, the angular separation between a sound source and a masking noise source had little effect on the degree of masking when the sound frequency was 18 kHz, in contrast to the pronounced effect at higher frequencies. Directional hearing has been demonstrated at frequencies as low as 0.5-2 kHz in several marine mammals, including killer whales (Richardson *et al*., 1995a). This ability may be useful in reducing masking at these frequencies. In summary, high levels of sound generated by anthropogenic activities may act to mask the detection of weaker biologically important sounds by some marine mammals. This masking may be more prominent for lower frequencies. For higher frequencies, such as that used in echolocation by toothed whales, several mechanisms are available that may allow them to reduce the effects of such masking.

Threshold Shift (noise-induced loss of hearing) – When animals exhibit reduced hearing sensitivity (i.e., sounds must be louder for an animal to detect them) following exposure to loud and/or persistent sound, it is referred to as a noise-induced threshold shift (TS). An animal can experience temporary threshold shift (TTS) or permanent threshold shift (PTS). TTS can last from minutes or hours to days (i.e., there is complete recovery), can occur in specific frequency ranges (i.e., an animal might only have a temporary loss of hearing sensitivity between the frequencies of 1 and 10 kHz), and can be of varying amounts (for example, an animal's hearing sensitivity might be reduced initially by only 6 dB or reduced by 30 dB). PTS is permanent, but some recovery is possible. PTS can also occur in a specific frequency range and amount as mentioned above for TTS.

The following physiological mechanisms are thought to play a role in inducing auditory TS: effects to sensory hair cells in the inner ear that reduce their sensitivity, modification of the chemical environment within the sensory cells, residual muscular activity in the middle ear,

displacement of certain inner ear membranes, increased blood flow, and post-stimulatory reduction in both efferent and sensory neural output (Southall *et al*., 2007). The amplitude, duration, frequency, temporal pattern, and energy distribution of sound exposure all can affect the amount of associated TS and the frequency range in which it occurs. As amplitude and duration of sound exposure increase, so, generally, does the amount of TS, along with the recovery time. For intermittent sounds, less TS could occur than compared to a continuous exposure with the same energy (some recovery could occur between intermittent exposures depending on the duty cycle between sounds) (Kryter *et al*., 1966; Ward, 1997). For example, one short but loud (higher SPL) sound exposure may induce the same impairment as one longer but softer sound, which in turn may cause more impairment than a series of several intermittent softer sounds with the same total energy (Ward, 1997). Additionally, though TTS is temporary, prolonged exposure to sounds strong enough to elicit TTS, or shorter-term exposure to sound levels well above the TTS threshold, can cause PTS, at least in terrestrial mammals (Kryter, 1985). In the case of the seismic survey, animals are not expected to be exposed to levels high enough or durations long enough to result in PTS.

PTS is considered auditory injury (Southall *et al*., 2007). Irreparable damage to the inner or outer cochlear hair cells may cause PTS; however, other mechanisms are also involved, such as exceeding the elastic limits of certain tissues and membranes in the middle and inner ears and resultant changes in the chemical composition of the inner ear fluids (Southall *et al*., 2007).

Although the published body of scientific literature contains numerous theoretical studies and discussion papers on hearing impairments that can occur with exposure to a loud sound, only a few studies provide empirical information on the levels at which noise-induced loss in hearing sensitivity occurs in nonhuman animals. For marine mammals, published data are limited to the

captive bottlenose dolphin, beluga, harbor porpoise, and Yangtze finless porpoise (Finneran *et al*., 2000, 2002, 2003, 2005, 2007, 2010a, 2010b; Finneran and Schlundt, 2010; Lucke *et al*., 2009; Mooney *et al*., 2009a, 2009b; Popov *et al*., 2011a, 2011b; Kastelein *et al*., 2012a; Schlundt *et al*., 2000; Nachtigall *et al*., 2003, 2004). For pinnipeds in water, data are limited to measurements of TTS in harbor seals, an elephant seal, and California sea lions (Kastak *et al*., 1999, 2005; Kastelein *et al*., 2012b).

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (i.e., recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. Similarly, depending on the degree and frequency range, the effects of PTS on an animal could range in severity, although it is considered generally more serious because it is a permanent condition. Of note, reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al*., 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Given the higher level of sound necessary to cause PTS as compared with TTS, it is considerably less likely that PTS would occur during the seismic surveys in Cook Inlet.

Cetaceans generally avoid the immediate area around operating seismic vessels, as do some other marine mammals. Some pinnipeds show avoidance reactions to airguns, but their avoidance reactions are generally not as strong or consistent as those of cetaceans, and occasionally they seem to be attracted to operating seismic vessels (NMFS, 2010).

Non-auditory Physical Effects: Non-auditory physical effects might occur in marine mammals exposed to strong underwater pulsed sound. Possible types of non-auditory physiological effects or injuries that theoretically might occur in mammals close to a strong sound source include stress, neurological effects, bubble formation, and other types of organ or tissue damage. Some marine mammal species (i.e., beaked whales) may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds.

Classic stress responses begin when an animal's central nervous system perceives a potential threat to its homeostasis. That perception triggers stress responses regardless of whether a stimulus actually threatens the animal; the mere perception of a threat is sufficient to trigger a stress response (Moberg, 2000; Sapolsky *et al*., 2005; Seyle, 1950). Once an animal's central nervous system perceives a threat, it mounts a biological response or defense that consists of a combination of the four general biological defense responses: behavioral responses; autonomic nervous system responses; neuroendocrine responses; or immune responses.

In the case of many stressors, an animal's first and most economical (in terms of biotic costs) response is behavioral avoidance of the potential stressor or avoidance of continued exposure to a stressor. An animal's second line of defense to stressors involves the sympathetic part of the autonomic nervous system and the classical "fight or flight" response, which includes the cardiovascular system, the gastrointestinal system, the exocrine glands, and the adrenal medulla to produce changes in heart rate, blood pressure, and gastrointestinal activity that

humans commonly associate with "stress." These responses have a relatively short duration and may or may not have significant long-term effects on an animal's welfare.

An animal's third line of defense to stressors involves its neuroendocrine or sympathetic nervous systems; the system that has received the most study has been the hypothalmus-pituitary-adrenal system (also known as the HPA axis in mammals or the hypothalamus-pituitary-interrenal axis in fish and some reptiles). Unlike stress responses associated with the autonomic nervous system, virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction (Moberg, 1987; Rivier, 1995), altered metabolism (Elasser *et al*., 2000), reduced immune competence (Blecha, 2000), and behavioral disturbance. Increases in the circulation of glucocorticosteroids (cortisol, corticosterone, and aldosterone in marine mammals; see Romano *et al*., 2004) have been equated with stress for many years.

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and distress is the biotic cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose a risk to the animal's welfare. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other biotic functions, which impair those functions that experience the diversion. For example, when mounting a stress response diverts energy away from growth in young animals, those animals may experience stunted growth. When mounting a stress response diverts energy from a fetus, an animal's reproductive success and fitness will suffer. In these cases, the animals will have entered a pre-pathological or

pathological state which is called “distress” (sensu Seyle, 1950) or “allostatic loading” (sensu McEwen and Wingfield, 2003). This pathological state will last until the animal replenishes its biotic reserves sufficient to restore normal function. Note that these examples involved a long-term (days or weeks) stress response due to exposure to stimuli.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses have also been documented fairly well through controlled experiment; because this physiology exists in every vertebrate that has been studied, it is not surprising that stress responses and their costs have been documented in both laboratory and free-living animals (for examples see, Holberton *et al*., 1996; Hood *et al*., 1998; Jessop *et al*., 2003; Krausman *et al*., 2004; Lankford *et al*., 2005; Reneerkens *et al*., 2002; Thompson and Hamer, 2000). Although no information has been collected on the physiological responses of marine mammals to anthropogenic sound exposure, studies of other marine animals and terrestrial animals would lead us to expect some marine mammals to experience physiological stress responses and, perhaps, physiological responses that would be classified as “distress” upon exposure to anthropogenic sounds.

For example, Jansen (1998) reported on the relationship between acoustic exposures and physiological responses that are indicative of stress responses in humans (*e.g.*, elevated respiration and increased heart rates). Jones (1998) reported on reductions in human performance when faced with acute, repetitive exposures to acoustic disturbance. Trimper *et al*. (1998) reported on the physiological stress responses of osprey to low-level aircraft noise while Krausman *et al*. (2004) reported on the auditory and physiology stress responses of endangered Sonoran pronghorn to military overflights. Smith *et al*. (2004a, 2004b) identified noise-induced physiological transient stress responses in hearing-specialist fish (i.e., goldfish) that accompanied

short- and long-term hearing losses. Welch and Welch (1970) reported physiological and behavioral stress responses that accompanied damage to the inner ears of fish and several mammals.

Hearing is one of the primary senses marine mammals use to gather information about their environment and communicate with conspecifics. Although empirical information on the effects of sensory impairment (TTS, PTS, and acoustic masking) on marine mammals remains limited, we assume that reducing a marine mammal's ability to gather information about its environment and communicate with other members of its species would induce stress, based on data that terrestrial animals exhibit those responses under similar conditions (NRC, 2003) and because marine mammals use hearing as their primary sensory mechanism. Therefore, we assume that acoustic exposures sufficient to trigger onset PTS or TTS would be accompanied by physiological stress responses. However, marine mammals also might experience stress responses at received levels lower than those necessary to trigger onset TTS. Based on empirical studies of the time required to recover from stress responses (Moberg, 2000), NMFS also assumes that stress responses could persist beyond the time interval required for animals to recover from TTS and might result in pathological and pre-pathological states that would be as significant as behavioral responses to TTS. Resonance effects (Gentry, 2002) and direct noise-induced bubble formations (Crum *et al*., 2005) are implausible in the case of exposure to an impulsive broadband source like an airgun array. If seismic surveys disrupt diving patterns of deep-diving species, this might result in bubble formation and a form of the bends, as speculated to occur in beaked whales exposed to sonar. However, there is no specific evidence of this upon exposure to airgun pulses, and no beaked whale species occur in Apache's seismic survey area.

In general, very little is known about the potential for strong, anthropogenic underwater

sounds to cause non-auditory physical effects in marine mammals. Such effects, if they occur at all, would presumably be limited to short distances and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al*., 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. There is no definitive evidence that any of these effects occur even for marine mammals in close proximity to large arrays of airguns. In addition, marine mammals that show behavioral avoidance of seismic vessels, including belugas and some pinnipeds, are especially unlikely to incur non-auditory impairment or other physical effects. Therefore, it is unlikely that such effects would occur during Apache's surveys given the brief duration of exposure and the planned monitoring and mitigation measures described later in this document.

Stranding and Mortality: Marine mammals close to underwater detonations of high explosives can be killed or severely injured, and the auditory organs are especially susceptible to injury (Ketten *et al*., 1993; Ketten 1995). Airgun pulses are less energetic and their peak amplitudes have slower rise times. To date, there is no evidence that serious injury, death, or stranding by marine mammals can occur from exposure to air gun pulses, even in the case of large air gun arrays.

However, in past IHA notices for seismic surveys, commenters have referenced two stranding events allegedly associated with seismic activities, one off Baja California and a second off Brazil. NMFS has addressed this concern several times, including in the **Federal Register** notice announcing the IHA for Apache Alaska's first seismic survey in 2012. Readers are encouraged to review NMFS's response to comments on this matter found in 69 FR 74905 (December 14, 2004), 71 FR 43112 (July 31, 2006), 71 FR 50027 (August 24, 2006), 71 FR

49418 (August 23, 2006), and 77 FR 27720 (May 11, 2012).

Beluga whale strandings in Cook Inlet are not uncommon; however, these events often coincide with extreme tidal fluctuations ("spring tides") or killer whale sightings (Shelden *et al*., 2003). For example, in August 2012, a group of Cook Inlet beluga whales stranded in the mud flats of Turnagain Arm during low tide and were able to swim free with the flood tide. No strandings or marine mammals in distress were observed during the 2D test survey conducted by Apache in March 2011, and none were reported by Cook Inlet inhabitants. Based on our consideration of the best available information, NMFS does not expect any marine mammals will incur serious injury or mortality in Cook Inlet or strand as a result of the seismic survey.

2. Potential Effects from Pingers on Marine Mammals

Active acoustic sources other than the airguns will be used for Apache's 5-year oil and gas exploration seismic survey program in Cook Inlet. The specifications for the pingers (source levels and frequency ranges) were provided in the FR notice of the proposed rule (80 FR 9510). In general, pingers are known to cause behavioral disturbance and are commonly used to deter marine mammals from commercial fishing gear or fish farms.

3. Potential Effects from Aircraft Noise on Marine Mammals

Apache plans to utilize aircraft to conduct aerial surveys near river mouths in order to identify locations or congregations of beluga whales and other marine mammals prior to the commencement of operations. The aircraft will not be used every day but will be used for surveys near river mouths. Survey aircraft will fly at an altitude of about 300 m (1,000 ft) when practicable and when weather conditions allow. In the event of a marine mammal sighting, aircraft will try to maintain a radial distance of 457 m (1,500 ft) from the marine mammal(s). Aircraft will avoid approaching marine mammals from head-on, flying over or passing the

shadow of the aircraft over the marine mammals.

Studies on the reactions of cetaceans to aircraft show little negative response (Richardson *et al*., 1995). In general, reactions range from sudden dives and turns and are typically found to decrease if the animals are engaged in feeding or social behavior. Whales with calves or in confined waters may show more of a response. There has been little or no evidence of marine mammals in the Arctic responding to aircraft at altitudes greater than about 300 m (1,000 ft), during the past three decades. (NMFS, unpublished data). No change in beluga swim directions or other noticeable reactions have been observed during the Cook Inlet aerial surveys flown from 183 to 244 m (600 to 800 ft) since 1993 (*e.g.*, Rugh *et al*., 2000). Therefore, NMFS expects no effects on beluga whales or other cetaceans due to aerial surveys associated with this action.

The majority of observations of pinnipeds reacting to aircraft noise are associated with animals hauled out on land or ice. There are few data describing the reactions of pinnipeds in water to aircraft (Richardson *et al*., 1995). In the presence of aircraft, pinnipeds hauled out for pupping or molting generally became alert and then rushed or slipped (when on ice) into the water. Stampedes often result from this response and may increase pup mortality due to crushing or an increased rate of pup abandonment. The greatest reactions from hauled-out pinnipeds were observed when low flying aircraft passed directly above the animal(s) (Richardson *et al*., 1995). Although noise associated with aircraft activity could cause hauled out pinnipeds to rush into the water, there are no known haul out sites in the vicinity of the survey site. Therefore, the operation of aircraft during the seismic survey is not expected to result in the harassment of pinnipeds. To minimize the noise generated by aircraft, Apache will follow NMFS's Marine Mammal Viewing Guidelines and Regulations found on the Internet at: *http://www.alaskafisheries.noaa.gov/protectedresources/mmv/guide.htm*.

4. Vessel Impacts

Vessel activity and noise associated with vessel activity will temporarily increase in the action area during Apache's seismic survey as a result of the operation of nine vessels. To minimize the effects of vessels and noise associated with vessel activity, Apache will follow NMFS's Marine Mammal Viewing Guidelines and Regulations and will alter heading or speed if a marine mammal gets too close to a vessel. In addition, vessels will be operating at slow speed (2-4 knots) when conducting surveys and in a purposeful manner to and from work sites in as direct a route as possible. Marine mammal monitoring observers and passive acoustic devices will alert vessel captains as animals are detected to ensure safe and effective measures are applied to avoid coming into direct contact with marine mammals. Therefore, NMFS neither anticipates nor authorizes takes of marine mammals from ship strikes.

Odontocetes, such as beluga whales, killer whales, and harbor porpoises, often show tolerance to vessel activity; however, they may react at long distances if they are confined by ice, shallow water, or were previously harassed by vessels (Richardson *et al.*, 1995). Beluga whale response to vessel noise varies greatly from tolerance to extreme sensitivity depending on the activity of the whale and previous experience with vessels (Richardson *et al.*, 1995). Reactions to vessels depend on whale activities and experience, habitat, boat type, and boat behavior (Richardson *et al.*, 1995) and may include behavioral responses, such as altered headings or avoidance (Blane and Jaakson, 1994; Erbe and Farmer, 2000); fast swimming; changes in vocalizations (Lesage *et al*., 1999; Scheifele *et al*., 2005); and changes in dive, surfacing, and respiration patterns.

There are few data published on pinniped responses to vessel activity, and most of the information is anecdotal (Richardson *et al.*, 1995). Generally, sea lions in water show tolerance

to close approaching vessels and sometimes show interest in fishing vessels. They are less tolerant when hauled out on land; however, they rarely react unless the vessel approaches within 100-200 m (330-660 ft; reviewed in Richardson *et al.*, 1995).

5. Entanglement

Although some of Apache's equipment contains cables or lines, the risk of entanglement is extremely remote. The material used by Apache and the amount of slack in lines is not anticipated to allow for marine mammal entanglements. No incidents of entanglement have been reported from any seismic operators in Cook Inlet, and therefore injury or mortality from entanglement is not anticipated.

Anticipated Effects on Marine Mammal Habitat

This section describes the potential impacts to marine mammal habitat from the specified activity. Because the marine mammals in the area feed on fish and/or invertebrates there is also information on the species typically preyed upon by the marine mammals in the area. As noted earlier, upper Cook Inlet is an important feeding and calving area for the Cook Inlet beluga whale, and critical habitat has been designated for this species in the seismic survey area.

Common Marine Mammal Prey in the Project Area

Fish are the primary prey species for marine mammals in upper Cook Inlet. Beluga whales feed on a variety of fish, shrimp, squid, and octopus (Burns and Seaman, 1986). Common prey species in Cook Inlet include salmon, eulachon and cod. Harbor seals feed on fish such as pollock, cod, capelin, eulachon, Pacific herring, and salmon, as well as a variety of benthic species, including crabs, shrimp, and cephalopods. Harbor seals are also opportunistic feeders with their diet varying with season and location. The preferred diet of the harbor seal in the Gulf of Alaska consists of pollock, octopus, capelin, eulachon, and Pacific herring (Calkins,

1989). Other prey species include cod, flat fishes, shrimp, salmon, and squid (Hoover, 1988). Harbor porpoises feed primarily on Pacific herring, cod, whiting (hake), pollock, squid, and octopus (Leatherwood *et al.*, 1982). In the upper Cook Inlet area, harbor porpoise feed on squid and a variety of small schooling fish, which would likely include Pacific herring and eulachon (Bowen and Siniff, 1999; NMFS, unpublished data). Killer whales feed on either fish or other marine mammals depending on genetic type (resident versus transient respectively). Killer whales in Knik Arm are typically the transient type (Shelden *et al.*, 2003) and feed on beluga whales and other marine mammals, such as harbor seal and harbor porpoise. The Steller sea lion diet consists of a variety of fishes (capelin, cod, herring, mackerel, pollock, rockfish, salmon, sand lance, etc.), bivalves, squid, octopus, and gastropods.

Potential Impacts of Sound on Prey Species

With regard to fish as a prey source for cetaceans and pinnipeds, fish are known to hear and react to sounds and to use sound to communicate (Tavolga *et al.*, 1981) and possibly avoid predators (Wilson and Dill, 2002). Experiments have shown that fish can sense both the strength and direction of sound (Hawkins, 1981). Primary factors determining whether a fish can sense a sound signal, and potentially react to it, are the frequency of the signal and the strength of the signal in relation to the natural background sound level.

Fishes have evolved a diversity of sound generating organs and acoustic signals of various temporal and spectral contents. Fish sounds vary in structure, depending on the mechanism used to produce them (Hawkins, 1993). Generally, fish sounds are predominantly composed of low frequencies (less than 3 kHz). Fishes produce sounds that are associated with behaviors that include territoriality, mate search, courtship, and aggression. It has also been speculated that sound production may provide the means for long distance communication and

communication under poor underwater visibility conditions (Zelick *et al.*, 1999), although the fact that fish communicate at low-frequency sound levels where the masking effects of ambient noise are naturally highest suggests that very long distance communication would rarely be possible.

Since objects in the water scatter sound, fish are able to detect these objects through monitoring the ambient noise. Therefore, fish are probably able to detect prey, predators, conspecifics, and physical features by listening to environmental sounds (Hawkins, 1981). There are two sensory systems that enable fish to monitor the vibration-based information of their surroundings. The two sensory systems, the inner ear and the lateral line, constitute the acoustico-lateralis system.

Although the hearing sensitivities of very few fish species have been studied to date, it is becoming obvious that the intra- and inter-specific variability is considerable (Coombs, 1981). Nedwell *et al.* (2004) compiled and published available fish audiogram information. A noninvasive electrophysiological recording method known as auditory brainstem response is now commonly used in the production of fish audiograms (Yan, 2004). Popper and Carlson (1998) and the Navy (2001) found that fish generally perceive underwater sounds in the frequency range of 50-2,000 Hz, with peak sensitivities below 800 Hz. Even though some fish are able to detect sounds in the ultrasonic frequency range, the hearing thresholds at these higher frequencies tend to be considerably higher than those at the lower end of the auditory hearing frequency range.

Fish are sensitive to underwater impulsive sounds due to swim bladder resonance. As the pressure wave passes through a fish, the swim bladder is rapidly squeezed as the high pressure wave, and then the under pressure component of the wave, passes through the fish. The swim bladder may repeatedly expand and contract at the high sound pressure levels, creating pressure

on the internal organs surrounding the swim bladder.

Literature relating to the impacts of sound on marine fish species can be divided into the following categories: (1) pathological effects; (2) physiological effects; and (3) behavioral effects. Pathological effects include lethal and sub-lethal physical damage to fish; physiological effects include primary and secondary stress responses; and behavioral effects include changes in exhibited behaviors of fish. Behavioral changes might be a direct reaction to a detected sound or a result of the anthropogenic sound masking natural sounds that the fish normally detect and to which they respond. The three types of effects are often interrelated in complex ways. For example, some physiological and behavioral effects could potentially lead to the ultimate pathological effect of mortality. Hastings and Popper (2005) reviewed what is known about the effects of sound on fishes and identified studies needed to address areas of uncertainty relative to measurement of sound and the responses of fishes. Popper *et al*. (2003/2004) also published a paper that reviews the effects of anthropogenic sound on the behavior and physiology of fishes.

The level of sound at which a fish will react or alter its behavior is usually well above the detection level. Fish have been found to react to sounds when the sound level increased to about 20 dB above the detection level of 120 dB (Ona, 1988); however, the response threshold can depend on the time of year and the fish's physiological condition (Engas *et al.*, 1993). In general, fish react more strongly to pulses of sound rather than a continuous signal (Blaxter *et al.*, 1981), and a quicker alarm response is elicited when the sound signal intensity rises rapidly compared to sound rising more slowly to the same level.

Investigations of fish behavior in relation to vessel noise (Olsen *et al.*, 1983; Ona, 1988; Ona and Godo, 1990) have shown that fish react when the sound from the engines and propeller exceeds a certain level. Avoidance reactions have been observed in fish such as cod and herring

when vessels approached close enough that received sound levels are 110 dB to 130 dB (Nakken, 1992; Olsen, 1979; Ona and Godo, 1990; Ona and Toresen, 1988). However, other researchers have found that fish such as polar cod, herring, and capelin are often attracted to vessels (apparently by the noise) and swim toward the vessel (Rostad *et al.*, 2006). Typical sound source levels of vessel noise in the audible range for fish are 150 dB to 170 dB (Richardson *et al.*, 1995).

Carlson (1994), in a review of 40 years of studies concerning the use of underwater sound to deter salmonids from hazardous areas at hydroelectric dams and other facilities, concluded that salmonids were able to respond to low-frequency sound and to react to sound sources within a few feet of the source. He speculated that the reason that underwater sound had no effect on salmonids at distances greater than a few feet is because they react to water particle motion/acceleration, not sound pressures. Detectable particle motion is produced within very short distances of a sound source, although sound pressure waves travel farther.

Potential Impacts to the Benthic Environment

Apache's seismic survey requires the deployment of a submersible recording system in the inter-tidal and marine zones. An autonomous "nodal" (i.e., no cables) system would be placed on the seafloor by specific vessels in lines parallel to each other with a node line spacing of 402 m (0.25 mi). Each nodal "patch" would have six to eight node lines parallel to each other. The lines generally run perpendicular to the shoreline. An entire patch would be placed on the seafloor prior to airgun activity. As the patches are surveyed, the node lines would be moved either side to side or inline to the next location. Placement and retrieval of the nodes may cause temporary and localized increases in turbidity on the seafloor. The substrate of Cook Inlet consists of glacial silt, clay, cobbles, pebbles, and sand (Sharma and Burrell, 1970). Sediments

like sand and cobble dissipate quickly when suspended, but finer materials like clay and silt can create thicker plumes that may harm fish; however, the turbidity created by placing and removing nodes on the seafloor would settle to background levels within minutes after the cessation of activity. In addition, seismic noise will radiate throughout the water column from airguns and pingers until it dissipates to background levels.

Habitat Impacts - Conclusion

No studies have demonstrated that seismic noise affects the life stages, condition, or amount of food resources (fish, invertebrates, eggs) used by marine mammals, except when exposed to sound levels within a few meters of the seismic source or in a few very isolated cases. Where fish or invertebrates did respond to seismic noise, the effects were temporary and of short duration. The effects are also largely behavioral, rather than physiological. Consequently, disturbance to fish species due to the activities associated with the seismic survey (i.e, placement and retrieval of nodes and noise from sound sources) would be short term and fish would be expected to return to their pre-disturbance behavior once seismic survey activities cease.

Based on the preceding discussion, the activity is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations. Behavioral effects may be exhibited by fish species but as discussed above, these are also expected to be short term behavioral effects.

Mitigation

In order to issue an incidental take authorization (ITA) under section 101(a)(5)(A) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on

the availability of such species or stock for taking for certain subsistence uses (where relevant).

Mitigation Measures in Apache's Application

For the mitigation measures, Apache listed the following protocols to be implemented during its seismic survey program in Cook Inlet, which were incorporated into NMFS' proposed rule.

1. Operation of Mitigation Airgun at Night

Apache will conduct both daytime and nighttime operations. Nighttime operations would be initiated only if a "mitigation airgun" (typically the 10 in^3) has been continuously operational from the time that PSO monitoring has ceased for the day. Seismic activity would not ramp up from an extended shut-down (i.e., when the airgun has been down with no activity for at least 10 minutes) during nighttime operations, and survey activities would be suspended until the following day. At night, the vessel captain and crew would maintain lookout for marine mammals and would order the airgun(s) to be shut down if marine mammals are observed in or about to enter the established exclusion zones.

2. Exclusion and Disturbance Zones

Apache will establish exclusion zones to avoid Level A harassment ("injury exclusion zone") of all marine mammals and to minimize Level B harassment ("disturbance exclusion zone") for any number of belugas and for groups of five or more killer whales or harbor porpoises detected within the designated zones. The injury exclusion zone will correspond to the area around the source within which received levels equal or exceed 180 dB re 1 µPa [rms] for cetaceans and 190 dB re 1 µPa [rms] for pinnipeds and Apache will shut down or power down operations if any marine mammals are seen approaching or entering this zone (more detail below). The disturbance exclusion zone will correspond to the area around the source within

which received levels equal or exceed 160 dB re 1 µPa [rms] and Apache will implement power down and/or shutdown measures, as appropriate, if any beluga whales or group of five or more killer whales or harbor porpoises are seen entering or approaching the disturbance exclusion zone.

3. Power Down and Shutdown Procedures

A power down is the immediate reduction in the number of operating energy sources from a full array firing to a mitigation airgun. A shutdown is the immediate cessation of firing of all energy sources. The arrays will be immediately powered down whenever a marine mammal is sighted approaching close to or within the applicable exclusion zone of the full arrays but is outside the applicable exclusion zone of the single source. If a marine mammal is sighted within the applicable exclusion zone of the single energy source, the entire array will be shutdown (i.e., no sources firing). Following a power down or a shutdown, airgun activity will not resume until the marine mammal has clearly left the applicable injury or disturbance exclusion zone. The animal will be considered to have cleared the zone if it: (1) is visually observed to have left the zone; (2) has not been seen within the zone for 15 minutes in the case of pinnipeds and small odontocetes; or (3) has not been seen within the zone for 30 minutes in the case of large odontocetes, including killer whales and belugas.

4. Ramp-up Procedures

A ramp-up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of air guns firing until the full volume is achieved. The purpose of a ramp-up (or "soft start") is to "warn" cetaceans and pinnipeds in the vicinity of the airguns and to provide the time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities.

During the seismic survey, the seismic operator will ramp up the airgun array slowly. NMFS requires that the rate of ramp-up to be no more than 6 dB per 5-minute period. Ramp-up is used at the start of airgun operations, after a power- or shut-down, and after any period of greater than 10 minutes in duration without airgun operations (i.e., extended shutdown).

A full ramp-up after a shutdown will not begin until there has been a minimum of 30 minutes of observation of the applicable exclusion zone by PSOs to assure that no marine mammals are present. The entire exclusion zone must be visible during the 30-minute lead-in to a full ramp up. If the entire exclusion zone is not visible, then ramp-up from a cold start cannot begin. If a marine mammal(s) is sighted within the injury exclusion zone during the 30-minute watch prior to ramp-up, ramp-up will be delayed until the marine mammal(s) is sighted outside of the zone or the animal(s) is not sighted for at least 15-30 minutes: 15 minutes for small odontocetes and pinnipeds (*e.g.* harbor porpoises, harbor seals, and Steller sea lions), or 30 minutes for large odontocetes (*e.g.*, killer whales and beluga whales).

5. Speed or Course Alteration

If a marine mammal is detected outside the Level A injury exclusion zone and, based on its position and the relative motion, is likely to enter that zone, the vessel's speed and/or direct course may, when practical and safe, be changed to also minimize the effect on the seismic program. This can be used in coordination with a power down procedure. The marine mammal activities and movements relative to the seismic and support vessels will be closely monitored to ensure that the marine mammal does not approach within the applicable exclusion radius. If the mammal appears likely to enter the exclusion radius, further mitigative actions will be taken, i.e., either further course alterations, power down, or shut down of the airgun(s).

6. Measures for Beluga Whales and Groups of Killer Whales and Harbor Porpoises

The following additional protective measures for beluga whales and groups of five or more killer whales and harbor porpoises are required. Specifically, a 160-dB vessel monitoring zone would be established and monitored in Cook Inlet during all seismic surveys. If a beluga whale or groups of five or more killer whales and/or harbor porpoises are visually sighted approaching or within the 160-dB disturbance zone, survey activity would not commence until the animals are no longer present within the 160-dB disturbance zone. Whenever beluga whales or groups of five or more killer whales and/or harbor porpoises are detected approaching or within the 160-dB disturbance zone, the airguns may be powered down before the animal is within the 160-dB disturbance zone, as an alternative to a complete shutdown. If a power down is not sufficient, the sound source(s) shall be shut-down until the animals are no longer present within the 160-dB zone.

Additional Mitigation Measures Required by NMFS

In addition to the mitigation measures proposed by Apache, NMFS requires implementation of the following mitigation measures.

Susitna Delta Exclusion Zone

Apache must not operate airguns within 10 miles (16 km) of the mean lower low water (MLLW) line of the Susitna Delta (Beluga River to the Little Susitna River) between April 15 and October 15. The purpose of this mitigation measure is to protect beluga whales in this portion of designated critical habitat that is particularly important for beluga whale feeding and calving between mid-April and mid-October. This is a change from the proposed rule, which proposed an exclusion from the mean higher high water line (MHHW). The range of the setback required by NMFS is intended to protect this important habitat area during high beluga use and also to create an effective buffer where sound does not encroach on this habitat. This seasonal

exclusion will be in effect from April 15-October 15. Seismic exploration and associated activities may occur within this area from October 16-April 14.

Mitigation Airgun

The mitigation airgun will be operated at approximately one shot per minute, only during daylight and when there is good visibility, and will not be operated for longer than 3 hours in duration. In cases when the next start-up after the turn is expected to be during low light or low visibility, use of the mitigation airgun may be initiated 30 minutes before local sunset or low visibility conditions occur and may be operated until the start of the next seismic acquisition line but not longer than three hours continuously. The mitigation gun must still be operated at approximately one shot per minute.

Passive Acoustic Monitoring (PAM)

NMFS also requires that Apache use passive acoustic monitoring (PAM) during non-daylight hours for marine mammal detections as well as use PAM to confirm the lack of marine mammals in the potential ensonified area to ramp up airguns after a power down or shutdown in non-daylight hours, with the success and potential continuation of this method to be reviewed at the annual LOA stage. Following a power down or shutdown a trained PSO must use detection equipment and listen for 30 minutes. When 30 minutes have passed without detection of beluga, humpback whale, or Steller sea lion detection, the ramp-up can begin. NMFS will work with Apache before issuance of an LOA to design an appropriate system for this detection and will evaluate the effectiveness when considering subsequent LOAs.

Stranding Measures

NMFS requires that Apache suspend seismic operations if a live marine mammal stranding is reported in Cook Inlet coincident to, or within 72 hours of, seismic survey activities

involving the use of airguns (regardless of any suspected cause of the stranding). The shutdown must occur if the stranding location is within a radius two times that of the 160 dB isopleth of the largest airgun array configuration in use. This distance was chosen to create an additional buffer beyond the distance at which animals would typically be considered harassed, as animals involved in a live stranding event are likely compromised, with potentially increased susceptibility to stressors, and the goal is to decrease the likelihood that they are further disturbed or impacted by the seismic survey, regardless of what the original cause of the stranding event was. Shutdown procedures will remain in effect until NMFS determines and advises Apache that all live animals involved in the stranding have left the area (either of their own volition or following herding by responders).

Measures for Unexpected Species

Finally, NMFS requires that if during the seismic activities any marine mammal species are encountered for which take is not authorized, and that are likely to be exposed to sound pressure levels (SPLs) greater than or equal to 160 dB re 1 µPa (rms), then Apache must alter speed or course or power down or shut-down the sound source to avoid take of those species.

Mitigation Conclusions

NMFS has carefully evaluated Apache's proposed mitigation measures and considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable adverse impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

● The manner in which, and the degree to which, the successful implementation of the measures are expected to minimize adverse impacts to marine mammals;

● The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and

● The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of seismic airguns, or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels of seismic airguns or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of seismic airguns or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing the severity of harassment takes only).

5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat

during a biologically important time.

6. For monitoring directly related to mitigation – an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on our evaluation of the applicant's measures, as well as other measures considered by NMFS, NMFS has determined that the required mitigation measures provide the means of effecting the least practicable adverse impact on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an ITA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking". The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for ITAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area. Apache submitted information regarding marine mammal monitoring to be conducted during seismic operations as part of the proposed rule application. That information can be found in Sections 12 and 14 of the application.

Monitoring measures proposed by the applicant or prescribed by NMFS should contribute to or accomplish one or more of the following top-level goals:

1. An increase in our understanding of the likely occurrence of marine mammal species in the vicinity of the action, i.e., presence, abundance, distribution, and/or density of species.

2. An increase in our understanding of the nature, scope, or context of the likely exposure

of marine mammal species to any of the potential stressor(s) associated with the action (*e.g.* sound or visual stimuli), through better understanding of one or more of the following: the action itself and its environment (*e.g.* sound source characterization, propagation, and ambient noise levels); the affected species (e.g. life history or dive pattern); the likely co-occurrence of marine mammal species with the action (in whole or part) associated with specific adverse effects; and/or the likely biological or behavioral context of exposure to the stressor for the marine mammal (e.g. age class of exposed animals or known pupping, calving or feeding areas).

3. An increase in our understanding of how individual marine mammals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

4. An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: the long-term fitness and survival of an individual; or the population, species, or stock (e.g., through effects on annual rates of recruitment or survival).

5. An increase in our understanding of how the activity affects marine mammal habitat, such as through effects on prey sources or acoustic habitat (e.g., through characterization of longer-term contributions of multiple sound sources to rising ambient noise levels and assessment of the potential chronic effects on marine mammals).

6. An increase in understanding of the impacts of the activity on marine mammals in combination with the impacts of other anthropogenic activities or natural factors occurring in the region.

7. An increase in our understanding of the effectiveness of mitigation and monitoring measures.

8. An increase in the probability of detecting marine mammals (through improved technology or methodology), both specifically within the safety zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals.

Monitoring Results from Previously Authorized Activities

As noted earlier in this document, NMFS has issued three IHAs to Apache for this same type of activity. No seismic surveys were conducted under the IHA issued in February 2013 (became effective March 1, 2013). Apache conducted seismic operations under the first IHA issued in April 2012. Below is a summary of the results from the monitoring conducted in accordance with the 2012 and 2014 IHAs.

Marine mammal monitoring was conducted in central Cook Inlet between May 6 and September 30, 2012, which resulted in a total of 6,912 hours of observations. There was also monitoring from April 2, 2014, through June 27, 2014, which resulted in a total of 3,029 hours of observations. Monitoring was conducted from the two seismic survey vessels, a mitigation/monitoring vessel, four land platforms, and an aerial platform (either a helicopter or small fixed wing aircraft). PSOs monitored from the seismic vessels, mitigation/monitoring vessel, and land platforms during all daytime seismic operations. Aerial overflights were conducted 1-2 times daily over the survey area and surrounding coastline, including the major river mouths, to monitor for larger concentrations of marine mammals in and around the survey site. PAM took place from the mitigation/monitoring vessel during all nighttime seismic survey operations and most daytime seismic survey operations in 2012. During the entire 2012 survey season, Apache's PAM equipment yielded only six confirmed marine mammal detections, one of which was a Cook Inlet beluga whale.

Six identified species and three unidentified species of marine mammals were observed

from the vessel, land, and aerial platforms between May 6 and September 30, 2012. Eight identified species and three unidentified species were observed in 2014. The species observed included Cook Inlet beluga whales, harbor seals, harbor porpoises, Dall's porpoises, humpback whale, minke whale, Steller sea lions, gray whales, and California sea lions. PSOs also observed unidentified species, including a large cetacean, pinniped, and marine mammal. There were a total of 882 sightings and an estimated 5,232 individuals (the number of individuals is typically higher than the number of sightings because a single sighting may consist of multiple individuals) in 2012. There were a total of 645 sightings and an estimated 922 individuals in 2014. Harbor seals were the most frequently observed marine mammal at 563 sightings of approximately 3,471 individuals in 2012 and 492 sightings of approximately 613 individuals in 2014. In 2012 there were 151 sightings of approximately 1,463 individual belugas, and 57 sightings of approximately 170 individual belugas in 2014. In 2012, there were 137 sightings of approximately 190 individual harbor porpoises, with 77 sightings of approximately 113 individuals in 2014. There were nine grey whales seen in 2012 but only one seen in 2014. Steller sea lions were observed on three separate occasions in 2012 (4 individuals), while seen only twice (2 individuals) in 2014. No killer whales were observed during seismic survey operations conducted under the 2012 or 2014 IHA. Mitigation measures were implemented for species not included in the IHA to prevent unauthorized takes. In 2012 there were 17 recorded instances of Level B take, which consisted of four harbor porpoises and 13 harbor seals. In 2014, only 29 exposures to the 160dB isopleth were reported: 12 beluga whales, 6 harbor porpoise, 9 harbor seals, and 2 humpback whales. Across both years of activity, behavioral reactions included swimming and traveling, as well as bottlenosing (for harbor porpoises) and diving, sinking, or other submerging behaviors. None of the behavioral responses reported indicate that the impacts

of the seismic activity were more severe than anticipated. Many of the observations recorded during these monitoring efforts were sightings made during non-seismic observation efforts.

A total of 88 exclusion zone clearing delays, 154 shutdowns, 7 power downs, 23 shutdowns following a power down, and one speed and course alteration were implemented under the 2012 IHA. In 2014 there were 7 ramp-up delays, and 13 shutdowns.

Based on the information from the 2012 and 2014 monitoring reports, NMFS has determined that Apache complied with the conditions of their IHAs, and we conclude that these results support our original findings that the mitigation measures set forth in the Authorizations effected the least practicable impact on the species or stocks. The monitoring efforts support the take estimation calculations found later in this document for all species, but suggest that the calculation for harbor seals is an overestimate.

Although Apache did not conduct any seismic survey operations under the 2013 IHA, they still conducted marine mammal monitoring surveys between May and August 2013. During those aerial surveys, Apache detected a total of three marine mammal species: beluga whale; harbor porpoise; and harbor seal. A total of 718 individual belugas, three harbor porpoises, and 919 harbor seals were sighted. Of the 718 observed belugas, 61 were calves. All of the calf sightings occurred in the Susitna Delta area, with the exception of a couple south of the Beluga River and a couple in Turnagain Arm. More than 60 percent of the beluga calf sightings occurred in June (n=39).

Monitoring Measures

1. Visual Vessel-based Monitoring

Vessel-based monitoring for marine mammals will be done by experienced PSOs throughout the period of marine survey activities. PSOs would monitor the occurrence and

behavior of marine mammals near the survey vessel during all daylight periods (nautical dawn to nautical dusk) during operation and during most daylight periods when airgun operations are not occurring. PSO duties would include watching for and identifying marine mammals, recording their numbers, distances, and reactions to the survey operations, and documenting "take by harassment" as defined by NMFS, i.e., exposures above the associated take thresholds.

A minimum number of six PSOs (two per source vessel and two per support vessel) is required onboard the survey vessel to meet the following criteria: (1) 100 percent monitoring coverage during all periods of survey operations in daylight (nautical twilight-dawn to nautical twilight-dusk; (2) maximum of 4 consecutive hours on watch per PSO with at least one hour break between shifts; and (3) maximum of 12 hours of watch time per day per PSO.

PSO teams would consist of NMFS-approved field biologists. An experienced field crew leader would supervise the PSO team onboard the survey vessel. Apache currently plans to have PSOs aboard three vessels: the two source vessels (*M/V Peregrine Falcon* and *M/V Arctic Wolf*) and one support vessel (*M/V Dreamcatcher*). Two PSOs would be on the source vessels, and two PSOs would be on the support vessel to observe and implement the exclusion, power down, and shut down areas. When marine mammals are about to enter or are sighted within designated harassment and exclusion zones, airgun or pinger operations would be powered down (when applicable) or shut down immediately. The vessel-based observers would watch for marine mammals during all periods when sound sources are in operation and for a minimum of 30 minutes prior to the start of airgun or pinger operations after an extended shut down.

Crew leaders and most other biologists serving as observers would be individuals with experience as observers during seismic surveys in Alaska or other areas in recent years.

The observer(s) would watch for marine mammals from the best available vantage point

on the source and support vessels, typically the flying bridge. The observer(s) would scan systematically with the unaided eye and 7×50 reticle binoculars. Laser range finders would be available to assist with estimating distance on the two source vessels. Personnel on the bridge would assist the observer(s) in watching for marine mammals.

All observations would be recorded in a standardized format. Data would be entered into a custom database using a notebook computer. The accuracy of the data would be verified by computerized validity data checks as the data are entered and by subsequent manual checks of the database. These procedures would allow for initial summaries of the data to be prepared during and shortly after the completion of the field program, and would facilitate transfer of the data to statistical, geographical, or other programs for future processing and archiving. When a mammal sighting is made, the following information about the sighting would be recorded:

● Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from the PSO, apparent reaction to activities (e.g., none, avoidance, approach, paralleling, etc.), closest point of approach, and behavioral pace;

● Time, location, speed, activity of the vessel (e.g., seismic airguns off, pingers on, etc.), sea state, ice cover, visibility, and sun glare; and

● The positions of other vessel(s) in the vicinity of the PSO location.

The ship's position, speed of support vessels, and water temperature, water depth, sea state, ice cover, visibility, and sun glare would also be recorded at the start and end of each observation watch, every 30 minutes during a watch, and whenever there is a change in any of those variables.

Apache will also monitor for at least 30 minutes following the cessation of seismic

surveying. This post-activity monitoring period will provide data for comparisons to marine mammal presence and behavior during seismic activity.

2. Visual Shore-based Monitoring

In addition to the vessel-based PSOs, Apache will utilize a shore-based station daily, to visually monitor for marine mammals. The location of the shore-based station would need to be sufficiently high to observe marine mammals; the PSOs would be equipped with pedestal mounted "big eye" (20x110) binoculars. The shore-based PSOs would scan the area prior to, during, and after the airgun operations and would be in contact with the vessel-based PSOs via radio to communicate sightings of marine mammals approaching or within the project area. This communication will allow the vessel-based observers to go on a "heightened" state of alert regarding occurrence of marine mammals in the area and aid in timely implementation of mitigation measures. Observations from land-based observers will also be recorded and included in monitoring reports.

3. Aerial-based Monitoring

Weather and safety permitting, Apache will utilize helicopter or fixed-wing aircraft to conduct aerial surveys of the project area prior to the commencement of operations in order to identify locations of congregations of beluga whales. Apache will conduct daily aerial surveys. Daily surveys to assess the area intended to be surveyed on each day will be scheduled to occur at least 30 minutes and no more than 120 minutes prior to any seismic-related activities (including but not limited to node laying/retrieval or airgun operations). Aerial surveys will occur along and parallel to the shoreline throughout the project area as well as the eastern and western shores of central and northern Cook Inlet on a weekly basis.

Ssurvey aircraft would fly at an altitude of 305 m (1,000 ft). In the event of a marine

mammal sighting, aircraft would attempt to maintain a radial distance of 457 m (1,500 ft) from the marine mammal(s). Aircraft would avoid approaching marine mammals from head-on, flying over or passing the shadow of the aircraft over the marine mammal(s). By following these operational requirements, aerial surveys are not expected to harass marine mammals (Richardson *et al*., 1995; Blackwell *et al*., 2002).

Based on data collected from Apache during its survey operations conducted under the April 2012 and March 2014 IHAs, NMFS determined that the foregoing monitoring measures will allow Apache to identify animals nearing or entering the Level B disturbance exclusion zone with a reasonably high degree of accuracy.

4. Passive Acoustic Monitoring (PAM)

NMFS will work with Apache to execute a viable attempt at using PAM to acoustically clear the area during low-light conditions, when visually clearing an area is not possible. The exact technologies required for PAM will be determined during review of the LOA applications to ensure effectiveness of the required measure. This will primarily be for ramping up airguns after a power down or shutdown in non-daylight hours. In addition, Apache must conduct PAM throughout all seismic airgun array operations occurring between local sunset and local sunrise when the zone of influence extends to Cook Inlet waters north of 60^{o} 43'N at any time of year, and south of 60^{o} 43' from October 15 to April 15. NMFS will require Apache to use a fixed, nearshore PAM system, with at least one protected species observer trained in PAM to listen to the hydrophone. The continued use of this system will depend on its effectiveness and practicability and will be addressed through the adaptive management process and in annual LOAs issued under this rulemaking.

Reporting Measures

Apache will immediately contact NMFS if the total number of belugas detected in the Level B disturbance exclusion zone over the course of the survey exceeds 25 to allow NMFS to evaluate and make any necessary adjustments to monitoring and mitigation to ensure continuing compliance. Apache will also report when the take calculation using the methodology described in the Estimating Take section below reaches 25 belugas. If the number of detected takes for any marine mammal species meets or exceeds the number of takes authorized, Apache will immediately cease survey operations involving the use of active sound sources (e.g., airguns and pingers) and notify NMFS. Resumption of seismic operations may only occur if and when NMFS confirms that operations may proceed in compliance with both the MMPA and the ESA.

1. Weekly Reports

Apache will submit a weekly field report to NMFS Headquarters as well as the Alaska Regional Office, no later than close of business each Thursday during the weeks when in-water seismic survey activities take place. The weekly field reports will summarize species detected (number, location, distance from seismic vessel, behavior), in-water activity occurring at the time of the sighting (discharge volume of array at time of sighting, seismic activity at time of sighting, visual plots of sightings, and number of power downs and shutdowns), behavioral reactions to in-water activities, and the number of marine mammals exposed. Additionally, due to the adaptive management component of this rule, Apache must include which km^2 grid cells were surveyed during that week and the resulting number of belugas that may have been taken using the methods outlined in this notice below, which use the Goetz *et al*. (2012) density model as part of the basis for the calculation. Apache must provide the cells, corresponding density, and estimated number of beluga exposures using this methodology for that week, as well as the total from the preceding weeks.

2. Monthly Reports

Monthly reports will be submitted to NMFS for all months during which in-water seismic activities take place. The monthly report will contain and summarize the following information:

● Dates, times, locations, heading, speed, weather, sea conditions (including Beaufort sea state and wind force), and associated activities during all seismic operations and marine mammal sightings.

● Species, number, location, distance from the vessel, and behavior of any sighted marine mammals, as well as associated seismic activity (number of power-downs and shutdowns), observed throughout all monitoring activities.

● An estimate of the number (by species) of: (i) pinnipeds that have been exposed to the seismic activity (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 190 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited; and (ii) cetaceans that have been exposed to the seismic activity (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 180 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited.

● A description of the implementation and effectiveness of the: (i) terms and conditions of the Biological Opinion's Incidental Take Statement (ITS); and (ii) mitigation measures of the LOA. For the Biological Opinion, the report shall confirm the implementation of each Term and Condition, as well as any conservation recommendations, and describe their effectiveness for minimizing the adverse effects of the action on ESA-listed marine mammals.

3. Annual Reports

Apache will submit an annual report to NMFS's Permits and Conservation Division within 90 days after the end of every operating season but no later than 60 days before the

expiration of each annual LOA during the five-year period. The annual report will include:

● Summaries of monitoring effort (e.g., total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals).

● Descriptions of various factors influencing detectability of marine mammals (e.g., sea state, number of observers, and fog/glare) and how they may affect detection rates.

● Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover.

● Analyses of the effects of survey operations.

● Sighting rates of marine mammals during periods with and without seismic survey activities (and other variables that could affect detectability), such as: (i) initial sighting distances versus survey activity state; (ii) closest point of approach versus survey activity state; (iii) observed behaviors and types of movements versus survey activity state; (iv) numbers of sightings/individuals seen versus survey activity state; (v) distribution around the source vessels versus survey activity state; (vi) numbers of animals detected in the 160 dB harassment (disturbance exclusion) zone; and (vii) number and type of mitigation measures implemented including shutdowns and powerdowns.

NMFS will review the draft annual reports. Apache must then submit a final annual report to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, within 30 days after receiving comments from NMFS on the draft annual report. If NMFS determines it has no comments, the draft report shall be considered to be the final report.

4. Notification of Injured or Dead Marine Mammals

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this Authorization, such as an injury (Level A harassment), serious injury or mortality (e.g., ship-strike, gear interaction, and/or entanglement), Apache will immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, and the Alaska Regional Stranding Coordinators. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available)

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with Apache to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Apache may not resume their activities until notified by NMFS that it may do so, via letter or email, or telephone.

In the event that Apache discovers an injured or dead marine mammal, and the lead PSO

determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), Apache will immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, and the NMFS Alaska Stranding Hotline. The report must include the same information identified in the paragraph above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with Apache to determine whether modifications in the activities are appropriate.

In the event that Apache discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the authorized activities (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), Apache will report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, the NMFS Alaska Stranding Hotline, and the Alaska Regional Stranding Coordinators within 24 hours of the discovery. Apache will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. Activities may continue while NMFS reviews the circumstances of the incident.

NMFS requires that Apache must suspend seismic operations if a live marine mammal stranding is reported in Cook Inlet coincident to, or within 72 hours of, seismic survey activities involving the use of airguns (regardless of any suspected cause of the stranding). The shutdown must occur if the animal is within a distance two times that of the 160 dB isopleth of the largest airgun array configuration in use. This distance was chosen to create an additional buffer beyond the distance at which animals would typically be considered harassed, as animals involved in a live stranding event are likely compromised, with potentially increased susceptibility to stressors,

and the goal is to decrease the likelihood that they are further disturbed or impacted by the seismic survey, regardless of what the original cause of the stranding event was. Shutdown procedures will remain in effect until NMFS determines and advises Apache that all live animals involved in the stranding have left the area (either of their own volition or following herding by responders).

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment]. Only take by Level B behavioral harassment is anticipated as a result of the seismic survey program with required mitigation and monitoring. Anticipated impacts to marine mammals are associated with noise propagation from the sound sources (e.g., airguns and pingers) used in the seismic survey as supported by the SSV study, not from vessel strikes because of the slow speed of the vessels (2-4 knots), or from aircraft overflights, as surveys will be flown at a minimum altitude of 305 m (1,000 ft) and at 457 m (1,500 ft) when marine mammals are detected.

Apache requested authorization to take six marine mammal species by Level B harassment: Cook Inlet beluga whale; killer whale; harbor porpoise; gray whale; harbor seal; and Steller sea lion. Due to the reported sightings in Cook Inlet as well as public comment, NMFS has also included take of humpback whales, minke whales, and Dall's porpoise in this final rule.

For impulse sounds, such as those produced by airgun(s) used in the seismic survey,

NMFS used the 160 dB re 1 μPa (rms) isopleth to indicate the onset of Level B harassment. The current Level A (injury) harassment threshold is 180 dB (rms) for cetaceans and 190 dB (rms) for pinnipeds. The NMFS annual aerial survey data provided in Table 5 of Apache's application was used to derive density estimates for each species other than belugas (number of individuals/km^2). Beluga densities were extracted from the predictive habitat model created by Goetz *et al.* (2012). The Goetz model also is constructed from NMML summer months aerial survey data from 1993-2008.

Applicable Zones for Estimating "Take by Harassment"

To estimate takes by Level B harassment for this rule, as well as for mitigation radii to be monitored by PSOs, ranges to the 160 dB (rms) isopleths were estimated at three different water depths (5 m, 25 m, and 45 m) for nearshore surveys and at 80 m for channel surveys. The distances to this threshold for the nearshore survey locations are provided in Table 2 below.

Table 2. Distances to Sound Level Thresholds for the Nearshore Surveys.

Sound Level Threshold (dB re 1μPa)	Water Depth at Source Location (m)	Distance in the Onshore Direction (km)	Distance in the Offshore Direction (km)	Distance in the Parallel to Shore Direction (km)
160	5	1.03	4.73	2.22
160	25	5.69	7.77	9.5
160	45	6.75	5.95	9.15
180	5	0.46	0.6	0.54
180	25	1.06	1.07	1.42
180	45	0.7	0.83	0.89
190	5	0.28	0.33	0.33
190	25	0.35	0.36	0.44
190	45	0.1	0.1	0.51

To estimate take by Level B harassment, Apache used the largest value from each category. The distances to the thresholds for the channel survey locations are provided in Table 3

below and correspond to the broadside and endfire directions.

Table 3. Distances to Sound Threshold for Channel Surveys.

Sound Level Threshold (dB re 1 µPa)	Water Depth at Source Location (m)	Distance in the Broadside Direction (km)	Distance in the Endfire Direction (km)
160	80	5.14	7.33
189	80	0.91	0.98
190	80	0.15	0.18

The areas ensonified to the 160 dB isopleth for the nearshore survey are also provided in Table 3 in Apache's application. The estimated daily acoustic footprint (ensonified to the 160dB threshold) for each survey day is 517 km^2.

Compared to the airguns, the relevant isopleths for the positioning pinger are quite small. The distances to the 190, 180, and 160 dB (rms) isopleths are 1 m, 3 m, and 25 m (3.3, 10, and 82 ft), respectively. Due to the small isopleths and the existing mitigation for the airgun isopleths, which are much larger, pingers are not considered in the take estimation section.

Estimates of Marine Mammal Density

Based on the available data, Apache used one method to estimate densities for Cook Inlet beluga whales and another method for the other marine mammals in the area expected to be taken by harassment. Both methods are described in this document.

1. Beluga Whale Density Estimates

In consultation with staff from NMFS's National Marine Mammal Laboratory (NMML) during development of the second IHA in early 2013, Apache used a habitat-based model

developed by Goetz *et al.* (2012a). Information from that model has once again been used to estimate densities of beluga whales in Cook Inlet and we consider it to be the best available information on beluga density. A summary of the model is provided here, and additional detail can be found in Goetz *et al.* (2012a). Using NMML's beluga aerial survey data, Goetz *et al.* (2012a) developed a model based on sightings, depth soundings, coastal substrate type, environmental sensitivity index, anthropogenic disturbance, and anadromous fish streams to predict beluga densities throughout Cook Inlet. The result of this work is a beluga density map of Cook Inlet, which predicts spatially explicit density estimates for Cook Inlet belugas. This predictive habitat model is based on data about distribution and group size of beluga whales observed between 1994 and 2008 during aerial surveying in summer months. A 2-part "hurdle" model (a hurdle model in which there are two processes, one generating the zeroes and one generating the positive values) was applied to describe the physical and anthropogenic factors that influence (1) beluga presence (mixed model logistic regression) and (2) beluga count data (mixed model Poisson regression). Beluga presence was negatively associated with sources of anthropogenic disturbance and positively associated with fish availability and access to tidal flats and sandy substrates. Beluga group size was positively associated with tidal flats and proxies for seasonally available fish. Using this analysis, Goetz *et al*. (2012) produced habitat maps for beluga presence, group size, and the expected number of belugas in each 1 km^2 cell of Cook Inlet. The habitat-based model developed by Goetz *et al*. (2012) was developed using a Geographic Information System (GIS). A GIS is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information; that is, data identified according to location. However, the Goetz *et a.* (2012) model does not incorporate seasonality into the density estimates, as the data used to feed the model is from NMML survey data largely

collected in June. However, Apache factors in seasonal considerations of beluga density into the design of the survey tracklines and locations based around mitigation measures such as seasonal closure of the Susitna Delta region in addition to other factors such as weather, ice conditions, and seismic needs.

As a result of discussions with NMFS, Apache used the NMML model (Goetz *et al*., 2012a) in their calculation for the estimate of takes. Apache has established two zones (Zone 1 – North of the Forelands, Zone 2 – South of the Forelands) and will conduct seismic surveys within all, or part of these zones; to be determined as weather, ice, and priorities dictate. Based on information using Goetz *et al*. (2012a) model, Apache derived one density estimate for beluga whales in Zone 1 (i.e., upper Cook Inlet) and another density estimate for beluga whales in Zone 2 (i.e., lower Cook Inlet). The density estimates calculated by Apache in their application for surveys areas in Upper Cook Inlet and lower Cook Inlet are, respectively, 0.0212 and 0.0056 whales / km^2.

2. Other (Non-beluga whale) Species Density Estimates

Densities of other marine mammals in the project area were estimated from the annual aerial surveys conducted by NMFS for Cook Inlet beluga whale between 2000 and 2012 in June (Rugh *et al.*, 2000, 2001, 2002, 2003, 2004b, 2005b, 2006, 2007; Shelden *et al.*, 2008, 2009, 2010, 2012; Hobbs *et al.*, 2011). These surveys were flown in June to collect abundance data of beluga whales, but sightings of other marine mammals were also reported. Although these data were only collected in one month each year, these surveys provide the best available relatively long term data set for sighting information in the project area. The general trend in marine mammal sighting is that beluga whales and harbor seals are the species seen most frequently in upper Cook Inlet, with higher concentrations of harbor seals near haul out sites on Kalgin Island

and of beluga whales near river mouths, particularly the Susitna River. The other marine mammals of interest for this rule (killer whales, gray whales, harbor porpoises, Steller sea lions) are observed infrequently in upper Cook Inlet and more commonly in lower Cook Inlet. These densities are calculated based on a relatively large area that was surveyed, much larger than the survey area for a given year of seismic data acquisition.

Table 5 in Apache's application provides a summary of the results of each annual NMFS aerial survey conducted in June from 2000 to 2012. The total number of individuals sighted for each survey by year is reported, as well as total hours for the entire survey and total area surveyed. To estimate density of marine mammals, total number of individuals (other species) observed for the entire survey area by year (surveys usually last several days) was divided by the approximate total area surveyed for each year (density = individuals/km^2). As noted previously, the total number of animals observed for the entire survey includes both lower and upper Cook Inlet, so the total number of each species reported and used to calculate density is higher than the number of marine mammals anticipated to be observed in the project area.

Harbor seals

In particular, the total number of harbor seals observed on several surveys is very high due to several large haul outs in lower and middle Cook Inlet. The focus of these NMML aerial surveys is on coastal environments, where beluga occurrence is high, which likely inflates the densities derived for harbor seals, as they also exhibit coastal habitat preference. Additionally, large haulouts for harbor seals are included in the NMML survey tracklines. These inclusions make it difficult to extrapolate the density derived as a uniform distribution across the entire portion of Apache's survey, 100 days of which are in deep water and removed from the harbor seal's preferred coastal habitat.

The table below (Table 4) provides average density estimates for gray whales, harbor seals, harbor porpoises, killer whales, and Steller sea lions over the 2000-2012 period.

Table 4. Animal densities in Cook Inlet.

Species	**Average Density (animals/km^2)**
Humpback whale	0.0024
Gray whale	5.33E-05
Harbor seal	0.25
Minke whale	1.14E-05
Dall's porpoise	0.0002
Harbor porpoise	0.0039
Killer whale	0.00075
Steller sea lion	0.0083

Calculation of Takes by Harassment

1. Beluga Whales

Apache will limit surveying in the seismic survey area to ensure takes do no exceed a maximum of 30 beluga takes during each open water season. The following equation allows Apache to ensure that the beluga takes do not exceed 30 when contemplating the amount of seismic effort that will be conducted in different areas with different densities across days:

Equation 1: $d_1A_1 + d_2A_{2\ldots} + d_xA_x \leq 30$ Beluga Takes

* $d_x = \frac{\text{Expected Beluga Takes from the NMML model in area covered in a given day}}{\text{Total Area surveyed on that given day including 160 dB buffer}}$
* A_x = Actual Area Surveyed (km^2) including 160 dB buffer in Zone X

This formula also allows Apache flexibility to prioritize survey locations in response to local weather, ice, and operational constraints. Apache may choose to survey portions of a zone or a zone in its entirety, and the analysis in this rule takes this into account. For the 2016 season,

Apache will survey the same area that was authorized in 2014. Using the above formula, if Apache surveys the entire area of Zone 1 (1,319 km^2) as delineated in their 2014 IHA, then essentially none of Zone 2 will be surveyed because the input in the calculation denoted by d_2A_2 would essentially need to be zero to ensure that the total assessed take of beluga whales is not exceeded. The use of this formula, combined with required weekly reporting to NMFS, will ensure that Apache's seismic program, including the 160 dB buffer, will not exceed 30 calculated beluga takes annually.

Table 5. Expected beluga whale takes, total area of zone, and average beluga whale density estimates.

	Expected Beluga Takes from NMML model (including the 160 dB buffer)	Total Area of Zone (km2) (including the 160 dB buffer)	Average Take Density (dx)
Zone 1	28	1319	d1 = 0.0212
Zone 2	29	5160	d2 = 0.0056

Apache will initially limit actual survey areas, including 160 dB buffer zones, to satisfy the formula denoted here. Operations are required to cease for the year once Apache has conducted seismic data acquisition in an area where multiplying the applicable density by the total ensonified area out to the 160-dB isopleth equals 30 beluga whales, using the equation provided above. Apache's annual seismic operational area would be determined as weather, ice, and priorities dictate. Apache has requested a maximum allowed take for Cook Inlet beluga whales of 30 individuals. During each annual LOA, Apache would operate in a portion of the total seismic operation area of 5,684 km^2 (2,195 mi^2), such that when one multiplies the modeled beluga whale density for each daily operational area times the area to be ensonified to the 160-dB isopleth of 9.5 km (5.9 mi), the sum of the estimated takes will not exceed 30 beluga whales in a given year.

2. Other Marine Mammal Species

The estimated number of other Cook Inlet marine mammals that may be harassed during the seismic surveys was calculated by multiplying the average density estimates (presented in Table 2 in this document) by the area ensonified per day by levels ≥160 dB re μPa rms by the number of days of surveying (see Appendix C and Appendix D in Apache's application for more information).

Apache anticipates that a crew will collect seismic data for 8-12 hours per day over approximately 160 days over the course of 8 to 9 months each year. It is assumed that over the course of these 160 days, 100 days would be working in the offshore region and 60 days in the shallow, intermediate, and deep nearshore region. Of those 60 days in the nearshore region, 20 days would be in each depth. It is important to note that environmental conditions (such as ice, wind, fog) will play a significant role in the actual operating days.

NMFS calculated the number of potential exposure instances for each non-beluga species using the density information derived from NMFS aerial surveys conducted from 2000-2012. These animal densities were multiplied by the number of days in each water depth (shallow, intermediate, deep, or offshore) as well as the estimated ensonified area per day for each water depth. This method is likely an overestimation of the number of individuals taken as it represents the likely number of instances of take, without accounting for repeated take of individuals, which is especially likely to occur with resident species such as harbor seals as detailed below.

Table 6 below outlines the calculation of annual exposures for non-beluga species.

Table 6. Annual instances of exposure calculated for non-beluga species.

	Annual Exposures
Gray Whale	8.13
Harbor seal	24279.35

Harbor porpoise	283.26
Killer whale	70.33
Steller sea lion	701.98
Humpback whale	203.66
Minke whale	0.98
Dall's porpoise	17.30

NMFS has further refined the annual estimates of Level B take. In consultation with the Alaska Regional Office and their access to sightings data for listed species, NMFS was able to derive estimates of the number of individuals likely to be taken by these activities for certain species. The NMFS aerial surveys from which density is derived include large portions of the lower Inlet that are not part of Apache's action area and coincide with some of the highest densities of Steller sea lions in Cook Inlet. Particularly in the Upper Inlet, Steller sea lions are sighted as singles or in pairs. Additionally, Apache's activity will not occur near any haulouts where Steller sea lions have been reported in large numbers. Due to their infrequency of occurrence in the northern parts of Cook Inlet, NMFS will authorize annual take of Steller sea lions equal to the maximum number of animals sighted in a single occurrence, 20 individuals.

Humpback whales are also sighted infrequently in Cook Inlet, with several sighted each summer, largely in the lower Inlet. Due to the well documented and seasonal nature of their occurrence in Cook Inlet, NMFS determined it appropriate to authorize an annual take of two humpback whales, which is expected to be the maximum number encountered in the action area during a season.

As noted above, using the (daily ensonified area x number of survey days x density) method results in a reasonable estimate of the instances of take, but likely significantly overestimates the number of individual animals expected to be taken. With most species, even this overestimated number is still very small, and additional analysis is not really necessary to

ensure minor impacts. However, because of the number and density of harbor seals in the area, a more accurate understanding of the number of individuals likely taken is necessary to fully analyze the impacts and ensure that the total number of harbor seals taken is small.

As described below, we believe that the modeled number of estimated instances of take may actually be high, based on monitoring results from the area. The density estimate from NMFS aerial surveys includes harbor seal haulouts far south of the action area that may never move to an ensonified area. Further, we believe that we can reasonably estimate the comparative number of individual harbor seals that will likely be taken, based both on monitoring data, operational information, and on a general understanding of harbor seal habitat use within Cook Inlet.

Using the (daily ensonified area x number of survey days x density) formula, the number of instances of exposure above the 160-dB threshold estimated for Apache's activity in Cook Inlet is 24,279. However, based on monitoring data from previous activities, it is clear this number is an overestimate – compared to both aerial and vessel based observation efforts. Apache's monitoring report from 2014 details that they saw 652 harbor seals from 76 aerial flights in the vicinity of the survey primarily during the months of May and June, which are the peak months for harbor seal haulout. In surveying the literature, correction factors to account for harbor seals in water based on land counts from aerial surveys vary from 1.2 to 1.65 (Harvey & Goley, 2011). Using the most conservative factor of 1.65 (allowing us to consider that some of the individuals on land may have entered the water at other points in day), if Apache saw 652 seals hauled out then there were an estimated 1076 seals in the water during those 76 days. If, because there were only 76 survey days, we conservatively multiply by 2.1 to estimate the number of seals that might have been seen if the aerial surveys were conducted for 160 days, this

yields an estimate of 2,260 instances of seal exposure in the water, which is far less than the estimated 24,279. That the number of potential instances of exposure is likely less than 24,279 is also supported by the visual observations from PSOs on board other seismic vessels. PSOs for SAE's 2015 work sighted 1,680 seals in water over 135 days of activity which is a similar operational period to Apache's annual requested window of operation. Given the size of the disturbance zone for these activities, it is likely that not all harbor seals that were exposed were seen by PSOs, however 1,680 is still far less than the estimate of 24,279 given by the density calculations.

Further, based on the residential nature of harbor seals and the number of patches Apache plans to shoot, it is possible to reasonably estimate the number of individual harbor seals exposed, given the instances of exposures. Based on provided estimates, Apache will shoot one patch in 5 days. If seals are generally returning to haulouts in the survey area over the 5 days of any given patch shoot, than any given seal in the area could be exposed a minimum of one day and a maximum of all five days, with an average of 3 days. If the original exposure estimate using density is 22,279 exposures, then when divided by three (the average number of times an animal could be exposed during the shooting of one patch), the expected number of individuals exposed is 7,426, which is approximately 32% of the population. This number is also likely an overestimate given that adjoining patches may be shot, meaning the same seals could be exposed over multiple patches. Given these multiple methods, as well as the behavioral preferences of harbor seals for haulouts in certain parts of the Inlet (Montgomery *et al.*, 2007), and high concentrations at haulouts in the lower Inlet (Boveng *et al*.), it is unreasonable to expect that more than 25% of the population, or 5,725 individuals, will be taken by Level B harassment during Apache's activity in any given year.

Summary of Level B Harassment Takes

Table 5 outlines the density estimates used in abundance and Level B harassment take calculations, the abundance of each species in Cook Inlet, the percentage of each species or stock estimated to be taken if each take were equivalent to an individual, and current population trends. Note that for harbor seals, however, that the authorized number of takes specifically does not represent the number of individuals, but rather the number of instances of take. The number of individual harbor seals taken is anticipated to be significantly smaller as described below in the Negligible Impact section. While the estimated number of individuals cannot be calculated as easily, it is semi-quantitatively assessed and that assessment has been used to estimate the percentage of the population that will be taken.

Table 7. Density estimates, annual instances of Level B harassment take authorized, species or stock abundance, percentage of population to be taken, and species trend status.

Species	Average Density (#individuals/km^2)	Authorized Level B Take	Abundance	Percentage of Population	Trend
Beluga Whale	Upper=0.0212 Lower=0.0056	30	340	8.8	Stable
Harbor Seal	0.282	24,279	22,900	-*	Stable
Harbor Porpoise	0.00339	283	31,046	0.91	No reliable information
Killer Whale	0.00081	70	1,123 (resident) 345(transient)	6.26 12.74	Resident stock possibly increasing Transient stock stable
Steller Sea Lion	0.0082	20	79,300	0.025	Decreasing but with regional variability (some stable or increasing)
Gray Whale	9.46E-05	8	19,126	0.043	Stable/increasing
Humpback Whale	0.00237	2	7,469	0.027	Southeast Alaska increasing
Minke whale	0.98	1	1233	0.080	No reliable information
Dall's porpoise	17.30	17	106,000	0.016	No reliable information

*For harbor seals, the authorized instances of take represented here are expected to be significant overestimates of the number of individuals taken. Additional analysis has been conducted to refine the estimated percentage of the population that is likely to be taken.

The following Table 8 applies the authorized Level B harassment take levels from Table 7 and expands them to a 5 year timeline, spanning the entire duration of the rule.

Table 8. Authorized Level B harassment take levels for 5 year period.

Species	Annual Level B Take	Project Total (5 Year) Level B Take
Beluga Whale	30	150
Harbor Seal	5,725*	28,625
Harbor Porpoise	283	1415
Killer Whale	70	350
Steller Sea Lion	20	100
Gray Whale	8	40
Humpback Whale	2	10
Minke whale	1	5
Dall's porpoise	17	85

*This number represents the number of harbor seal individuals authorized to be taken, rather than instances of exposure.

Analysis and Determinations

Negligible Impact Analysis

Negligible impact is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival" (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (i.e., population-level effects). An estimate of the number of Level B harassment takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through

behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, feeding, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

1. General Discussion (All Species)

Given the required mitigation and related monitoring, no injuries or mortalities are anticipated to occur as a result of Apache's seismic survey in Cook Inlet, and none are authorized. Animals in the area are not expected to incur hearing impairment (i.e., TTS or PTS) or non-auditory physiological effects. The takes that are anticipated are expected to be limited to relatively short-term Level B behavioral harassment. The seismic airguns do not operate continuously over a 24-hour period. Rather airguns are operational for a few hours at a time totaling about 12 hours a day.

Taking into account the mitigation measures that are planned, effects on marine mammals are generally expected to be restricted to avoidance of a limited area around the survey operation and short-term changes in behavior, falling within the MMPA definition of "Level B harassment." Animals are not expected to permanently abandon any area that is surveyed, and any behaviors that are interrupted during the activity are expected to resume once the activity ceases or moves away. Only a relatively small portion of marine mammal habitat will be affected at any time, and other adjacent areas of Cook Inlet of equivalent value will be available for necessary biological functions.

The addition of nine vessels, and noise due to vessel operations associated with the seismic survey, would not be outside the present experience of marine mammals in Cook Inlet,

although levels may increase locally to the seismic survey. Given the large number of vessels in Cook Inlet and the observed apparent habituation to vessels by some individual Cook Inlet beluga whales and other marine mammals that may occur in the area (NMFS, 2008a), as well as the fact that the increased noise from the seismic survey will not be focused in one concentrated area in which individual animals are known to concentrate for longer times, vessel activity and noise is not expected to have effects that could cause significant or long-term consequences for individual marine mammals or their populations (Lerczak *et al.*, 2000).

Mitigation measures such as controlled vessel speed, dedicated marine mammal observers, non-pursuit, and shutdowns or power downs when marine mammals are seen within defined ranges designed both to avoid injury and disturbance will further reduce short-term reactions and minimize any effects on hearing sensitivity. In all cases, the effects of the seismic survey are expected to be short-term, with no lasting biological consequence.

Potential impacts to marine mammal habitat were discussed previously in this document (see the "Anticipated Effects on Habitat" section). Although some disturbance is possible to food sources of marine mammals, the impacts are anticipated to be minor enough as to not affect an individual's ability to forage. Based on the size of Cook Inlet where feeding by marine mammals occurs versus the localized area of the marine survey activities, any missed feeding opportunities in the direct project area would be minor based on the fact that other feeding areas exist elsewhere.

2. Mysticetes

Of the three mysticete species for which take is authorized, one species (humpback whale) is listed under the ESA. The Central North Pacific stock of humpback whales winters in Hawaii but travels to the Gulf of Alaska for summer feeding. There is no critical habitat

designated for humpback whales in Cook Inlet. Gray whales and minke whales are also seen in Cook Inlet infrequently, with no known biologically important areas of these species in Cook Inlet. While low frequency specialists (e.g., mysticetes) may be more sensitive to the low frequency sounds of seismic airguns, and the sounds may me more likely to temporarily mask their calls than the calls of odontocetes, due to the very limited anticipated spatial and temporal overlap of any individual mysticetes with this activity, only relatively short-term and lower-level behavioral impacts are anticipated. The exposure of mysticetes to sounds produced by Apache's seismic survey operation is not anticipated to have an effect on annual rates of recruitment or survival of the affected species or stocks.

3. Odontocetes

Odontocete (including Cook Inlet beluga whales, killer whales, Dall's porpoise, and harbor porpoises) reactions to seismic energy pulses are usually assumed to be limited to shorter distances from the airgun(s) than are those of mysticetes, in part because odontocete hearing is assumed to be less sensitive to lower frequency sources than that of mysticetes. Harbor porpoises are seen with regularity in Cook Inlet but the relevant stock is a stable population, of which Cook Inlet is only a portion of its total Gulf of Alaska range. Killer whales and Dall's porpoise are sighted infrequently in upper Cook Inlet and there are no known areas of biological importance to these species in upper Cook Inlet. The exposure of odontocetes to sounds produced by Apache's seismic survey operation is not anticipated to have an effect on annual rates of recruitment or survival of the affected species or stocks.

3a. Belugas

Endangered Cook Inlet beluga whales are resident species in Cook Inlet with two areas of critical habitat designated under the ESA: Critical Habitat Area 1 in the Upper Inlet, and Critical

Habitat Area 2 farther south in the Inlet. The estimated annual rate of decline for Cook Inlet beluga whales was 0.6 percent between 2002 and 2012. Despite a moratorium on the subsistence hunting of belugas, the population has been slow to increase, with the most recent abundance estimate calculating a population of 340 individuals (Shelden *et al.*, 2015). The causes contributing to the lack of recovery are still largely unknown. With this in mind, NMFS has included several measures, described below, to further minimize impacts on beluga whales.

Due to the dispersed distribution of beluga whales in Cook Inlet during winter and the concentration of beluga whales in upper Cook Inlet from late April through early fall, belugas will likely occur in the majority of Apache's survey area during the majority of Apache's annual operational timeframe of March through December. Due to extensive mitigation measures including a shutdown requirement if belugas are sighted within the Level B harassment zone, it is likely that only few animals would be exposed to received sound levels associated with behavioral disturbance, and highly unlikely that any would be exposed to received sound levels equal to or greater than those that may cause injury.

Additionally, NMFS will seasonally restrict seismic survey operations in the Susitna Delta region of upper Cook Inlet, a location known to be important for beluga whale feeding, calving, and nursing. NMFS will implement a 16 km (10 mi) seasonal exclusion from seismic survey operations in this region from April 15-October 15. NMFS is implementing this exclusion zone from the mean lower low water line (MLLW), which excludes a large portion of the Inlet north of the Forelands from seismic surveying activity during periods of high use and biological importance to belugas. The highest concentrations of belugas are typically found in this area from early May through September each year. NMFS has incorporated a 2-week buffer on each end of this seasonal use timeframe to account for any anomalies in distribution and marine

mammal usage. To further minimize impacts, Apache will be required to power down or shutdown when any beluga is seen approaching or within the 160dB behavioral disturbance zone. This mitigation measure is expected to further lower the number of belugas taken, but more importantly, to reduce the anticipated consequences of any behavioral disturbance by ensuring that it does not occur at this important area in a time when animals need to specifically focus on, and expend energy towards, feeding, calving, or nursing.

There is little available literature regarding behavioral response of Cook Inlet belugas to seismic surveys. When in the Canadian Beaufort Sea in summer, belugas appear responsive to seismic energy, with few being sighted within 10–20 km (6–12 mi) of seismic vessels during aerial surveys (Miller *et al.*, 2005). However, it has been documented that beluga responses to anthropogenic noise vary depending upon location and so the results from the Beaufort Sea surveys may or may not be directly relevant to potential reactions of Cook Inlet beluga whales (Wartzok *et al.*, 2003; Huntington, 2002).

4. Pinnipeds

Steller sea lion trends for the western stock are variable throughout the region with some decreasing and others remaining stable or even indicating slight increases. While Steller sea lions are sighted regularly in Cook Inlet, these sightings occur much farther south than Apache's proposed action area. They are rarely sighted north of the Forelands, and when they are sighted it is largely as pairs or individuals.

Some individual pinnipeds may be exposed to sound from the seismic surveys more than once during the timeframe of the project. Taking into account the mitigation measures that are planned, effects on pinnipeds are generally expected to be restricted to avoidance of a limited area around the survey operation and short-term changes in behavior, falling within the MMPA

definition of "Level B harassment". Animals are not expected to permanently abandon any area that is surveyed, and any behaviors that are interrupted during the activity are expected to resume once the activity ceases or moves to another location. Only a small portion of pinniped habitat will be affected at any time, and other areas within Cook Inlet will be available for necessary biological functions. In addition, the area where the survey will take place is not known to be an important location where pinnipeds haul out. The closest known haul-out site is located on Kalgin Island, which is about 22 km from the McArther River. More recently, some large congregations of harbor seals have been observed hauling out in upper Cook Inlet. However, it is still rare to encounter large numbers of harbor seals during in-water activity. Additionally, most known large harbor seal haulouts are in the southern portion of Cook Inlet, well south of the area Apache plans to survey. Therefore, the exposure of pinnipeds to sounds produced by this phase of Apache's seismic survey is not anticipated to have an effect on annual rates of recruitment or survival on those species or stocks.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the monitoring and mitigation measures, NMFS finds that the total per-species or per-stock annual marine mammal take from Apache's seismic survey over the course of the 5-year period of this rule will have a negligible impact on the affected marine mammal species or stocks. NMFS has made the necessary findings to issue the 5-year regulations for Apache's activities but believes a cautious approach is appropriate in the management of impacts on this small resident beluga population with declining abundance and constricted range. Accordingly, NMFS will issue annual Letters of Authorization (LOAs), as appropriate, instead of a single 5-year LOA. Apache will be required to submit a draft monitoring report from their season of work by October 31st of

each year so that NMFS can review the report and provide any comments so that Apache can submit a final report by November 30th. This will allow the agency to take into account annually Apache monitoring reports and any other new information on anticipated impacts or Cook Inlet belugas, to inform our evaluation of subsequent LOA applications and ensure that we are able to confirm the necessary findings. LOA applications must be submitted by December 31st preceding the requested start date of operations. Additionally, the regulations contain an adaptive management provision that allows for the modification of mitigation or monitoring requirements at any time (in response to new information) to ensure the least practicable adverse impact on the affected species and maximize the effectiveness of the monitoring program. Consistent with our implementing regulations, if NMFS determines that the level of taking is having or may have a more than negligible impact on a species or stock, NMFS may suspend or modify an LOA, as appropriate, following notice and comment.

Small Numbers Analysis

The requested and authorized takes represent 9.6 percent of the Cook Inlet beluga whale population of approximately 312 animals (Allen and Angliss, 2014), 6.26 percent of the Alaska resident stock and 12.74 percent of the Gulf of Alaska, Aleutian Island and Bering Sea stock of 345 transient killer whales, 0.91 percent of the Gulf of Alaska stock of approximately 31,046 harbor porpoises, 0.27 percent of the Central North Pacific stock of approximately 7,469 humpback whales, 0.016 percent of the Alaska stock of 106,000 Dall's porpoise, 0.08 percent of the Alaska stock of 1,233 minke whales, and 0.042 percent of the eastern North Pacific stock of approximately 19,126 gray whales. The requested takes for Steller sea lions represent 0.025 percent of the western stock of approximately 79,300 animals.

The take estimates for beluga whales, humpback whales, and Steller sea lions represent

the number of individuals of each species or stock that could be taken by Level B behavioral harassment. For the remaining species (killer whales, harbor porpoise, Dall's porpoise, minke whales, and gray whales), the Level B take estimates represent the instances of exposure that may occur as a result of Apache's activity, meaning that the number of unique individuals taken will likely be lower.

The take request presented for harbor seals would represent 106 percent of the Cook Inlet/Shelikof stock of approximately 22,900 animals if each instance of exposure represented a unique individual, however, that is not the case. The mathematical calculation that resulted in 22,900 does not account for other factors that, when considered appropriately, suggest that far fewer individuals will be taken. The species' coastal nature, affinity for haulout sites in the southern Inlet, and absence during previous seismic surveys suggests that the number of individuals seals exposed to noise at or above the Level B harassment threshold, which likely represent repeated exposures of the same individual, is at a low enough level for NMFS to consider small.

When calculating take using the method used by NMFS in previous Apache IHAs to estimate the number of individuals taken (total area multiplied by density) the number of harbor seals taken is 1,769. This previous method calculated take by multiplying density times the total ensonified area (over the whole survey) and represents a good way to gauge the minimum number of individuals exposed, but tends to underestimate take over the course of a survey that extends multiple days and repeated exposures of the same areas across multiple days. This method is useful to more closely gauge the actual number of individuals in situations with resident populations or where the same individuals are expected to remain around the action area for extended periods of time. The true number of individual seals likely to be taken in this

situation may be greater than 1,769 but is expected to be considerably lower than the 24,279 instances of take analyzed for authorization here (as described previously). Moreover, the Cook Inlet/Shelikof stock of harbor seals extends well south and west of Cook Inlet, with Apache's activity overlapping only a small portion of the stock's habitat. Harbor seals are known to haul out in large numbers in Kachemak Bay and at the mouth of several rivers, including Fox River, with both of these locations well south of Apache's survey area.

Previous monitoring reports also help to provide context for the number of individual harbor seals likely to be taken. In 2012, SAExploration Inc. observers detected fewer than 300 seals during 116 days of operations, with 100 seals the most seen at once, at a river mouth, hauled out, not in the water or exposed to seismic activity. In 2014, Apache observers saw an estimated 613 individuals in 82 days of operation, mostly during non-seismic periods. Most harbor seals were recorded from the land station, not source vessels. Of the 492 groups of harbor seals seen, 441 were seen during non-seismic operations. The number of harbor seals observed and reported within the take zone in previous surveys suggests that the predicted instances of take of harbor seals for Apache's surveys may be overestimates. Further, the known distribution of this harbor seal stock, including the known preference for haulouts at river mouths as well as the southern portion of Cook Inlet, suggest that the number of exposures calculated through the daily ensonified method is a notable overestimate of the number of individual seals likely to be taken. We have estimated for authorization the calculated number of instances of take, however, when these factors regarding the spatiotemporal distribution of this harbor seal stock throughout its range are considered, we believe that it is a reasonable prediction that not more than 25% of the individuals in the population will be taken.

NMFS finds that the numbers of animals estimated for take authorization here are small

on a per-species or per-stock basis when considered relative to the relevant stock abundances. In addition to the quantitative methods used to estimate take, NMFS also considered qualitative factors that further support the "small numbers" determination, including: (1) The seasonal distribution and habitat use patterns of Cook Inlet beluga whales, which suggest that for much of the time only a small portion of the population would be accessible to impacts from Apache's activity, as most animals are found in the Susitna Delta region of Upper Cook Inlet from early May through September, during which seismic activity in the Susitna Delta area is restricted; (2) other cetacean species and Steller sea lions are not common in the seismic survey area. Therefore, NMFS determined that the numbers of animals likely to be taken is small.

Impact on Availability of Affected Species for Taking for Subsistence Uses

Relevant Subsistence Uses

The subsistence harvest of marine mammals is an integral part of the cultural identity of the region's Alaska Native communities. Inedible parts of the whale provide Native artisans with materials for cultural handicrafts, and the hunting itself perpetuates Native traditions by transmitting traditional skills and knowledge to younger generations (NOAA, 2007).

The Cook Inlet beluga whale has traditionally been hunted by Alaska Natives for subsistence purposes. For several decades prior to the 1980s, the Native Village of Tyonek residents were the primary subsistence hunters of Cook Inlet beluga whales. During the 1980s and 1990s, Alaska Natives from villages in the western, northwestern, and North Slope regions of Alaska either moved to or visited the south central region and participated in the yearly subsistence harvest (Stanek, 1994). From 1994 to 1998, NMFS estimated 65 whales per year (range 21-123) were taken in this harvest, including those successfully taken for food and those struck and lost. NMFS has concluded that this number is high enough to account for the

estimated 14 percent annual decline in the population during this time (Hobbs *et al.*, 2008). Actual mortality may have been higher, given the difficulty of estimating the number of whales struck and lost during the hunts. In 1999, a moratorium was enacted (Public Law 106-31) prohibiting the subsistence take of Cook Inlet beluga whales except through a cooperative agreement between NMFS and the affected Alaska Native organizations. Since the Cook Inlet beluga whale harvest was regulated in 1999 requiring cooperative agreements, five beluga whales have been struck and harvested. Those beluga whales were harvested in 2001 (one animal), 2002 (one animal), 2003 (one animal), and 2005 (two animals). The Native Village of Tyonek agreed not to hunt or request a hunt in 2007, when no co-management agreement was to be signed (NMFS, 2008a).

On October 15, 2008, NMFS published a final rule that established long-term harvest limits on the Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibits harvest for a 5-year period (2008-2012), if the average abundance for the Cook Inlet beluga whales from the prior five years (2003-2007) is below 350 whales. The next 5-year period that could allow for a harvest (2013-2017), would require the previous five-year average (2008-2012) to be above 350 whales. The 2008 Cook Inlet Beluga Whale Subsistence Harvest Final Supplemental Environmental Impact Statement (NMFS, 2008a) authorizes how many beluga whales can be taken during a 5-year interval based on the 5-year population estimates and 10-year measure of the population growth rate. Based on the 2008-2012 5-year abundance estimates, no hunt occurred between 2008 and 2012 (NMFS, 2008a). The Cook Inlet Marine Mammal Council, which managed the Alaska Native Subsistence fishery with NMFS, was disbanded by a unanimous vote of the Tribes' representatives on June 20, 2012. No harvest occurred in 2015 or is likely in 2016. Residents of

the Native Village of Tyonek are the primary subsistence users in the Knik Arm area.

Data on the harvest of other marine mammals in Cook Inlet are lacking. There is a low level of subsistence hunting for harbor seals in Cook Inlet. Seal hunting occurs opportunistically among Alaska Natives who may be fishing or travelling in the upper Inlet near the mouths of the Susitna River, Beluga River, and Little Susitna River. Some data are available on the subsistence harvest of harbor seals, harbor porpoises, and killer whales in Alaska in the marine mammal stock assessments. However, these numbers are for the Gulf of Alaska including Cook Inlet, and they are not indicative of the harvest in Cook Inlet. Some detailed information on the subsistence harvest of harbor seals is available from past studies conducted by the Alaska Department of Fish & Game (Wolfe *et al*., 2009). In 2008, 33 harbor seals were taken for harvest in the Upper Kenai-Cook Inlet area. In the same study, reports from hunters stated that harbor seal populations in the area were increasing (28.6%) or remaining stable (71.4%). The specific hunting regions identified were Anchorage, Homer, Kenai, and Tyonek, and hunting generally peaks in March, September, and November (Wolfe *et al*., 2009).

Potential Impacts on Availability for Subsistence Uses

Section 101(a)(5)(A) also requires NMFS to determine that the taking will not have an unmitigable adverse effect on the availability of marine mammal species or stocks for subsistence use. NMFS has defined "unmitigable adverse impact" in 50 CFR 216.103 as an impact resulting from the specified activity: (1) That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine

mammals to allow subsistence needs to be met.

The primary concern is the disturbance of marine mammals through the introduction of anthropogenic sound into the marine environment during the seismic survey. Marine mammals could be behaviorally harassed and either become more difficult to hunt or temporarily abandon traditional hunting grounds. However, the seismic survey will not have any impacts to beluga harvests as none currently occur in Cook Inlet. Additionally, subsistence harvests of other marine mammal species are limited in Cook Inlet.

Plan of Cooperation or Measures to Minimize Impacts to Subsistence Hunts

Regulations at 50 CFR 216.104(a)(12) require LOA applicants for activities that take place in Arctic waters to provide a Plan of Cooperation or information that identifies what measures have been taken and/or will be taken to minimize adverse effects on the availability of marine mammals for subsistence purposes. NMFS regulations define Arctic waters as waters above 60^{o} N. latitude. Much of Cook Inlet is north of 60^{o} latitude.

Since November 2010, Apache has met and continues to meet with many of the villages and traditional councils throughout the Cook Inlet region. During these meetings, no concerns have been raised regarding potential conflict with subsistence harvest. Past meetings have been held with Alexander Creek, Knikatnu, Native Village of Tyonek, Salamatof, Tyonek Native Corporation, Ninilchik Traditional Council, Ninilchik Native Association, Village of Eklutna, Kenaitze Indian Tribe, and Cook Inlet Region, Inc.

Additionally, Apache met with the Cook Inlet Marine Mammal Council (CIMMC) to describe the project activities and discuss subsistence concerns. The meeting provided information on the time, location, and features of the program, opportunities for involvement by local people, potential impacts to marine mammals, and mitigation measures to avoid impacts.

Discussions regarding marine seismic operations continued with the CIMMC until its disbandment.

In 2014, Apache held meetings or discussions regarding project activities associated with this rule with the following entities: Native Village of Tyonek, Tyonek Native Corporation, Cook Inlet Region, Inc., Ninilchik Native Association, Ninilchik Tribal Council, Salamatof Native Association, Cook Inlet Keeper, Alaska Salmon Alliance, Upper Cook Inlet Drift Association, and the Kenai Peninsula Fisherman's Association. Further, Apache has placed posters in local businesses, offices, and stores in nearby communities and published newspaper ads in the Peninsula Clarion.

Apache has identified the following features that are intended to reduce impacts to subsistence users:

- In-water seismic activities will follow mitigation procedures to minimize effects on the behavior of marine mammals and, therefore, opportunities for harvest by Alaska Native communities; and
- Regional subsistence representatives may support or join PSO efforts recording marine mammal observations along with marine mammal biologists during the monitoring programs and will be provided with annual reports.

Apache and NMFS recognize the importance of ensuring that ANOs and federally recognized tribes are informed, engaged, and involved during the permitting process and will continue to work with the ANOs and tribes to discuss operations and activities. On February 6, 2012, in response to requests for government-to-government consultations by the CIMMC and Native Village of Eklutna, NMFS met with representatives of these two groups and a representative from the Ninilchik. We engaged in a discussion about the proposed IHA for phase

1 of Apache's seismic program, the MMPA process for issuing an IHA, concerns regarding Cook Inlet beluga whales, and how to achieve greater coordination with NMFS on issues that impact tribal concerns. NMFS contacted the local Native Villages in August 2014 to inform them of our receipt of an application from Apache to promulgate regulations and issue subsequent annual LOAs.

Unmitigable Adverse Impact Analysis and Determination

The project will not have any effect on beluga whale harvests because no beluga harvest will take place in 2016, nor is one likely to occur in the other years that would be covered by the 5-year regulations and associated LOAs. Additionally, the seismic survey area is not an important site for the subsistence harvest of other species of marine mammals. Also, because of the relatively small proportion of marine mammals utilizing upper Cook Inlet, the number harvested is expected to be extremely low. Therefore, because the program would result in only temporary disturbances, the seismic program would not impact the availability of these other marine mammal species for subsistence uses.

The timing and location of subsistence harvest of Cook Inlet harbor seals may coincide with Apache's project, but because this subsistence hunt is conducted opportunistically and at such a low level (NMFS, 2013c), Apache's program is not expected to have an impact on the subsistence use of harbor seals.

NMFS anticipates that any effects from Apache's seismic survey on marine mammals, especially harbor seals and Cook Inlet beluga whales, which are or have been taken for subsistence uses, would be short-term, site specific, and limited to inconsequential changes in behavior and mild stress responses. NMFS does not anticipate that the authorized taking of affected species or stocks will reduce the availability of the species to a level insufficient for a

harvest to meet subsistence needs by: (1) Causing the marine mammals to abandon or avoid hunting areas; (2) directly displacing subsistence users; or (3) placing physical barriers between the marine mammals and the subsistence hunters; and that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met. Based on the description of the specified activity, the measures described to minimize adverse effects on the availability of marine mammals for subsistence purposes, and the mitigation and monitoring measures, NMFS has determined that there will not be an unmitigable adverse impact on subsistence uses from Apache's activities. Additionally, the adaptive management component of this rulemaking allows NMFS to adjust mitigation and monitoring requirements as appropriate to minimize severity and level of take of marine mammals due to Apache's activity.

Endangered Species Act (ESA)

There are three marine mammal species listed as endangered under the ESA with confirmed or possible occurrence in the project area: the Cook Inlet beluga whale, the western DPS of Steller sea lion, and the Central North Pacific humpback whale. In addition, the action will occur within designated critical habitat for the Cook Inlet beluga whale. NMFS's Permits and Conservation Division consulted with NMFS' Alaska Region Protected Resources Division under section 7 of the ESA. This consultation concluded on February 3, 2016, when a Biological Opinion was issued. The Biological Opinion determined that the issuance of an IHA is not likely to jeopardize the continued existence of the Cook Inlet beluga whales, Central North Pacific humpback whales, or western distinct population segment of Steller sea lions or destroy or adversely modify Cook Inlet beluga whale critical habitat. Finally, the Alaska region issued an ITS for Cook Inlet beluga whales, humpback whales, and Steller sea lions. The ITS contains

reasonable and prudent measures implemented by the terms and conditions to minimize the effects of take.

National Environmental Policy Act (NEPA)

NMFS prepared an EA that includes an analysis of potential environmental effects associated with NMFS' issuance of five-year regulations to Apache to take marine mammals incidental to conducting a 3D seismic survey program in Cook Inlet, Alaska. NMFS has finalized the EA and prepared a FONSI for this action. Therefore, preparation of an Environmental Impact Statement is not necessary.

Classification

The Office of Management and Budget has determined that this rule is not significant for purposes of Executive Order 12866.

Pursuant to section 605(b) of the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this rule will not have a significant economic impact on a substantial number of small entities. Apache Alaska Corporation is the only entity that would be subject to the requirements in these regulations. Apache Alaska Corporation is a part of Apache Corporation, which has operations and locations in the United State, Canada, Australia, Egypt, and the United Kingdom (North Sea), employs thousands of people worldwide, and has a market value in the billions of dollars. Therefore, Apache is not a small governmental jurisdiction, small organization, or small business, as defined by the RFA. Because of this certification, a regulatory flexibility analysis is not required and none has been prepared.

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to

the requirements of the Paperwork Reduction Act (PRA) unless that collection of information displays a currently valid OMB control number. This rule contains collection-of-information requirements subject to the provisions of the PRA. These requirements have been approved by OMB under control number 0648–0151 and include applications for regulations, subsequent LOAs, and reports. Send comments regarding any aspect of this data collection, including suggestions for reducing the burden, to NMFS and the OMB Desk Officer (see ADDRESSES).

List of Subjects in 50 CFR Part 217

Exports, Fish, Imports, Indians, Labeling, Marine mammals, Penalties, Reporting and recordkeeping requirements, Seafood, Transportation.

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Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs,

National Marine Fisheries Service.

For reasons set forth in the preamble, 50 CFR part 217 is amended as follows:

PART 217 – REGULATIONS GOVERNING THE TAKE OF MARINE MAMMALS INCIDENTAL TO SPECIFIED ACTIVITIES

1. The authority citation for part 217 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq*., unless otherwise noted.

2. Subpart N is added to part 217 to read as follows:

Subpart N – Taking Marine Mammals Incidental to Seismic Surveys in Cook Inlet, Alaska

Sec.

Subpart N – Taking Marine Mammals Incidental to Seismic Surveys in Cook Inlet, Alaska

§ 217.130 Specified activity and specified geographical region.

(a) Regulations in this subpart apply only to Apache Alaska Corporation (Apache), and those persons it authorizes to conduct activities on its behalf, for the taking of marine mammals that occurs in the area outlined in paragraph (b) of this section incidental to Apache's oil and gas exploration seismic survey program operations.

(b) The taking of marine mammals by Apache may be authorized in a Letter of Authorization (LOA) only if it occurs in Cook Inlet, Alaska.

§ 217.131 Effective dates.

Regulations in this subpart are effective from August 19, 2016 through July 20, 2021.

§ 217.132 Permissible methods of taking.

(a) Under LOAs issued pursuant to § 216.106 of this chapter and § 217.136, the Holder of the LOA (hereinafter "Apache") may incidentally, but not intentionally, take marine mammals within the area described in § 217.130(b), provided the activity is in compliance with all terms,

conditions, and requirements of the regulations in this subpart and the appropriate LOA.

(b) The incidental take of marine mammals under the activities identified in § 217.130(a) is limited to the indicated number of takes of individuals of the following species and is limited to Level B harassment:

(1) Cetaceans:

(i) Beluga whale (*Delphinapterus leucas*) – 150 over the five-year period, with no more than 30 in any year;

(ii) Harbor porpoise (*Phocoena phocoena*) – 1,455 over the five-year period, with an average of 283 annually;

(iii) Killer whale (*Orcinus orca*) – 350 over the five-year period, with an average of 70 annually;

(iv) Gray whale (*Eschrichtius robustus*) – 40 over the five-year period, with an average of 8 annually;

(v) Humpback whale (*Megaptera noveangliae*) – 10 over the five-year period, with an average of 2 annually;

(vi) Minke whale (*Balaenoptera acutorostra*) – 5 over the five-year period, with an average of 1 annually;

(vii) Dall's porpoise (*Phocoenoides dalli*) – 85 over the five-year period, with an average of 17 annually;

(2) Pinnipeds:

(i) Harbor seal (*Phoca vitulina*) – 28, 625 over the five-year period, with no more than 5,725 in any year; and

(ii) Steller sea lion (*Eumetopias jubatus*) – 20.

§ 217.133 Prohibitions.

Notwithstanding takings contemplated in § 217.130 and authorized by a LOA issued under § 216.106 of this chapter and § 217.136, no person in connection with the activities described in § 217.130 may:

(a) Take any marine mammal not specified in § 217.132(b);

(b) Take any marine mammal specified in § 217.132(b) other than by incidental Level B harassment;

(c) Take any marine mammal in excedance of the numbers specified in 217.132(b)(1);

(d) Take a marine mammal specified in § 217.132(b) if the National Marine Fisheries Service (NMFS) determines such taking is resulting or will result in more than a negligible impact on the species or stocks of such marine mammal;

(e) Take a marine mammal specified in § 217.132(b) if NMFS determines such taking is resulting in or will result in an unmitigable adverse impact on the species or stock of such marine mammal for taking for subsistence uses; or

(f) Violate, or fail to comply with, the terms, conditions, and requirements of this subpart or an LOA issued under § 216.106 and § 217.136 of this chapter.

§ 217.134 Mitigation requirements.

When conducting the activities identified in § 217.130(a), the mitigation measures contained in any LOA issued under § 216.106 and § 217.136 of this chapter must be implemented. These mitigation measures include but are not limited to:

(a) General conditions:

(1) If any marine mammal species not listed in § 217.132(b) are observed during conduct of the activities identified in § 217.130(a) and are likely to be exposed to sound pressure levels

(SPLs) greater than or equal to 160 dB re 1 µPa (rms), Apache must avoid such exposure (e.g., by altering speed or course or by power down or shutdown of the sound source).

(2) If the allowable number of takes on an annual basis listed for any marine mammal species in § 217.132(b) is exceeded, or if any marine mammal species not listed in § 217.132(b) is exposed to SPLs greater than or equal to 160 dB re 1 µPa (rms), Apache shall immediately cease survey operations involving the use of active sound sources (e.g., airguns and pingers), record the observation, and notify NMFS Office of Protected Resources.

(3) Apache must notify the Office of Protected Resources, NMFS, at least 48 hours prior to the start of seismic survey activities each year.

(4) Apache shall conduct briefings as necessary between vessel crews, marine mammal monitoring team, and other relevant personnel prior to the start of all survey activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, operational procedures, and reporting requirements.

(b) *Visual monitoring*. (1) Apache shall establish zones corresponding to the area around the source within which SPLs are expected to equal or exceed relevant acoustic criteria for Level A and Level B harassment. These zones shall be established as exclusion zones (shutdown zones, described in in § 217.134 (c)(2)) to avoid Level A harassment of any marine mammal, Level B harassment of beluga whales, or Level B harassment of aggregations of five or more killer whales or harbor porpoises. For all marine mammals other than beluga whales or aggregations of five or more harbor porpoises or killer whales, the Level B harassment zone shall be established as a disturbance zone and monitored as described in § 217.135(a)(1). These zones shall be defined in each annual LOA to allow for incorporation of new field measurements.

(2) Vessel-based monitoring for marine mammals must be conducted before, during, and

after all activity identified in § 217.130(a) that is conducted during daylight hours (defined as nautical twilight-dawn to nautical twilight-dusk), and shall begin at least thirty minutes prior to the beginning of survey activity, continue throughout all survey activity that occurs during daylight hours, and conclude no less than thirty minutes following the cessation of survey activity. Apache shall use a sufficient number of qualified protected species observers (PSO), at least two PSOs per vessel, to ensure continuous visual observation coverage during all periods of daylight survey operations with maximum limits of four consecutive hours on watch and twelve hours of watch time per day per PSO. One PSO must be a supervisory field crew leader. A minimum of two qualified PSOs shall be on watch at all times during daylight hours on each source and support vessel (except during brief meal and restroom breaks, when at least one PSO shall be on watch).

(i) A qualified PSO is a third-party trained biologist, with prior experience as a PSO during seismic surveys and the following minimum qualifications:

(A) Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;

(B) Advanced education in biological science or related field (undergraduate degree or higher required);

(C) Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience);

(D) Experience or training in the field identification of marine mammals, including the identification of behaviors;

(E) Sufficient training, orientation, or experience with the survey operation to provide for

personal safety during observations;

(F) Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when survey activities were conducted; dates and times when survey activities were suspended to avoid exposure of marine mammals to sound within defined exclusion zones; and marine mammal behavior; and

(G) Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

(ii) PSOs must have access to binoculars (7 x 50 with reticle rangefinder; Fujinon or equivalent quality), and optical rangefinders, and shall scan the surrounding waters from the best available suitable vantage point with the naked eye and binoculars. At least one PSO shall scan the surrounding waters during all daylight hours using bigeye binoculars.

(iii) PSOs shall also conduct visual monitoring:

(A) While the airgun array and nodes are being deployed or recovered from the water; and

(B) During periods of good visibility when the sound sources are not operating for comparison of animal abundance and behavior.

(iv) PSOs shall be on watch at all times during daylight hours when survey operations are being conducted, unless conditions (e.g., fog, rain, darkness) make observations impossible. The lead PSO on duty shall make this determination. If conditions deteriorate during daylight hours such that the sea surface observations are halted, visual observations must resume as soon as conditions permit.

(3) Survey activity must begin during periods of good visibility, which is defined as daylight hours when weather (e.g., fog, rain) does not obscure the relevant exclusion zones

within maximum line-of-sight. In order to begin survey activity, the relevant taxa-specific exclusion zones must be clear of marine mammals for not less than thirty minutes. If marine mammals are present within or are observed approaching the relevant exclusion zone during this thirty-minute pre-clearance period, the start of survey activity shall be delayed until the animals are observed leaving the zone of their own volition and/or outside the zone or until fifteen minutes (for pinnipeds and harbor porpoises) or thirty minutes (for beluga whales, killer whales, and gray whales) have elapsed without observing the animal. While activities will be permitted to continue during low-visibility conditions, they must have been initiated following proper clearance of the exclusion zone under acceptable observation conditions and must be restarted, if shut down for greater than ten minutes for any reason, using the appropriate exclusion zone clearance procedures.

(c) *Ramp-up and shutdown*. (1) Survey activity involving the full-power airgun array or shallow-water source must be initiated, following appropriate clearance of the exclusion zone, using accepted ramp-up procedures. Ramp-up is required at the start of survey activity and at any time following a shutdown of ten minutes or greater. Ramp-up shall be implemented by starting the smallest single gun available and increasing the operational array volume in a defined sequence such that the source level of the array shall increase in steps not exceeding approximately 6 dB per five-minute period. PSOs shall continue monitoring the relevant exclusion zones throughout the ramp-up process and, if marine mammals are observed within or approaching the zones, a power down or shutdown shall be implemented and ramp-up restarted following appropriate exclusion zone clearance procedures as described in paragraph (b)(3) of this section.

(2) Apache must shut down or power down the source, as appropriate, immediately upon

detection of any marine mammal approaching or within the relevant Level A exclusion zone or upon detection of any beluga whale or aggregation of five or more harbor porpoises or killer whales approaching or within the relevant Level B exclusion zone. Power down is defined as reduction of total airgun array volume from either the full-power airgun array (2,400 in3) or the shallow-water source (440 in3) to a single mitigation gun (maximum 10 in3). Power down must be followed by shutdown in the event that the animal(s) approach the exclusion zones defined for the mitigation gun. Detection of any marine mammal within an exclusion zone shall be recorded and reported weekly, as described in § 217.135(c)(2), to NMFS Office of Protected Resources.

(i) When a requirement for power down or shutdown is triggered, the call for implementation shall be made by the lead PSO on duty and Apache shall comply. Any disagreement with a determination made by the lead PSO on duty shall be discussed after implementation of power down or shutdown, as appropriate.

(ii) Following a power down or shutdown not exceeding ten minutes, Apache shall follow the ramp-up procedure described in paragraph (c)(1) of this section to return to full-power operation.

(iii) Following a shutdown exceeding ten minutes, Apache shall follow the exclusion zone clearance, described in paragraph (b)(3) of this section, and ramp-up procedures, described in paragraph (c)(1) of this section, before returning to full-power operation.

(3) Survey operations may be conducted during low-visibility conditions (e.g., darkness, fog, rain) only when such activity was initiated following proper clearance of the exclusion zone under acceptable observation conditions, as described in paragraph (b)(3) of this section, and there has not been a shutdown exceeding ten minutes. Passive acoustic monitoring is required during all non-daylight hours. Following a shutdown exceeding ten minutes during low-visibility

conditions, survey operations must be suspended until the return of good visibility or the use of passive acoustic monitoring must be implemented. Use of a NMFS-approved passive acoustic monitoring scheme, which will be detailed in each LOA, monitored by a trained PSO, will be used to listen for marine mammal vocalizations. If no vocalizations are observed for 30 minutes, Apache may consider the zone clear and commence ramp-up of airguns. During low-visibility conditions, vessel bridge crew must implement shutdown procedures if marine mammals are observed.

(d) *Additional mitigation.* (1) The mitigation airgun must be operated at no more than approximately one shot per minute, and use of the gun may not exceed three consecutive hours. Ramp-up may not be used to circumvent the three-hour limitation on mitigation gun usage by returning guns to higher power momentarily and then returning to mitigation airgun..

(2) Apache shall alter speed or course during seismic operations if a marine mammal, based on its position and relative motion, appears likely to enter the relevant exclusion zone and such alteration may result in the animal not entering the zone. If speed or course alteration is not safe or practicable, or if after alteration the marine mammal still appears likely to enter the zone, power down or shutdown must be implemented.

(3) Apache shall not operate airguns within 16 km of the Mean Lower low water (MLLW) line of the Susitna Delta (Beluga River to the Little Susitna River) between April 15 and October 15.

(4) Apache must suspend survey operations if a live marine mammal stranding is reported within a distance of two times the 160dB isopleth of the seismic source vessel coincident to or within 72 hours of survey activities involving the use of airguns, regardless of any suspected cause of the stranding. A live stranding event is defined as a marine mammal

found on a beach or shore and unable to return to the water; on a beach or shore and able to return to the water but in apparent need of medical attention; or in the water but unable to return to its natural habitat under its own power or without assistance.

(i) Apache must immediately implement a shutdown of the airgun array upon becoming aware of the live stranding event within 19 km of the seismic array.

(ii) Shutdown procedures shall remain in effect until NMFS determines that all live animals involved in the stranding have left the area (either of their own volition or following responder assistance).

(iii) Within 48 hours of the notification of the live stranding event, Apache must inform NMFS where and when they were operating airguns, beginning 72 hours before the stranding was first observed, and at what discharge volumes.

(iv) Apache must appoint a contact who can be reached at any time for notification of live stranding events. Immediately upon notification of the live stranding event, this person must order the immediate shutdown of the survey operations.

§ 217.135 Requirements for monitoring and reporting.

(a) *Visual monitoring program*. (1) Disturbance zones shall be established as described in § 217.134(b)(1), and shall encompass the Level B harassment zones not defined as exclusion zones in § 217.134(b)(1). These zones shall be monitored to maximum line-of-sight distance from established vessel- and shore-based monitoring locations. If belugas or groups of five or more killer whales or harbor porpoises are observed approaching the 180 dB exclusion zone, operations will power down or shut down. If marine mammals other than beluga whales or aggregations of five or greater harbor porpoises or killer whales are observed within the 160 dB disturbance zone, the observation shall be recorded and communicated as necessary to other

PSOs responsible for implementing shutdown/power down requirements and any behaviors documented.

(2) Apache shall utilize a shore-based station to visually monitor for marine mammals. The shore-based station must be staffed by PSOs under the same minimum requirements described in § 217.134(b)(2), must be located at an appropriate height to monitor the area ensonified by that day's survey operations, must be of sufficient height to observe marine mammals within the ensonified area; and must be equipped with pedestal-mounted bigeye (25 x 150) binoculars. The shore-based PSOs shall scan the defined exclusion and disturbance zones prior to, during, and after survey operations, and shall be in contact with vessel-based PSOs via radio to communicate sightings of marine mammals approaching or within the defined zones.

(3) When weather conditions allow for safety, Apache shall utilize helicopter or fixed-wing aircraft to conduct daily aerial surveys of the area that they expect to survey prior to the commencement of operations in order to identify locations of beluga whale aggregations (five or more whales) or cow-calf pairs. Daily surveys that cover all the area potentially surveyed by vessel in that particular day shall be scheduled to occur at least thirty but no more than 120 minutes prior to any seismic survey-related activities (including but not limited to node laying/retrieval or airgun operations) and surveys of similar size shall also occur on days when there may be no seismic activities. Additionally, weekly comprehensive aerial surveys shall occur along and parallel to the shoreline throughout the project area as well as the eastern and western shores of central and northern Cook Inlet in the vicinity of the survey area.

(i) When weather conditions allow for safety, aerial surveys shall fly at an altitude of 305 m (1,000 ft). In the event of a marine mammal sighting, aircraft shall attempt to maintain a lateral distance of 457 m (1,500 ft) from the animal(s). Aircraft shall avoid approaching marine

mammals head-on, flying over or passing the shadow of the aircraft over the animal(s).

(ii) [Reserved]

(4) PSOs must use NMFS-approved data forms and shall record the following information:

(i) Effort information, including vessel name; PSO name; survey type; date; time when survey (observing and activities) began and ended; vessel location (latitude/longitude) when survey (observing and activities) began and ended; vessel heading and speed (knots).

(ii) Environmental conditions while on visual survey, including wind speed and direction, Beaufort sea state, Beaufort wind force, swell height, weather conditions, ice cover (percent of surface, ice type, and distance to ice if applicable), cloud cover, sun glare, and overall visibility to the horizon (in distance).

(iii) Factors that may be contributing to impaired observations during each PSO shift change or as needed as environmental conditions change (e.g., vessel traffic, equipment malfunctions).

(iv) Activity information, such as the number and volume of airguns operating in the array, tow depth of the array, and any other notes of significance (e.g., pre-ramp-up survey, ramp-up, power down, shutdown, testing, shooting, ramp-up completion, end of operations, nodes).

(v) When a marine mammal is observed, the following information shall be recorded:

(A) Information related to the PSO including: Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform, aerial, land); PSO who sighted the animal; time of sighting;

(B) Vessel information including: vessel location at time of sighting; water depth;

direction of vessel's travel (compass direction);

(C) Mammal-specific physical observations including: direction of animal's travel relative to the vessel (drawing is preferred); pace of the animal; estimated distance to the animal and its heading relative to vessel at initial sighting; identification of the animal (genus/species/sub-species, lowest possible taxonomic level, or unidentified; also note the composition of the group if there is a mix of species); estimated number of animals (high/low/best); estimated number of animals by cohort (when possible; adults, yearlings, juveniles, calves, group composition, etc.); description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);

(D) Mammal-specific behavioral observations including: detailed behavioral observations (e.g., number of blows, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior); animal's closest point of approach and/or closest distance from the center point of the airgun array; platform activity at time of sighting (e.g., deploying, recovering, testing, shooting, data acquisition, other).

(vi) Description of any actions implemented in response to the sighting (e.g., delays, power down, shutdown, ramp-up, speed or course alteration); time and location of the action should also be recorded.

(vii) If mitigation action was not implemented when required, description of circumstances.

(viii) Description of all use of mitigation gun including running time, start and stop time, and reason for implementation.

(5) The data listed in § 217.135(a)(4)(i) and (ii) shall also be recorded at the start and end

of each watch and during a watch whenever there is a change in one or more of the variables.

(b) *Onshore seismic effort*. (1) When conducting onshore seismic effort, in the event that a shot hole charge depth of 10 m is not consistently attainable due to loose sediments collapsing the bore hole, a sound source verification study must be conducted on the new land-based charge depths.

(2) [Reserved]

(c) *Reporting*. (1) Apache must immediately report to NMFS at such time as 25 total beluga whales (cumulative total during period of validity of annual LOA) have been detected within the 160-dB re 1 µPa (rms) exclusion zone, regardless of shutdown or power down procedures implemented, during seismic survey operations.

(2) Apache must submit a weekly field report to NMFS Office of Protected Resources each Thursday during the weeks when in-water seismic survey activities take place. The weekly field reports shall summarize species detected (number, location, distance from seismic vessel, behavior), in-water activity occurring at the time of the sighting (discharge volume of array at time of sighting, seismic activity at time of sighting, visual plots of sightings, and number of power downs and shutdowns), behavioral reactions to in-water activities, and the number of marine mammals exposed to sound at or exceeding relevant thresholds. Additionally, Apache must include which km^2 grid cells were surveyed during that week and the resulting number of belugas that may have been taken using the Goetz *et al*. (2012) model. Apache must provide the cells, corresponding density, and possible number of beluga exposures using the Goetz model for that week, as well as the total from the preceding weeks.

(3) Apache must submit a monthly report, no later than the fifteenth of each month, to NMFS Office of Protected Resources for all months during which in-water seismic survey

activities occur. These reports must summarize the information described in paragraph (a)(4) of this section and shall also include:

(i) An estimate of the number (by species) of:

(A) Pinnipeds that have been exposed to sound (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 190 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited; and

(B) Cetaceans that have been exposed to sound (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 180 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited.

(ii) A description of the implementation and effectiveness of the terms and conditions of the Biological Opinion's Incidental Take Statement and mitigation measures of the LOA. For the Biological Opinion, the report shall confirm the implementation of each Term and Condition, as well as any conservation recommendations, and describe their effectiveness in minimizing the adverse effects of the action on Endangered Species Act-listed marine mammals.

(4) Apache shall submit an annual report to NMFS Office of Protected Resources covering a given calendar year by October 31st annually. The annual report shall include summaries of the information described in paragraph (a)(4) of this section and shall also include:

(i) Summaries of monitoring effort (*e.g.*, total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals);

(ii) Analyses of the effects of various factors influencing detectability of marine mammals (*e.g.*, sea state, number of observers, and fog/glare);

(iii) Species composition, occurrence, and distribution of marine mammal sightings,

including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover;

(iv) Analyses of the effects of survey operations; and

(v) Sighting rates of marine mammals during periods with and without seismic survey activities (and other variables that could affect detectability), such as:

(A) Initial sighting distances versus survey activity state;

(B) Closest point of approach versus survey activity state;

(C) Observed behaviors and types of movements versus survey activity state;

(D) Numbers of sightings/individuals seen versus survey activity state;

(E) Distribution around the source vessels versus survey activity state; and

(F) Numbers of marine mammals (by species) detected in the 160, 180, and 190 dB re 1 µPa (rms) zones.

(5) Apache shall submit a final annual report to the Office of Protected Resources, NMFS, within thirty days after receiving comments from NMFS on the draft report, by November 30th annually.

(d) *Notification of dead or injured marine mammals*. (1) In the event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this Authorization, such as an injury (Level A harassment), serious injury, or mortality, Apache shall immediately cease the specified activities and report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS. The report must include the following information:

(i) Time, date, and location (latitude/longitude) of the incident;

(ii) Description of the incident;

(iii) Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);

(iv) Description of marine mammal observations in the 24 hours preceding the incident;

(v) Species identification or description of the animal(s) involved;

(vi) Status of all sound source use in the 24 hours preceding the incident;

(vii) Water depth;

(viii) Fate of the animal(s); and

(ix) Photographs or video footage of the animal(s).

(2) Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with Apache to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Apache may not resume their activities until notified by NMFS that they may do so.

(3) In the event that Apache discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (e.g., in less than a moderate state of decomposition), Apache shall immediately report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS. The report must include the same information identified in § 217.135(d)(1). If the observed marine mammal is dead, activities may continue while NMFS reviews the circumstances of the incident. If the observed marine mammal is injured, measures described in § 217.134(d)(4) must be implemented. NMFS will work with Apache to determine whether additional mitigation measures or modifications to the activities are appropriate.

(4) In the event that Apache discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities

authorized in the LOA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, scavenger damage), Apache shall report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS, within 24 hours of the discovery. Apache shall provide photographs or video footage or other documentation of the stranded animal sighting to NMFS. If the observed marine mammal is dead, activities may continue while NMFS reviews the circumstances of the incident. If the observed marine mammal is injured, measures described in § 217.134(d)(4) must be implemented and Apache may not resume activities until notified by NMFS that they may do so.

§ 217.136 Letters of Authorization.

(a) To incidentally take marine mammals pursuant to this subpart, Apache must apply for and obtain an LOA, as required by § 216.106 of this chapter.

(b) LOAs issued to Apache, unless suspended or revoked, may be effective for a period of time not to exceed one year or the period of validity of this subpart.

(c) An LOA application must be submitted to the Director, Office of Protected Resources, NMFS, by December 31st of the year preceding the desired start date.

(d) An LOA application must include the following information:

(1) The date(s), duration, and the area(s) where the activity will occur;

(2) The species and/or stock(s) of marine mammals likely to be found within each area;

(3) The estimated percentage and numbers of marine mammal species/stocks potentially affected in each area for the period of effectiveness of the Letter of Authorization.

(4) If an application is for an LOA renewal, it must meet the requirements set forth in §

217.137.

(e) In the event of projected changes to the activity or to mitigation and monitoring measures required by an LOA, Apache must apply for and obtain a modification of the Letter of Authorization as described in § 217.137.

(f) An LOA will set forth:

(1) Permissible methods of incidental taking;

(2) Means of effecting the least practicable adverse impact (i.e., mitigation) on the species, their habitat, and on the availability of the species for subsistence uses; and

(3) Requirements for monitoring and reporting.

(g) Issuance of an LOA (including renewals and modifications) will be based on a determination by NMFS that the level of taking will be consistent with the findings made for the total taking allowable under this subpart.

(h) If NMFS determines that the level of taking is resulting or may result in more than a negligible impact on the species or stocks of such marine mammal, the LOA may be modified or suspended after notice and a public comment period.

(i) Notice of issuance or denial of a LOA shall be published in the Federal Register within 30 days of a determination.

§ 217.137 Renewals and modifications of Letters of Authorization and Adaptive Management.

(a) An LOA issued under § 216.106 of this chapter and § 217.136 for the activity identified in § 217.130(a) may be renewed or modified upon request by the applicant, provided the following are met (in addition to the determination in § 216.136(e)):

(1) Notification to NMFS that the activity described in the application submitted under

§217.130(a) will be undertaken and that there will not be a substantial modification to the described work, mitigation or monitoring undertaken during the upcoming or remaining LOA period;

(2) Timely receipt (by the dates indicated) of monitoring reports, as required under **§** 217.135(c)(3).

(3) A determination by the NMFS that the mitigation, monitoring and reporting measures required under § 217.135(c) and the LOA issued under § 216.106 and § 217.136, were undertaken and are expected to be undertaken during the period of validity of the LOA.

(b) If a request for a renewal of a Letter of Authorization indicates that a substantial modification, as determined by NMFS, to the described work, mitigation or monitoring undertaken during the upcoming season will occur, the NMFS will provide the public a period of 30 days for review and comment on the request as well as the proposed modification to the LOA. Review and comment on renewals of Letters of Authorization are restricted to:

(1) New cited information and data indicating that the original determinations made for the regulations are in need of reconsideration, and

(2) Proposed changes to the mitigation and monitoring requirements contained in this subpart or in the current Letter of Authorization.

(c) A notice of issuance or denial of a renewal of a Letter of Authorization will be published in the **Federal Register** within 30 days of a determination.

(d) An LOA issued under § 216.106 of this chapter and § 217.136 for the activity identified in §217.130 may be modified by NMFS under the following circumstances:

(1) *Adaptive management.* NMFS, in response to new information and in consultation with Apache, may modify the mitigation or monitoring measures in subsequent LOAs if doing so

creates a reasonable likelihood of more effectively accomplishing the goals of mitigation and monitoring.

(i) Possible sources of new data that could contribute to the decision to modify the mitigation or monitoring measures include:

(A) Results from Apache's monitoring from the previous year(s).

(B) Results from marine mammal and/or sound research or studies.

(C) Any information that reveals marine mammals may have been taken in a manner, extent or number not authorized by this subpart or subsequent LOAs.

(ii) If, through adaptive management, the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS will publish a notice of proposed LOA in the **Federal Register** and solicit public comment.

(2) NMFS will withdraw or suspend an LOA if, after notice and opportunity for public comment, NMFS determines this subpart is not being substantially complied with or that the taking allowed is or may be having more than a negligible impact on an affected species or stock specified in § 217.132(b) or an unmitigable adverse impact on the availability of the species or stock for subsistence uses. The requirement for notice and comment will not apply if NMFS determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals. Notice would be published in the **Federal Register** within 30 days of such action.

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