

ENVIRONMENTAL ASSESSMENT
OF THE EFFECTS OF PERMIT ISSUANCE FOR
RESEARCH AND RECOVERY ACTIVITIES ON STELLER SEA LIONS

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Abstract: The National Marine Fisheries Service (NMFS) proposes to issue permits and permit amendments for scientific research on Steller sea lions (*Eumetopias jubatus*) in the wild, pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.), and the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.). The purpose of the proposed permits and amendments is to allow an exemption to the moratoria on takes established under the MMPA and ESA. The permits would allow for takes of threatened and endangered Steller sea lions for scientific research purposes. The need for the research is related to monitoring the population status and better understanding the cause(s) of the population decline in order to develop conservation and protective measures to ensure Steller sea lion recovery. The objective of the proposed research is to collect information on life history, foraging behavior, habitat use, physiology, population status and trends, survival and reproductive rates, and condition of Steller sea lions in the North Pacific. Scientific research permits are generally categorically excluded from the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.) requirements to prepare an environmental assessment (EA) or environmental impact statement (EIS) (NAO 216-6). However, when the activities that would be authorized in a scientific research permit would have uncertain environmental impacts or unique or unknown risks, would establish a precedent or decision in principle about future proposals, may result in cumulatively significant impacts, or may have any adverse effects upon endangered or threatened species and their habitats, the preparation of an EA or EIS is required. Because some of the proposed research may result in adverse effects on threatened and endangered Steller sea lions, NMFS determined that further environmental review was warranted to determine whether significant impacts could result from issuance of the proposed permits. Therefore, this document evaluates the relevant effects of a variety of scientific research activities on Steller sea lions under several alternative permitting options.

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CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 Description of Action

The National Marine Fisheries Service (NMFS) has received applications for four new permits and major amendments¹ to five existing permits for takes² of Steller sea lions (*Eumetopias jubatus*) in the wild, pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*), and the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). In response to receipt of these applications, NMFS proposes to issue three new permits and major amendments to the five existing permits.

Applications for new five-year permits were received from The North Pacific Universities Marine Mammal Research Consortium, University of British Columbia, Vancouver, B.C. (NPUMMRC: File No. 715-1784); Dr. Markus Horning, Texas A&M University, Galveston, TX (File No. 1034-1773); the National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle, WA (NMML: File No. 782-1768); and the Alaska Department of Fish and Game, Anchorage, AK (ADF&G: File No. 358-1769). NMFS is deferring a decision on the permit requested by Dr. Horning pending completion of additional environmental analyses.

Applications for major amendments were received from the Alaska SeaLife Center, Seward, AK (ASLC: Permit No. 881-1668); the Aleutians East Borough, Juneau, AK (AEB: Permit No. 1010-1641); the Oregon Department of Fish and Wildlife, Corvallis, OR (ODFW: Permit No. 434-1669); and Dr. Randall Davis, Texas A&M University, Galveston, TX (Permit No. 800-1664). These major amendment applications are to extend the duration of the permits for three years, through 2008.

¹ A major amendment is defined as “any change to the permit specific conditions under §216.36(a) regarding: (i) The number and species of marine mammals that are authorized to be taken, imported, exported, or otherwise affected; (ii) The manner in which these marine mammals may be taken, imported, exported, or otherwise affected, if the proposed change may result in an increased level of take or risk of adverse impact; (iii) The location(s) in which the marine mammals may be taken, from which they may be imported, and to which they may be exported, as applicable, and; (iv) The duration of the permit, if the proposed extension would extend the duration of the permit more than 12 months beyond that established in the original permit.” 50 CFR §216.39(a)(1)

² Under the MMPA, “take” is defined as to “harass, hunt, capture, collect or kill, or attempt to harass, hunt, capture, collect or kill any marine mammal.” “Harass” is further defined 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 a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild [Level B harassment].” [16 U.S.C. 1362(18)(A)] The ESA defines “take” as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

In addition to the application for a new permit for research on Steller sea lions in Alaska (File No. 782-1768), the NMML submitted an application for a permit for research on California sea lions, harbor seals, northern elephant seals, and Steller sea lions on Washington and Oregon. Permit No. 782-1702 was issued to NMML on September 16, 2003 for research on pinnipeds in Washington and Oregon, including aerial, vessel and ground surveys of Steller sea lions and harassment of Steller sea lions incidental to capture and other activities directed at other pinniped species. NMFS deferred a decision on NMML's request to permit capture, sampling, tagging, and hot branding of up to 12 Steller sea lions per year incidental to capture of California sea lions in Washington and Oregon pending completion of additional analyses under NEPA and ESA section 7. Thus, a major amendment to Permit No. 782-1702 to allow capture, sampling, tagging, and hot-branding of Steller sea lions in Washington and Oregon is part of the Proposed Action in this Environmental Assessment (EA). The purposes of the proposed capture of Steller sea lions in Washington and Oregon are: to identify individual animals to determine predation rates on endangered salmonids; to perform disease screening and genetic analyses; and to document movements and migration rates of individuals.

The NPUMMRC (File No. 715-1784), has requested a five-year permit to collect data on sea lion distribution and diet compositions through aerial surveys of sea lion rookeries and haul outs in Southeast Alaska, collection of scat from rookeries and haul outs in Southeast Alaska, conducting behavioral observations of sea lions on rookeries, haul outs and tagged sea lions at sea. The objectives of the study are to understand how diets vary temporally and spatially, and how this variation is related to population trends and abundance, nutritional stress, and commercial fishing activities.

Dr. Horning, Texas A&M University (File No. 1034-1773), has requested a permit to implant dual Life History Transmitters (a.k.a., LHX tags) into up to 80 free-ranging Steller sea lions (> 9 months to 4 years old), using ship-based surgical operations under gas anesthesia. The objectives of the proposed study are (1) to determine age specific survival rates for juvenile Steller sea lions, (2) to determine the time of year for the greatest mortality of juvenile Steller sea lions, (3) to determine approximate locations of mortalities, (4) to analyze ontogenetic and seasonal changes in the dive behavior and dive effort from deceased animals and relate these to environmental conditions and prey abundance as assessed by other groups, (5) to test the effects of body condition and health indicators on survival of juveniles, and (6) to assess the predictive power of parameters measurable in juvenile Steller sea lions for future survival. All animals captured would also be subject to comprehensive "body condition and health assessments" and would be hot-branded for future identification. NMFS proposes to defer a decision on this permit pending completion of additional environmental analyses. However, this activity – implantation of the LHX transmitters – is also part of the proposed amendments to ASLC's Permit No. 881-1668.

The NMML (File No. 782-1768), requests a five year permit to collect information on the life history, foraging behavior, habitat use, physiology, population status and trends, survival and reproductive rates, and condition of Steller sea lions in the North Pacific. To accomplish this, NMML proposes to conduct aerial surveys and ground counts as well as capture, sample, and mark Steller sea lions.

The ADF&G (File No. 358-1769), requests a five year permit to investigate the various hypotheses for the decline of Steller sea lions in western Alaska, including conducting studies of life history traits, physiological investigations of animal condition and time of weaning, and studies of animal movement and dive activity. To accomplish this, ADF&G proposes to conduct aerial surveys and ground counts as well as capture, sample, and mark Steller sea lions.

The ASLC (Permit No. 800-1668-03), has requested permit amendments to extend the duration of the permit and modify some of the objectives, methods, and numbers of Steller sea lions taken. The ASLC states that the overall purpose of their research, including the proposed amendments, is to collect information on the health status (*e.g.*, morphometrics, body composition, immunology, epidemiology, endocrinology, viral serology), physiology (*e.g.*, vitamin requirements, stress responses to capture, handling, and captivity), life history (*e.g.*, ontogenetic and annual cycles, population dynamics), foraging behavior, and habitat use of Steller sea lions. To accomplish their objectives, the ASLC proposes to capture, sample, and mark Steller sea lions in the wild and conduct experimental studies on a number of juvenile Steller sea lions removed from the wild and maintained temporarily at the ASLC.

The AEB (Permit No. 1010-1641-01), has requested an amendment to extend the duration of the permit, with an increase in the number of sea lions that may be harassed during aerial surveys annually. The purpose of the research proposed by the AEB is to provide additional information on seasonal prey consumption by Steller sea lions through analysis of scat collected at rookeries and haulouts along the Alaska Peninsula and Eastern Aleutian Islands, and to improve the accuracy and precision of population indices through expanded aerial and vessel surveys in the western Gulf of Alaska.

The ODFW (Permit No. 434-1669-01), has requested an amendment to extend the duration of the permit for three years, and add a study on the effects of hot-branding. The proposed study of hot-branding does not include a request for an increase in numbers of animals captured and handled. The purpose of the research is to continue monitoring the status of the Steller sea lion population in California, Oregon, and Washington. ODFW proposes to continue their population monitoring and assessment through ground counts and observations as well as by capture, sample, and mark of Steller sea lions.

Dr. Davis, Texas A&M University (Permit No. 800-1664-01), has requested an amendment to extend the duration of the permit and to modify some of the objectives and methods for taking Steller sea lions. The purpose of the research proposed by Dr. Davis is to study the hunting behavior and three-dimensional movements of Steller sea lions. The results would be used, in conjunction with data on satellite remote sensing of hydrographic features, and on the abundance, distribution, and composition of prey at spatial and temporal scales, to address questions about Steller sea lion prey preference, predator/prey relationships, and ecological attributes of foraging habitat.

1.1.1 Background

Steller sea lions were listed as threatened under the ESA in 1990³ under an emergency rule because the numbers of Steller sea lions observed on rookeries in Alaska had declined by 63% since 1985 and by 82% since 1960. A final rule was published on November 26, 1990 and the final listing became effective on December 4, 1990. In 1997, Steller sea lions were classified as two distinct population segments under the ESA. The segment of the population of Steller sea lions west of 144°W longitude was listed as endangered, while the threatened listing was maintained for the remainder of the population in the United States.⁴ The reclassifications were primarily due to information that indicated two genetically differentiated population segments, a continued decline in abundance trends, and population viability analysis models that predicted a 65-100% probability of extinction for the population from Kenai Peninsula to Kiska Island within 100 years if the trends continued.

Despite decades of research and data collection, the cause of the original population decline remains unknown. The prevalent theory for the continued population decline is that it is related to nutritional stress resulting from a change in the abundance and/or distribution of prey species caused by some combination of commercial fisheries activities and environmental changes (Alaska Sea Grant 1993; Loughlin 1998). Because commercial fisheries may compete with Steller sea lions for prey, either directly or indirectly, fishery management plans and federal regulations have been designed to reduce the potential for adverse effects of fisheries on Steller sea lion populations. However, the effectiveness of these plans and regulations is uncertain, as is the exact nature of the effect of fisheries on sea lions.

Approximately 80 million dollars was appropriated during 2000/2001 with Congressional direction to perform research into the cause of the Steller sea lion decline and to develop conservation and protective measures to ensure sea lion recovery.⁵ In addition to funds provided to the State of Alaska, the Alaska SeaLife Center, the University of Alaska, the North Pacific Marine Mammal Consortium, and various agencies within the Department of Commerce, funds were appropriated to the Secretary of Commerce to “develop and implement a coordinated, comprehensive research and recovery program for the Steller sea lion.” These funds were allocated through a competitive grants program called the Steller Sea Lion Research Initiative (SSLRI).

The objective of the SSLRI was to assist eligible individuals and groups in carrying out research into the cause of the decline and to develop conservation and protective measure to ensure recovery of the species. A secondary objective of the SSLRI was that research products contribute immediate, short-term information relevant to adaptive fishery management strategies in the Bering Sea/Aleutian Islands and the Gulf of Alaska groundfish fisheries.

³ 55 FR 12645, April 5, 1990

⁴ 62 FR 24345, May 5, 1997

⁵ See the notice of availability of funds for the Steller Sea Lion Research Initiative, 66 FR 15842, March 21, 2001; see also FY2001 Consolidated Appropriations Act, Pub. L. No. 106-554, Div. A, Chap. 2, Sections 206 and 209, 114 Stat. 2763, 2763A-175 through 2763A-179 (2000).

The Senate appropriations bill identified the following 12 areas for study: (1) available prey species; (2) predator/prey relationships; (3) predation by other marine mammals; (4) interactions between fisheries and Steller sea lions, including the localized depletion theory; (5) regime shift, climate change, and other impacts associated with changing environmental conditions in the North Pacific and Bering Sea; (6) disease; (7) juvenile and pup survival rates; (8) population counts; (9) nutritional stress; (10) foreign commercial harvest of sea lions outside the exclusive economic zone; (11) the residual impacts of former government-authorized Steller sea lion eradication bounty programs; and (12) the residual impacts of intentional lethal takes of Steller sea lions.

1.1.2 Purpose and Need

The purpose of issuance of the proposed permits is to allow an exception to the moratoria on takes established under the MMPA and ESA. The MMPA and ESA prohibit takes of threatened and endangered marine mammals with only a few specific exceptions, including for scientific research and scientific purposes, respectively. The permits under the Proposed Action would allow for takes of threatened and endangered Steller sea lions for scientific purposes.

The need for the proposed action arises from NMFS responsibility to implement both the MMPA and ESA for species under its jurisdiction, including Steller sea lions. The MMPA directs NMFS to ensure that marine mammal species and populations not be permitted to diminish beyond the point at which they cease to be a significant functioning element of their ecosystem. The MMPA also dictates that NMFS take steps to replenish marine mammal species or populations that have already diminished below their optimum sustainable. To accomplish these purposes of the MMPA, NMFS needs to allow research on Steller sea lions that would allow the agency to make informed management decisions. The ESA directs NMFS, as a Federal agency, to use its authority to conserve endangered species and threatened species through the use of all necessary methods, including research and population monitoring.

The Final Recovery Plan for Steller Sea Lions (NMFS 1992)) identified gaps in information that is necessary for scientific resources management of Steller sea lions and specified types of research that should be conducted to collect the necessary information. Scientific research and population monitoring activities are likely to result in taking of Steller sea lions through harassment, harm, pursuit, wounding, trapping, capture, collection, and killing. As these are all activities prohibited under the MMPA, ESA, or both, NMFS needs to issue permits for such research and population monitoring activities as it finds necessary to effect the recovery of Steller sea lions.

1.1.3 Objectives

The objective of permit issuance under section 104 of the MMPA is to authorize taking of marine mammals where such taking is necessary to further a bona fide scientific purpose. The MMPA defines “bona fide research” as

scientific research on marine mammals, the results of which – (A) likely would be accepted for publication in a refereed scientific journal; (B) are likely to contribute to the

basic knowledge of marine mammal biology or ecology; or (C) are likely to identify, evaluate, or resolve conservation problems.

The objective of permit issuance under section 10(a)(1)(A) of the ESA is to allow conduct of otherwise prohibited acts (i.e., taking) for scientific purposes, where such taking will not operate to the disadvantage of such endangered species and will be consistent with the purposes and policy set forth in section 2 of the ESA. The purposes of the ESA are to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in section 2(a) of the ESA. The policy of the ESA is that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA. The ESA defines “conserve” and “conservation” as

to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the ESA] are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Both the MMPA and ESA stipulate that no provision of the statute shall take precedence over any more restrictive conflicting provision of another statute. Whereas the MMPA allows for taking of marine mammals for research that is merely likely to contribute to the basic knowledge of marine mammal biology or ecology in general, the ESA only allows for issuance of permits to conduct research that is likely to further the conservation of the affected species. Under the ESA “conserve” is effectively synonymous with recover since the definition of conserve indicates an ultimate goal of bringing a species to the point where listing under the ESA is no longer necessary for its continued existence. **Thus, the objective of issuing the proposed permits is to allow conduct of bona fide scientific research that will likely contribute to recovery of Steller sea lions.**

In determining which research activities are likely to contribute to the recovery of a listed species, NMFS refers to the species “recovery plan.” A recovery plan, as required under Section 4 of the ESA, describes site-specific management actions necessary to achieve species conservation. The general research needs and objectives identified in the Recovery Plan for Steller Sea Lions (NMFS 1992) include research to: identify habitat requirements and areas of special biological significance; identify management stocks; monitor status and trends of sea lion abundance and distribution; monitor health, condition, and vital parameters; assess and minimize causes of mortality; and investigate feeding ecology and factors affecting energetic status.

NMFS has convened a new recovery team to develop a revised recovery plan for Steller sea lions. Until that plan is finalized, NMFS will rely upon the existing recovery plan, as well as

stock assessment reports, and the best available scientific and commercial data available in determining research needed for recovery of Steller sea lions.

Chapter 2 outlines the information and criteria NMFS considered in determining a reasonable range of alternatives for issuing permits that would allow conduct of bona fide scientific research likely to contribute to recovery of Steller sea lions

1.2 Other EA/EIS that influence scope of this EA

There is one Supplemental EIS (SEIS) and three EAs that influence the scope of this EA. The SEIS, prepared in 2001, evaluated the impacts of Steller sea lion protective measures in the federal groundfish fisheries off Alaska. The first EA, prepared in 1993, evaluated the impacts of hot-branding and other techniques for marking marine mammals. The second EA, prepared in 2002, evaluated the impacts of issuing permits for research on threatened and endangered Steller sea lions. The third EA, a supplement to the 2002 EA and prepared in 2003, evaluated the impacts of issuing amendments to two of the research permits considered under the proposed action of the 2002 EA. Each of the documents is summarized below.

In November 2001, a SEIS was prepared to evaluate Steller sea lion protective measures in the federal groundfish fisheries off Alaska (NMFS 2001). The SEIS evaluated alternatives to mitigate potential adverse effects resulting from competition for fish between Steller sea lions and commercial fisheries, which had been identified as jeopardizing the continued existence of Steller sea lions and adversely modifying their critical habitat (NMFS 2000). This issue is controversial because environmental groups have argued that fisheries compete with Steller sea lions for prey, and this competition has reduced the survival of Steller sea lions, resulting in continued population declines. Conversely, members of the fishing community maintain that the fishing industry is not responsible for the Steller sea lion population decline, and argue that other factors, such as climate change and predation by killer whales, are to blame.

The lack of scientific evidence directly linking fisheries with effects on Steller sea lions, combined with ESA requirements relative to burden of proof, have heightened the controversy over the impacts of commercial fisheries on the status of Steller sea lions. The issues to be resolved in the SEIS included the implications of the three nautical mile no-transit zones that effectively close some Alaska State waters to directed fishing for groundfish, and the design and execution of some experimental research programs intended to investigate the interactions between fisheries and Steller sea lions. NMFS identified a preferred alternative that involved application of different types of management measures by area and fishery. The management measures included fishery-specific closed areas around rookeries and haulouts, as well as season and catch apportionments. Uncertainty about the nature of the effects of fisheries on Steller sea lions, and the effectiveness and socioeconomic impacts of conservation measures intended to minimize the potential for adverse impacts, remain an issue of controversy that has heightened the sense of need for continued and additional research on the causes of the decline of Steller sea lions. The SEIS did not analyze the potential environmental impacts of the activities in the Proposed Action for this EA.

An EA was prepared in 1993 by the NMFS National Marine Mammal Laboratory and NMFS Office of Protected Resources on the effects of branding pinnipeds in Washington, Oregon and

California. The EA was prepared in response to public comments received concerning two applications for permits to hot-brand harbor seals and Steller sea lions. The EA includes a review of some techniques for marking pinnipeds and an assessment of the consequences of each technique. The alternatives presented in the EA were: (1) non-issuance of authorization to permanently mark; (2) issuance of authorization to permanently mark using techniques other than branding; (3) issuance of authorization to brand; and (4) issuance of authorization to brand with conditions. The preferred alternative was issuance of authorization to hot brand with specific conditions to mitigate the effects, including monitoring of the short- and long-term effects of hot-branding on these two species of pinnipeds.

This alternative was preferred for a number of reasons. First, it was determined that a method of permanently marking pinnipeds in a way that allowed reliable identification of individuals was needed for effective monitoring of the status and health of harbor seal and Steller sea lion populations in California, Washington, and Oregon. Although natural marks and plastic flipper tags have been used for identifying individual animals of a variety of species, these alternatives were not considered suitable for this purpose because natural marks may not be consistently identified by researchers, and flipper tags, in addition to being difficult to read from a distance, are not considered permanent markings. The use of tattooing and toe-clipping or web punching as methods of permanent marking were not considered suitable for the study objectives because such marks are not visible from a distance and require frequent recapture of the individuals (and associated disturbance of other animals on a rookery or haulout site) for confirmation of identity. Freeze branding was not considered a viable alternative to hot-branding because: (1) freeze brands require longer contact time with the animal which could result in more stress; (2) animals would have to be anesthetized to obtain legible brands, and the use of anesthesia was cautioned against because of the potential for overdose and overheating; (3) the equipment needed for freeze-branding was considered too cumbersome and logistically difficult in the field; and (4) the unpigmented skin produced by a freeze-brand could be difficult to distinguish from the light pelage of harbor seals and Steller sea lions.

A Finding of No Significant Impact was signed by the Acting Assistant Administrator for Fisheries on July 16, 1993. However, the scope of the EA did not include Steller sea lions in Alaska, nor did it consider the potential cumulative effects of the suite of scientific research activities currently permitted and proposed. In addition, the status of Steller sea lions had changed significantly since the time the EA was prepared: the western population was listed as endangered in 1997 and the population had continued to decline at an average rate of 5% per year (Sease and Taylor 2001), with an 18% decline in pups counted between 1997 to 1998.

In response to applications for permits to conduct research on threatened and endangered Steller sea lions, NMFS prepared an EA in 2002 to evaluate the effects of scientific research on threatened and endangered Steller sea lions (NMFS 2002). The magnitude and intensity of the proposed research was unprecedented, affecting the entire population of Steller sea lions within the U.S. and including multiple intrusive procedures for large numbers of animals. The permit applications were largely related to substantial funding opportunities, made available through Congressional appropriations. The language of the appropriations directed research into the cause of the population decline and to develop conservation and protective measure to ensure recovery of the species, as well as contribute immediate, short-term information relevant to

adaptive fishery management strategies in the Bering Sea/Aleutian Islands and the Gulf of Alaska groundfish fisheries.

The 2002 EA analyzed the effects on Steller sea lions and the environment of a variety of research activities under three permitting alternatives. One alternative was the No Action, in which no new permits or amendments would be issued, thereby keeping the level of impact of research the same as in the previous five years. A second alternative would have directed some of the more intrusive research away from the endangered population of Steller sea lions, thereby reducing the potential for adverse impacts relative to the Proposed Action. The Proposed Action was to issue the permits as requested by the applicants but with a number of mitigation measures. Some of the mitigation measures were intended to minimize the potential for adverse impacts by requiring researchers to use commonly accepted “best practices” in capture and handling of animals. Other mitigation measures of the Proposed Action were intended to limit the duration of adverse impacts while simultaneously collecting information on the effects of the research program on Steller sea lions. In June 2002, a Finding of No Significant Impact was signed by the Assistant Administrator for Fisheries which concluded that the issuance of the permits and permit amendments as described in the Proposed Action, would not significantly impact the human environment. The 2002 EA only analyzed the effects of the research through 2004. The Proposed Action for this EA would allow research activities through 2010.

A supplemental EA was prepared by NMFS in 2003 to assess the impacts of issuing major amendments to two of the permits analyzed under the Proposed Action of the 2002 EA. The 2002 EA did not discuss collection of muscle tissue incidental to remote blubber biopsy sampling under Dr. VanBlaricom’s permit (University of Washington, Permit No. 1016-1651) because the request for that activity was received after the analyses were completed. The 2002 EA also did not discuss the transport of wild Steller sea lions to the ASLC for temporary captivity and associated experiments included in the original application because NMFS determined there was not enough information in the application on the proposed activities to perform an analysis of effects. The 2003 supplemental EA analyzed the impacts of issuing the proposed amendments under the existing mitigation measures of the permits as previously issued, with the addition of a few activity-specific mitigation measures agreed upon by the permit holders. A FONSI was signed on July 21, 2003 and permit amendments were issued. As with the 2002 EA, the supplemental EA only analyzed the effects of the research through 2004. The Proposed Action for this EA would allow research activities through 2010.

1.3 Decision and other agencies involved in this analysis

NMFS must decide whether issuing the proposed permits and permit amendments would be consistent with the purposes and policies of the MMPA, ESA and their implementing regulations, including making certain the permitted activities would not operate to the disadvantage of Steller sea lions. NMFS consults with the Marine Mammal Commission and other appropriate federal or state agencies in reviewing permit applications. However, NMFS has sole jurisdiction for issuance of permits for research on Steller sea lions. Thus, no other agencies are directly involved in this analysis.

1.4 Scoping Summary

Pursuant to requirements of the MMPA, ESA, and implementing regulations (50 CFR §216.33 (d)(1)) NMFS publishes a notice of receipt of applications for permits in the *Federal Register*. The *Federal Register* notice of receipt summarizes the application, including: the purpose of the request, the species and number of marine mammals; the type and manner of special exception activity proposed; the location in which the marine mammals will be taken; and the requested period of the permit. This notice also lists where the application will be available for review and invites all interested parties to submit written comments concerning the application within 30 days of the date of the notice. Concurrent with publication of this notice, NMFS forwards a copy of the application to the MMC for comment (50 CFR §216.33 (d)(2)). The application is also forwarded to NMFS Regional Offices and Science Centers in the area where the proposed research would occur, and to independent scientific experts, as appropriate (50 CFR §216.33 (d)(3)).

There have been three Federal Register notice and comment periods relevant to the applications for permits analyzed in this EA: one in 2002, one in 2003, and one in 2005. A fourth Federal Register notice and comment period in 2000, on an application for a permit for research on harbor seals, is also relevant to the scope of this EA in terms of recent public controversy over a methodology being analyzed in the Proposed Action – hot-branding.

On June 27, 2002, a notice of receipt was published in the *Federal Register* for applications for new permits from ASLC, AEB, ODFW, and Dr. Davis (67 FR 43283). These four permit holders originally requested five-year permits. As a mitigation measure, the permits were limited to two years. Permits may be extended by major amendment. The provisions of 50 CFR §216.33(d) and (e) governing notice of receipt, review, and decision for original applications apply to all proposed major amendments. In addition to requesting their permits be extended for three years, the permit holders (with the exception of AEB) are requesting authorization for new or modified activities and, in some cases, increases in the numbers of animals taken. Thus, these amendment applications are available for public comment and review by the MMC concurrent with this EA.

The aforementioned *Federal Register* notice published in June 2002 announcing receipt of applications from ASLC, AEB, ODFW, and Dr. Davis contained a statement that NMFS had prepared an EA on the issuance of the proposed permits, resulting in a finding of no significant impact. Substantial comments were received from the public and the MMC regarding the analyses in the EA and on the associated permit applications. Their complete comments are attached in Appendix A; the following is a summary of the main issues and concerns raised. Inasmuch as the proposed action in this EA encompasses much of the research analyzed in the 2002 EA, the comments received on the 2002 EA and previous applications are relevant to the scope of this EA.

In their comments on the 2002 EA and associated permit applications, the MMC recommended that NMFS defer final action on the permit applications pending (1) receipt and review, in consultation with the MMC, of supplemental information that addresses the issues discussed in their comments; and (2) clarification, in response to the MMC's comments, of the basis for NMFS finding that the proposed activities, if authorized, would not result in a significant impact

to Steller sea lions. The MMC also recommended a number of conditions to be placed upon the research to minimize adverse impacts on Steller sea lions. In general, the MMC expressed concern that the number of projects, many of which are intrusive in nature, may cumulatively operate to the disadvantage of the western (endangered) Steller sea lion population. The MMC stated it was unable to adequately determine if this would be the case given the information provided in the applications and EA. Specifically, the MMC stated it was not possible to determine (1) the likelihood that the objectives of some of the proposed projects would be achieved; (2) whether, and to what extent, attempts would be made to monitor the short- and long-term adverse effects of the research efforts; and (3) the extent to which the various research activities would be coordinated. The MMC also remained concerned that the cumulative effects of the proposed research, in combination with other factors affecting endangered Steller sea lions, could have significant adverse impacts on the population.

The MMC had numerous specific comments on the findings of the EA, including concerns about the number of mortalities and amount of intrusive research that would be authorized. The MMC observed that NMFS based its finding of no significant impact on the presumed beneficial effects of proposed mitigation measures, the development of a monitoring plan, efforts to limit incidental mortality, and research coordination. The MMC pointed out that while some of the proposed mitigation measures should help prevent detrimental effects of research, the proposed research coordination and monitoring plan will not contribute to reduction of significant effects of the research until such a plan is completed and implemented.

Ultimately, the MMC recommended NMFS reconsider the finding of no significant impact set forth in the 2002 EA and either (1) do a better job of explaining the rationale for such a finding, (2) scale back those research projects that have the potential to result in sea lion mortalities and other adverse impacts such that a finding of no significant impact is more defensible, or (3) prepare an environmental impact statement on the proposed action.

The Humane Society of the United States (HSUS) and the Trustees for Alaska (representing Greenpeace, Oceana, the Sierra Club, and The Ocean Conservancy) also submitted substantive comments regarding the 2002 EA and associated applications for permits. In general, neither group believed NMFS had adequately demonstrated that the impacts of the proposed action would be insignificant or that all research proposals satisfied permit issuance criteria. Both groups expressed concern over the lack of a research coordination and monitoring plan. Like the MMC, both groups were concerned that the proposed permits would cause unnecessary disturbance and increase mortality on the endangered population of Steller sea lions without necessarily contributing significantly to their conservation.

HSUS had additional specific comments on the various permit applications under the proposed action in the 2002 EA. For those proposals involving hot branding, the HSUS suggested researchers should spend more effort trying to re-sight branded animals and analyze the information from re-sighting, rather than continuing to brand animals. If continued or additional branding is authorized, the applicants should be required to monitor post-branding effects and provide evidence of little or no effects of their various activities on rookeries.

HSUS questioned the relevance of some research proposal to Steller sea lion conservation, such as the proposal for attaching cameras to adult females. HSUS specifically expressed concern that the cumulative impacts of the projects proposed by the ASLC were not addressed in the EA. HSUS was also concerned that data collected from live captured animals maintained under a variety of conditions and subject to constant testing at ASLC would result in compromised data.

The Trustees found the cumulative effects analysis in the 2002 EA to be internally confused and inadequate, particularly in that it did not consider the effects of research stress being added to nutritional stress. The Trustees for Alaska stated it was essential that all direct, indirect and cumulative impacts of the research program be carefully evaluated and all projects be shown to be essential for the conservation of the species, given the scope of the research initiative and the anticipated impacts on great numbers of animals in threatened and endangered populations. Overall, the Trustees believed NMFS was frequently arguing from the absence of evidence to an assumption of no harmful effects. No studies have been conducted that would allow NMFS to conclude that the effects of specific research practices are insignificant or benign. The Trustees stated that NMFS had not shown that all projects and procedures in the proposed action are necessary and essential to the conservation of Steller sea lions. They stated that the analysis in the 2002 EA was not adequate to distinguish between projects that merit permitting and those that are unnecessary, duplicative, inhumane, or in violation of other established permitting criteria. The Trustees were concerned about the efficacy of the experimental protocols, sampling regimes, and statistical power to detect effects, as well as the ability of NMFS to coordinate and synthesize the data generated by such a large research program involving many different agencies.

The Trustees were specifically concerned about a number of individual research proposals. As with HSUS, the Trustees expressed serious doubts about the usefulness of additional hot branding in the absence of a long-term monitoring/resighting component. The Trustees commented that the ASLC proposal for capture and retention of wild juvenile sea lions for up to 3 months, during which time “life-history transmitters” would be surgically implanted, is a highly experimental and unvalidated technique. The Trustees stated that using animals from an endangered population as “guinea pigs” to test the viability of the surgical implantation technique is not an appropriate form of research and should not be permitted at this time.

A notice of receipt of the application for a permit from NMML for research on various pinnipeds in Washington and Oregon (File No. 782-1702) was published in the *Federal Register* on September 16, 2003. NMFS deferred a decision on the request to capture, sample, and mark Steller sea lions in Washington and Oregon pending completing of an EA. The MMC recommended approval of the permit provided NMFS require the researchers to follow certain mitigation measures and ensured that activities to be conducted under the permit are coordinated with those of other permit holders who might be carrying out research on the same species in the same areas, as possible, data are shared, to avoid unnecessary duplication of research and disturbance of animals.

A notice of receipt of the applications for new permits from NMML, ADF&G, Dr. Horning, and NPUMMRC and applications for major amendments from AEB, Dr. Davis, and the ASLC was published in the *Federal Register* for public comment (70 FR 17072). The notice also made

available for comment NMFS' draft EA on the impacts of issuance of the proposed permits. The applications and draft EA were forwarded to the MMC for review during the public comment period.

Substantial comments were received from the public and the MMC regarding the applications that are part of the proposed action for this EA. Defenders of Wildlife and HSUS submitted separate comments that raised similar concerns about the adequacy of the analysis in the draft EA. Both organizations were concerned that some or all of the proposed permits did not satisfy all applicable permit issuance criteria under the MMPA and ESA. The HSUS also had specific concerns about the humaneness of various proposed techniques. Both HSUS and Defenders of Wildlife recommended NMFS deny the permits or defer a decision pending completion of an EIS.

The MMC submitted preliminary comments recommending NMFS defer action on the proposed permits pending receipt and review, in consultation with the MMC, of supplemental information from the applicants addressing specific deficiencies in the applications. The MMC also recommended NMFS defer a decision on the proposed permits pending completion of consultation under the ESA and additional justification for concluding that the proposed activities, if authorized, would not result in a significant impact to Steller sea lions.

Issues Within the Scope of this EA

The use of hot-branding to mark marine mammals has historically been a source of public controversy and concern. In 1993, when NMFS proposed to issue permits authorizing hot-branding of harbor seals and Steller sea lions, the Animal Welfare Institute, the Humane Society of the United States, the Animal Legal Defense Fund, the Marine Mammal Center, Earth Island Institute, People for the Ethical Treatment of Animals, the Animal Protection Institute of America, and Dr. David Lavigne, University of Guelph, Ontario, Canada submitted substantive comments in opposition to the permits. The majority of comments received related primarily to concern about the humaneness of the technique, i.e., the degree of pain, suffering, and stress that results from hot branding. No other field research technique has generated as much public interest or debate as that of hot-branding marine mammals.

In 2000, when NMFS published a notice of receipt of an application for research on harbor seals that included a proposal for hot-branding (65 FR 35903, June 6, 2000), the Animal Protection Institute requested that NMFS deny permission to hot brand harbor seals, stating that the technique was cruel, excessive and unnecessary, and suggesting that freeze-branding was a more humane alternative. NMFS also received comments in 2001 from the Animal Welfare Institute protesting the current hot-branding of young Steller sea lions. At a March 2002 meeting of scientists funded under the SSLRI to conduct research on Steller sea lions, some researchers asked why cryo-branding was not used instead of hot branding and some participants were concerned about the ability to estimate survival rates of a population using hot-branded animals when the effects of hot-branding on survival (i.e., brand-related mortality) may be unknown.

Hot-branding of marine mammals is not only controversial in the United states. In April 2000, a long-running study on Australian elephant seals (*Mirounga leonina*) conducted by the Australian Antarctic Division was brought under intense scrutiny as a result of allegations of cruelty by

branding. Following a report for the Tasmanian Parks and Wildlife Service on the practice of hot branding elephant seals, the Australian Environment Minister ordered an end to hot-branding on sub-Antarctic Macquarie Island at the same time that authorities in Tasmania's state government said they would refuse to issue further permits for research.

The case of the Australian elephant seal decline and associated research program is somewhat analogous to that of Steller sea lions in four ways. First, the Australian elephant seal is classified as an endangered species, as is the western population of Steller sea lions. Second, the population of elephant seals at Macquarie Island (~20,000 breeding females in 2000) has been declining since the 1950s, which is a similar time frame to the decline of Steller sea lions. Third, as with Steller sea lions, the decline of southern elephant seals has been linked to effects of commercial fisheries and climate change. Fourth, there has been a long-term research program, which includes branding animals, aimed at addressing the potential effects of increased pressure on food supply from commercial fishing and climate change.

In the case of hot-branding and certain other research activities, some of the controversy seems related to disapproval of the action itself rather than dispute over the likely environmental effects of the action. However, there has also been substantive disagreement over the likely effects of hot-branding and certain other research activities that was not resolved by previous EAs. In addition, there has been controversy over the adequacy of NMFS finding of no significant impact in issuance of the previous Steller sea lion research permits.

Under NEPA, an action may be considered significant based on the degree to which possible effects on the quality of the environment are likely to be highly controversial. This excludes controversy by itself as an indicator of significance of impacts. That is, the controversy must relate to some substantive disagreement over the likely environmental effects of an action rather than simple disapproval of the action itself or dispute over approval of the action per se. However, NAO 216-6 directs NMFS to consider public controversy by itself, even in the absence of substantive dispute over likely effects, in determining the significance of an action's environmental impacts.

Given the concerns expressed by the MMC, HSUS, and Trustees for Alaska regarding the 2002 EA and associated applications, as well as CEQ and NAO 216-6 criteria for evaluating significance of an action, the controversy over issuance of the previous Steller sea lion research program permits should be considered within the scope of this EA.

Because the controversy related to the Proposed Action is not entirely unrelated to the degree of uncertainty over potential impacts, this EA addresses the controversy surrounding potential impacts within the context of the following six substantive environmental impact issues:

1. Is NMFS able to coordinate research under the various permits and ensure that activities are not unnecessarily duplicative and do not result in significant adverse impacts on threatened and endangered Steller sea lions?
2. Is NMFS able to adequately monitor the effects of the overall research program on Steller sea lions?

3. Can NMFS coordinate and synthesize the data generated by the various permit holders in a way that is useful or meaningful for conservation of Steller sea lions?
4. Are all of the research proposals consistent with permit issuance criteria under the MMPA and ESA, such as whether all of the projects are likely to contribute to conservation of Steller sea lions?
5. Does the amount of incidental mortality to be authorized represent a significant adverse impact on Steller sea lions?
6. Is there sufficient information to adequately assess the potential effects of various research activities, either individually or cumulatively, on Steller sea lions as a species?

Within the broad issue of whether the various research proposals are consistent with permit issuance criteria under the MMPA and ESA and, especially, whether all of the projects are likely to contribute to conservation of Steller sea lions, are various more specific issues. For example, consistent with the purposes and policies of the ESA and permit issuance criteria under NMFS implementing regulations, NMFS must determine whether new, experimental, or otherwise unvalidated techniques or protocols should be pursued in threatened or endangered species before the value of the technique or effects of the activity are known. Similarly, NMFS must determine whether there is sufficient information on the effects of individual research activities (such as capture, restraint, blood sampling, hot branding, etc.) to adequately assess the possible synergistic and cumulative effects of multiple activities being conducted on the same individuals. Given the past and recent public comments about the use of hot-branding, NMFS must also evaluate whether hot-branding in particular has had or is likely to have significant adverse effects on Steller sea lions.

In the 2002 EA and 2003 supplemental EA related to research on Steller sea lions NMFS reviewed the available information on the effects of the various research activities under the Proposed Action of this EA. NMFS found that while there was some information on the potential or likely effects of certain research or sampling activities on individual animals, there was little or no information on the effects of some of the more novel activities on individuals, nor was there information on the synergistic and cumulative effects of multiple activities on individuals. Further, there was no information on the population- or species-level effects of a research program of the magnitude and complexity of the Steller sea lion research program under the Proposed Action.

To resolve this information deficit, the mitigation measures of the 2002 EA and 2003 Supplemental EA, which were made conditions of the associated permits, required permit holders to conduct monitoring of Steller sea lions subsequent to research activities and report information on the effects of research on the individuals and populations to NMFS. As is discussed in Chapter 4, there has been insufficient information collected since the 2002 EA to resolve all of the information gaps identified in that analysis. Chapter 4 outlines the approach NMFS will take, given the available information, in determining whether the proposed research permits are likely to have a significant adverse effect on Steller sea lions or the environment.

1.5 Federal permits, licenses, and entitlements necessary to implementation of the action

Persons seeking an exemption from the take moratoria established by the MMPA and ESA must apply for permits. In the case of marine mammals (except walrus, polar bears, sea otters, manatees and dugong), such permit must be obtained from NMFS. Appendix B describes the statutory and regulatory requirements for obtaining a permit for research on marine mammals, including species listed as threatened or endangered. This Appendix also lists the terms and conditions that permit holders must comply with.

In general, NMFS does not require permits, licenses, and entitlements from other federal agencies in order to issue permits for scientific purposes under the MMPA or ESA. However, if NMFS' issuance of permits may adversely affect ESA-listed species under the jurisdiction of the FWS, NMFS is required, under Section 7 of the ESA, to consult with FWS. If FWS determines that permit issuance would result in taking of listed species where such taking is incidental to the purpose of the action and would not be likely to jeopardize the continued existence of listed species under FWS jurisdiction, or destroy or adversely modify critical habitat, FWS may provide an exception for specified levels of "incidental take." An incidental take statement provides an exemption from the taking prohibitions of section 9 of the ESA, but only where NMFS and/or the permit applicant can demonstrate clear compliance with the implementing terms and conditions. These terms and conditions are binding on NMFS and implement reasonable and prudent measures intended to minimize the impact of incidental take on listed species. These measures may in turn become binding conditions of any permit issued by NMFS.

If FWS determines that NMFS issuance of permits would jeopardize the continued existence of listed species under FWS jurisdiction, or destroy or adversely modify critical habitat, FWS may identify reasonable and prudent alternatives. Reasonable and prudent alternatives are actions FWS believes would avoid the likelihood of jeopardy to the species or destruction or adverse modification of critical habitat. NMFS must agree to adopt these measures in issuing permits in order to avoid jeopardy or adverse modification.

While NMFS may not require permits or licenses to implement its permits, some permit holders may need to secure additional federal, state or local permits or licenses to conduct the research specified in their NMFS permit. For example, some of the proposed research could occur within the boundaries of state or national wildlife refuges or parks, such as the Alaska Maritime National Wildlife Refuge (AMNWR). The AMNWR encompasses coastline, islands, reefs, etc. extending from southeast Alaska on the border of British Columbia to Cape Lisburne on the Chukchi Sea. Some islands within the AMNWR have restricted access in order to protect wildlife (including seabirds, Steller sea lions, and other mammals), and special use permits must be obtained from the U.S. Fish and Wildlife Service (USFWS) prior to conduct of certain activities within the refuge. Military clearance is required for access to Adak, Shemya, Amchitka, and Attu Islands in the Aleutian Chain. In addition, NMFS regulatory permit issuance criteria (50 CFR § 216.35) stipulates that "Persons who require state or Federal licenses to conduct activities authorized under the permit must be duly licensed when undertaking such activities." This regulatory requirement is a made a condition of all NMFS permits.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated objective, as well as alternatives eliminated from detailed study. This chapter also summarizes the expected outcomes of, and any related mitigation for, each alternative. Note that expected outcomes of an alternative are not the same as potential impacts. Outcomes relate to how the alternatives would achieve the defined purpose and need. NMFS evaluation of the potential environmental impacts of the alternatives is summarized in Chapter 4.

The Proposed Action is issuance of the requested permits and permit amendments as summarized in Chapter 1 and according to the methods described in applications submitted by the individuals and institutions listed but with several exceptions discussed in section 2.2 below. The Proposed Action also includes mitigation measures that are required by regulation, as listed in Appendix B, and a number of mitigation measures deemed appropriate by NMFS, as discussed in Section 4.5 below.

In general, a reasonable alternative to a proposed action is one that identifies feasible and sensible ways to achieve the stated objective while decreasing the potential environmental impacts relative to the proposed action. As outlined in Chapter 1, the stated objective of the Proposed Action for this EA (issuing the proposed permits and permit amendments) is to allow conduct of bona fide scientific research that will likely contribute to recovery of Steller sea lions. Thus, a reasonable alternative to issuance of the proposed permits and permit amendments is one that allows for collection of information needed to recover Steller sea lions while using methods or mitigating measures that reduce or eliminate adverse environmental impacts associated with the Proposed Action. It is therefore not reasonable to propose alternatives that would either not achieve the objective or would increase the potential for adverse impacts relative to the Proposed Action.

It is also not reasonable to propose alternatives that would be in violation of any permit issuance criteria or otherwise not be consistent with applicable laws. Appendix B lists the criteria for issuance of permits pursuant to the MMPA and ESA. Any proposed alternative must be consistent with all applicable criteria.

A reasonable alternative can be more logistically difficult or expensive than the proposed action as long as it is still technically implementable. Thus, if there are methods or mitigation measures that will reduce the adverse impacts associated with the proposed action, it is reasonable to propose them so long as they are practicable. NMFS has authority to specify any permit conditions deemed appropriate. It is sometimes deemed appropriate to require permit holders to use mitigation measures to minimize the potential for adverse effects of an activity. Thus, a reasonable alternative may simply be the proposed activity as modified by appropriate mitigation measures. In other cases, a reasonable alternative may contain methods that are a substantial deviation from the proposed action, but which have lower impacts than the proposed action. In the later case, NMFS may suggest to an applicant that they use the alternative method. However, the applicant may choose to decline a permit rather than use the alternative method.

To reiterate, a reasonable alternative to the Proposed Action is one that reduces or eliminates adverse environmental impacts associated with the Proposed Action while achieving the stated objective of allowing conduct of bona fide scientific research that will likely contribute to recovery of Steller sea lions. As discussed in Section 1.4, NMFS determined during scoping that there were six significant environmental impact issues related to potential adverse impacts of issuing the proposed permits and permit amendments. These six relevant environmental issues are:

1. Coordinating research under the various permits to ensure that activities are not unnecessarily duplicative and do not result in significant adverse impacts on threatened and endangered Steller sea lions.
2. Adequately monitoring the effects of the overall research program on Steller sea lions.
3. Coordinating and synthesizing the data generated by the various permit holders in a way that is useful or meaningful for conservation of Steller sea lions.
4. Ensuring that all the research proposals are consistent with permit issuance criteria under the MMPA and ESA, such as whether all the projects are likely to contribute to conservation of Steller sea lions.
5. Determining whether the amount of incidental mortality to be authorized represents a significant adverse impact on Steller sea lions.
6. Determining whether there is sufficient information to adequately assess the potential effects of various research activities, either individually or cumulatively, on Steller sea lions as a species.

In selecting reasonable alternatives, NMFS considered alternative research methods and additional mitigation measures that would reduce or eliminate the adverse environmental impacts associated with the proposed permits and permit amendments. Because controversy is an issue within the scope of this EA, a reasonable alternative to issuance of the proposed permits and permit amendments is also one that would reduce or eliminate the controversy.

As previously stated, the objective of the Proposed Action in this EA is to allow conduct of bona fide scientific research that will likely contribute to recovery of Steller sea lions. There is a need for better information on the effects of human activities on Steller sea lions so that informed management decisions can be made about whether or how to modify human activities to promote recovery of Steller sea lions.

Some activities are not actually designed or intended to resolve the questions surrounding the effects of human activities on the population decline but they may still be appropriate to permit. For example, it is appropriate to monitor the abundance and distribution of Steller sea lions. Even though such monitoring cannot resolve conservation problems, it may identify problems that need to be addressed. Similarly, while studies related to environmental causes of the decline (e.g., climate change, predation, disease) will not lead directly to management actions because such factors are beyond our ability to control, these studies may also help identify conservation problems for the species. It is important to investigate these hypotheses in order to understand the Steller sea lions' environment and to know how human activities may exacerbate these effects.

In addition to the reasonable range of alternatives, the action agency is required to evaluate a No Action alternative. The No Action alternative serves as the baseline against which the potential impacts of the Proposed Action and other alternatives are evaluated. A No Action alternative can either mean the agency does nothing or that the agency continues the current management activities but does not undertake the proposed project. The latter case is also called the status quo. In this EA, the No Action alternative maintains the status quo of agency actions related to Steller sea lions, which means continuing to implement existing management activities related to recovery of Steller sea lions while denying the proposed new permits and permit amendments.

In addition to the No Action alternative and the Proposed Action, NMFS identified four other alternatives likely to fulfill the stated objective while reducing adverse impacts and controversy. Each of the six alternatives are described below.

2.1 Alternative 1 – No Action: No New Permits or Amendments

Under this alternative, which is the “status quo” alternative, the permits held by the ASLC, Dr. Davis, AEB, ODFW, and NMML (Permit No. 782-1702) would not be amended, and new permits would not be issued to NMML (File No. 782-1768), ADF&G, Dr. Horning, or NPUMMRC. However, research would continue through June 2009 under the various existing permits listed in Table 1 below. In addition, NMFS would continue to implement existing management measures for Steller sea lion conservation including maintaining the general prohibitions of section 9 of the ESA and current regulatory provisions (50 CFR 223.202 and 226.202) related to discharge of firearms, no approach in buffer areas, and designated critical habitat with associated restrictions. Under the “status quo” there would also still be research related to hypotheses for the Steller sea lion decline that does not require MMPA or ESA permits or result in “taking” of Steller sea lions, including investigations of climate change and oceanographic factors affecting prey abundance and distribution.

Table 1 lists all current permits that allow takes of Steller sea lions. These 13 permits combined currently authorize takes of Steller sea lions throughout their range in the U.S. (including California, Oregon, and Alaska) by a variety of research activities involving both level A and level B harassment as defined under the MMPA.

Of the permits in Table 1 for research on Steller sea lions, the research methods vary from import/export of tissue samples, to remote observations and aerial surveys, to capture and sampling of free-ranging animals by a variety of methods. Details of the various protocols for each permit can be found in the applications submitted by the permit holders and on file with NMFS.⁶

Four of the permits listed in Table 1 are not for research on Steller sea lions specifically but authorize takes of Steller sea lions incidental to research on other marine mammals. These permit are 662-1661 (Dena Matkin), 473-1700 (Janice Straley), 1049-1718 (Kate Wynne), and 782-1702-03 (NMML). The first three of these permits are for research on killer whales and other cetaceans. The fourth permit is to monitor the status of harbor seals, California sea lions,

⁶ The applications are available upon request from the NMFS Office of Protected Resources, Division of Permits, Conservation and Education, 1315 East-West Highway, Silver Spring, MD 20910.

and northern elephant seals in California, Washington and Oregon. In all four cases, research directed at other species may occur in the vicinity of, and result in harassment of, Steller sea lions.

The permits held by Mystic Aquarium (Permit No. 42-1642-03) and John Wise (Permit No. 1008-1637-01) for research and enhancement activities on Steller sea lions are not considered in the cumulative impacts of scientific research on Steller sea lions in the wild because they do not involve additional direct takes of sea lions in the wild, but rather rely on captive animals and blood and tissue samples collected in the field by other permit holders during their permitted activities.

The tables in Appendix C list the types of research-related takes for each permit by age, sex, location, and season. A general description of the methods for and purpose of the activities authorized in these permits can be found in Appendix D. The specific methods and purposes of individual permits can be found in the applications on file with NMFS Permits, Conservation and Education Division.

Table 1: Current Permits for Research on Steller Sea Lions

Permit Number	Permit Holder	Expiration Date
662-1661	Dena Matkin	May 31, 2009
473-1700	Janice Straley, University of Alaska - Southeast	June 30, 2009
1049-1718	Kate Wynne, University of Alaska - Fairbanks	June 30, 2009
774-1714	NMFS Southwest Fisheries Science Center	June 30, 2009
881-1668-04	Alaska SeaLife Center	December 30, 2005*
434-1669-02	Oregon Dept. Fish & Wildlife (ODFW)	December 30, 2005*
800-1664-02	Randall Davis	December 30, 2005*
1010-1641-01	Aleutians East Borough (AEB)	December 30, 2005*
782-1532-03	National Marine Mammal Laboratory (NMML)	December 30, 2005*
358-1564-06	Alaska Dept. Fish & Game (ADFG)	June 30, 2005
42-1642-02	Mystic Aquarium	October 15, 2006
1008-1637-00	John Wise	October 31, 2006
782-1702-03	NMML	September 30, 2008

* The permits currently held by NMML (Permit No. 782-1532), ASLC, Dr. Davis, AEB, and ODFW would remain valid through December 2005. The permits held by NMML, ASLC, Dr. Davis, AEB, and ODFW were originally issued to expire on December 31, 2004. NMFS extended the expiration date of these permits by 12 months, to December 31, 2005, through a minor amendment. The purpose of this amendment was to keep the permits valid while NMFS completed processing of the pending applications for amendments involving changes in objectives, protocols, and numbers. These minor amendments to extend the expiration date did not authorize additional takes of Steller sea lions beyond those authorized for 2004.

2.2 Alternative 2 – Proposed Action: Issuance of Proposed Permits and Amendments with exceptions

As indicated above, the Proposed Action is issuance of the requested permits and permit amendments as summarized in Chapter 1 and according to the methods described in applications submitted by the individuals and institutions listed, with four major exceptions.

First, as indicated in Chapter 1, NMFS is deferring a decision on the permit requested by Dr. Horning to surgically implant dual LHX transmitters into free-ranging Steller sea lions. Dr. Horning currently has a permit to conduct validation studies for the transmitters in California sea lions. While the preliminary results of that study indicate surgical implantation of the tags can be accomplished successfully, the sample size for the study to date is only four animals. In addition, none of the tags implanted into California sea lions have yet been retrieved so there is no confirmation that they have or will perform as anticipated. Thus, NMFS proposes to allow Dr. Horning to surgically implant the LHX transmitters into the Steller sea lions captured by the ASLC under Permit No. 881-1668 for their “transient juvenile” program. This interim step in Dr. Horning’s study would proceed as proposed in the application originally submitted by the ASLC in 2002. Thus, rather than allowing surgical implantation of the tags in the field, where animals would be released within hours post-operatively, NMFS proposes to allow the surgery at the ASLC’s facility where the animals could be monitored by veterinary and husbandry staff for several days post-operatively and treated should there be any complications from the surgery.

The second major exception to the requested permits and amendments is that NMFS proposes to defer a decision on the use of Telazol to capture, restrain, or anesthetize female sea lions that may be pregnant or lactating pending further analysis of the potential impacts of the drug on sea lion fetuses or nursing pups. Thus, NMFS does not intend to grant a permit to NMML, Dr. Davis, or the ASLC to use Telazol in female Steller sea lions that may be pregnant or lactating. As a consequence, NMFS also does not propose to amend ASLC’s permit to allow collection of milk samples from adult female Steller sea lions at this time.

The third major exception to the requested permits and amendments is that NMFS proposes to defer a decision on the injection of oxytetracycline, an antibiotic, as proposed by ADF&G to label whiskers of Steller sea lions. NMFS needs additional time to gather and evaluate information on the potential environmental impacts of this activity.

The fourth major exception to the requested permits and amendments is that NMFS proposes to defer a decision on remote biopsy sampling of Steller sea lions as proposed by the ASLC. NMFS previously permitted remote biopsy sampling of adult Steller sea lions under Permit No. 1016-1651 issued to Dr. Vanblaricom, University of Washington. ASLC proposes to remotely biopsy sample animals as young as two months old. The proposed remote biopsy sampling of animals has an unknown risk of serious injury and mortality. Although blubber samples were successfully collected from adult Steller sea lions in 2002-2003 using darts fired from a cross-bow, there was insufficient post-sampling monitoring to conclude a lack of post-sampling mortality or serious injury. Animals sampled remotely were not marked and could not be followed for any substantial period of time to ensure survival or normal behavior post-sampling. At this time, NMFS has insufficient information on the likely effects of this activity to determine whether it meets all applicable permit issuance criteria.

All permits and amendments would contain such terms and conditions as are required under the MMPA, ESA, and NMFS implementing regulations as well as mitigation and monitoring conditions deemed appropriate by NMFS. The specific mitigation measures proposed by NMFS are discussed in Section 4.5 and Appendix B.

Thus, under the Proposed Action four of the existing permits would be extended through December 2008 and four new permits would be issued with expiration dates in 2010. Further, the permits listed in Table 1 above with expiration dates in 2006, 2008, and 2009 would remain in effect through their expiration dates. Table 2 summarizes the number of permits and expiration dates for the Proposed Action.

Table 2: Proposed Permits for Research on Steller Sea Lions

Note: Permits in bold-font represent those that would be issued or amended under the Proposed Action.

Permit Number	Permit Holder	Expiration Date
662-1661	Dena Matkin	May 31, 2009
473-1700	Janice Straley, University of Alaska - Southeast	June 30, 2009
1049-1718	Kate Wynne, University of Alaska - Fairbanks	June 30, 2009
774-1714	NMFS Southwest Fisheries Science Center	June 30, 2009
42-1642-02	Mystic Aquarium	October 15, 2006
1008-1637-00	John Wise	October 31, 2006
881-1668-04	Alaska SeaLife Center	December 30, 2008
434-1669-02	Oregon Dept. Fish & Wildlife (ODFW)	December 30, 2008
800-1664-02	Randall Davis, Texas A&M University	December 30, 2008
1010-1641-01	Aleutians East Borough (AEB)	December 30, 2008
358-1564-06	Alaska Dept. Fish & Game (ADFG)	May 31, 2010
782-1702-03	NMML	September 30, 2008
782-1768	NMML	May 31, 2010
715-1784	North Pacific Universities Marine Mammal Research Consortium (NPUMMRC)	May 31, 2010

As with the No Action alternative, under the Proposed Action NMFS would continue to implement existing management measures for Steller sea lion conservation including maintaining the general prohibitions of section 9 of the ESA and current regulatory provisions (50 CFR 223.202 and 226.202) related to discharge of firearms, no approach in buffer areas, and designated critical habitat with associated restrictions. Under the Proposed Action there would also still be research related to hypotheses for the Steller sea lion decline that does not require MMPA or ESA permits or result in “taking” of Steller sea lions, including investigations of climate change and oceanographic factors affecting prey abundance and distribution.

The MMPA and ESA require NMFS to impose certain conditions on permit holders. These conditions, which are described in Appendix B , are therefore also part of the Proposed Action. In addition, NMFS has identified a number of mitigation and monitoring measures that could be considered “best practices” as they are intended to reduce the potential for adverse effects of specific activities. These “best practices” are described in section 4.5 and would be made a condition of all permits and permit amendments issued under the Proposed Action alternative.

Under the Proposed Action there would be an increase in the total number of permits that authorize takes of Steller sea lions. In addition, there would be an increase in the total number of takes of Steller sea lions permitted per year as well as by some activities already permitted under the No Action. In addition, issuing permits under the Proposed Action would allow takes of Steller sea lions by activities not previously permitted under the No Action alternative. Further, there would be an increase in the frequency of some take activities under the Proposed Action compared to the No Action alternative. Appendix E lists the types of research-related takes for each permit by age, sex, location, and season under the Proposed Action. The following is a summary of how takes under the Proposed Action would differ from takes under the No Action Alternative (as listed in Appendix C).

Aerial Surveys – The Proposed Action would include issuance of new permits to NMML, ADF&G, and NPUMMRC and an amendment to the permit held by AEB, which would represent an overall annual increase in the number of Steller sea lions that could be harassed during aerial surveys as well as an increase in the number of permits authorizing this activity. The new permits and amendment issued under the Proposed Action would be valid through 2010 and 2008, respectively, which would also represent an increase in the total number of Steller sea lions that could be harassed by this activity over time because existing permits for this activity under the No Action alternative expire in 2005 and 2008.

Vessel surveys – The Proposed Action would include an amendment to the permit held by AEB to increase the number of Steller sea lions that could be harassed annually by vessel surveys. This amendment would also extend the duration of the activity for three years, which represents an increase in the total number of Steller sea lions that may be harassed by this activity over time.

Ground Counts and scat collection – Issuance of new permits to NMML and ADF&G and an amendment to the permit held by ODFW would represent an overall annual increase in the number of Steller sea lions that could be harassed during ground counts and scat collection. The new permits and amendment issued under the Proposed Action would be valid through 2010 and 2008, respectively, which would also represent an increase in the total number of Steller sea lions that could be harassed by this activity over time because existing permits for this activity under the No Action alternative expire in 2005.

Incidental disturbance during scat collection, capture/sampling activities and observational activities – Issuance of new permits to NMML, ADF&G, the NPUMMRC, and Dr. Horning and amendments to the permits held by ODFW, Dr. Davis, ASLC, and AEB would represent an overall annual increase in the number of Steller sea lions that could be harassed incidental to various activities. The new permits and amendments issued under the Proposed Action would be valid through 2010 and 2008, respectively, which would also represent an increase in the total number of Steller sea lions that could be harassed by this activity over time because existing permits for this activity under the No Action alternative expire in 2005.

Incidental disturbance during studies of other marine mammal species – The issuance of new permits and amendments under the Proposed Action would not change the number of Steller sea lions authorized to be harassed incidental to studies of other marine mammal species.

Tracking animals at sea – Issuance of a permit to NPUMMRC would add annual takes of up to 30 Steller sea lions 1-3 years old by harassment during tracking from vessels. Note that while this activity was conducted in 2004 under ADF&G Permit No. 358-1564 (using takes allocated for “Incidental disturbance during scat collection, capture/sampling activities and observational activities”), issuance of this permit would authorize this activity for four years beyond the expiration of the existing permit in the No Action alternative.

Incidental mortality – There would be an increase in the number of research-related mortalities allowed due to issuance of a new permit to NPUMMRC and amendments to the permits held by ASLC and NMML (No. 782-1702). Note that while issuance of new permits to ADF&G and NMML (No. 782-1768) and amendments to the permit held by ODFW, AEB, and Dr. Davis would include incidental mortalities, the numbers would be the same as in the No Action alternative and thus would not represent a net increase in the number of incidental mortalities authorized annually. However, since the permits currently held by NMML (No. 782-1532), ADF&G, ODFW, AEB, and Dr. Davis are due to expire in 2005 whereas the new permits under the Proposed Action would be valid through 2010, issuance of the new permits and amendments would represent an increase in the total number of authorized mortalities over time.

Capture and Restraint – There would be a change in the ages of animals captured/restrained under some permits as well as an increase in the total number of sea lions captured per year compared to the No Action alternative. The new permits issued to NMML and ADF&G would not change the total number of sea lions captured per year compared to the No Action alternative. However, since these new permits would be valid through 2010, the total number of sea lions captured over time would be greater than under the No Action where authority to capture sea lions would cease in 2005. The permit amendment issued to NMML’s Permit No. 782-1702 would allow annual capture of up to 12 sea lions of any age older than one year. The permit amendment issued to Dr. Davis would allow him to capture animals younger than a year old, and recapture each animal up to three times.

Blood collection (venipuncture) – Issuance of new permits and permit amendments under the Proposed Action would represent an increase in the total number of sea lions that could be blood sampled annually. It would also represent an increase in the total number of animals sampled over time because the permits would be valid longer than under the No Action alternative. Under some permit amendments, the minimum age of animals sampled would be reduced.

Muscle biopsy (restrained animals) – Issuance of new permits to ADF&G and NMML would represent an increase in the number of Steller sea lions that could be muscle biopsied annually. It would also represent an increase in the total number of animals sampled over time because the permits would be valid longer than under the No Action alternative. In addition, the minimum age of animals biopsied would be lower under the Proposed Action.

Skin biopsy – Issuance of new permits to ADF&G and NMML and an amendment to the permit held by ODFW would represent an increase in the number of Steller sea lions biopsied annually. It would also represent an increase in the total number of animals sampled over time because the permits would be valid longer than under the No Action alternative.

Blubber biopsy – Issuance of new permits to NMML (No. 782-1768) and ADF&G and amendments to the permits held by NMML (No. 782-1702), Dr. Davis, and ASLC would represent an increase in the number of Steller sea lions biopsied annually. It would also

represent an increase in the total number of animals sampled over time because the permits would be valid longer than under the No Action alternative. In addition, the minimum age of animals sampled under some permits would be reduced.

Fecal loops and skin or mucousal swabs – Issuance of new permits to ADF&G and NMML (No. 782-1768) and amendments to permits held by NMML (No. 782-1702), ASLC, and Dr. Davis would represent an increase in the number of Steller sea lions sampled annually. It would also represent an increase in the total number of animals sampled over time because the permits would be valid longer than under the No Action alternative. In addition, the minimum age of animals sampled under some permits would be reduced.

Tooth extraction – Issuance of new permits to NMML and ADF&G and amendments to permits held by ASLC and Dr. Davis would represent an annual increase in the number of Steller sea lions that could have a tooth pulled. It would also represent an increase in the total number of animals sampled over time because the permits would be valid longer than under the No Action alternative. In addition, the minimum age of animals sampled under some permits would be reduced.

Collect vibrissae, hair and nails – Issuance of new permits to NMML (No. 782-1768) and ADF&G and amendments to permits held by NMML (No. 782-1792) and Dr. Davis would represent an increase in the number of Steller sea lions that could be taken by this activity. It would also represent an increase in the total number of animals sampled over time because the permits would be valid longer than under the No Action alternative.

Flipper tagging – Issuance of new permits to NMML (No. 782-1768) and ADF&G and amendments to permits held by NMML (No. 782-1792), ASLC, ODFW, and Dr. Davis would represent an annual increase in the number of Steller sea lions that could be flipper tagged. It would also represent an increase in the total number of animals tagged over time because the permits would be valid longer than under the No Action alternative.

Hot-branding – Issuance of new permits to NMML (No. 782-1768) and ADF&G and amendments to permits held by NMML (No. 782-1792), ASLC, ODFW, and Dr. Davis would represent an annual increase in the number of Steller sea lions that could be hot-branded. It would also represent an increase in the total number of animals tagged over time because the permits would be valid longer than under the No Action alternative.

Attachment of scientific instruments (e.g. VHF and SLTDR tags) – There would be an annual increase in the total number of Steller sea lions having some type of scientific instrument attached. There would also be an increase in the total number of Steller sea lions having some type of scientific instrument attached over time because the new permits and amendments would be valid longer than under the No Action alternative.

Surgically implant data loggers in juvenile sea lions held at ASLC – Issuance of an amendment to ASLC's permit would represent the addition of this new activity, which is not currently authorized under the No Action alternative.

Insert stomach temperature transmitter – Issuance of an amendment to the permit held by ASLC would represent the addition of this new activity, which is not currently authorized under the No Action alternative.

Bioelectric Impedance Analysis (BIA) – There would be an annual increase in the total number of Steller sea lions undergoing this activity. There would also be an increase in the total number of Steller sea lions undergoing this activity over time because the new permits and amendments would be valid longer than under the No Action alternative.

Inject stable isotopes and administer labelled markers – There would be an annual increase in the total number of Steller sea lions receiving injections of stable isotopes. There would also be an increase in the total number of Steller sea lions receiving injections of stable isotopes over time because the new permits and amendments would be valid longer than under the No Action alternative. Under the No Action alternative, the stable isotope used is deuterium oxide. Issuance of an amendment to the permit held by ASLC would add injections of doubly labeled water (deuterium oxide and oxygen 18) and ¹⁵[N]Glycine as well as administering Cr²O³ and Co-EDTA.

Inject Evans blue dye – There would be an annual increase in the total number of Steller sea lions undergoing this activity. There would also be an increase in the total number of Steller sea lions undergoing this activity over time because the new permits and amendments would be valid longer than under the No Action alternative.

Enema or stomach intubation – There would be an annual increase in the total number of Steller sea lions undergoing this activity. There would also be an increase in the total number of Steller sea lions undergoing this activity over time because the new permits and amendments would be valid longer than under the No Action alternative.

Portable metabolic chamber measurements – Issuance of a permit to ADF&G would represent an annual increase in the total number of Steller sea lions undergoing this activity. There would also be an increase in the total number of Steller sea lions undergoing this activity over time because the new permit would be valid longer than the existing permit under the No Action alternative.

Ultrasonic imaging – Issuance of new permits to ADF&G and NMML (No. 782-1768) and amendments to permits held by ASLC and Dr. Davis would represent an annual increase in the total number of Steller sea lions undergoing this activity. There would also be an increase in the total number of Steller sea lions undergoing this activity over time because the new permits and amendments would be valid longer than the existing permits under the No Action alternative.

Removal from wild with temporary captivity at ASLC and associated sampling – The number of juvenile sea lions captured per year for transport to the ASLC for temporary captivity and associated studies would remain the same as in the No Action alternative. However, a variety of new activities, as well as an increase in the frequency of previously authorized activities, would be permitted under the amended permit, as indicated in Table 2 of Appendix E. In addition, the permit amendment would extend the duration of the permit thereby increasing the total number of Steller sea lions subjected to temporary captivity and associated activities over time.

2.3 Alternatives Considered but Eliminated from Detailed Study

In addition to the No Action and Proposed Action, NMFS considered three alternative ways of issuing permits for research on Steller sea lions. The main difference among the three alternatives is in the extent and type of adverse impacts that could result from research. All three alternatives were identified as likely to result in reduced impacts from research compared to both the No Action and Proposed Action. These alternatives were also identified as likely to contribute to conservation of Steller sea lions.

2.3.1 Temporary moratorium on all research affecting Steller sea lions

Under this alternative, there would be no takes of Steller sea lions for scientific research permitted. This would mean suspending any existing permits that authorize takes of Steller sea lions and denying future applications for such takes for a given time. The intent of a moratorium on research takes would be to remove the potential adverse effects of scientific research on Steller sea lions for a period of time.

Under this alternative, NMFS would continue to implement existing activities intended to recover Steller sea lions or reduce the impacts of human activities on the population, including maintaining the general prohibitions of section 9 of the ESA and current regulatory provisions (50 CFR 223.202 and 226.202) related to discharge of firearms, no approach in buffer areas, and designated critical habitat with associated restrictions. Under this alternative, there would still be research related to some of the hypotheses for the Steller sea lion decline, including investigations of climate change and oceanographic factors affecting prey abundance and distribution. However, no research directly affecting Steller sea lions would occur, thereby eliminating the adverse effects of research and any controversy associated with the effects of the research.

This alternative was not considered further because it would not allow collection of information on population distribution and abundance trends (such as that from aerial surveys) or vital rates. This information is important in monitoring the status of the species and may be used in identifying conservation problems.

2.3.2 Non-Intrusive Population Monitoring Only

Under this alternative, which would effectively be a moratorium on intrusive research on Steller sea lions in the wild, the existing permits would be amended to suspend authorization for takes of an intrusive nature, and new permits or permit amendments would not authorize intrusive research. This option would effectively limit research to activities such as behavioral observations and aerial or vessel surveys that do not have the potential to injure Steller sea lions or Steller sea lion stocks in the wild. There would be no takes from capture and sampling activities, and all scat collection would be limited to vacant haulouts. The number of Steller sea lion taken, and the frequency and distribution of takes by aerial and vessel under this alternative would be the same as under the Proposed Action alternative. Placing observers and establishing or servicing remote monitoring equipment would not result in additional takes, because access would be accomplished from routes that would not disturb sea lions. All mitigation measures identified under the previous alternatives would be required for activities under this alternative.

As with the No Action, Proposed Action, and Temporary Moratorium alternatives, NMFS would continue to implement existing management measures for Steller sea lion conservation including maintaining the general prohibitions of section 9 of the ESA and current regulatory provisions (50 CFR 223.202 and 226.202) related to discharge of firearms, no approach in buffer areas, and designated critical habitat with associated restrictions. There would also still be research related to hypotheses for the Steller sea lion decline, including investigations of climate change and oceanographic factors affecting prey abundance and distribution.

This alternative would reduce the potential adverse impacts relative to the Proposed Action by eliminating any of the effects associated with intrusive research, including injury, infection, and mortality. This alternative would also reduce the controversy associated with the research by excluding the most controversial activities identified during scoping.

This alternative was not considered further because permit holders and applicants have indicated it is important for them to conduct the intrusive activities to obtain information on the physiology, foraging behavior, health and reproductive status of individual sea lions.

2.3.3 Redirect “Experimental” Intrusive Research to Surrogate Species

Under this alternative, takes from population monitoring via aerial surveys, ground counts, remote monitoring, and behavioral observations would be allowed as with the No Action and Proposed Action Alternatives. The only research of an intrusive nature that would be permitted for the western (endangered) population would be that directly related to conservation and management needs, such as collection of genetic samples for determination of population structure or blood samples for health assessment. All other intrusive research would be restricted to the eastern (threatened) population, or a non-ESA listed surrogate species, such as California sea lions.

The decision as to whether intrusive research should be performed on the western population, eastern population, or a surrogate species would be related to how the proposed research would fit into the overall Steller sea lion recovery plan framework or is otherwise related to something that is important to the recovery of the species. Thus, consistent with the issuance criteria under the MMPA and ESA, as outlined in Sections 1.5.2 and 1.5.3, which require that research be conducted consistent with the purposes and policies set forth in section 2 of the ESA, proposed intrusive research that would contribute significantly to identifying, evaluating, or resolving conservation problems for the species or stock would be allowed on both the eastern and western stocks. Intrusive research that would contribute to fulfilling a research need or objective identified in the Recovery Plan would begin with the eastern stock until the potential adverse effects are known to be negligible. This would include testing new techniques and equipment, some of which would also be re-directed to surrogate species prior to authorization on Steller sea lions. Intrusive research that would contribute significantly to understanding the basic biology or ecology of the species (and is therefore not likely to vary among populations or stocks), or contribute significantly to fulfilling a critically important research need not directly related to conservation and management, would be limited to the eastern stock and/or surrogate species.

Until a new Recovery Plan is released, research permits would be granted based on goals identified in the current Recovery Plan, and in consideration of the research objectives identified by the peer-reviewed workshops, conservation measures in the Biological Opinion on the Alaska groundfish fishery (NMFS 2000), and in consultation with the Marine Mammal Commission and other experts consulted during the permit application review process. All mitigation measures identified under the Proposed Action would be required for activities under this alternative. In addition, the timing, frequency, or location of some takes would be re-distributed according to the criteria described for this alternative.

As with all other alternatives, NMFS would continue to implement existing management measures for Steller sea lion conservation including maintaining the general prohibitions of section 9 of the ESA and current regulatory provisions (50 CFR 223.202 and 226.202) related to discharge of firearms, no approach in buffer areas, and designated critical habitat with associated restrictions. There would also still be research related to hypotheses for the Steller sea lion decline, including investigations of climate change and oceanographic factors affecting prey abundance and distribution.

This alternative would reduce the potential adverse impacts relative to the Proposed Action by minimizing some of the effects associated with intrusive research, including injury, infection, and mortality, in the endangered population. This alternative would also reduce the controversy associated with the research by re-directing the most controversial activities identified during scoping into implementation on non-listed species.

This alternative was not considered further because various permit holders and applicants have indicated it is either not logistically feasible for them to conduct their activities with species or populations other than those they have requested or because the nature of the population decline makes it important to conduct their investigations in the population experiencing the decline.

2.4 Comparison of Alternatives

To the extent that the Proposed Action alternative would authorize all the same methods as the No Action alternative, and much of the research would be conducted by the same permit holders, the expected outputs of both the Proposed Action and No Action alternatives are likely to be the same. The Proposed Action includes some activities not permitted under the No Action Alternative. However, based on available information the expected outputs of these actions (in terms of information beneficial to recovery of Steller sea lions) are not anticipated to be substantially different than those of the No Action alternative.

The principal differences between the No Action and Proposed Action alternatives are in the duration of the permits and the number of animals that are allowed to be taken annually. Under the No Action alternative, all permits authorizing capture and intrusive activities on Steller sea lions in the wild would expire by the end of 2005. Under the Proposed Action alternative, some permits authorizing capture and intrusive activities on Steller sea lions in the wild would be valid through 2010.

Under both the Proposed Action and No Action alternatives, permits would allow Steller sea lions to be taken year-round and throughout their range in the US. Thus, the magnitude of the two alternatives, in terms of the geographic and temporal extent of the research and the number or kinds of research activities, is not substantially different.

CHAPTER 3 AFFECTED ENVIRONMENT

This chapter presents baseline information necessary for consideration of the alternatives, and describes the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented. The effects of the alternatives are discussed in Chapter 4.

3.1 Social and Economic Environment

Although economic and social factors are listed in the definition of effects in the NEPA regulations, the definition of human environment states that “economic and social effects are not intended by themselves to require preparation of an EIS.” However, an EIS or EA must include a discussion of a proposed action’s economic and social effects when these effects are related to effects on the natural or physical environment. The social and economic effects of the Proposed Action mainly involve the effects on the people involved in the research, as well as any industries that support the research, such as charter vessels, and suppliers of equipment needed to accomplish the research. There are no significant social or economic impacts of the Proposed Action interrelated with significant natural or physical environmental effects. Thus, the EA does not include any further analysis of social or economic effects of the proposed action.

3.2 Physical Environment

The action area being considered encompasses the entire range of Steller sea lions in California, Washington, Oregon, and Alaska, including the eastern (threatened) and western (endangered) populations. This area includes both state waters and the United States Exclusive Economic Zone off the coasts of California, Washington, Oregon, and Alaska. However, most of the research under the Proposed Action would focus on animals located on rookeries and haulouts, and in waters surrounding these areas. The action area would also include the facilities at the ASLC in Alaska.

There are places of special importance to marine species within the action area, including National Wildlife Refuges (NWR), designated critical habitat, and Essential Fish Habitat. Each of these areas is discussed below.

3.2.1 Sanctuaries, Parks, Historic Sites, Etc.

Some of the proposed research would occur within NWRs. NWRs are maintained by the USFWS, which may require holders of NMFS permits for research on Steller sea lions to obtain special use permits for certain activities within the boundaries of a Refuge. Refuges are established for three purposes: (1) the restoration, preservation, development, and management of wildlife and wetlands habitat; (2) the protection and preservation of endangered or threatened species and their habitat; and (3) the management of wildlife and wildlands to obtain the maximum benefits from these resources.

The Alaska Maritime NWR includes over 3,000 islands, islets, rocks, pinnacles, and headlands from northwest Alaska into the Bering Sea and along 4,800 miles of Alaska’s coastline and the Aleutian chain. Most of the refuge (2.64 million acres) is designated as wilderness and has the

most diverse wildlife species of all the refuges in Alaska, including between 15 to 30 million birds (80% of all Alaska seabirds, including species of puffins, kittiwakes, murre, petrels, auklets, murrelets, and gulls) representing about 55 species. In addition to Steller sea lions, marine mammals such as harbor seals, walrus, sea otters, polar bears, and whales are also common within the refuge. Other animals within the refuge include bald eagles, peregrine falcons, bears, caribou, musk oxen, river otters, and foxes. Further, the refuge contains many Aleut archeological sites as well as remnants of the only World War II battles fought on U.S. soil. Military clearance is required to visit some islands of the Aleutian Chain (Adak, Shemya, Amchitka, and Atfu).

3.2.2 Designated Critical Habitat

Critical habitat has been designated for Steller sea lions in California, Oregon, and Alaska (50 CFR 226.202). Critical habitat for Steller sea lions includes all major rookeries in California, Oregon, and Alaska and major haulouts in Alaska. Steller sea lion critical habitat in Alaska includes a terrestrial zone that extends 0.9 km (3,000 feet) landward from the baseline or point of each major rookery and major haulout. Critical habitat in Alaska also includes an air zone extending 0.9 km (3,000 feet), measured vertically from sea level, above the terrestrial zone of each major rookery and major haulout. In addition, for major rookeries and major haulouts east of 144° W. longitude, critical habitat includes an aquatic zone that extends 0.9 km (3,000 feet) seaward in State and Federally managed waters from the baseline or basepoint of each major rookery and major haulout. In California and Oregon, critical habitat includes an air zone extending 0.9 km (3,000 feet), measured vertically from sea level, above areas historically occupied by sea lions at each major rookery. In addition, critical habitat in California and Oregon includes an aquatic zone that extends 0.9 km (3,000 feet) seaward in State and Federally managed waters from the baseline or basepoint of each major rookery. Steller sea lion critical habitat also includes three special aquatic foraging areas in Alaska, including the Shelikof Strait area, the Bogoslof area, and the Segum Pass area.

No critical habitat has been designated for any endangered whale species other than right whales. Right whale critical habitat has only been designated in the Atlantic Ocean (50 CFR 226.203), which is not within the action area for the proposed action. Critical habitat has been designated for several species of salmon and steelhead in California, Oregon, Idaho, and Washington (50 CFR 226.204, 226.205, 226.210, and 226.212). Critical habitat for salmon and steelhead includes all river reaches accessible to the listed salmon within the range of the Evolutionary Significant Units listed, and consists of water, substrate, and adjacent riparian zone of estuarine and riverine reaches in specified hydrologic units and counties.

3.2.3 Essential Fish Habitat

Congress defined Essential Fish Habitat (EFH) as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. 1802(10)). The EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act offer resource managers means to accomplish the goal of giving heightened consideration to fish habitat in resource management. EFH has been designated for many of the fish species within the action area. Details of the designations and descriptions of the habitats are available in the Pacific Fishery Management Plans. Activities that have been shown to affect EFH include disturbance

or destruction of habitat from stationary fishing gear, dredging and filling, agricultural and urban runoff, direct discharge, and the introduction of exotic species. The Proposed Action does not include any of these types of activities and is therefore not likely to have an impact on any designated EFH.

3.3 Biological Environment

In addition to the target species, Steller sea lions, a wide variety of marine species could be found within the action area, including other marine mammals, sea turtles, invertebrates, teleost and elasmobranch fish, and sea birds. Since most of the activities in the Proposed Action could occur year-round and anywhere within the range of Steller sea lions in the U.S., this section describes the marine organisms that may be present at any given time from California through Alaska.

3.3.1 Invertebrates

A variety of invertebrates may be present within the action area including assorted mollusks, crustaceans, sponges, and jellyfish. Some of these invertebrates are captured in the Alaska groundfish fishery but are of minor commercial importance. Some of the invertebrates within the action are of commercial importance, including Alaska king, Tanner, and snow crabs.

In general, marine invertebrates are not likely to be exposed to aerial surveys or research activities directed at Steller sea lions on land. Some unknown number of invertebrates could be exposed to the vessels used for vessel-based research activities and transportation to and from rookeries and haul-outs. Any effects of vessel traffic on invertebrates would likely be related to short-term changes in water turbidity (caused by the passage of the vessel and operation of its propeller) and any discharge from the vessel. The number of vessels associated with both the No Action and Proposed Action alternatives is small compared to the existing level of vessel traffic in the action area and would likely result in immeasurable impacts on the invertebrate community.

In Alaska, there are restrictions on vessel traffic around Steller sea lion rookeries and some haulouts. Research permits allow an exemption to these restrictions. In these instances, there would be an increase in the amount of vessel traffic in some areas under the Proposed Action relative to the No Action.

An unknown number of invertebrates could be exposed to some of the drugs and chemicals, as well as any metabolic by-products of these substances, that would be administered to Steller sea lions under both alternatives because these substances may make their way into the water. The stable isotopes in both alternatives are biologically inert.

3.3.2 Fish

There are dozens of fish species that may occur within the action area, including anchovy, tuna, swordfish, herring, sardine, mackerel, rockfish, flatfish (e.g., sole, flounder, turbot, halibut), and various species of sharks and skates. A number of the fish species within the action area are exploited commercially. In Alaska, these include pollock, Pacific cod, Atka mackerel, flatfish,

rockfish, sablefish, squid, skate, shark, and octopi. There are also five species of Pacific salmon (pink, chum, sockeye, coho and Chinook), plus steelhead trout, within the action area.

As with invertebrates, fish in general are not likely to be exposed to aerial surveys or research activities directed at Steller sea lions on land. Some unknown number of fish could be exposed to the vessels used for vessel-based research activities and transportation to and from rookeries and haul-outs. Any effects of vessel traffic on fish would likely be related to short-term changes in water turbidity (caused by the passage of the vessel and operation of its propeller) and any discharge from the vessel. The number of vessels associated with both the No Action and Proposed Action alternatives is small compared to the existing level of vessel traffic in the action area and would likely result in immeasurable impacts on the invertebrate community.

In Alaska, there are restrictions on vessel traffic around Steller sea lion rookeries and some haulouts. Research permits allow an exemption to these restrictions. In these instances, there would be an increase in the amount of vessel traffic in some areas under the Proposed Action relative to the No Action.

An unknown number of fish could be exposed to some of the drugs and chemicals, as well as any metabolic by-products of these substances, that would be administered to Steller sea lions under both alternatives because these substances may make their way into the water. The stable isotopes in both alternatives are biologically inert.

3.3.3 Sea Turtles

Endangered green, leatherback, loggerhead, and olive ridley sea turtles may occur within the proposed action area.

As with invertebrates and fish, sea turtles are not likely to be exposed to aerial surveys or research activities directed at Steller sea lions on land. Some unknown number of sea turtles could be exposed to the vessels used for vessel-based research activities and transportation to and from rookeries and haul-outs. Any effects of vessel traffic on sea turtles would likely be related to short-term changes in water turbidity (caused by the passage of the vessel and operation of its propeller) and any discharge from the vessel. The number of vessels associated with both the No Action and Proposed Action alternatives is small compared to the existing level of vessel traffic in the action area and would likely result in immeasurable impacts on the invertebrate community.

An unknown number of sea turtles could be exposed to some of the drugs and chemicals, as well as any metabolic by-products of these substances, that would be administered to Steller sea lions under both alternatives because these substances may make their way into the water. The stable isotopes in both alternatives are biologically inert.

3.3.4 Seabirds

There are dozens of species of seabirds that may be found within the action area, including brown pelicans, boobies, storm petrels, alcids, shearwaters, puffins, kittiwakes, murrelets, gulls, and terns.

Different species of birds may be exposed to the land, air and water-based research activities to varying degrees depending on the time of year and location of the research. Since some seabirds nest on islands used by Steller sea lions as rookeries and haulouts, these birds could be exposed to aerial surveys, vessel-surveys, and land-based activities.

3.3.5 Marine Mammals

In addition to Steller sea lions, other marine mammals (both pinnipeds and cetaceans) may be present in the action area. NMFS publishes annual stock assessment reports for the marine mammals under its jurisdiction. Except for sea otters, details on the distribution, abundance, productivity and annual human-caused mortality for the marine mammal species that may occur in the action area can be found in the U.S. Pacific Marine Mammal Stock Assessment reports and the Alaska Marine Mammal Stock Assessment Reports, which are available in PDF from the NMFS website. The most current information on the status of the sea otter is available from the U.S. Fish and Wildlife Service, which has jurisdiction for this species. The following is a brief summary of the status of the target species of the Proposed Action, Steller sea lions.

A detailed description of the distribution, population status and trends, and life history of Steller sea lions is contained within the Final Supplemental Environmental Impact Statement on Steller Sea Lion Protective Measures in the Federal Groundfish Fisheries Off Alaska (NMFS 2001) and in the Fisheries Management Plan Biological Opinion (NMFS 2000). The following is a brief summary of the relevant details. The estimated minimum population of Steller sea lions is 69,434, which includes animals in California, Washington, Oregon, and British Columbia. This represents a total of 30,403 sea lions in the eastern population, of which 5,991 are pups, and 39,031 sea lions in the western population, of which 9,373 are pups (NMML 2000).

The rate of decline in the western stock averages 5% per year but has not been uniform: in the eastern Gulf of Alaska the rate of decline is 10.52% per year while in the eastern Aleutian Islands, the rate is 1.75% per year (Loughlin and York, in press). Conversely, trend counts indicate the size of the eastern stock has increased at an average rate of 5.9% per year between 1979 and 1997 (Calkins et al. 1999). It has been hypothesized that the overall decline of the Steller sea lion population is consistent with a 10-20% annual decrease in juvenile survival.

Steller sea lion males are typically sexually mature at three to seven years, but are not usually large enough to compete for females until they are nine to 11 years old (Pitcher and Calkins 1981; Gisiner 1985). Females, which tend to be less than one-third the size of males at maturity, are sexually mature at three to six years. Male Steller sea lions rarely live beyond their mid-teens, while females may live up to 30 years old. Adult males and females congregate at rookeries in the spring of each year, where most adult females will give birth and be mated.

Females give birth to a single pup between mid-May and mid-July, with the highest frequency of births occurring during mid-June (Calkins and Pitcher 1982; Merrick 1987; Chumbley et al. 1997). Newborn pups weigh about 20 to 30 kg and, although they are somewhat precocious compared to terrestrial mammals, are not yet able to swim or maneuver well on land. Behavioral observations and analyses using allometric relationships indicate that the majority of Steller sea lion pups are weaned at 11 months old (or when they have reached a mass equivalent to 1/3 of

maternal mass), or just prior to their mother giving birth to a new pup (Pitcher and Calkins 1981; Lee et al. 1991).

The transition to nutritional independence (i.e. weaning) is believed to be a gradual process during which pups begin to develop foraging skills and supplement milk from their mother with prey items captured in the water. Pups probably do not begin making true foraging dives, where prey is captured and consumed, until near weaning, but they may begin playing in the water near their rookery at a much younger age. However, pups are not adept swimmers until they are at least 2 months old (Sandegren 1970). There is little information on the behavior of Steller sea lions during the period between weaning and when they have become sexually mature and return to a rookery to reproduce.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508). Thus, the significance must be analyzed in several contexts, such as society as a whole, the affected resources and regions, and the affected interests. Intensity refers to the severity of the impact and the following 10 specific aspects that must be considered: (1) beneficial and adverse effects; (2) effects on public health and safety; (3) unique characteristics of the geographic area (*e.g.*, proximity to historic or cultural resources, park lands, and ecologically critical areas); (4) degree to which possible effects are likely to be highly controversial; (5) degree to which possible effects are highly uncertain or involve unique or unknown risks; (6) precedent-setting actions; (7) whether the action is related to other actions with individually insignificant but cumulatively significant impacts; (8) loss or destruction of significant scientific, cultural, or historical resources (including adverse effects on sites listed in the National Register of Historic Places); (9) degree to which action may adversely affect an endangered or threatened species or designated critical habitats; and (10) violation of Federal, state, or local laws imposed for protection of the environment.

NMFS has, through NAO 216-6, established agency procedures for complying with NEPA and the implementing regulations issued by the Council on Environmental Quality. NAO 216-6 specifies that issuance of scientific research permits under the MMPA and ESA is among a category of actions that are generally exempted (categorically excluded) from further environmental review, except under extraordinary circumstances. Specifically, when a proposed action that would otherwise be categorically excluded is the subject of public controversy based on potential environmental consequences, has uncertain environmental impacts or unknown risks, establishes a precedent or decision in principle about future proposals, may result in cumulatively significant impacts, or may have an adverse effect upon endangered or threatened species or their habitats, preparation of an EA or EIS is required.

NEPA does not define what constitutes an adverse effect on a threatened or endangered species. However, issuance of a permit under the MMPA and ESA authorizes “takes” of marine mammals and threatened or endangered species, respectively. Given the definitions of take, harassment, and harm under the MMPA and ESA (see footnotes number 1 and 2), a “take” as authorized under a permit issued pursuant to the MMPA or ESA could be considered an “adverse effect” on the affected individual animal under NAO 216-6. In the case of the proposed action, the “take” or adverse effect could occur via harassment (both “Level A” and “Level B” as defined under the MMPA), capture, collection, and mortality.

An adverse effect on an individual marine mammal does not necessarily translate into an adverse effect on the population or the environment. In order for an adverse effect on an individual member or some number of individuals of a species to result in an adverse effect on the species as a whole, the effects on the individuals must result in reduced reproduction or survival of the individual that would consequently result in an appreciable reduction in the likelihood of survival or recovery for the species. Therefore, in order for the proposed action to have an adverse effect on a species, the exposure of individual animals of a given species to the various

research activities would first have to result in direct mortality or serious injury that would result in mortality of the exposed individual, or disrupt essential behaviors of the exposed individual, such as feeding, mating, or nursing, to a degree that the individual's likelihood of successful reproduction or survival was substantially reduced. Second, that mortality of an individual or substantial reduction in the individual's likelihood of successful reproduction or survival would have to result in a net reduction in the number of individuals of its species. In other words, the loss of the individual or its future offspring would not be offset by the addition, through birth or emigration, of other individuals into the population. Third, that net loss to the species would have to be reasonably expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the listed species in the wild. The effects of the proposed action on threatened and endangered species are further evaluated through the interagency consultation process pursuant to Section 7 of the ESA, as described in Section 4.4 below.

A description of the potential short-term, or immediate, effects on individual Steller sea lions from the various types of research activities authorized and proposed can be found in Appendix F. The following is a description of these effects in the context of the magnitude of the two alternatives. In other words, the following analysis takes into consideration the potential effects of a specific activity on an individual animal and assesses the potential impacts to the species of the number of animals (by age, sex, and life history stage where possible) that would be affected over time. Thus, the following assessment considers both the synergistic effects (interaction of effects of discrete activities such that the total effect is greater than the sum of the effects of individual activities) and cumulative effects (increases in the effect of activities due to the successive addition of effects) of the alternatives.

There have been no studies dedicated to documenting and assessing the effects of research on Steller sea lions or other marine mammals at a population level, nor on the synergistic or cumulative effects of various research activities and other human-related impacts on individual marine mammals or populations. Thus, the potential cumulative effects on individual marine mammals and stocks from both of the alternatives are based on assessment of the best available information on effects on individuals extrapolated to the population given the relative takes per stock per year.

4.1 Effects of Alternative 1 – No Action

For the most basic level of effects analysis, the activities authorized under this alternative can be divided into two broad categories: non-intrusive and intrusive. Non-intrusive activities are those that do not result in physical contact between researchers or research tools and Steller sea lions. Thus, aerial surveys, vessel surveys, and observational activities are considered non-intrusive. Anything that requires capture and handling (including blood and tissue sampling, marking, attachment of instruments, administering chemicals) or some form of physical contact with the animal (including remote biopsy sampling, remote marking, and remote darting for sedation) is considered intrusive.

In general, the risks of adverse effects (such as stress, pain, injury, or mortality) on individual sea lions are greater from intrusive activities than from non-intrusive activities. There are two primary reasons for this difference. First, wild animals are often stressed by the presence or close approach of humans, whether on foot or in some kind of vehicle. Since non-intrusive

activities typically take place at a greater distance from the animals than intrusive activities, the potential for this type of stress is reduced relative to intrusive activities.

Second, many intrusive activities have an inherent risk of injury or mortality, either direct or indirect. Injuries result in varying degrees of pain and stress. Some injuries may increase an individual animal's risk of infection. Some injuries or secondary infections can lead to reduced fitness or mortality of individual animals. Even those injuries that do not result in infection or death have physiological costs associated with healing. Whether the cost of wound healing leads to reduced fitness would depend on many factors including the body condition of the animal at the time of the injury, the time of year (as it relates to thermoregulatory and other homeostatic demands), and the availability of adequate nutrients.

It should be noted that even non-intrusive activities might have significant adverse effects, particularly if they are chronic or severe. Although studies of the effects of human disturbance in the marine environment are somewhat limited, the literature on effects of human disturbance of wildlife in general, including that from the terrestrial animal world, indicates there is reason to assume that human disturbance, even when it does not result directly in physical injury, can have significant adverse impacts on a marine mammal or marine mammal populations. Studies of stress in humans suggest that chronic stress can have serious consequences, such as weakened immunity leading to more frequent illness and shortened life span.

In evaluating the available information on the effects of research, it is important to distinguish between detectable or measurable responses or effects and those effects or responses that cannot be seen or measured. Some animals may exhibit overt behavioral responses to certain activities, and the effect, or cost, of these responses can be assessed. However, a lack of observable or otherwise detectable response to a research activity should not, in the absence of supporting documentation, be taken as a lack of effect.

Given the type of activities permitted under the No Action alternative, it is likely that some Steller sea lions would experience stress, pain, and injury, to varying degrees. It is also likely that some Steller sea lions would die as a result of the research activities. Annual reports from permit holders provide an account of the number of observed mortalities. In the past two years (2003-2004), the number of reported mortalities did not exceed 10 per year. The number of observed and reported mortalities may or may not represent the number of actual mortalities.

Annual reports for permit holders also provide an account of the number of animals captured and sampled as well as the number of animals harassed incidental to these activities. During 2003-2004, no permit holders reported responses of animals to research activities that were different from those described in Appendix F.

The "transient" juvenile program at the ASLC, which began with the capture of 2 animals in 2003, was the first of its kind. In the supplemental EA prepared by NMFS prior to issuance of the permit for this activity, NMFS considered the possible effects of this activity. In general, it was assumed the animals would either suffer reduced fitness (either in the form of reduced body condition or behavioral deficiencies that would affect survival) as a consequence of their

captivity and associated experimental protocols or they would leave the ASLC in better body condition than their free-ranging cohorts because of access to more food during captivity.

The ASLC brought a total of 12 juvenile sea lions into their facilities between August 2003 and December 2004 for the “transient juvenile” program. All of the animals were released and followed via satellite tags for at least several weeks. While this demonstrates that ASLC can successfully capture, maintain, and sample sea lions for up to three months, it does not establish whether such activities have been adverse or beneficial to the individual sea lions. Each of the sea lions brought to the ASLC was subjected to various handling and sampling protocols, each with some risk of adverse effects.

Because the ASLC’s activities with temporary captive sea lions have not included a control group of animals that are simply housed and fed but not handled or sampled, it is not possible to know whether, how, or to what extent the captivity alone (without the potential adverse effects of the various studies, blood and tissue sampling, anesthesia, handling, tagging and marking activities) has affected individual sea lions. In addition, the ASLC did not conduct all of the permitted activities with the transient animals, so there is no information available on the cumulative effects of the full range of permitted activities on individual animals.

4.2 Effects of Alternative 2 – Proposed Action

The activities under the Proposed Action include all of the activities under the No Action alternative. In that respect, some of the likely effects of the Proposed Action are the same as discussed for the No Action alternative. However, the Proposed Action would extend the duration of these effects for three to five years beyond those of the No Action alternative, which has permits expiring in 2005. In addition, the Proposed Action includes activities not authorized under the No Action alternative.

There is an increased risk of serious injury or mortality associated with some of the proposed research activities that are part of the Proposed Action but not the No Action alternative. For example, the proposed surgical implantation of transmitters has an inherent risk of serious injury and mortality in the short-term and an unknown risk of long-term effects on fitness and survival. A validation study has yet to be completed that would provide information to evaluate the likely rates of serious injury and mortality or potential for reduced fitness from this activity. The total number of Steller sea lions that would have tags surgically implanted would not exceed 48 over the course of the next three years.

There is insufficient information on the effects of the transient program under the No Action alternative to adequately assess the likely effects of adding all of the new protocols and additional handling under the Proposed Action. However, the total number of sea lions that may be subject to the various protocols would be limited to 16 animals per year over the next three years for a total of 48 juvenile Steller sea lions affected by this suite of activities under the Proposed Action.

4.3 Comparison of Alternatives

The significance of the effects of an alternative is determined according to the context in which the action will occur and the intensity of the action. The context includes where the action will occur and what specific resources are affected. The intensity of the action includes the type of impact (beneficial or adverse), the duration of the impact (short or long), the magnitude of the impact (minor versus major), and the degree of risk associated with the impact (high versus low level of probability of an impact occurring). The intensity of a given action is also determined relative to cumulative impacts.

In that the action area for both alternatives extends from California through Alaska and some actions under both Alternatives would occur within designated critical habitat for Steller sea lions, as well as within the boundaries of the Alaska Maritime National Wildlife Refuge, the geographic context of both Alternatives is of similar importance. The context of both alternatives is also similar in that all the same specific resources would be affected.

The intensity of the two alternatives in terms of potential beneficial impacts – *i.e.*, producing information relative to the objective – is similar because the types of activities under each alternative are largely the same. The duration, and thus intensity, of the impacts would be longer under the Proposed Action because the subject permits under the No Action would expire in 2005 whereas under the Proposed Action they would be valid through 2010. The potential magnitude of the impacts and probability of adverse impacts under the Proposed Action is greater compared to the No Action alternative because the Proposed Action would authorize additional research effort with associated potential for disturbance, injury, and mortality of Steller sea lions.

The Proposed Action, which would increase the number of permits, and therefore the number of takes of marine mammals, increases the potential for adverse impacts through repeated harassment of individual marine mammals compared to the No Action alternative. There is insufficient information to assess the likely duration or extent of ultimate impacts of the Proposed Action relative to the No Action. However, it is reasonable to assume ultimate effects of the Proposed Action would continue further in time than those of the No Action because the activities themselves would occur over a longer period.

The total number of animals affected by all types of research activities is greater under the Proposed Action. However, the magnitude of the effects of the Proposed Action relative to those of the No Action alternative cannot be assessed solely on the basis of numbers. An evaluation of magnitude must consider both the number of animals exposed as well as the likely consequences of the exposure. The potential for adverse effects on individual animals is somewhat greater under the Proposed Action, which would increase the total number of procedures performed on individual sea lions and increase the number of times some individual sea lions would be exposed to certain research activities (including anesthesia and tissue sampling).

4.4 Compliance with ESA

After reviewing the current status of Steller sea lions, the environmental baseline for the action area, the effects of the proposed issuance of marine mammal permits and amendments described

in the Proposed Action, and cumulative effects, it is NMFS' biological opinion that issuance of the permits and amendments, as described in the Proposed Action, is not likely to jeopardize the continued existence of threatened or endangered Steller sea lions, nor would it result in the destruction or adverse modification of designated Steller sea lion critical habitat.

4.5 Mitigation measures

NMFS and MMC believe there is a need for close coordination of the research to avoid unnecessarily duplicative research or unnecessary adverse effects on the animals. All marine mammal research permits issued by NMFS contain conditions requiring permit holders to coordinate their activities with those of others doing similar work on the same species and/or in the same area or seasons to avoid unnecessary duplication of research and adverse effects on the marine mammals.

There are a number of measures that are considered "good practice" and that are commonly followed by qualified, experienced personnel to minimize the potential risks associated with various of the proposed procedures. In addition to the measures identified by researchers in their applications, all NMFS marine mammal research permits contain conditions intended to minimize the potential adverse effects of the research activities on the animals. These conditions are specific to the type of research authorized and the species involved. The following mitigation measures are based on information in the literature, and from the researchers themselves, about the effects of particular research techniques and the responses of animals to the activities.

Mitigation for aerial surveys: Survey planes should approach from a kilometer or more offshore and without banking, which is believed to reduce the incidence of hauled out animals entering the water prior to the survey photographs, because the animals would only be within hearing range of the plane for 1-2 minutes.

Mitigation for capture and restraint: These procedures should be performed or directly supervised by qualified personnel and it is recommended that an experienced marine mammal veterinarian be present to carry out or provide direct on-site supervision of all activities involving use of anesthesia and sedatives. Researchers should carry out activities efficiently, such that the total time that researchers are occupying the rookery/haul out, and total number of times a site is disturbed, are minimized. Stays on rookeries longer than five hours are justified only when it prevents additional disturbance of the site on subsequent days. Permit holders should use personnel experienced in capture and sampling techniques to complete the activities as quickly as possible.

To avoid respiratory distress, ischemia (restricted blood flow), or nerve damage, it is considered important that animals be properly positioned, i.e. ventrally recumbent, during anesthesia (Dierauf 1990). Respiration and pCO₂ should be monitored and oxygen administered, as needed to avoid prolonged breath holding during gas anesthesia, which can result in cardiac hypoxia (lack of oxygen to the heart muscle). Qualified personnel (i.e., experienced veterinarians, biologists, or other highly trained personnel) should be prepared to control or assist ventilations when using Valium, isoflurane, or Tiletamine. An emergency kit with equipment and supplies for responding to complications or emergencies should be readily available. The animal's body

temperature should be closely monitored and steps taken to avoid hypo- and hyperthermia (e.g. cooling with water or covering to keep warm, as necessary). Drug doses should be calculated on the basis of the researcher's best estimate of an animal's lean body mass and metabolic rate.

If an animal is showing signs of acute or protracted alarm reaction (e.g., overexertion, constant muscle tensions, abnormal respiration or heart rate) that may lead to serious injury, capture myopathy, other disease conditions, or death, research-related procedures must immediately cease and the animals should be monitored or the symptoms treated as determined appropriate by the Principal Investigator, Co-Investigator, or attending veterinarian. Similarly, caution should be exercised when approaching all Steller sea lions, particularly mother/pup pairs, and efforts to approach and handle a particular animal or mother/pup pair should be immediately terminated if there is any evidence that the activity(ies) may be life-threatening.

To reduce the risk of unintentional injection of drugs by projectile syringe (darts) into blubber, intravenously, or into vital organs, the length of the needle used should be appropriate for the size of the animal and its blubber thickness. In addition, care should be taken in darting animals to avoid accidental drownings of animals that either flee into the water prior to induction or slump into pools of water at induction.

Researchers should ensure that animals that have been captured or are recovering from anesthesia have an opportunity to recover without undue risk of injury from other animals. Animals should be processed in groups small enough that all animals can be adequately monitored (e.g., 2 physically restrained but not chemically immobilized animals per observer). Handling and restraint time should be minimized to the maximum extent practicable. For example, if multiple procedures are to be performed on the same animal, there should be enough qualified personnel available to conduct as many activities simultaneously as possible without resulting in undue stress on the animal. When pups are collected, they should be sufficiently separated from each other and monitored to ensure that they are not suffocating, being crushed, or aspirating milk.

There is no indication that fostering is common in Steller sea lions. It is reasonable to assume that if a lactating female dies as a result of research, her dependent pup will starve. Therefore, researchers should take reasonable steps to identify pups of lactating females before attempting to immobilize a lactating female. In the event a lactating female dies or is seriously injured as a result of the research activities, the orphaned pup, when it can be identified, should be humanely provided for (i.e. salvaged [placed in a Stranding facility for rehabilitation and eventual release], or if salvage is not possible, euthanized).⁷

To the maximum extent practical without causing further disturbance of the rookery/haulout, researchers shall conduct post-handling monitoring of animals captured or sampled, for signs of acute stress or injury. To the maximum extent practical without causing further disturbance of

⁷ Pups humanely euthanized would count against the total number of animals authorized for incidental mortality under the permit. If the dependent pup of a lactating female could not be identified prior to sampling the female, and the female dies as a result of the research, the pup should be assumed dead and counted against the total number of animals authorized for incidental mortality under the permit. Similarly, if a pregnant female dies as a result of the research, the fetus should also be counted against the total number of animals authorized for incidental mortality.

animals, researchers shall also monitor rookeries/haul outs following any disturbance (e.g., capture activities) to determine if any animals have been injured or pups abandoned.

Mitigation for intrusive sampling procedures (e.g., blood collection, biopsy, tooth pulling, fecal loops/culture swabs, enemas, stomach intubation, BIA): These procedures should be performed or directly supervised by qualified personnel and it is recommended that an experienced marine mammal veterinarian be present to carry out or provide direct on-site supervision of all activities involving use of anesthesia and sedatives.

To the maximum extent practical, the animal should be restrained on a smooth surface. An attending veterinarian or other qualified personnel should be present during these procedures to monitor the physiologic state of each animal (e.g., by monitoring respiratory rate and character, heart rate, body temperature, and behavioral response to handling and sampling procedures). Animals that are physically restrained but continue to struggle or show signs of stress should be released immediately to minimize the risk that continued stress would lead to capture myopathy.

The volume of blood taken from individual animals should not exceed 1 ml blood per kg body mass, either as a single blood draw or over the course of several days.⁸ Qualified researchers should not need to exceed three attempts (needle insertions) per animal when collecting blood. When conducting isotopically labeled water trials, additional needle insertions may be allowed, but the use of a catheter is strongly encouraged to minimize impacts on the animal. If an animal cannot be adequately immobilized for blood sampling, particularly when drawing blood from the intervertebral sinus, efforts to collect blood should be discontinued to avoid the possibility of serious injury or mortality from stress.

Sterile, disposable needles, biopsy punches, etc., should be used to minimize the risk of infection and cross-contamination. Where disposable equipment is not available (i.e., enema and stomach tubes, flipper punch, dental elevators) liquid chemical sterilants should be used with adequate contact times (as indicated on the product label) to affect proper sterilization, and instruments should be rinsed with sterile water or saline before use on animals. Care should be taken to avoid contact of equipment disinfectants with an animal's skin, and disinfectant agents should be changed periodically to avoid growth of resistant strains of microorganisms.

Only experienced, qualified personnel (veterinarians, biologists) who know how to properly pass a stomach tube to avoid introduction of liquid into the trachea,⁹ should attempt this procedure. Because proper cold sterilization takes some time, researchers should bring an adequate number

⁸ Based on veterinary established guidelines for safe removal of blood from research animals. [McGuill, M.W. and A.N. Rowan. 1989. Biological effects of blood loss: implications for sampling volumes and techniques. *ILAR News* 315-20. and Morton, D.B. et al. 1993. Removal of blood from laboratory animals and birds. First report of the BVA/FRAME/RSPCA/UFAW joint working group on refinement. *Laboratory Animals* 27: 1-22.]

⁹ The proper procedure is to first estimate the length of the stomach tube necessary by measuring the distance to the stomach along the outside of the animal's body. The tube should be smoothly inserted into the mouth, down the left side of the animal's throat, into the stomach. If the animal cannot vocalize, the tube has been inserted into the trachea. To further verify that the tube is in the stomach, a small amount of air should be blown down the tube while listening for gurgling either through the tube or via a stethoscope placed on the left abdominal wall. Dierauf, L.A. 1990. Pinniped husbandry. In L.A. Dierauf (editor). *CRC Handbook of Marine Mammal Medicine: Health, Disease, and Rehabilitation*. CRC Press, Inc. Boca Raton, FL

of stomach tubes to ensure all tubes are properly sterilized between animals, or that there is one tube per animal.

Mitigation for flipper tagging: Care should be taken to avoid placing the tag so low as to have the animal walking on it or so high as to have it irritating the animal's flank area (Dierauf 1990).

Mitigation for hot-branding: Pups that are very young or in poor physical condition (e.g. under 20kg) should not be branded. It is recommended that isoflurane gas be used during branding, both as a temporary anesthetic and to ensure that animals remain still for optimal brand quality.

Mitigation for attachment of scientific instruments: When epoxy hardener is mixed with resin catalyst, heat is generated, and the mix can cause thermal burns. Therefore, care should be used in adjusting the proportions of epoxy hardener and resin catalyst to prevent a "hot" mix and the minimum practical amount of epoxy should be used to prevent burning the animal. The weight and dimensions of the instrument package relative to the animal's size and mass, and duration of attachment, are important considerations in choosing a tag. Tag size and placement should be selected that will not interfere significantly with an animal's ability to forage or conduct other vital functions.

Mitigation for behavioral/demographic observations and remote monitoring: To minimize the potential for disturbance caused by the placement of observers on rookeries and haulouts or for set-up and maintenance of remote monitoring stations, researchers should, to the maximum extent practicable, either access the locations concurrent with other research activities, or from points or by means that would not disturb sea lions (e.g. approaching from the other side of the island, where no animals are hauled out).

Mitigation for temporary captivity

The mitigation measures in Permit No. 881-1668-03 specific to minimizing adverse effects the transport, short-term captivity, sampling, and subsequent release of juvenile sea lions at the ASLC would remain in effect in the amendment under the Proposed Action. As with all NMFS permits for research on pinnipeds used in captive experiments, the Steller sea lions must be maintained only in Animal and Plant Health Inspection Service (APHIS), USDA certified research facilities and a copy of the APHIS license(s) must be provided to NMFS. No research on captive animals may occur until the research protocols have been reviewed and approved by the ASLC's Institutional Animal Care and Use Committee (IACUC).

Any cages used to transport animals between facilities and/or to a release site must meet the standards set forth by the APHIS, "Primary enclosures used to transport marine mammals" (9 CFR §3.113 attached). During transport, researchers must keep the animal(s) at a comfortable temperature, using fresh or salt water as needed to cool the animal. Every effort must be made to minimize transport time, and animals should be transported during the cooler part of the day (where applicable), and during minimal traffic (when by ground), to the maximum extent possible. An emergency kit must accompany the animals during transport in the event an animal is injured or otherwise needs medical treatment. All transports of animals must be done by qualified personnel experienced in pinniped handling and medical procedures.

All animals must be held in quarantine conditions during captivity. All animals undergoing research must be closely monitored to determine if research activities are having an adverse effect on the individual(s). A licensed marine mammal veterinarian must be available for emergencies, illnesses, and for health screening prior to release.

Sea lions undergoing fasting at the ASLC would be monitored daily and the permit would require that they be removed from the trial (*i.e.*, returned to feeding) if there was any indication they were becoming ill. The permit would also be conditioned to require cessation of the experiment for any animal whose rate of mass loss was greater than 3% of their initial mass per day or whose total mass loss exceeds 15% of initial body mass. Finally, any sea lions subjected to the controlled fasting experiments would be allowed time to recover and readjust metabolism prior to being returned to the wild.

To minimize the potential adverse behavioral effects of captivity, sea lions must be isolated from unnecessary direct human contact (*e.g.*, hand feeding) to the maximum extent practical prior to release, and exposed to live prey species and demonstrate that they will capture and eat live prey, without humans visually present if possible. All sea lions must be flipper tagged for identification purposes prior to release. All sea lions must be monitored for a minimum of two weeks following any intrusive research procedures (with the exception of attachment of flipper tags and external scientific instruments), or until the site where the intrusive procedure was performed has healed. To allow sea lions to recover from the stress of handling and minimize the potential adverse effects of any drugs used during the research and ensure adequate healing without excessive inflammation, all sea lions must be off drugs (excluding vitamins/dietary supplements in the food, sedation for attachment of tags immediately prior to transport, and sedation for transport itself) for at least two weeks prior to return to the wild. In addition, all sea lions must be examined and approved by a qualified veterinarian to insure that the animal is in good health, is likely to survive in the wild, and does not pose a threat to the wild marine mammal population(s).

The ASLC's protocol for disease screening prior to release and for behavioral de-conditioning of animals for release into the wild must be provided to NMFS Office of Protected Resources. The ASLC must have a plan to provide permanent holding in the event that any sea lions are deemed non-releasable, and subsequent disposition of the animal(s) must be decided in consultation with NMFS Office of Protected Resources. The amended permit would require the ASLC to cease all research and not bring any additional sea lions into captivity if two sea lions are found unsuitable for return to the wild as result of the research or captivity. Any sea lions that are determined unsuitable for release as a result of the research or captivity would count against the mortalities allowed in the current permit. The ultimate disposition (euthanasia or permanent captivity under a scientific research and enhancement permit) of any non-releasable animals would be determined by the Office Director. Since they are listed under the ESA, permanent captivity for any non-releasable sea lions would have to be authorized under a permit for enhancement or scientific research. The terms and conditions of such permits, including whether the animals would be allowed to reproduce in captivity, would be determined by NMFS pursuant to the MMPA, ESA and their implementing regulations, including consultation under Section 7 of the ESA.

To prevent any artificial mixing of genetic stocks and to maximize their chances for successful reintegration into the wild population, animals would only be released in Alaska and every effort would be made to release them: (1) in groups; and (2) at the original capture site(s), in the vicinity of con-specifics of the same population, or in an area where they would normally be found given the time of year. The ASLC must notify NMFS Regional Administrator and/or Regional Stranding Coordinator of the date and location of the release two weeks prior to releasing animals to the wild.

Mitigation for incidental mortality

To ensure that the total number of observed mortalities under all permits does not exceed permitted levels, all permit holders would be required to notify NMFS of research-related mortalities by phone as soon as possible after the incident, preferably within 24-72 hours. Within two weeks of the incident, unless other arrangements have been made, the permit holder must submit a written report that includes a complete description of the events surrounding the incident and identification of steps that will be taken to reduce the potential for additional accidents.

In the event that research-related mortality of sea lions reaches the number specified in a permit, research must be immediately suspended and the protocol must be reviewed, and, if necessary, revised to the satisfaction of NMFS in consultation with the Marine Mammal Commission.

In addition, activities under all permits for takes of Steller sea lions would be suspended, pending review, if the total number of research-related mortalities of endangered Steller sea lions reaches 10 animals under any combination of permits. In the event that research is suspended because combined mortalities of endangered Steller sea lions reaches 10, research may recommence upon review of the information submitted by permit holders on the cause(s) of the deaths and authorization by the Chief, Permits, Conservation and Education Division.

4.6 Unavoidable Adverse Effects

The mitigation measures imposed by permit conditions are intended to reduce, to the maximum extent practical, the potential for adverse effects of the research on the Steller sea lions. However, as described above and in the Appendix F, individual Steller sea lions will experience, to varying degrees, discomfort, pain, injury, stress, and possibly mortality as a result of the research activities. The degree to which an individual animal experiences stress, discomfort, injury, or pain as a result of research activities is dependent on a variety of factors including, but not limited to, age (young animals may be more susceptible to stress of capture and to injury during disturbance of rookeries), breeding status (lactating females may be more likely to react negatively to disturbance on a rookery), and overall health. Because the research involves wild animals that are not accustomed to being approached and handled, the presence of researchers on a rookery or haulout will unavoidably result in harassment of sea lions. Because it is often difficult to assess the health status of an animal from a distance, it would not always be possible to determine, in advance, whether an individual sea lion is compromised and therefore predisposed to react negatively to the stress of capture, handling, and the various drug agents.

4.7 Cumulative Effects

In addition to the synergistic or additive effects of the combination of research activities proposed, it is necessary to address whether the proposed action is “related to other actions with individually insignificant but cumulatively significant impacts.” Cumulative impact is the impact on the environment, which results from the incremental impact of the action, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Significance cannot be avoided if it is reasonable to anticipate a cumulatively significant impact on the environment.

The baseline for this document includes the past and present impacts of all state, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone consultations under Section 7 of the ESA, and the impact of contemporaneous state or private actions. The details of the wide variety of human activities and natural phenomena that may affect the resources within the action area are documented in the Recovery Plans for those species listed as endangered, NMFS Stock Assessment Reports, numerous Biological Opinions prepared on federally-permitted fisheries and vessel operations (including dredging and disposal operations), and in the previous EA and supplemental EA. The following is a brief summary of the past, present, and future human-related activities affecting the marine mammals, particularly Steller sea lion, within the action area.

4.7.1 Subsistence Harvest and Other Intentional Lethal Takes

Between 1992 and 1995, the mean annual subsistence takes of Steller sea lions averaged 448 animals per year. The mean annual subsistence takes of Steller sea lions have declined to approximately one-third between 1996-1998, and have been estimated at 171 animals per year (Wolfe and Hutchinson-Scarborough 1999). Wolfe and Hutchinson-Scarborough (1999) indicate that subsistence harvest levels have declined sharply between 1992 and 1998, due largely to a decline in the number of hunters harvesting sea lions. The authors hypothesize that this decline in the subsistence harvest may be due to a number of local factors, including seasonal hunting conditions and local food needs, and may reflect a personal choice to avoid hunting Steller sea lions out of concerns about the population size. The majority of sea lions are taken in the Aleutian and Pribilof Islands. While subsistence takes may contribute to the current decline, estimated subsistence takes account for only a small portion of the total sea lions lost to the population each year. Further, the significance of subsistence harvesting, as with other sources of mortality, may increase as the population decreases, unless there is a corresponding decrease in the rate of harvesting. Subsistence harvesting may also inhibit recovery at selected sites.

An experimental commercial harvest contracted by the Bureau of Commercial Fisheries resulted in the killing of 630 adult male Steller sea lions in Alaskan waters. Between 1963 and 1972, over 45,000 Steller sea lion pups of both sexes were killed in the Aleutian Islands and Gulf of Alaska. The harvest of adult males likely had no significant effect on the population trends, but the removal of the large number of pups contributed to local population trends in the Aleutian Islands and Gulf of Alaska from the 1960s through the early 1980s. There are presently no commercial harvests of Steller sea lions in Alaska.

Although government-sanctioned efforts to control populations of Steller sea lions considered as nuisances or competitors by the fishing industry and fishery management agencies ceased with passage of the MMPA in 1972, there are still anecdotal reports of fishermen shooting sea lions and a small number of prosecutions still occur. Records from NMFS Enforcement indicate that there were two cases of illegal shooting of Steller sea lions in 1998, both of which were successfully prosecuted (NMFS, Alaska Enforcement Division). In addition, there are a small number of Steller sea lions that strand with evidence of gunshot wounds (average of two animals per year from 1996-99; Angliss et al., in press). However, it is not possible to determine whether these animals were illegally shot or if they were struck and lost during the legal subsistence harvest. Because the full extent of such killings is not known, intentional shooting of sea lions by fishermen should be considered a potential factor in the decline of sea lions at some locations.

4.7.2 Interactions with Commercial Fisheries

Commercial fisheries can directly affect Steller sea lions by capturing, injuring, or killing them incidental to fishing operations. Estimates of rates of entanglement through the early 1980's suggest that mortalities from entanglement were a contributing factor in the decline of Steller sea lions in the Bering Sea, Aleutian Islands, and Gulf of Alaska. However, recent estimates of the numbers of sea lions killed incidental to commercial fisheries is low (28.3/year for the western stock and 16/year for the eastern stock) and is not considered to have a significant effect on Steller sea lion population dynamics. However, the relative impact of incidental mortality in commercial fisheries may increase as the population declines, even if the rate of incidental takes remains constant.

Commercial fisheries may also affect Steller sea lions indirectly by altering the quality of their habitat. The removal of large numbers of fish (both target and non-target or bycatch species) from a marine ecosystem can change the composition of the fish community, which can alter the abundance and distribution of prey available for Steller sea lions. In addition, removal of large amounts of biomass by commercial fisheries can compete with other consumers that depend on the target species for food, which can, in turn, increase competition between Steller sea lions and other piscivorous predators. Changes in the abundance and distribution of prey can have cascading effects on predators including increased susceptibility to predation and reduced productivity.

4.7.3 Scientific Research

Steller sea lions were intentionally killed for scientific research through the end of World War II, and as recently as the 1980s. The data collected from these animals, including stomach contents, blood samples, and morphometrics, was used to examine age, size, reproductive condition, food habits, and incidence of disease and parasites. Recent research efforts have employed non-lethal means for collecting such data, although there is often the risk of mortality resulting from certain research techniques, as discussed above and in Appendix F.

For more than a decade, researchers have been conducting aerial surveys, counts of pups on rookeries, and capturing individual sea lions for flipper-tagging, hot-branding, collection of blood and tissue samples, morphometric data, and attachment of scientific instruments. The effects of research on the Steller sea lion population are uncertain, but some research techniques and activities are known to adversely affect individual animals, as described in Appendix F. It is

not known whether research activities themselves have had a significant adverse impact on the Steller sea lion population, or if the disturbance and incidental mortality associated with research activities have been a factor in the decline.

Until recently, the principal investigators in Steller sea lion research activities were limited to a few scientists, primarily from federal and state entities, with collaboration from a small number of non-profit organizations, including several universities. Recent funding opportunities have significantly expanded the number of individuals and entities engaged in Steller sea lion research, as well as the number and types of projects proposed.

The FY2001 congressional appropriations language identified a total of \$43.2 million in the NOAA budget for the implementation of Steller sea lion protective measures. This represented a substantial increase of over \$36.8 million for research and management of Steller sea lions from previous years. Recipients of the funding included NMFS, Office of Atmospheric Research (OAR), National Ocean Service (NOS), North Pacific Fisheries Management Council (NPFMC), State of Alaska (Alaska Department of Fish and Game: ADF&G), University of Alaska, Alaska Sea Life Center (ASLC), and the North Pacific Universities Marine Mammal Research Consortium (NPUMMRC). While portions of this appropriation were allocated directly to agencies or organizations for specific purposes, including research regarding litigation concerning the Alaska Steller sea lion and Bering Sea/Gulf of Alaska groundfish fisheries, \$20,000,000 was appropriated to the Secretary of Commerce to develop a coordinated, comprehensive research and recovery program for the Steller sea lion.¹⁰ Of this, \$15 million was set aside for non-federal research, to be distributed competitively through a grants process referred to as the Steller Sea Lion Research Initiative (SSLRI: 66 FR 15842).

An additional \$40.15 million was appropriated in 2002 for research on Steller sea lions and was distributed non-competitively to the NMFS (for ESA, Steller sea lion recovery, climate change (OAR), and predator-prey studies (NOS)), North Pacific Fisheries Management Council, Alaska SeaLife Center, University of Alaska (Gulf Apex Predator Project), North Pacific Universities Marine Mammal Research Consortium, Alaska Department of Fish and Game, and the Alaska Fisheries Development Foundation.

Research has been and is also being conducted on endangered Steller sea lions in Russian and Japanese waters. This research includes population assessments and investigations of vital rates (which includes measuring and branding pups, and monitoring abundance and breeding success), remote monitoring of behavior (including attendance patterns), resighting of marked (branded) animals, and collecting blood and scat samples. Much of the recent and ongoing research in Russia has involved collaborative efforts between scientists from NMML and the Alaska SeaLife Center, using protocols and techniques comparable to those employed for studies of Steller sea lions in U.S. waters.

No permits issued by NMFS pursuant to section 10(a)(1)(A) of the ESA authorize intentional lethal mortality of Steller sea lions. However, some permits, including those in the Proposed Action, allow for mortality of Steller sea lions incidental to research activities. Occasionally

¹⁰ FY2001 Consolidated Appropriations Act, Pub. L. No. 106-554, Div. A, Chap. 2, Sections 206 and 209, 114 Stat. 2763, 2763A-175 through 2763A-179 (2000).

deaths of small cetaceans and pinnipeds have been directly attributed to research activities under a NMFS permit, including the types of activities in the Proposed Action.

The number of permits, and associated takes by harassment alone, indicate a high level of research effort relative to the population size. This intense research effort is due, in part, to the endangered status of Steller sea lions and the intense interest in developing appropriate management and conservation measures to recover the species without adversely impacting commercial fisheries or other human activities.

Given the number of permits and associated takes, repeated disturbance of individual sea lions must occur. It is difficult to assess the effects of such repeated, and potentially chronic disturbance. However, NMFS has taken steps to limit repeated harassment and avoid unnecessary duplication of effort through permit conditions requiring coordination among permit holders. NMFS will continue to monitor the effectiveness of these conditions in avoiding unnecessary repeated disturbances.

In addition to the permits described in section 1.1, which are part of the proposed action, the following existing permits authorize takes of Steller sea lions in the action area.

- ◆ **Permit No. 662-1661**, issued to Ms. Dena Matkin, Gustavus, Alaska, authorizes annual takes of up to 750 Steller sea lions in Alaska by harassment incidental to studies of killer whale predation. The purpose of the research is to continue long-term, year-round photo-identification work in Southern Alaska to define the population size, structure and range of killer whales, and to obtain identification of photographs of humpback whales opportunistically in conjunction with the killer whale research. In addition, killer whale predation events will be studied to determine predation rates on humpback whales, Steller sea lions, minke whales, gray whales, harbor porpoise, Dall's porpoise, harbor seals, Pacific white-sided dolphins and Northern fur seals. Dead parts from these species available after a killer whale predation event will be salvaged and analyzed. The permit expires on May 31, 2009.

- ◆ **Permit No. 473-1700**, issued to Ms. Janice Straley, University of Alaska Southeast, Sitka, Alaska authorizes annual takes of up to 100 Steller sea lions in Alaska by harassment incidental to studies of killer whale predation. The objectives of the proposed research project are to collect data to: 1) continue a study in developing long term sighting histories of individual humpback whales (*Megaptera novaeangliae*) to assess stock structure, life history parameters, feeding behaviors, social behaviors of feeding populations, and population estimates; (2) assess the feasibility of using a CRITTERCAM to aid researchers in determining how sperm whales (*Physeter macrocephalus*) are depredating longline fishing gear in the Gulf of Alaska; (3) opportunistically photo-identify and biopsy sample killer, sperm, minke (*Balaenoptera acutorostrata*), gray (*Eschrichtius robustus*) and fin whales (*Balaenoptera physalis*) to enhance the body of knowledge, stock structure, and current status of these species in the North Pacific; and (4) following killer whale predation events, photograph, observe, biopsy sample, incidentally harass and collect and export dead parts from prey including: humpback whales, gray whales, minke whales, fin whales, harbor porpoise (*Phocoena*

phocoena), Dall's porpoise (*Phocoenoides dalli*), Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), Northern fur seals (*Callorhinus ursinus*), Steller sea lions and harbor seals (*Phoca vitulina*). The permit expires on June 30, 2009.

- ◆ **Permit No. 774-1714**, issued to NMFS, Southwest Fisheries Science Center, La Jolla, California, authorizes takes of up to 30, 000 Steller sea lions annually (and up to six times per sea lion per year) in California, Oregon, Washington, and Alaska by harassment during aerial surveys. The permit also authorizes takes of up to 3,000 Steller sea lions annually (and up to three times per sea lion per year) in California by harassment incidental to aerial and ground surveys of California sea lions. The objectives of the permit are: (1) to conduct population assessments for pinnipeds to determine abundance, distribution patterns, length frequencies, breeding densities, to determine the diet from collection of scat and spew, and to assess the status of pinniped species and identify fishery-marine mammal conflicts; (2) to determine the abundance, distribution, movement patterns, and stock structure of cetaceans in U.S. territorial and international waters; (3) to determine the abundance, distribution, movement patterns, stock structure and diet of marine turtles in U.S. territorial and international waters; and (4) to salvage, collect, import, and export biological samples to determine stock structure. The permit expires on June 30, 2009.
- ◆ **Permit No. 1049-1718**, issued to Ms. Kate M. Wynne, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Kodiak, Alaska, authorizes takes of up to 100 Steller sea lions annually in Alaska by harassment incidental to studies of killer whale predation. The primary objectives of the research include: 1) developing long term sighting histories of individual humpback whales (*Megaptera novaeangliae*) to assess stock structure, life history parameters, feeding behaviors, social behaviors of feeding populations, and population estimates; 2) collecting and comparing data on killer whale (*Orcinus orca*) predation in southeastern Alaska, the Gulf of Alaska and Aleutian Islands; and 3) collecting data to assess the distribution, abundance, and foraging ecology of fin whales (*Balaenoptera physalis*) in the Gulf of Alaska. All research will take place in Alaskan waters over a five-year period. The permit expires on June 30, 2009.
- ◆ **Permit No. 782-1532-03**, issued to NMFS National Marine Mammal Laboratory, Seattle, Washington, authorizes takes of Steller sea lions throughout Alaska as described in Table 1 of Appendix C. The objectives of the authorized research, as stated in the application, are to continue monitoring the status of the Alaskan Steller sea lion population (*Eumetopias jubatus*) and to identify causes of the population decline so as to provide for the population's recovery. This represents continued implementation of the Steller sea lion Recovery Plan with respect to the following objectives as provided for in the Plan: identify habitat requirements and protect areas of special biological significance; identify management stocks; monitor status and trends of sea lions; monitor health, condition, and vital parameters; and investigate feeding ecology and factors affecting energetic status. The permit expires on December 30, 2005.
- ◆ **Permit No. 42-1642-03**, issued to Mystic Aquarium and Institute for Exploration, Mystic, CT, authorizes studies on Steller sea lions maintained in captivity at Mystic

Aquarium's facilities, receipt of tissues from marine mammals taken during subsistence harvests, and import and export of marine mammal tissues for various marine mammal health investigations.

The purposes of the authorized research are to: 1) study metabolic clearance rates of vitamins A and E using isotope tracers and vitamin analogs in captive Steller sea lions, in relation to various life history stages; 2) establish the vitamin A and E status of free-ranging Steller sea lions from samples received from other permit holders; 3) determine the metabolic requirements for these vitamins by relating intake to blood levels in captive specimens; and (4) study the disease hemochromatosis (an excessive accumulation of iron in tissues often associated with hepatic lesions) as well as other factors associated with general marine mammal health. The Permit also authorizes the importation of one adult male Steller sea lion known as "Kodiak" from the Vancouver Aquarium, Vancouver, Canada, for breeding with female Steller sea lions currently maintained by Mystic Aquarium, in support of the study on changes in vitamin A and E status in relation to various life history stages, as part of an on-going investigation of the decline of the Steller sea lion population. Any progeny resulting from breeding will serve to expand the pool of captive sea lions available for enhancement and scientific research activities, including the studies described above. The permit expires on October 15, 2007.

- ◆ **Permit No. 1008-1637**, issued to Dr. John Wise, Laboratory of Environmental and Genetic Toxicology, Bioscience Research Institute, University of Southern Maine, Portland, Maine, authorizes the permit holder to obtain, possess, analyze, archive, transfer, import/export (to and from Canada), re-import and re-export (to and from Canada), unlimited numbers of tissue specimens (any hard or soft part, including but not limited to: lung, liver, kidney, brain, skin, blubber, muscle, reproductive organs, thymus, spleen, blood lymphocytes, lymph tissue, etc.) from various marine mammals and endangered or threatened species. The objectives of the research, as stated in the application, are to: 1) determine tissue levels of metals in Steller sea lions and other marine mammal species; and 2) to establish a national resource of marine mammal cell lines for use as model systems in the investigation of various factors related to marine mammal health (e.g., toxicity of metals, virology, etc.). Once the cell lines are established, they may be transferred to other researchers for study, including export to Canada. The cell lines will not be sold for profit or used for commercial purposes. The permit expires on October 31, 2006.

Future Federal actions that are unrelated to the proposed action would include issuance of additional scientific research permits or permit amendments for studies directed at Steller sea lions. In addition to the applications that are the subject of the proposed action, there are two other applications for permits to take Steller sea lions.

The ASLC has submitted an application (File No. 881-1745) for a five-year permit for takes of Steller sea lions held at the ASLC for the purposes of conducting studies on the nutritional physiology, metabolic development, clinical health, reproductive physiology, and bioenergetics of Steller sea lions under captive conditions. Craig Matkin, North Gulf Oceanic Society, Homer,

Alaska (File No. 545-1761) has submitted an application for a five-year permit to take Steller sea lions in Alaska by harassment incidental to conducting population studies on numerous cetacean species. Both of these permits are pending environmental review under NEPA and section 7 of the ESA.

It is not possible to predict when or if additional applications will be received for permits to conduct research on marine mammals in the action area. However, it is reasonable to assume, given the past history of research permits and funding for research on Steller sea lions, that some or all of the current permit holders would request new permits as their current authorizations expire, or major amendments to their existing permits as new funds become available.

Given the past history for ASLC's various marine mammal permits, including the one that is within the Proposed Action, it is reasonable to assume ASLC will request further permit amendments and new permits both to continue the work currently authorized and pending a decision as well as to add new objectives and modify protocols for research on Steller sea lions. As an example, in the 18 months following issuance of Permit No. 881-1668-00, the ASLC submitted six separate requests to add new procedures, modify protocols or objectives, and increase the numbers of animals taken by existing activities. There is a similar pattern of amendment requests for each of the previous and other current permits held by ASLC for research on various species of marine mammals. Further, ASLC has frequently been and will likely continue to be a recipient of substantial congressional funding directed at research on Steller sea lions¹¹. This makes it reasonable to assume the ASLC will have the resources to continue the existing level of research on this species. To the extent that some of these future permit actions would be conducted on the same individuals or same populations of marine mammals, the impacts are likely to be incremental.

Any new or pending applications for permits for research on marine mammals, including Steller sea lions, will be subject to supplemental or additional review under NEPA.

¹¹ ASLC received \$5987K in 2001, \$5000K in 2002, \$4968K in 2003, \$5731K in 2004, and \$6900K in 2005.

4.8 Consideration of Significant Criteria

In the EA, NMFS considered the context and intensity of the factors identified in NOAA NAO 216-6 section 6.01b, as well as short and long term effects of the proposed action. Based on the analysis in the EA, NMFS finds that:

1. There are no significant beneficial or adverse environmental effects anticipated from issuance of the proposed permits. The new information gained under the Proposed Action will contribute to conservation and management of Steller sea lions. The adverse effects of the proposed permits would be limited to effects on individual marine mammals, and is not expected to have a population level adverse impact.
2. The proposed action is not expected to have a substantial adverse impact on public health and safety. While there may be some risk to individual researchers associated with handling large marine carnivores, the likelihood of injury to the researchers is greatly minimized when these activities are conducted by or under the close supervision of experienced personnel, as required by all permits.
3. The geographic area of the proposed action includes what could be considered unique characteristics such as Essential Fish Habitat (EFH) as defined under the Magnuson-Stevens Act and identified in Fishery Management Plans, designated critical habitat for Steller sea lions, and the Alaska Maritime National Wildlife Refuge. However, the proposed action is directed at marine mammals and is expected to result in only negligible impacts on the physical environment.
4. There is no significant controversy regarding the effects of the proposed action on the human environment. Although NMFS received comments from the public in opposition to issuance of the proposed permits, the activities are similar to research conducted over the past two years during which time NMFS did not receive objections and there was no evidence of adverse population level impacts.
5. The effects of the proposed action are not highly uncertain nor do they involve unique or unknown risks. While there was a low number of Steller sea lion mortalities incidental to the research over the past two years, the total number was within that authorized by the permits and would not have a population level impact. Further, there is no evidence of an accelerated population decline as a result of research activities.
6. Issuance of the permits as described in the proposed action does not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. Each permit application received is evaluated upon its own merits relative to the criteria established in the MMPA, ESA, and NMFS implementing regulations. Issuance of a permit to a specific individual or organization for a given research activity does not in any way guarantee or imply that NMFS will authorize other individuals or organizations to conduct the same research activity. A primary consideration in issuance of permits is whether or not the proposed activity is *bona fide* as defined at 50 CFR §216.3, which includes whether the results are likely to contribute to the basic knowledge of marine mammal biology or ecology or are

likely to identify, evaluate, or resolve conservation problems. This criterion should preclude unnecessarily duplicative or poorly designed studies from permit issuance.

7. There are no individually insignificant but cumulatively significant impacts of the proposed action. While there was a low number of Steller sea lion mortalities incidental to the research, the total number was within that authorized by the permits. Further, there is no evidence of an accelerated population decline as a result of research activities. In addition, all permits would contain mitigation measures, including a requirement for the researchers to develop a research monitoring plan.

8. The proposed action would not adversely affect entities listed in or eligible for listing in the National Register of Historic Places, nor would it cause loss or destruction of significant scientific, cultural, or historic resources.

9. The proposed action is not expected to have a significant adverse impact on endangered or threatened species of marine mammal populations. The adverse effects of the proposed permits would be limited to effects on individual marine mammals. Further, pursuant to section 7 of the ESA, it is NMFS Biological Opinion that issuance of the proposed permits is not likely to jeopardize the continued existence of threatened or endangered Steller sea lions.

10. The proposed action would not be in violation of Federal, state, or local laws for environmental protection. Applicable Federal laws are NEPA, MMPA, ESA, CITES, Magnuson-Stevens Act, NMSA, and AWA; compliance with these statutes is addressed through the permit issuance process. There are no state or local laws relevant to the proposed action.

11. The proposed action is not likely to result in the introduction or spread of a nonindigenous species. Species transfer in the marine environment is most commonly associated with exchange of ballast water and biofouling, neither of which are likely from the research-related ship use in the proposed action.

12. The Proposed Action is not reasonably expected to allow substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in fisheries management plans. Although impacts on the physical environment, including habitat, can result from vessels, the impacts of the vessels associated with the Proposed Action would be negligible in comparison to the baseline conditions in the action area.

13. The Proposed Action cannot reasonably be expected to have a substantial impact on biodiversity and ecosystem function within the affected area. The proposed action is not expected to have a significant adverse impact on endangered or threatened species at the population level. The adverse effects of the proposed permits would be limited to effects on individual marine mammals.

14. There are no significant social or economic impacts of the Proposed Action so there are no significant socio-economic impacts interrelated with significant natural or physical environmental effects.

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GLOSSARY OF TERMS AND ACRONYMS

AEB: Aleutians East Borough, the holder of Permit No. 1010-1641-00

ASLC: Alaska SeaLife Center, the holder of Permit No. 881-1668-01

ADF&G: Alaska Department of Fish and Game, the Holder of Permit No. 358-1564-05

Bona fide scientific research: Defined under the MMPA as scientific research conducted by qualified personnel, the results of which: (1) likely would be accepted for publication in a refereed scientific journal; (2) are likely to contribute to the basic knowledge of marine mammal biology or ecology (this includes, e.g., marine mammal parts in a properly curated, professionally accredited scientific collection); or (3) are likely to identify, evaluate, or resolve conservation problems. [50 CFR §216.3]

ESA: Endangered Species Act of 1973 (16 U.S.C. §§ 1532-1544). This Act requires federal consultation before any major federal action impacting threatened or endangered species is undertaken, outlaws the taking of such species, and provides for acquisition of habitat to protect threatened and endangered species.

Harass: Under the 1994 Amendments to the MMPA, harassment is statutorily defined 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 a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).”

Humane: The method of taking, import, export, or other activity that involves the least possible degree of pain and suffering practicable to the animal involved. [50 CFR §216.3]

Intrusive research: Defined as any procedure conducted for *bona fide* scientific research, that involves: a break in or cutting of the skin or equivalent, insertion of an instrument or material into an orifice, introduction of a substance or object into the animal’s immediate environment that is likely either to be ingested or to contact and directly affect animal tissues (i.e., chemical substances), or a stimulus directed at animals that may involve a risk to health or welfare or that may have an impact on normal function or behavior (e.g., audio broadcasts directed at animals that may affect behavior, or attachment of instruments to an animal using suction-cups or by penetration of the animal’s skin). [50 CFR §216.3]

MMC: Marine Mammal Commission. The MMPA established the MMC, which is composed of three members appointed by the President for three-year terms. The MMC was created to provide scientific advice and recommendations to the Secretaries of Commerce and the Interior, who share responsibilities under the Marine Mammal Protection Act. The MMC was required to establish a Committee of Scientific Advisors with which to consult on studies, recommendations, research programs, and permit applications for scientific research. The MMC has access to all

studies and data compiled by federal agencies on marine mammals and must coordinate its efforts to avoid duplication of research.

MMPA: Marine Mammal Protection Act (16 U.S.C. §§ 1361-1421h). This law, which became effective in 1972, prohibits taking and importation of marine mammals without a permit. The Act established a federal responsibility to conserve marine mammals, with management authority vested in the Department of Commerce for cetaceans and pinnipeds other than walrus. The Department of the Interior is responsible for all other marine mammals, including sea otters, walrus, polar bear, dugong, and manatee.

NMML: National Marine Mammal Laboratory, the Holder of Permit No. 782-1532-02

ODFW: Oregon Department of Fish and Wildlife, the holder f Permit No. 434-1669-01

Plan: Final Recovery Plan for Steller Sea Lions

Service: National Marine Fisheries Service, Office of Protected Resources

Take: Defined under the **MMPA** as to “harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect” and under the **ESA** as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

APPENDIX A: COMMENTS RECEIVED ON 2002 EA AND ASSOCIATED PERMIT APPLICATIONS

APPENDIX B: REQUIREMENTS FOR OBTAINING A PERMIT FOR RESEARCH ON PROTECTED SPECIES

The permit process is a regulatory process. It is inherent in the purposes and policies of the MMPA and ESA that human activities resulting in “takes” can and do adversely affect protected species and therefore such activities must be limited and monitored (i.e., regulated).

The MMPA and ESA established moratoria on “taking” marine mammals and threatened or endangered species. Both statutes provide some exemptions and exceptions to these moratoria. Scientific research permits under the MMPA and recovery permits under the ESA are two of the most commonly used exemptions. Both the MMPA and ESA specify a limited range of circumstances under which NMFS may decide to grant an exemption through issuance of a permit. NMFS has also promulgated regulations to implement these provisions of the MMPA and ESA.

As the one requesting an exemption to a take moratorium, the applicant must demonstrate that permit issuance would not be detrimental to protected species (i.e., will not disadvantage, jeopardize, or otherwise adversely affect a protected species). Accordingly, the MMPA, ESA, and NMFS implementing regulations establish information requirements for permit applicants. An application that satisfies some but not all of the applicable criteria for permit issuance will be returned without prejudice to the applicant with an explanation of the deficiencies.

Persons seeking a special exception permit for scientific research must submit a properly formatted and signed application to the Office Director. The applicant must describe the species to be taken, the manner and duration of the takes, the qualifications of the researchers to conduct the proposed activities, as well as provide justification for such taking. The applicant must also provide sufficient information about the activity to allow NMFS to determine whether permit issuance would comply with all applicable statutory and regulatory issuance criteria and to assess the potential environmental impacts of permit issuance.

The following constitute the statutory requirements for NMFS permits for research on marine mammals and threatened and endangered species under NMFS jurisdiction.

MMPA STATUTORY PERMIT ISSUANCE CRITERIA (16 U.S.C. 1374 Sec. 104(c)(3)(A))

Section 104 of the MMPA stipulates that:

The Secretary may issue a permit under this paragraph for scientific research purposes to an applicant which submits with its permit application information indicating that the taking is required to further a bona fide scientific purpose.

Section 3 of the MMPA defines bona fide research as:

scientific research on marine mammals, the results of which –

(A) likely would be accepted for publication in a refereed scientific journal;

(B) are likely to contribute to the basic knowledge of marine mammal biology or ecology; or

(C) are likely to identify, evaluate or resolve conservation problems.

ESA STATUTORY PERMIT ISSUANCE CRITERIA (16 U.S.C. 1539 Sec. 10 (a)(1)(A) and 10(d))

Section 10 of the ESA stipulates that:

The Secretary may permit, under such terms and conditions as he shall prescribe – (A) any act otherwise prohibited by section 9 for scientific purposes or to enhance the propagation or survival of the affected species, including, but not limited to, acts necessary for the establishment and maintenance of experimental populations pursuant to subsection (j).

The Secretary may grant exceptions under subsections (a)(1)(A) and (b) of this section only if he finds and publishes his finding in the Federal Register that (1) such exceptions were applied for in good faith, (2) if granted and exercised will not operate to the disadvantage of such endangered species, and (3) will be consistent with the purposes and policy set forth in section 2 of this Act.

In addition to the above statutory requirements, permits issued pursuant to section 104 of the MMPA must comply with regulatory criteria specified at 50 CFR §216.31-216.44 and §222.301-222.309. The following is a list of the regulations applicable to application information requirements, permit issuance criteria, and permit terms and conditions.

MMPA REGULATIONS FOR PERMIT APPLICATION SUBMISSION, REVIEW, AND DECISION PROCESS (50 CFR §216.33)

(a) *Application submission.* Persons seeking a special exemption permit under this subpart must submit an application to the Office Director. The application must be signed by the applicant, and provide in a properly formatted manner all information necessary to process the application. Written instructions addressing information requirements and formatting may be obtained from the Office Director upon request.

(c) *Initial review.* (1) NMFS will notify the applicant of receipt of the application.

(2) During the initial review, the Office Director will determine:

(i) Whether the application is complete.

(ii) Whether the proposed activity is for purposes authorized under this subpart.

(iii) If the proposed activity is for enhancement purposes, whether the species or stock identified in the application is in need of enhancement for its survival or recovery and whether the proposed activity will likely succeed in its objectives.

(iv) Whether the activities proposed are to be conducted consistent with the permit restrictions and permit specific conditions as described in Sec. 216.35 and Sec. 216.36(a).

(v) Whether sufficient information is included regarding the environmental impact of the proposed activity to enable the Office Director:

(A) To make an initial determination under the National Environmental Policy Act (NEPA) as to whether the proposed activity is categorically excluded from preparation of further environmental documentation, or whether the preparation of an environmental assessment (EA) or environmental impact statement (EIS) is appropriate or necessary; and

(B) To prepare an EA or EIS if an initial determination is made by the Office Director that the activity proposed is not categorically excluded from such requirements.

(3) The Office Director may consult with the Marine Mammal Commission (Commission) and its Committee of Scientific Advisors on Marine Mammals (Committee) in making these initial, and any subsequent, determinations.

(4) Incomplete applications will be returned with explanation. If the applicant fails to resubmit a complete application or correct the identified deficiencies within 60 days, the application will be deemed withdrawn. Applications that propose activities inconsistent with this subpart will be returned with explanation, and will not be considered further.

(d) *Notice of receipt and application review.* (1) Upon receipt of a valid, complete application, and the preparation of any NEPA documentation that has been determined initially to be required, the Office Director will publish a notice of receipt in the Federal Register. The notice will:

(i) Summarize the application, including:

(A) The purpose of the request;

(B) The species and number of marine mammals;

(C) The type and manner of special exception activity proposed;

(D) The location(s) in which the marine mammals will be taken, from which they will be imported, or to which they will be exported; and

(E) The requested period of the permit.

(ii) List where the application is available for review.

(iii) Invite interested parties to submit written comments concerning the application within 30 days of the date of the notice.

(iv) Include a NEPA statement that an initial determination has been made that the activity proposed is categorically excluded from the requirement to prepare an EA or EIS, that an EA was prepared resulting in a finding of no significant impact, or that a final EIS has been prepared and is available for review.

(2) The Office Director will forward a copy of the complete application to the Commission for comment. If no comments are received within 45 days (or such longer time as the Office Director may establish) the Office Director will consider the Commission to have no objection to issuing a permit. [[Page 38]]

(3) The Office Director may consult with any other person, institution, or agency concerning the application.

(4) Within 30 days of publication of the notice of receipt in the Federal Register, any interested party may submit written comments or may request a public hearing on the application.

(5) If the Office Director deems it advisable, the Office Director may hold a public hearing within 60 days of publication of the notice of receipt in the Federal Register. Notice of the date, time, and place of the public hearing will be published in the Federal Register not less than 15 days in advance of the public hearing. Any interested person may appear in person or through representatives and may submit any relevant material, data, views, or comments. A summary record of the hearing will be kept.

(6) The Office Director may extend the period during which any interested party may submit written comments. Notice of the extension must be published in the Federal Register within 60 days of publication of the notice of receipt in the Federal Register.

(7) If, after publishing a notice of receipt, the Office Director determines on the basis of new information that an EA or EIS must be prepared, the Office Director must deny the permit unless an EA is prepared with a finding of no significant impact. If a permit is denied under these circumstances the application may be resubmitted with information sufficient to prepare an EA or EIS, and will be processed as a new application.

(e) *Issuance or denial procedures.* (1) Within 30 days of the close of the public hearing or, if no public hearing is held, within 30 days of the close of the public comment period, the Office Director will issue or deny a special exception permit.

(2) The decision to issue or deny a permit will be based upon:

(i) All relevant issuance criteria set forth at Sec. 216.34;

(ii) All purpose-specific issuance criteria as appropriate set forth at Sec. 216.41, Sec. 216.42, and Sec. 216.43;

(iii) All comments received or views solicited on the permit application; and

(iv) Any other information or data that the Office Director deems relevant.

(3) If the permit is issued, upon receipt, the holder must date and sign the permit, and return a copy of the original to the Office Director. The permit shall be effective upon the permit holder's signing of the permit. In signing the permit, the holder:

(i) Agrees to abide by all terms and conditions set forth in the permit, and all restrictions and relevant regulations under this subpart; and

(ii) Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director.

(4) Notice of the decision of the Office Director shall be published in the Federal Register within 10 days after the date of permit issuance or denial and shall indicate where copies of the permit, if issued, may be reviewed or obtained. If the permit issued involves marine mammals listed as endangered or threatened under the ESA, the notice shall include a finding by the Office Director that the permit:

(i) Was applied for in good faith;

(ii) If exercised, will not operate to the disadvantage of such endangered or threatened species; and

(iii) Is consistent with the purposes and policy set forth in section 2 of the ESA.

(5) If the permit is denied, the Office Director shall provide the applicant with an explanation for the denial.

(6) Under the MMPA, the Office Director may issue a permit for scientific research before the end of the public comment period if delaying issuance could result in injury to a species, stock, or individual, or in loss of unique research opportunities. The Office Director also may waive the 30-day comment period required under the ESA in an emergency situation where the health or life of an endangered or threatened marine mammal is threatened and no reasonable alternative is available. If a permit is issued under these circumstances, notice of such issuance before the end of the comment period shall be published in the Federal Register within 10 days of issuance.

(7) The applicant or any party opposed to a permit may seek judicial review of the terms and conditions of such permit or of a decision to deny such permit. Review may be obtained by filing a petition for review with the appropriate U.S. District Court as provided for by law.

MMPA REGULATORY PERMIT ISSUANCE CRITERIA (50 CFR §216.34)

For the Office Director to issue any permit under this subpart, the applicant must provide sufficient information to demonstrate that the proposed activity satisfies all of the following seven criteria. (Note: sections 216.42 and 216.43 are reserved for regulations for photography and public display permits.)

(1) The proposed activity is humane and does not present any unnecessary risks to the health and welfare of marine mammals.

(2) The proposed activity is consistent with all restrictions set forth at §216.35 and any purpose-specific restrictions as appropriate set forth at §216.41, §216.42, and §216.43.

(3) The proposed activity, if it involves endangered or threatened marine mammals, will be conducted consistent with the purposes and policies set forth in section 2 of the ESA.

(4) The proposed activity by itself or in combination with other activities will not likely have a significant adverse impact on the species or stock.

(5) The applicant's expertise, facilities, and resources are adequate to accomplish successfully the objectives and activities stated in the application.

(6) If a live animal will be held captive or transported, the applicant's qualifications, facilities, and resources are adequate for the proper care and maintenance of the marine mammal.

(7) Any requested import or export will not likely result in the taking of marine mammals or marine mammal parts, beyond those authorized by the permit.

MMPA REGULATORY PERMIT RESTRICTIONS (50 CFR §216.35)

The following restrictions shall apply to all permits issued under this subpart:

(a) The taking, importation, export, or other permitted activity involving marine mammals and marine mammal parts shall comply with the regulations of this subpart.

(b) The maximum period of any special exception permit issued, or any major amendment granted, is five years from the effective date of the permit or major amendment. In accordance with the provisions of Sec. 216.39, the period of a permit may be extended by a minor amendment up to 12 months beyond that established in the original permit.

(c) Except as provided for in Sec. 216.41(c)(1)(v), marine mammals or marine mammal parts imported under the authority of a permit must be taken or imported in a humane manner, and in compliance with the Acts and any applicable foreign law. Importation of marine mammals and marine mammal parts is subject to the provisions of 50 CFR part 14.

(d) The permit holder shall not take from the wild any marine mammal which at the time of taking is either unweaned or less than eight months old, or is a part of a mother-calf/pup pair, unless such take is specifically authorized in the conditions of the special exception permit. Additionally, the permit holder shall not import any marine mammal that is pregnant or lactating at the time of taking or import, or is unweaned or less than eight months old unless such import is specifically authorized in the conditions of the special exception permit.

(e) Captive marine mammals shall not be released into the wild unless specifically authorized by the Office Director under a scientific research or enhancement permit.

(f) The permit holder is responsible for all activities of any individual who is operating under the authority of the permit;

(g) Individuals conducting activities authorized under the permit must possess qualifications commensurate with their duties and responsibilities, or must be under the direct supervision of a person with such qualifications;

(h) Persons who require state or Federal licenses to conduct activities authorized under the permit must be duly licensed when undertaking such activities;

(i) Special exception permits are not transferable or assignable to any other person, and a permit holder may not require any direct or indirect compensation from another person in return for requesting authorization for such person to conduct the taking, import, or export activities authorized under the subject permit;

(j) The permit holder or designated agent shall possess a copy of the permit when engaged in a permitted activity, when the marine mammal is in transit incidental to such activity, and whenever marine mammals or marine mammal parts are in the possession of the permit holder or agent. A copy of the permit shall be affixed to any container, package, enclosure, or other means of containment, in which the marine mammals or marine mammal parts are placed for purposes of transit, supervision, or care. For marine mammals held captive and marine mammal parts in storage, a copy of the permit shall be kept on file in the holding or storage facility.

MMPA REGULATORY REQUIREMENTS FOR PERMIT CONDITIONS (50 CFR §216.36)

(a) Specific conditions. (1) Permits issued under this subpart shall contain specific terms and conditions deemed appropriate by the Office Director, including, but not limited to:

(i) The number and species of marine mammals that are authorized to be taken, imported, exported, or otherwise affected;

(ii) The manner in which marine mammals may be taken according to type of take;

(iii) The location(s) in which the marine mammals may be taken, from which they may be imported, or to which they may be exported, as applicable, and, for endangered or threatened marine mammal species to be imported or exported, the port of entry or export;

(iv) The period during which the permit is valid.

(b) Other conditions. In addition to the specific conditions imposed pursuant to paragraph (a) of this section, the Office Director shall specify any other permit conditions deemed appropriate.

MMPA REGULATORY REQUIREMENTS FOR PERMIT REPORTING (50 CFR §216.38)

All permit holders must submit annual, final, and special reports in accordance with the requirements established in the permit, and any reporting format established by the Office Director.

MMPA REGULATORY REQUIREMENTS FOR SCIENTIFIC RESEARCH AND ENHANCEMENT PERMITS (50 CFR §216.41)

Permits for scientific research and enhancement. In addition to the requirements under Secs. 216.33 through 216.38, permits for scientific research and enhancement are governed by the following requirements:

(a) *Applicant.* (1) For each application submitted under this section, the applicant shall be the principal investigator responsible for the overall research or enhancement activity. If the research or enhancement activity will involve a periodic change in the principal investigator or is otherwise controlled by and dependent upon another entity, the applicant may be the institution, governmental entity, or corporation responsible for supervision of the principal investigator. (2) For any scientific research involving captive maintenance, the application must include supporting documentation from the person responsible for the facility or other temporary enclosure.

(b) *Issuance Criteria.* For the Office Director to issue any scientific research or enhancement permit, the applicant must demonstrate that:

- (1) The proposed activity furthers a bona fide scientific or enhancement purpose;
- (2) If the lethal taking of marine mammals is proposed:
 - (i) Non-lethal methods for conducting the research are not feasible; and
 - (ii) For depleted, endangered, or threatened species, the results will directly benefit that species or stock, or will fulfill a critically important research need.
- (3) Any permanent removal of a marine mammal from the wild is consistent with any applicable quota established by the Office Director.
- (4) The proposed research will not likely have significant adverse effects on any other component of the marine ecosystem of which the affected species or stock is a part.
- (5) For species or stocks designated or proposed to be designated as depleted, or listed or proposed to be listed as endangered or threatened:
 - (i) The proposed research cannot be accomplished using a species or stock that is not designated or proposed to be designated as depleted, or listed or proposed to be listed as threatened or endangered;
 - (ii) The proposed research, by itself or in combination with other activities will not likely have a long-term direct or indirect adverse impact on the species or stock;
 - (iii) The proposed research will either:
 - (A) Contribute to fulfilling a research need or objective identified in a species recovery or conservation plan, or if there is no conservation or recovery plan in place, a research need or objective identified by the Office Director in stock assessments established under section 117 of the MMPA;
 - (B) Contribute significantly to understanding the basic biology or ecology of the species or stock, or to identifying, evaluating, or resolving conservation problems for the species or stock; or
 - (C) Contribute significantly to fulfilling a critically important research need.

(c) *Restrictions.* (1) The following restrictions apply to all scientific research permits issued under this subpart:

- (i) Research activities must be conducted in the manner authorized in the permit.
- (ii) Research results shall be published or otherwise made available to the scientific community in a reasonable period of time.
- (iii) Research activities must be conducted under the direct supervision of the principal investigator or a co-investigator identified in the permit.

(iv) Personnel involved in research activities shall be reasonable in number and limited to:

(A) Individuals who perform a function directly supportive of and necessary to the permitted research activity; and

(B) Support personnel included for the purpose of training or as backup personnel for persons described in paragraph (c)(1)(iv)(A).

(v) Any marine mammal part imported under the authority of a scientific research permit must not have been obtained as the result of a lethal taking that would be inconsistent with the Acts, unless authorized by the Office Director.

(vi) Marine mammals held under a permit for scientific research shall not be placed on public display, included in an interactive program or activity, or trained for performance unless such activities:

(A) Are necessary to address scientific research objectives and have been specifically authorized by the Office Director under the scientific research permit; and

(B) Are conducted incidental to and do not in any way interfere with the permitted scientific research; and

(C) Are conducted in a manner consistent with provisions applicable to public display, unless exceptions are specifically authorized by the Office Director.

(vii) Any activity conducted incidental to the authorized scientific research activity must not involve any taking of marine mammals beyond what is necessary to conduct the research (i.e., educational and commercial photography).

ESA REGULATORY PERMIT APPLICATION REQUIREMENTS (50 CFR §222.308(b))

The following information will be used as the basis for determining whether an application is complete and whether a permit for scientific purposes or for enhancement of propagation or survival of the affected species should be issued by the Assistant Administrator. An application for a permit shall provide the following information and such other information that the Assistant Administrator may require:

(1) Title, as applicable, either--

(i) Application for permit for scientific purposes under the Act; or

(ii) Application for permit for the enhancement of the propagation or survival of the endangered species Under the Act.

(2) The date of the application.

(3) The identity of the applicant including complete name, address, and telephone number. If the applicant is a partnership or a corporate entity, set forth the details. If the endangered species is to be utilized by a person other than the applicant, set forth the name of that person and such other information as would be required if such person were an applicant.

(4) A description of the purpose of the proposed acts, including the following:

(i) A detailed justification of the need for the endangered species, including a discussion of possible alternatives, whether or not under the control of the applicant; and

(ii) A detailed description of how the species will be used.

(5) A detailed description of the project, or program, in which the endangered species is to be used, including the following:

(i) The period of time over which the project or program will be conducted;

(ii) A list of the names and addresses of the sponsors or cooperating institutions and the scientists involved;

(iii) A copy of the formal research proposal or contract if one has been prepared;

(iv) A statement of whether the proposed project or program has broader significance than the individual researcher's goals. For example, does the proposed project or program respond directly or indirectly to recommendation of any national or international scientific body charged with research or management of the endangered species? If so, how?; and

(v) A description of the arrangements, if any, for the disposition of any dead specimen or its skeleton or other remains in a museum or other institutional collection for the continued benefit to science.

(6) A description of the endangered species which is the subject of the application, including the following:

(i) A list of each species and the number of each, including the common and scientific name, the subspecies (if applicable), population group, and range;

(ii) A physical description of each animal, including the age, size, and sex;

(iii) A list of the probable dates of capture or other taking, importation, exportation, and other acts which require a permit for each animal and the location of capture or other taking, importation, exportation, and other acts which require a permit, as specifically as possible;

(iv) A description of the status of the stock of each species related insofar as possible to the location or area of taking;

(v) A description of the manner of taking for each animal, including the gear to be used;

(vi) The name and qualifications of the persons or entity which will capture or otherwise take the animals; and

(vii) If the capture or other taking is to be done by a contractor, a statement as to whether a qualified member of your staff (include name(s) and qualifications) will supervise or observe the capture or other taking. Accompanying such statement shall be a copy of the proposed contract or a letter from the contractor indicating agreement to capture or otherwise take the animals, should a permit be granted.

(7) A description of the manner of transportation for any live animal taken, imported, exported, or shipped in interstate commerce, including the following:

(i) Mode of transportation;

(ii) Name of transportation company;

(iii) Length of time in transit for the transfer of the animal(s) from the capture site to the holding facility;

(iv) Length of time in transit for any planned future move or transfer of the animals;

(v) The qualifications of the common carrier or agent used for transportation of the animals;

(vi) A description of the pen, tank, container, cage, cradle, or other devices used to hold the animal at both the capture site and during transportation;

(vii) Special care before and during transportation, such as salves, antibiotics, moisture; and

(viii) A statement as to whether the animals will be accompanied by a veterinarian or by another similarly qualified person, and the qualifications of such person.

(8) Describe the contemplated care and maintenance of any live animals sought, including a complete description of the facilities where any such animals will be maintained including:

(i) The dimensions of the pools or other holding facilities and the number, sex, and age of animals by species to be held in each;

(ii) The water supply, amount, and quality;

(iii) The diet, amount and type, for all animals;

(iv) Sanitation practices used;

(v) Qualifications and experience of the staff;

(vi) A written certification from a licensed veterinarian or from a recognized expert who are knowledgeable on the species (or related species) or group covered in the application. The certificate shall verify that the veterinarian has personally reviewed the amendments for transporting and maintaining the animal(s) and that, in the veterinarian's opinion, they are adequate to provide for the well-being of the animal; and

(vii) The availability in the future of a consulting expert or veterinarian meeting paragraph requirements of (b)(8)(vi) in this section.

(9) A statement of willingness to participate in a cooperative breeding program and maintain or contribute data to a stud book.

(10) A statement of how the applicant's proposed project or program will enhance or benefit the wild population.

(11) For the 5 years preceding the date of application, the applicant shall provide a detailed description of all mortalities involving species under the control of or utilized by the applicant and are either presently listed as endangered species or are taxonomically related within the Order to the species which is the subject of this application, including:

(i) A list of all endangered species and related species that are the subject of this application that have been captured, transported, maintained, or utilized by the applicant for scientific purposes or for the enhancement of propagation or survival of the affected species, and/or of related species that are captured, transported, maintained, or utilized by the applicant for scientific purposes or for enhancement of propagation or survival of the affected species;

(ii) The numbers of mortalities among such animals by species, by date, by location of capture, i.e., from which population, and the location of such mortalities;

(iii) The cause(s) of any such mortality; and

(iv) The steps which have been taken by applicant to avoid or decrease any such mortality.

(12) A certification in the following language: I hereby certify that the foregoing information is complete, true, and correct to the best of my knowledge and belief. I understand that this information is submitted for the purpose of obtaining a permit under the Endangered Species Act, as amended, and regulations promulgated thereunder, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or to penalties under the Act.

(13) The applicant and/or an officer thereof must sign the application.

ESA REGULATORY PERMIT ISSUANCE CRITERIA (50 CFR §222.308(c))

NMFS' regulations implementing the ESA require that the following criteria be considered in determining whether to issue a permit for scientific purposes for takes of endangered species:

(1) Whether the permit, if granted and exercised, will not operate to the disadvantage of the endangered species;

(2) Whether the permit would be consistent with the purposes and policy set forth in section 2 of the ESA;

(3) Whether the permit would further a *bona fide* and necessary or desirable scientific purpose or enhance the propagation or survival of the endangered species, taking into account the benefits anticipated to be derived on behalf of the endangered species;

(4) Whether alternative non-endangered species or population stocks can and should be used;

(5) Whether the expertise, facilities, or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application; and

(6) Opinions or views of scientists or other persons or organizations knowledgeable about the species which is the subject of the application or of other matters germane to the application.

(7) Whether alternative non-endangered species or population stocks can and should be used;

(8) Whether the animal was born in captivity or was (or will be) taken from the wild;

(9) Provision for disposition of the species if and when the applicant's project or program terminates;

(10) How the applicant's needs, program, and facilities compare and relate to proposed and ongoing projects and programs;

(11) Whether the expertise, facilities, or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application; and

(12) Opinions or views of scientists or other persons or organizations knowledgeable about the species which is the subject of the application or of other matters germane to the application.

ESA REGULATORY REQUIREMENTS FOR PERMIT TERMS AND CONDITIONS (50 CFR §222.308(d))

Permits applied for under this section shall contain terms and conditions as the Assistant Administrator may deem appropriate, including but not limited to the following:

- (1) The number and kind of species covered;
- (2) The location and manner of taking;
- (3) Port of entry or export;
- (4) The methods of transportation, care, and maintenance to be used with live species;
- (5) Any requirements for reports or rights of inspections with respect to any activities carried out pursuant to the permit;
- (6) The transferability or assignability of the permit;
- (7) The sale or other disposition of the species, its progeny, or the species product;

APPENDIX C: ACTIVITY TABLES FOR NO ACTION ALTERNATIVE

No Action Alternative Activity Table 1. All takes are authorized on an annual basis. Where “Season” is marked as “year-round” the total “number of animals taken per year” could be used by the permit holder any time during the year, according to the objectives and protocols described in their application and mitigation measures required by the permit. Where “season” is marked with a number of months, the total “number of animals taken per year” would be used entirely during those months. NOTE: The existing ADF&G permit (No. 358-1564) is valid through June 30, 2005; the NMML Permit No. 782-1702 is valid through September 30, 2008; Permit Nos. 434-1669, 1010-1641, 800-1664, and 881-1668 are valid through December 30, 2005 but do not authorize takes beyond those remaining from the 2004 permit year.

					Location
Aerial survey: breeding season					
ADFG	pups	15k	U	June – July annually (permit expires June 30, 2005)	Alaska-wide
	non-pups	45k	U		
NMML (782-1532)	pups	15k	U	June – July '05 using takes remaining from '04	Alaska-wide
	non-pups	45k	U		
Aerial survey: non-breeding season					
NMML (782-1532)	all	35k	U	Aug-May '05 using takes remaining from '04	Alaska-wide
Aerial survey: other					
NMML (782-1532)	all	35k	U	Jan – Dec '05 using takes remaining from '04	Alaska-wide
NMML (782-1702)	all	4500	Up to 40	Year-round	WA and OR
AEB	all	14k	U	Mar, June, Sept., Dec. '05 using takes remaining from '04	GOA, East Aleutian Is., AK Peninsula

Activity			animal	Season	Location
SWFSC	All	30k	6	Year-round	CA, OR, WA, AK east of 144°W
Vessel survey					
AEB	all	800	4	Mar, June, Sept., Dec. '05 using takes remaining from '04	GOA, East Aleutian Is., AK Peninsula
Ground counts (may include incidental scat collection)					
ADF&G	non-pups	15k	U	Jun-Jul annually (permit expires June 30, 2005)	≤ 10 selected rookeries in SEAK, Western Aleutian Islands
	pups	10k	U		
NMML (782-1532)	pups	3,100	U	Jun-Jul '05 using takes remaining from '04	Alaska-wide
	non-pups	10,200	U		
ODFW	non-pups	1,800	U	June – July '05 using takes remaining from '04	CA/OR/WA
	pups	900	U		CA/OR/WA
Incidental disturbance during scat collection, capture/sampling, instrument retrieval, or observational activities					
ADF&G	all	7k	U	year-round (until permit expires in June '05)	Alaska-wide
NMML (782-1532)	all	15k	U	year-round '05 using takes remaining from '04	Alaska-wide
ODFW	all	10k	U	year-round '05 using takes remaining from '04	CA/OR/WA
Davis	all	400	U	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
ASLC	all	5,850	U	year-round	Alaska-wide

Activity			animal	Season	Location
AEB	all	800	U	Mar, June, Sept., Dec. '05 using takes remaining from '04	GOA, East Aleutian Is., AK Peninsula
Incidental disturbance during studies of other marine mammal species					
SWFSC	all	3k	3	Year-round	CA, OR, WA, AK east of 144°W
NMML-1702	all	4,500	30	Year-round	WA and OR
Matkin	all	750	U	Year-round	AK
Straley	all	100	U	Year-round	AK
Wynne	all	100	U	Year-round	AK
Collect carcasses/parts of carcasses of dead sea lions					
ADF&G	all	unlimited	1	year-round (until permit expires in June '05)	Alaska-wide
ASLC	all	unlimited	1	year-round	Alaska-wide
Receive tissue samples from subsistence harvested sea lions					
ADF&G	all	unlimited	1	year-round (until permit expires in June '05)	Alaska-wide
Behavioral and demographic observations and remote monitoring on rookeries and haulouts					
AEB	All	0	0	year-round	GOA, Eastern Aleutians, Alaska Peninsula
Imaging sea lion/prey interactions with multi-beam sonar					
No permits currently authorize this activity					
Tracking animals at sea					

Activity			animal	Season	Location
ADF&G	1-3 yrs	30 from "Incidental disturbance during scat collection, capture/sampling, instrument retrieval, or observational activities"	1	Sep-Dec (until permit expires in June '05)	SEAK
Incidental mortality					
ADF&G	all	10 (not to exceed 5 in western pop.)	1	year-round (until permit expires in June '05)	Alaska-wide
NMML (782-1532)	all	10 (not to exceed 5 in western pop.)	1	year-round '05 using takes remaining from '04	Alaska-wide
ODFW	all	10	1	year-round	CA/OR/WA
Davis	6 mos to 3 years	10	1	year-round	GOA & Aleutian Is. (NTE 2 from western pop)
	females > 3 years	3	1	year-round	
ASLC	all	5	1	year-round	Alaska-wide
AEB	All	1	1	year-round	GOA, East Aleutian Is., AK Peninsula
Remote blubber biopsy (same animals captured below)					
NMML (782-1532)	2 mos to 3 yrs	120	1	year-round '05 using takes remaining from '04	Alaska-wide
	adult	60	1		
Remote marked (pelage dye, bleach, or paint) or remote tagged (with dart tags fired from CO₂ rifle or pistol)					
No permits currently authorize this activity					
Capture/Recapture (various methods) and Restraint (various methods) with Standard Morphometric Measurements					

Activity			animal	Season	Location
ADF&G	>5 days to 2 mos	700	1	June-July (permit expires June 30, 2005)	Alaska-wide
	>2 mo to 3 years	300	4	year-round (until permit expires in June '05)	
	> 3 years	10	2	year-round (until permit expires in June '05)	
NMML (782-1532)	> 5 days to 4 mos	1100	1	June-July '05 using takes remaining from '04	Alaska-wide
	≥ 4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	
Davis	≥ 1 year	30	3	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
	females > 3 years	15	3		
ODFW	1 week to 6 weeks	200	1	Jun-Jul '05 using takes remaining from '04	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round '05 using takes remaining from '04	CA/OR/WA
ASLC	>5 dys to 2 mos	60	1	Jun-Jul '05 using takes remaining from '04	Selected rookeries
	2 mos to 1 yr	240	1	year-round '05 using takes remaining from '04	Alaska-wide
	> 1 yr to 4 yrs	230	1	year-round '05 using takes remaining from '04	Alaska-wide
	Adult females	80	1	year-round '05 using takes remaining from '04	Alaska-wide

Note that the following takes are a subset of those animals authorized for capture and, thus, do not represent additional animals but additional procedures per animal.

Blood collection

Activity			animal	Season	Location
NMML (782-1532)	newborn to 4 mos	450	2	June-July '05 using takes remaining from '04	Alaska-wide
	4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	
ADF&G	newborn to 2 mos	700	2	June-July (permit expires June 30, 2005)	Alaska-wide
	2 months to 3 yrs	300	4	year-round (until permit expires in June '05)	
	> 3 years	10	2	year-round (until permit expires in June '05)	
Davis	≥ 1 year	30	3	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
	females > 3 years	15	3		
ODFW	1 week to 6 weeks	50	1	June – July '05 using takes remaining from '04	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round '05 using takes remaining from '04	
ASLC	>5 dys to 2 mos	60	1	June – July '05 using takes remaining from '04	Selected rookeries
	2 mos to 1 yr	60	1	year-round '05 using takes remaining from '04	Alaska-wide
	> 1 yr to 4 yrs	154	1	year-round '05 using takes remaining from '04	Alaska-wide
	Adult females	20	1	year-round '05 using takes remaining from '04	Alaska-wide
Muscle biopsy					
ADF&G	≥ 4 mos to 3 years	90	4	year-round (until permit expires in June '05)	Alaska-wide
NMML (782-1532)	≥ 4 mos to 3 years	60	2	year-round '05 using takes remaining from '04	Alaska-wide

Activity			animal	Season	Location
Tissue samples for genetic analysis (i.e., skin biopsy)					
NMML (782-1532)	≤ 1.5 mos	450	1	June-July '05 using takes remaining from '04	Alaska-wide
ODFW	1 week to 6 weeks	200	1	June-July '05 using takes remaining from '04	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round '05 using takes remaining from '04	
Blubber biopsy (may include skin)					
ADF&G	> 5 days to 2 mos	20	1	June-July (permit expires June 30, 2005)	Alaska-wide
	≥2 mos to 3 years	300	4	year-round (until permit expires in June '05)	
	> 3 years	10	1	year-round (until permit expires in June '05)	
NMML (782-1532)	≥ 4 mos to 3 years	120	2	year-round '05 using takes remaining from '04	Alaska-wide
Davis	≥ 1 year	30	3	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
	females > 3 years	15	3		
ASLC	>5 dys to 2 mos	60	1	Jun- Jul '05 using takes remaining from '04	Selected rookeries
	2 mos to 1 yr	60	1	year-round '05 using takes remaining from '04	Alaska-wide
	> 1 yr to 4 yrs	154	1	year-round '05 using takes remaining from '04	Alaska-wide
	Adult females	20	1	year-round '05 using takes remaining from '04	Alaska-wide
Fecal loops/culture swabs, skin and mucousal swabs					

Activity			animal	Season	Location
ADF&G	> 5 days to 2 mos	350	2	June-July (permit expires June 30, 2005)	Alaska-wide
	>2 mos to 3 years	300	4	year-round (until permit expires in June '05)	
	> 3 years	10	2	year-round (until permit expires in June '05)	
NMML (782-1532)	≤ 1.5 mos	250	2	June-July '05 using takes remaining from '04	Alaska-wide
	≥ 4 mos to 3 years	120	2	year-round '05 using takes remaining from '04	
Davis	≥ 1 year	30	3	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
	females > 3 years	15	3		
ODFW	≤ 1.5 months	200	1	June – July '05 using takes remaining from '04	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round '05 using takes remaining from '04	CA/OR/WA
ASLC	>5 dys to 2 mos	60	1	June- July '05 using takes remaining from '04	Selected rookeries
	2 mos to 1 yr	60	1	year-round '05 using takes remaining from '04	Alaska-wide
	> 1 yr to 4 yrs	154	1	year-round '05 using takes remaining from '04	Alaska-wide
	Adult females	20	1	year-round '05 using takes remaining from '04	Alaska-wide
Collect milk sample (includes injection of oxytocin)					
No permits currently authorize this activity					

Activity			animal	Season	Location
Tooth extraction (only 1 tooth is taken over the life of an animal)					
ADF&G	6 mos to 3 years	300	1	year-round (until permit expires in June '05)	Alaska-wide
	> 3 years	10	1	year-round (until permit expires in June '05)	Alaska-wide
NMML (782-1532)	≥4 mos to 3 yrs	120	1	year-round '05 using takes remaining from '04	Alaska-wide
ASLC	ASCL does not currently have authority for this activity.				
Collect vibrissae, hair and nails					
ADF&G	>5 days to 2 mos	20	1	June-July (permit expires June 30, 2005)	Alaska-wide
	>2 mos to 3 yrs	350	2	year-round (until permit expires in June '05)	
	> 3 years	10	2	year-round (until permit expires in June '05)	
NMML (782-1532)	≥4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	Alaska-wide
Flipper tag or other temporary mark (e.g., bleach, paint, dye, glued patch)					
ADF&G	>5 days to 2 mos	700	1	June-July (permit expires June 30, 2005)	Alaska-wide
	>2 mos to 3 yrs	300	1	year-round (until permit expires in June '05)	Alaska-wide
NMML (782-1532)	Newborn to 4 mos	1100	1	June-July '05 using takes remaining from '04	Alaska-wide
	≥4 mos to 3 yrs	120	1	year-round '05 using takes remaining from '04	

Activity			animal	Season	Location
Davis	≥ 1 year	30	1	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
	females > 3 years	15	1		
ODFW	< 6 weeks	200	1	June – July '05 using takes remaining from '04	CA/OR/WA
ASLC	>5 dys to 2 mos	60	1	June – July '05 using takes remaining from '04	Selected rookeries
	2 mos to 1 yr	60	1	year-round '05 using takes remaining from '04	Alaska-wide
	> 1 yr to 4 yrs	20	1	year-round '05 using takes remaining from '04	Alaska-wide
	Adult females	20	1	year-round '05 using takes remaining from '04	Alaska-wide
Hot-brand (only one brand over life of animal)					
ADF&G	>5 days to 2 mos	600	1	June-July (permit expires June 30, 2005)	Alaska-wide
	>2 mos to 3 yrs	300	1	year-round (until permit expires in June '05)	
NMML (782-1532)	≤ 1.5 mos	600	1	June-July '05 using takes remaining from '04	Alaska-wide
	≥ 4 mos to 3 yrs	120	1	year-round '05 using takes remaining from '04	
Davis	≥ 1 year	30	1	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
	females > 3 years	15	1		
ODFW	< 1.5 months	200	1	June – July '05 using takes remaining from '04	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round '05 using takes remaining from '04	CA/OR/WA
ASLC	> 5 dys to 2 mos	60	1	June – July '05 using takes remaining from '04	Selected rookeries

Activity			animal	Season	Location
Attachment of scientific instruments (e.g., VHF, SLTDR, UTPR, video system/data logger, sonic tag, drag/buoyancy blocks)					
ADF&G	>5 days to 2 mos	130	1	June-July (permit expires June 30, 2005)	Alaska-wide
	>2 mos to 3 yrs	65	4	year-round (until permit expires in June '05)	
NMML (782-1532)	≥ 4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	Alaska-wide
Davis	≥ 1 year	30	3	year-round '05 using takes remaining from '04	GOA & Aleutian Is.
	females > 3 years	15	3		
ODFW	≥4 mos to 3 yrs	30	1	year-round '05 using takes remaining from '04	CA/OR/WA
ASLC	ASLC does not currently have authority for this activity.				
Surgically implant data loggers in free-ranging animals					
No permits currently authorize this activity					
Bioelectric impedance analysis					
NMML (782-1532)	≥ 4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	Alaska-wide
ADF&G	≥2 mos to 3 yrs	300	2	year-round (until permit expires in June '05)	Alaska-wide
ASLC	> 1 year to 4 years	134	1	year-round using takes remaining from '04	Alaska-wide
Inject stable isotopes (e.g., H-3, O-18) and collect serial blood samples					
ADF&G	>2 mos to 3 yrs	300	4	year-round (until permit expires in June '05)	Alaska-wide

Activity			animal	Season	Location
NMML (782-1532)	≥ 4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	Alaska-wide
ASLC	> 1 year to 4 years	134	1	year-round using takes remaining from '04	Alaska-wide
Inject Evans blue dye and collect serial blood samples					
ADF&G	> 2 mos to 3 yrs	300	4	year-round (until permit expires in June '05)	Alaska-wide
NMML (782-1532)	≥ 4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	Alaska-wide
Inject oxytetracycline to mark whisker					
No permits currently authorize this activity					
Enema or stomach intubation					
ADF&G	>5 days to 2 mos	350	2	June-July (permit expires June 30, 2005)	Alaska-wide
	>2 mos to 3 yrs	300	4	year-round (until permit expires in June '05)	
NMML (782-1532)	≥ 4 mos to 3 yrs	120	2	year-round '05 using takes remaining from '04	Alaska-wide
ODFW	4 months to 3 years	30	1	year-round '05 using takes remaining from '04	CA/OR/WA
ASLC	ASLC does not currently have authority for this activity.				
Portable metabolic chamber measurements					
ADFG	> 2 mos to 3 yrs	200	4	year-round (until permit expires in June '05)	Alaska-wide

Activity			animal	Season	Location
Ultrasonic imaging [note: (R) means animals will be sampled with remote device on rookery]					
ADFG	ADFG does not currently have authority for this activity.				
NMML (782-1532)	NMML does not currently have authority for this activity.				
ASLC	> 1 year to 4 years	134	1	year-round using takes remaining from '04	Alaska-wide
Removal from wild with temporary captivity at ASLC and associated sampling (see Table 2 for captive procedures) -- see Table 2 for associated sampling activities					
ASLC	>1 yr to 4 yrs	16	1	year round	Alaska-wide

No Action Alternative Activity Table 2. This table represents activities that would be conducted with juvenile Steller sea lions (ages >1 year to 4 years) captured in Alaska and brought to the Alaska SeaLife Center for temporary captivity under Permit No. 881-1668.

			Frequency
1. Transport and temporary maintenance at ASLC for up to 3 months followed by return to wild	16 ¹ (not more than 4 at once)	1	Capture may occur at any time of year
2. Physical Restraint	16	Up to 13	Up to weekly as needed for “health assessments” and activity #23
3. Anesthesia	16	Up to 13	Up to weekly as needed for “health assessments” and activity #23
4. Sedatives	16	Up to 13	Up to weekly as needed for “health assessments” and activity #23
5. Body mass/morphometrics/3D-photogrammetry for “health assessment”	16	Up to 13	At entrance, exit, and weekly in between
6. Blood sampling for “health assessment”	16	Up to 13	At entrance, exit, and weekly in between
7. Blubber/skin biopsy for “health assessment”	16	2	At entrance and exit
8. Inject labeled water & collect serial blood samples for “health assessment”	16	4	At entrance and exit, plus twice more for activity #22
9. Inject Na Br and collect serial blood samples for “health assessment”	This activity is not currently authorized.		
10. Bioelectric impedance analysis for “health assessment”	16	2	At entrance and exit
11. Diagnostic ultrasound for “health assessment”	16	Up to 13	At entrance and exit, and weekly in between
12. Fecal collection (fecal loop) for “health assessment”	16	Up to 13	At entrance and exit, and weekly in

			between
13. Skin & mucosal swabs for “health assessment”	16	Up to 13	At entrance, exit, and weekly in between
14. Diagnostic x-ray for “health assessment”	16	2	At entrance and exit
15. Diagnostic endoscopy for “health assessment”	16	2	At entrance and exit
16. Urinalysis (with catheter) for “health assessment”	16	2	At entrance and exit
17. Flipper tag	16	1	Once – before exit
18. Hot brand	16	1	Once – before exit
19. Attach external data logger	16	1	Once – before exit
20. Food assimilation and protein turnover studies with 48 hours dry holding, dosing with Cr ² O ³ and Co-EDTA and injection of ¹⁵ [N]Glycine and associated blood sampling	This activity is not currently authorized.		
21. Doubly-labeled water technique validation study with 4 days dry holding, injection of isotopes and serial blood samples	This activity is not currently authorized.		
22. Controlled fasting (includes pre/post D ₂ O and 3 pre-fast and 3 post-fast blubber biopsies)	4 out of 16 in #1	1	Up to 8 animals over duration of permit ²
23. ACTH challenge (includes serial blood samples over 2 hour period)	4 out of 16 in #1	1	Up to 8 animals over duration of permit ³
24. Surgically implant dual “Life History Transmitters”	This activity is not currently authorized.		

1. Animals captured in field by ASLC under Permit No. 881-1668. See Proposed Action Activity Table 1.

2. Note the ASLC has already completed this study with 4 animals in 2004 so they would not use more than 4 more over the duration of the permit.

3. Note the ASLC has already completed this study with 4 animals in 2004 so they would not use more than 6 more over the duration of the permit.

APPENDIX D: GENERAL DESCRIPTION OF RESEARCH METHODOLOGIES

Aerial survey: The purpose of aerial surveys is to obtain photographs in which the number of animals present on a rookery or haulout are counted. This information is used to estimate the abundance of animals. The protocol currently employed by NMML and ADF&G for aerial surveys involves flying over rookeries and haul out sites at slow air speeds (100-150 knots), low altitudes (150-200 m), and close offshore (500 m), to take 35-mm color photographs and a back-up high-resolution 8mm video or digital for the purpose of counting non-pups present. The surveys typically include a single pass over each site, with additional passes made only when the photographers have reason to believe they may have missed part of the site. Replicate surveys on separate days are occasionally conducted to develop an estimate of the survey variance. Such estimates require multiple surveys at individual sites. The surveys are conducted between 1000 and 1600 hrs, as determined by the sun's position.

Vessel surveys: For the purposes of resighting sea lions tagged and branded by other permit holders and for collecting behavioral observations, vessels approach sea lion rookeries and haulouts within 200 meters. No vessel would be within close proximity to a rookery or haulout for this activity for more than 2-3 days at a time.

Ground counts: Because the resolution of the photographs taken during aerial surveys has been inadequate to detect pups reliably in some locations, during June and July researchers come ashore, or approach closely in vessels, to count young pups. Whenever possible, pups are counted from vessels, overlooks or other vantage points to minimize disturbance of rookeries. However, when these methods are unsuitable for accurate counts, personnel come ashore at rookeries to count pups in what are also called "drive counts" and "spook counts." Typically, all, or the majority of, adult and juvenile animals are intentionally driven or "spooked" from the rookery into the water or water's edge, in order to facilitate counting pups. After all or the majority of non-pups have retreated or entered the water, two or more biologists walk across the rookery, making independent counts of live and dead pups on the beach and in the water. Researchers typically occupy the rookery for ≤ 2 hours for counting, except when a number of pups are captured for weighing, measuring, and collection of tissue samples. In these instances, time on the rookery is determined by the processing time associated with various sampling protocols.

NMFS permits usually require researchers to wait until the end of the pupping season, after mother-pup bonds are well established, before conducting this activity. Although the timing of these activities, as indicated in the applications, permits, and annual reports, is intended to coincide with the end of pupping season, there may still be large numbers of very young pups and some pre-parturient females present on a rookery. This is because although the timing of pupping is relatively constant and synchronous (90% of pups born within a 25-day period) within a region, there is individual variation in parturition (likely related to temporal variability in nutritional status of reproductive females) as well as regional differences throughout the range (Pitcher et al. 2001). Pitcher et al. (2001) found that nearly all births of full-term pups throughout the range of Steller sea lions occur between May 15 and July 15, with the earliest

mean date of pupping at Forrester Island in Southeast Alaska (June 4) and latest at Año Nuevo Island, California (21 June). The mean date of birth becomes progressively later both north and south of Forrester Island, and is likely related to selection for time periods when weather conditions are favorable for pup survival and when adequate prey are predictably available near rookeries for lactating females.

Scat collection: Personnel go ashore on rookeries and haulouts to collect scat (fecal) samples for dietary studies, which can result in harassment and displacement of sea lions on rookeries and haulouts. Although blubber, whiskers, and other tissue samples are used in analyses of diet and feeding ecology, collection of these samples requires capture and restraint of animals. While not without limitations and biases (Bigg and Fawcett 1985; Antonelis et al. 1987; Harvey 1989; Pierce et al. 1993), scat collection provides a mechanism for broad estimates of the recent prey consumed by large numbers of sea lions without the potential adverse effects associated with capture and restraint. Scat samples are also analyzed for levels of hormones associated with stress and reproduction, thereby providing an estimate of the status of animals on the rookery without capture and handling. Scat collection typically coincides with ground counts or other rookery and haul-out activities, to minimize the amount of disturbance from sample collection alone.

Behavioral and Demographic Observations and Remote Monitoring: Field teams are stationed at select locations to conduct daily counts of sea lions by class (e.g., pups, juveniles, adult females, territorial males, etc.), conduct studies of attendance patterns of branded, tagged, and naturally-marked animals, record the presence of tagged and branded animals, and record observations of entangled or injured sea lions and the presence of other marine mammals and boat or air traffic. Remote monitoring stations equipped to collect any or all of still photographs, video images, VHF telemetry signals, and sonic transmitters, are set up on selected islands to collect similar data on seasonal movements and changes in abundance of sea lions. One objective of the observations and monitoring is to provide information on the sex and age structure of the population to complement that collected during ground counts, aerial surveys and capture activities. A second objective is to re-sight branded animals for studies of vital statistics. Observations are made from cliffs or other vantage points above rookeries and does not result in any takes. Establishing and servicing remote monitoring stations may result in harassment of some animals: these takes are included in the tasks for ground counts and capture/sampling activities.

Capture and restraint: It is usually necessary to restrain an animal in order to collect specimens, perform an examination, hot-brand, or attach slipper tags or scientific instruments. There are a variety of methods available for capture and restraint of Steller sea lions, depending on the size of the animal and the time of year for capture.

On the rookery, very young pups are caught and picked up by researchers, while capture of older/larger animals usually requires the use of a net, trap, or injectible immobilizing agent (administered remotely by a dart). The injectible immobilizing agent used for subduing older animals is Telazol (tiletamine-zolazepam; 2mg/kg). Animals in the water are captured using a hoop net, rope lasso/noose or floating platform trap. The lasso/noose and floating traps allow

sampling of a portion of the population previously inaccessible to researchers, including the juvenile age class of most interest in studies of the decline.

Pups may be restrained “for handling and processing” by hand, in a hoop net, or with inhalation (through a mask over their nose) of isoflurane gas. Older animals are “maintained on gas anesthesia for biological sampling and instrument attachment” through an endotracheal tube (intubated) for administering isoflurane. Older animals may be restrained with inhalation of isoflurane, as well as in a “fabric restraining wrap” or by wrapping in a “restraining net” or with the use of Valium (5ml per 100kg mass at 5mg/ml concentration) for sedation. Valium (Diazepam), a benzodiazepine with anticonvulsant and sedative effects, may be used to restrain animals during tagging and collection of blood and tissue samples.

Blood collection (venipuncture): Blood samples are collected from pups and juveniles of both sexes for a variety of analyses ranging from basic health assessment (including basic hematology and serum chemistry panels, disease status, and body composition), to studies to estimate blood volume as it relates to dive capacity. Although most blood characteristics are influenced by all types of stressors, including the stress associated with chase, capture, physical restraint, and chemical immobilization (Kirkpatrick 1980), some studies have correlated differences in blood chemistries to individual health in relationship to disease or environmental conditions when the effects of the stress associated with chase/capture/restraint were considered (Fadely 1997; Zenteno-Savin et al. 1997; Rea et al. 1998).

Blood collection in wild pinnipeds requires restraint, either physical or chemical. Smaller pups can be physically restrained by one to two researchers kneeling over or beside the animal to hold it stationary. Restraint of larger sea lions (i.e., over 75 kg) is facilitated by use of Valium, or, if other, lengthy physiological procedures are to be performed, with gas anesthesia. The most common site for blood collection in Steller sea lions is the caudal gluteal vein, which is near the animal’s tail (near the iliac crest), just to either side of the spine. To locate this vein, the animal must be restrained symmetrically, lying on its stomach with foreflippers tucked against the body and hindflippers straight out behind the animal. The caudal gluteal vein is not particularly large, especially in young pups, and can be difficult to locate beneath the fur, especially if the animal is not properly restrained and immobilized. Blood can also be collected from the interdigital veins of the hind flipper, which can be easier to locate due to the absence of hair and blubber layer on the flippers. However, the caudal gluteal vein is preferred because it may be very difficult to obtain blood from the interdigital veins under cold and wet conditions when the sea lion is experiencing vasoconstriction (reduced blood flow) in its extremities.

Blood sampling is often performed in conjunction with other sampling procedures such as flipper tagging, hot branding, administration of deuterium oxide, tooth extraction, enemas, and skin and blubber biopsy.

Muscle biopsy: Muscle biopsies can be used to analyze myoglobin content and fiber type. These measurements will permit calculation of muscle oxygen stores, which, in combination with estimates of blood volume (using Evans blue dye, as described below), can be used to estimate the aerobic dive capacity, which is a measure of diving ability. Determining how aerobic dive capacity changes with developmental stage from pup to juvenile is used in

interpreting foraging behavior derived from telemetry data. In general, obtaining a muscle biopsy involves cleansing the site (e.g., with Betadine) and injecting local anesthesia (e.g., Xylocaine) subcutaneously and intramuscularly at the sampling site or the use of general anesthesia (e.g., isoflurane gas). A small (e.g., 6-7 mm) incision is then made with a scalpel blade and a closed muscle biopsy canula needle is inserted into the incision. The needle must be pushed through the fascia into the muscle layer to a depth of approximately 1-cm, opened, and pressure applied to force muscle into the needle. The needle must then be closed and withdrawn. Pressure should be applied to the wound to staunch any bleeding. The wound is usually left open (no sutures or other method will be used to close the wound) to allow any abscesses that may form from infection to drain.

Skin and blubber biopsy: Skin biopsies approximately 5-to 7-mm in diameter are obtained by punching tissue from the webbing of the hind flipper, and are used for genetic analyses to identify biologically discrete (management) stocks, delineate home ranges, and evaluate site fidelity and the degree of population interchange. Blubber samples are used to compliment studies of diet and feeding ecology (via analysis of fatty acids and stable isotopes) and contaminants. For skin samples alone, an ear-tag punch designed for livestock can be pushed through the flipper with lever action, cleanly removing a small plug of skin from the flipper. Blubber samples are obtained using a biopsy punch. The biopsy site is usually prepared by trimming fur from a small patch, and scrubbing the area with pads soaked in dilute Betadine and then pads soaked in alcohol using sterile technique (i.e., starting at the center of the sample site and moving outward). A small (e.g., 1-2 cm) incision is made in the skin prior to application of the biopsy punch to accommodate the needle while producing a smaller entry wound than would otherwise occur from the needle directly. The biopsy punch is then applied in a rotating action to cut into the blubber layer to obtain a core. The core is then grasped by sterile forceps, elevated, and cut away by sterile scissors or scalpel blade. Any blood flow from the biopsy site is staunched with direct pressure with a sterile pad. Because absolute sterility of technique cannot be assured in the field, the wound will be left open (no sutures or other method will be used to close the wound) to allow any abscesses that may form from infection to drain.

Fecal loops and culture swabs: Samples of fluids and tissues are collected for a variety of analyses including determination of the presence of parasites and viral or bacterial infections. Disposable sterile fecal loops are available to collect fecal samples for determination of parasites, disease, and hormone concentrations. In addition, sterile bacterial culture swabs can be used to collect samples from dermal lesions, or from ocular, rectal, and/or vaginal areas. This procedure is usually performed in conjunction with capture, gas anesthesia, flipper tagging, hot branding, administration of deuterium oxide, blood collection, tooth extraction, enemas, skin, blubber, and muscle biopsy.

Tooth extraction: Teeth are extracted in order to estimate the age of animals captured by sectioning the tooth in a laboratory and counting incremental growth layers. An animal's size at a given age is one of the most useful measures of condition, and is important in measures of weaning status. Age of pups up to one year can be estimated based on the season of capture, teeth eruption pattern, and general animal size. However, these techniques are not precise for sea lions older than one year because of the overlap in size. Extraction of one 2nd pre-molar tooth from the right side of the mouth, using a scalpel to loosen attachments and then extracting the

tooth with a dental elevator, is accomplished under general anesthesia. If marked animals are recaptured in subsequent years following tooth extraction, it should not be necessary to pull additional teeth for aging.

Collecting vibrissae, hair and nails: Vibrissae, hair, and nails are collected for analysis of stable isotopes to determine the trophic level at which an animal has been feeding over time. NMML also proposed to use vibrissae in genetic analyses. Vibrissae can be collected either by clipping close to the skin, or by pulling out at the root. For hair samples, an area approximately 3cm² is clipped close to the skin. The tip of a nail from each foreflipper is clipped. The stable isotope ratios of Steller sea lion vibrissae have been shown to have regular, oscillating patterns of 1-3 cm, and changes in the ratio can occur in less than 1 cm (Hirons et al. 1998). Thus, clipped whiskers can provide incomplete records of the sea lion's dietary history, whereas a pulled whisker provides a complete record.

Surgically implant data loggers: The Life History Transmitters (a.k.a, LHX tags) are equipped with sensors to monitor pressure, motion, light levels, temperature, and conductivity. These data loggers are designed to be implanted intraperitoneally and record data from these sensors for up to 10 years. The LHX tags are intended to transmit the stored data upon release from an animal's body cavity following mortality. Each animal would receive two tags as insurance in case one tag fails. Each tag is 122 mm long by 42 mm in diameter and weighs approximately 116 grams.

Animals must be anesthetized for the surgical implantation. Because the surgery can take up to two hours, animals would need to be intubated and maintained under gas anesthesia. An incision of 7-8 cm long, through the abdominal wall including abdominal muscles and peritoneal layers, is required to insert each tag. The incisions are closed using absorbable sutures. The skin incision may also be further secured by application of surgical glue or dissolvable staples.

Insert stomach temperature transmitters: Transmitters can be inserted into an animal's stomach via a stomach tube passed through the mouth and esophagus. The cylindrical transmitters measure 4.5 cm diameter by 7 cm long. The transmitters are designed to measure changes in pressure, impedance, and stomach temperature. These measurements are correlated to feeding events. Animals must be sedated or anesthetized for insertion of the transmitter.

Bioelectric Impedance Analysis (BIA): BIA is a method for measuring body composition by measuring the conductivity across electrodes placed on the skin, or inserted subcutaneously (under the skin). The advantage of this technique is that estimates of body composition can be obtained in a few minutes, compared to the two or more hours needed when using deuterated water methods. This technique, which has been used with varying degrees of precision in a variety of marine mammals (Gales et al. 1994; Arnould 1995; Bowen et al. 1998; Bowen et al. 1999; Castellini 2001), requires development of a mathematical model that compares body composition obtained from another method (e.g., deuterated water) with conductance measures from BIA. The procedure, as described in the applications, is to insert four 1.5-inch 20-gauge needles subcutaneously (two just behind the skull and two near the tail), attach leads to a BIA unit, and measure the rate of current between them. A small current is sent from the BIA unit through one set of electrodes in order to measure the conductivity of the body. The electrodes

are removed following the reading and then the measurements are repeated 2-5 times for precision, meaning the electrodes are re-inserted into the individual animal for each new reading.

Evans blue dye: The purpose of this procedure is to determine blood volume. This measure can be used in combination with determination of muscle myoglobin (see muscle biopsy above) to estimate the aerobic dive capacity, which could provide a better understanding of when young sea lions become physiologically able to access various prey resources. Understanding how the aerobic dive capacity changes during development from pup to juvenile is considered important in interpreting foraging behavior. Following collection of an initial blood sample, a dose of Evans blue dye is administered intravenously. Additional blood samples are collected at regular intervals for approximately 30 minutes to establish a dilution factor.

Flipper tagging: Plastic (Allflex™) tags bearing unique alphanumeric codes may be affixed to any animal captured, including pups as young as one week old, for future identification of individual animals. These type of tags are commonly used in livestock, where they are attached through the upper or front edge of the ear, near the base of the ear where the cartilage is thicker and the tag less likely to pull out, using special pliers in a process similar to ear piercing. In sea lions, these tags are affixed to the trailing edge of each foreflipper, through the loose skin near the area where the flipper meets the body.

In most cases, each animal receives two tags, one per foreflipper, to optimize the chance of recognizing the animal if only one flipper is visible, and to minimize the chance of losing the ability to identify the animal should one tag be lost. Flipper tags are subjected to extreme physical abuse and are prone to high loss rates. Under ideal conditions, they can be expected to last four to six months. However, studies in captive pinnipeds suggest that tags last 1-2 years, before being torn loose or worn to the point of unreadability (Dierauf 1990). The tags are brightly colored to optimize visibility and, under optimal conditions, can be read from up to one-half mile away using optical aids (e.g., binoculars and digital cameras). Because blood and tissue samples are frequently collected from animals at the time of tagging, the tagging is often performed with animals under gas anesthesia.

Hot branding: The purpose of hot-branding is to permanently mark animals with a unique combination of numbers and/or letters that would allow identification of individual animals over time. The ability to identify individual animals long-term is considered important in determination of vital rates such as age-specific survival and age at first reproduction. Studies on seasonal movements, site fidelity and dispersal are facilitated by the ability to identify individuals in a population. Any animals captured and sampled may be hot branded for future identification. In addition to facilitating longitudinal studies of vital rates, these brands allow researchers operating under the various permits to determine whether an animal was recently captured and handled (including whether drugs were administered) by another permit holder.

Animals of all ages may be branded. Pups \leq six weeks old are branded on their natal rookeries. The process of branding pups on rookeries usually requires that the majority of juvenile and adult animals be driven from the rookery as described for ground counts above. Pups are sometimes corralled against cliffs or boulders for processing. Branding of animals captured at-

sea, outside of breeding season, or otherwise away from rookeries may not result in disturbance of other sea lions.

Hot-branding of pinnipeds involves the use of cold-rolled steel branding irons heated to “red-hot” (about 500°F) in a portable, propane-fired forge, applied to the shoulder of the animal. This procedure produces burns that penetrate the entire outer layer of the skin and into the inner skin layer (i.e., 2nd degree burns). These burns are characterized by formation of blisters, swelling, and fluids seeping from the burned area and are accompanied by severe pain due to damage of capillary blood vessels in the skin. However, the total skin area affected is a small percentage of the animal’s skin surface (less than 2% for a one-week old pup measuring 95 cm standard length and 65 cm axillary girth).

Each animal receives a single three- or four-digit brand, where each digit is approximately 5 cm wide and 8 cm high, and the individual digits are placed 4-5 cm apart. Each brand requires about one minute to complete, exclusive of preparation and anesthesia.

External attachment of scientific instruments: Various types of instruments may be attached to Steller sea lions for remote collection of data. For example, VHF transmitters and satellite-linked time depth recorders (SLTDR) are used to collect data on attendance and movement patterns and foraging behavior. Typically, animals fitted with scientific instruments also have blood and various tissue samples collected, may be anesthetized/sedated, and may be flipper tagged and hot-branded.

Instrument packages are usually attached to pinnipeds by gluing to the hair with a fast-drying epoxy adhesive. The duration of instrument attachment is dependent on the timing of molting because the instrument will be shed as the hair is molted. The mass, dimensions, and drag characteristics of the instruments vary with the type of instrument. The location of instrument attachment also varies with the function of the instrument. Some instruments are attached to the dorsal surface, others may be affixed to the animal’s head or flippers.

Injecting stable isotopes: Deuterium labeled water may be used to quantify water (and milk) influx, determine total body water, and estimate body composition in free-ranging animals. Isotopic measurements of energy expenditure and/or food consumption utilize similar protocols (Costa 1987). An initial blood sample must be taken to determine the animal’s natural isotopic background concentration. An accurate measurement of the animal’s mass is also needed. A measured amount (e.g., 1 g D₂O per kg body mass) of isotope is administered and a second blood sample is taken following isotope equilibration. The time period necessary for isotopic equilibration varies with the size and feeding state of the animal, and can range from 1 to 3 hours. Thus animals must be held for the duration of the equilibration period, or recaptured for collection of the post-equilibration sample. Due to the limited sensitivity of infrared spectrophotometers used to measure the deuterium isotope, it is typically necessary to inject large volumes of labeled water (e.g., 1 g kg⁻¹ for total body water determinations) to achieve high blood deuterium levels. Blood samples of 0.5 ml or more are required for analysis. Alternatively, lower isotope enrichment (0.01 to 0.04 g kg⁻¹) can be used if samples are to be analyzed by the more expensive gas isotope ratio mass spectroscopy.

Administer Co-EDTA and chromic oxide (Cr₂O₃) with associated dry holding: Chromic oxide and Co-EDTA can be used as markers in studies of the digestibility of food. These substances, administered in or with food, allow quantification of the rate of passage of food through the digestive track. They also allow measurement of the relationship between food intake and digestibility of various food items. Because measurements of rates of passage and digestibility require both administration of known quantities of food and collection of urine and feces, this technique requires that animals be maintained in an environment that eliminates access to additional food and water during the trial while allowing for collection of urine and feces. Thus, this procedure requires “dry holding” for up to 48 hours.

Ultrasound: Portable sector and linear ray ultrasound equipment can be used to non-invasively obtain two-dimensional visualization of many internal organs and to estimate blubber thickness. Animals must be either physically or chemically restrained to accomplish this procedure. It is not usually necessary to shave the hair as long as the coat is kept wet and generous amounts of coupling gel (a non-toxic substance) are used to maintain an adequate coupling.

Enemas: The purpose of using enemas is to collect the contents of the digestive tract for analyses of an animal’s diet. In general, the process involves insertion of a tube into the rectum followed by flushing with several liters of water. Animals usually must be anesthetized during the procedure, which is usually conducted in conjunction with other sampling and marking activities.

Stomach intubation: Researchers may use stomach intubation as an alternative to, or in conjunction with, enemas for collecting diet samples. Samples are collected directly from the stomach because the rate of prey digestion varies with prey type and some items may be too degraded during digestion for analysis from samples obtained via enemas. The stomach intubation may also be used to test for the presence of and obtain a sample of milk. In general, the procedure is to insert a stomach tube into the mouth and throat of anesthetized animals and gently guide the tube down through the esophagus. Suction results in any stomach fluids [wicking] up the tube, which is then pinched, extracted, and the stomach contents drained into sample containers.

Incidental Mortality: No permit authorizes intentional lethal takes of Steller sea lions. However, in acknowledgement of the fact that there is an inherent risk of serious injury and mortality associated with some research activities on wild animals, all permits allow for a limited number of mortalities incidental to the research. The number of incidental mortalities allowed is based on the permit holders’ estimate of the potential for such mortalities.

Consistent with the broad definitions of “take” under the MMPA and ESA, permits issued pursuant to section 104 of the MMPA and section 10(a)(1)(A) of the ESA provide an exemption from the take prohibitions for any mortality resulting from the actions or presence of the researchers while conducting permit-authorized activities, as limited by the numbers specified in the permit. This exemption includes, but is not limited to: deaths of dependent pups by starvation following abandonment resulting from disturbance to a rookery or the research-related death of a lactating female; deaths of marine mammals due to adverse reactions to anesthetics or other chemical agents; deaths of marine mammals caused or precipitated by infections resulting

from intrusive research procedures; deaths of animals due to capture myopathy resulting from the stress of capture and handling; and deaths of animals due to serious injuries sustained in attempts to escape or evade capture or in response to stampedes or aggressive social interactions caused by research activities.

APPENDIX E: ACTIVITY TABLES FOR PROPOSED ACTION ALTERNATIVE

Proposed Action Activity Table 1. All takes are authorized on an annual basis. Where “Season” is marked as “year-round” the total “number of animals taken per year” could be used by the permit holder any time during the year, according to the objectives and protocols described in their application and mitigation measures required by the permit. Where “season” is marked with a number of months, the total “number of animals taken per year” would be used entirely during those months. NOTE: The ADF&G, NMML (782-1768), NPUMMRC, and Horning permits would be valid for five years from date of issuance (i.e., through spring 2010); the amendment to NMML Permit No. 782-1702 would be valid through the current expiration date of September 30, 2008; the amendments to the AEB, ASLC, ODFW, and Davis permits would be valid through December 2008.

					Location
Aerial survey: breeding season					
NMML (782-1768)	pups	10k	U	June '05-'09	West of 144°W
	non-pups	29k	U	June '06 & '08	
	non-pup	15k	U	Jun-Jul '05, '07, '09	
	pup	6k	U	June '05-'09	East of 144°W
	non-pup	18k	U	June '06 & '08	
	non-pup	10k	U	Jun-Jul '05, '07, '09	
NMML (782-1702)	all	4500	Up to 40	Year round	WA and OR
NPUMMRC	pups	5k	2	once in Jun & once in Jul	SEAK
	non-pups	15k	2	once in Jun & once in Jul	SEAK
Aerial survey: non-breeding season					
NMML-1768	all	25k	U	Aug-May '05-'09	West of 144°W
	all	10k	U	Aug-May '05-'09	East of 144°W
NPUMMRC	non-pup	20k	Up to 10	monthly Aug-May	SEAK

			year		Location
Aerial survey: other					
ADFG	non-pups	15k	U	Mar-Apr '05-'10	SEAK-Alsek & Akwe River
NMML-1768	all	25k	U	Mar, Jun, Sep, Dec '05-'09	West of 144°W
	all	55k	U	Jan-Dec '05-'09	East of 144°W
AEB	all	28k	4	Sep, Dec, Mar, Jun '05, '07	GOA, East Aleutian Is., AK Peninsula
		77k	4	Sep, Dec, Mar, Jun '06	
Vessel survey					
AEB	all	1600	4	Sep, Dec, Mar, Jun	GOA, East Aleutian Is., AK Peninsula
Ground counts (may include incidental scat collection)					
ADF&G	non-pups	15k	U	Jun-Jul '05-'10	SEAK
	pups	10k	U	Jun-Jul '05-'10	
NMML-1768	pups	4,100	U	Jun-Jul '05, '07, '09	West of 144°W
	non-pups	15k	U	Jun-Jul '05, '07, '09	
	pups	6k	U	Jun-Jul '06, '08	West of 144°W
	non-pups	18k	U	Jun-Jul '06, 08	
ODFW	non-pups	5k	U	June – July annually	CA/OR/WA
	pups	2k	U	June – July annually	CA/OR/WA
Incidental disturbance during scat collection, capture/sampling, instrument retrieval, or observational activities					
ADF&G	all	15k	U	year-round	Alaska-wide
NMML-1768	all	20k	U	year-round	Alaska-wide
NMML-1702	all	4500	Up to 30	Year-round	WA/OR
ODFW	all	10k	U	year-round	CA/OR/WA
NPUMMRC	all	3k	Up to 12	monthly	SEAK

			year		Location
Davis	adults	1200	U	year-round	GOA & Aleutian Is.
	pups and juveniles	1200	U	year-round	GOA & Aleutian Is.
ASLC	all	15k	U	year-round	Alaska-wide
AEB	all	1600	4	Sep, Dec, Mar, Jun	GOA, East Aleutian Is., AK Peninsula
Incidental disturbance during studies of other marine mammal species					
SWFSC	all	3k	3	Year-round	CA, OR, WA, AK east of 144°W
NMML-1702	all	4,500	30	Year-round	WA and OR
Matkin	all	750	U	Year-round	AK
Straley	all	100	U	Year-round	AK
Wynne	all	100	U	Year-round	AK
Collect carcasses/parts of carcasses of dead sea lions					
ADF&G	all	unlimited	1	year-round	Alaska-wide
ASLC	all	unlimited	1	year-round	Alaska-wide
Receive tissue samples from subsistence harvested sea lions					
ADF&G	all	unlimited	1	year-round	Alaska-wide
Behavioral and demographic observations on rookeries					
NMML-1768	all	0	0	year-round	Range-wide
ADFG	all	0	0	year-round	Alaska-wide
Remote monitoring stations on rookeries and haulouts					
NMML-1768	all	0	0	year-round	Range-wide
ODFW	all	0	0	year-round	CA/OR/WA

			year		Location
Imaging sea lion/prey interactions with multi-beam sonar					
NMML-1768	all	0	0	year-round	Range-wide
Tracking animals at sea					
NPUMMRC	1-3 yrs	30	1	Sep-Dec	SEAK
Incidental mortality					
ADF&G	all	10	1	year-round	Alaska-wide, NTE 5 from western population
NMML-1768	all	10	1	year-round	Alaska-wide, NTE 5 from western population
NMML-1702	all	1	1	year-round	WA/OR
ODFW	all	10	1	year-round	CA/OR/WA
NPUMMRC	all	5	1	year-round	SEAK
Davis	6 mos to 3 years	10	1	year-round	GOA & Aleutian Is.
	females > 3 years	3	1	year-round	NTE 2 from western pop
ASLC	all	10	1	year-round	Alaska-wide, NTE 5 from western population
AEB	All	1	1	year-round	GOA, East Aleutian Is., AK Peninsula
Remote marked (pelage dye, bleach, or paint) or remote tagged (with dart tags fired from CO₂ rifle or pistol)					
NMML-1702	>1 year	3	3	Year-round	WA/OR
Capture/Recapture (various methods) and Restraint (various methods) with Standard Morphometric Measurements					
ADF&G	>5 days to 2 mos	700	1	June-July	Alaska-wide
	>2 mo to 3 years	300	4	year-round	
	> 3 years	30	2	year-round	

			year		Location
NMML-1768	> 5 days to 2 mo	1100	1	June-July	Alaska-wide
	> 2 mo to 3 yrs	120	4	year-round	
	> 3 yrs	60	2	year-round	
NMML-1702	> 1 year	12	2	Year-round	WA/OR
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > 3 years	15	4	year-round	GOA & Aleutian Is.
ODFW	1 week to 6 weeks	200	1	Jun-Jul	CA/OR/WA
	≥4 mos to 3 yrs	30	1	Year-round	CA/OR/WA
ASLC	>5 dys to 2 mos	40	1	Jun-Jul '05	Selected rookeries
		20	5	Breeding season '05	Selected rookeries
		60	1	Jun-Jul '06 & '07	Selected rookeries
		40	5	Breeding season '06 & '07	Alaska-wide
	2 mos to 1 yr	220	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '05, '06, '07	
	> 1 yr to 4 yrs	210	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '06, '07	
	Adult females	20	1	year-round '05	Alaska-wide
		20	3	year-round '05	Alaska-wide
60		1	year-round '06, '07	Alaska-wide	
40		3	year-round '06, '07	Alaska-wide	
Note that the following takes are a subset of those animals authorized for capture and, thus, do not represent additional animals but additional procedures per animal.					
Blood collection					
NMML-1768	> 5 days to 2 mo	450	1	June-July	Alaska-wide

					Location
	> 2 mo to 3 yrs	120	4	year-round	
	> 3 yrs	60	2	year-round	
NMML-1702	> 1 year	12	2	year-round	WA/OR
ADF&G	newborn to 2 mos	700	2	June-July	Alaska-wide
	2 months to 3 yrs	300	4	year-round	
	> 3 years	30	2	year-round	
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > 3 years	15	4	year-round	GOA & Aleutian Is.
ODFW	1 week to 6 weeks	50	1	June - July	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round	
ASLC	>5 dys to 2 mos	40	1	June – July '05	Selected rookeries
		20	5	Breeding season '05	Selected rookeries
		40	1	June – July '06,	Alaska-wide
		40	5	'07Breeding season '05	Alaska-wide
	2 mos to 1 yr	220	1	year-round	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '06, '07	
	> 1 yr to 4 yrs	134	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '06, '07	
	Adult females	20	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	Alaska-wide
40		3	year-round '06, '07	Alaska-wide	
Muscle biopsy					
ADF&G	≥ 4 mos to 3 years	90	4	year-round	Alaska-wide
	> 3 yrs	30	4	year-round	Alaska-wide
NMML-1768	> 2 mo to 3 yrs	60	4	year-round	Alaska-wide
	> 3 yrs	30	2	year-round	Alaska-wide

			year		Location
Tissue samples for genetic analysis (i.e., skin biopsy)					
NMML-1768	> 5 days to 2 mo	450	1	June-July annually	Alaska-wide
	> 2 mo to 3 yrs	120	1	year-round	
	> 3 yrs	60	1	year-round	
ADF&G	> 5 days to 2 mos	700	1	June-July annually	Alaska-wide
	≥2 mos to 3 yrs	300	4	year-round	
	> 3 years	30	1	year-round	
ODFW	1 week to 6 weeks	200	1	June-July annually	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round	
Blubber biopsy (may include skin)					
ADF&G	> 5 days to 2 mos	20	1	June-July annually	Alaska-wide
	≥2 mos to 3 years	300	4	year-round	
	> 3 years	30	1	year-round	
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Alaska-wide

					Location
	> 3 yrs	60	2	year-round	Alaska-wide
NMML-1702	> 1 year	12	2	Year-round	WA/OR
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > 3 years	15	4	year-round	GOA & Aleutian Is.
ASLC	>5 dys to 2 mos	40	1	Jun- Jul '05	Selected rookeries
		20	3	Breeding season '05	Selected rookeries
		40	1	June –July '06, '07	Alaska-wide
		40	3	Breeding season '06, '07	Alaska-wide
	2 mos to 1 yr	220	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '06, '07	
		40	3	year-round '06, '07	
	> 1 yr to 4 yrs	134	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '06, '07	
	Adult females	20	1	year-round '05	Selected rookeries
		20	3	year-round '05	Selected rookeries
20		1	year-round '06, '07	Alaska-wide	
40		3	year-round '06, '07	Alaska-wide	
Fecal loops/culture swabs, skin and mucousal swabs					
ADF&G	> 5 days to 2 mos	350	2	June-July annually	Alaska-wide
	>2 mos to 3 years	300	4	year-round	
	> 3 years	10	2	year-round	
NMML-1768	> 5 days to 2 mo	1100	1	June-July annually	Alaska-wide
	> 2 mo to 3 yrs	120	4	year-round	
	> 3 yrs	60	2	year-round	
NMML-1702	> 1 year	12	2	Year-round	WA/OR
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > years	15	4	year-round	GOA & Aleutian Is.

			year		Location
ODFW	≤ 1.5 months	200	1	June – July annually	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round	CA/OR/WA
ASLC	>5 dys to 2 mos	40	1	June- July '05	Selected rookeries
		20	3	Breeding season '05	Selected rookeries
		40	1	June –July '06, '07	Alaska-wide
		40	3	Breeding season '06, '07	Alaska-wide
	2 mos to 1 yr	220	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '06, '07	
		40	3	year-round '06, '07	
	> 1 yr to 4 yrs	134	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '06, '07	
	Adult females	20	1	year-round '05	Selected rookeries
		20	3	year-round '05	Selected rookeries
20		1	year-round '06, '07	Alaska-wide	
40		3	year-round '06, '07	Alaska-wide	
Tooth extraction (only 1 tooth is taken over the life of an animal)					
ADF&G	6 mos to 3 years	300	1	year-round	Alaska-wide
	> 3 years	30	1	year-round	Alaska-wide
NMML-1768	> 2 mo to 3 yrs	120	1	year-round	Alaska-wide
	> 3 yrs	60	1	year-round	Alaska-wide
Davis	6 mos to 3 years	30	1	year-round	GOA & Aleutian Is.

					Location
	females > years	15	1	year-round	GOA & Aleutian Is.
ASLC	2 mos to 1 yr	240	1	year-round '05	Alaska-wide
		260	1	year-round '06, '07	
	> 1 yr to 4 yrs	154	1	year-round '05	Alaska-wide
		174	1	year-round '06, '07	
Adult females	60	1	year-round '05	Alaska-wide	
	100	1	year-round '06, '07		
Collect vibrissae, hair and nails					
ADF&G	>5 days to 2 mos	20	1	June-July annually	Alaska-wide
	>2 mos to 3 yrs	350	2	year-round	
	> 3 years	10	2	year-round	
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Alaska-wide
	> 3 yrs	60	2	year-round	Alaska-wide
NMML-1702	>1 year	12	2	Year-round	WA/OR
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > years	15	4	year-round	GOA & Aleutian Is.
Flipper tag or other temporary mark (e.g., bleach, paint, dye, glued patch)					
ADF&G	>5 days to 2 mos	700	1	June-July annually	Alaska-wide
	>2 mos to 3 yrs	300	1	year-round	Alaska-wide
NMML-1768	> 5 days to 2 mo	700	1	June-July annually	Alaska-wide
	> 2 mo to 3 yrs	120	4	year-round	
	> 3 yrs	60	2	year-round	
NMML-1702	> 1 year	12	2	Year-round	WA/OR
Davis	6 mos to 3 years	30	1	year-round	GOA & Aleutian Is.
	females > years	15	1	year-round	GOA & Aleutian Is.
ODFW	pups < 6 weeks	200	1	June – July annually	CA/OR/WA

			year		Location
ASLC	>5 dys to 2 mos	60	1	June – July '05	Selected rookeries
		100	1	June – July '06, '07	Alaska-wide
	2 mos to 1 yr	240	1	year-round '05	Alaska-wide
		260	1	year-round '06, '07	
	> 1 yr to 4 yrs	154	1	year-round '05	Alaska-wide
174		1	year-round '06, '07		
Adult females	60	1	year-round '05	Alaska-wide	
	100	1	year-round '06, '07		
Hot-brand (only one brand over life of animal)					
ADF&G	>5 days to 2 mos	600	1	June-July annually	Alaska-wide
	>2 mos to 3 yrs	300	1	year-round	
	> 3 years	30	1	year-round	
NMML-1768	> 5 days to 2 mo	400	1	June-July annually	Alaska-wide
	> 2 mo to 3 yrs	120	1	year-round	
	> 3 yrs	60	1	year-round	
NMML-1702	> 1 year	12	1	Year-round	WA/OR
Davis	6 mos to 3 years	30	1	year-round	GOA & Aleutian Is.
	females > 3 years	15	1	year-round	GOA & Aleutian Is.
ODFW	< 1.5 months	200	1	June – July annually	CA/OR/WA
	≥4 mos to 3 yrs	30	1	year-round	CA/OR/WA
ASLC	> 5 dys to 2 mos	60	1	June – July '05	Selected rookeries
		100	1	June- July '06, '07	Alaska-wide
	2 mos to 1 yr	240	1	year-round '05	Alaska-wide
		260	1	year-round '06, '07	
	> 1 yr to 4 yrs	154	1	year-round '05	Alaska-wide
174		1	year-round '06, '07		
Adult females	60	1	year-round '05	Alaska-wide	
	100	1	year-round '06, '07		

			year		Location
Attachment of scientific instruments (e.g., VHF, SLTDR, UTPR, video system/data logger, sonic tag, drag/buoyancy blocks)					
ADF&G	>5 days to 2 mos	130	1	June-July annually	Alaska-wide
	>2 mos to 3 yrs	65	4	year-round	
	> 3 yrs	30	1	year-round	
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Range-wide
	> 3 yrs	60	2	year-round	Range-wide
NMML-1702	> 1 year	6	2	Year-round	WA/OR
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > 3 years	15	4	year-round	GOA & Aleutian Is.
ODFW	≥4 mos to 3 yrs	30	1	year-round	CA/OR/WA
	1 week to 2 months	80	1	June – July annually	CA/OR/WA
ASLC	2 mos to 1 yr	20	3	year-round '05	Alaska-wide
		40	3	year-round '06, '07	
	>1 yr to 4 yrs	20	3	year-round '05	Alaska-wide
		40	3	year-round '06, '07	
	Adult female	20	3	year-round '05	Alaska-wide
		40	3	year-round '06, '07	
Insert stomach temperature transmitters					
ASLC	>2 mos to 1 yr	20	1	Year-round '05	Alaska-wide
		40	1	Year-round '06 and '07	
	>1 year to 4 yrs	20	1	Year-round '05	Alaska-wide
		40	1	Year-round '06 and '07	
	Adult females	40	1	Year-round '05	Alaska-wide
		80	1	Year-round '06 and '07	
Bioelectric impedance analysis					
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Alaska-wide

					Location
	> 3 yrs	60	2	year-round	Alaska-wide
ADF&G	≥2 mos to 3 yrs	300	2	year-round	Alaska-wide
	> 3 yrs	30	2	year-round	Alaska-wide
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > 3 years	15	4	year-round	GOA & Aleutian Is.
ASLC	> 5 days to 2 mos	20	5	Breeding season '05	Selected rookeries
		40	5	Breeding season '06, '07	Alaska-wide
	2 mos to 1 yr	220	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '05	
	> 1 year to 4 years	134	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '06, '07	
	Adult females	20	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	Alaska-wide
40		3	year-round '06, '07	Alaska-wide	
Inject stable isotopes (e.g., H-3, O-18) and collect serial blood samples					
ADF&G	>2 mos to 3 yrs	300	4	year-round	Alaska-wide
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Alaska-wide
	> 3 yrs	60	2	year-round	Alaska-wide
ASLC	> 5 dys to 2 mos	20	5	Breeding season '05	Selected rookeries
		40	5	Breeding season '06, '07	Alaska-wide
	2 mos to 1 yr	220	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
		40	3	year-round '06, '07	
	> 1 year to 4 years	134	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	
40		3	year-round '06, '07		

					Location
	Adult females	20	1	year-round '05, '06, '07	Alaska-wide
		20	3	year-round '05	Alaska-wide
		40	3	year-round '06, '07	Alaska-wide
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > 3 years	15	4	year-round	GOA & Aleutian Is.
Inject Evans blue dye and collect serial blood samples					
ADF&G	> 2 mos to 3 yrs	300	4	year-round	Alaska-wide
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Alaska-wide
	> 3 yrs	60	2	year-round	Alaska-wide
Enema or stomach intubation					
ADF&G	>5 days to 2 mos	350	2	June-July annually	Alaska-wide
	>2 mos to 3 yrs	300	4	year-round	
	> 3 yrs	30	2	year-round	
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Alaska-wide
	> 3 yrs	60	2	year-round	Alaska-wide
ODFW	4 months to 3 years	30	1	year-round	CA/OR/WA
ASLC	2 mos to 1 yr	20	3	year-round '05	Alaska-wide
		40	3	year-round '06, '07	
	>1 yr to 4 yrs	20	3	year-round '05	Alaska-wide
		40	3	year-round '06, '07	
	Adult females	20	3	Year-round '05	Alaska-wide
		40	3	Year-round '06, '07	Alaska-wide
Portable metabolic chamber measurements					
ADFG	2 mos to 3 yrs	200	4	year-round	Alaska-wide
	> 3 yrs	30	2	year-round	Alaska-wide

			year		Location
Ultrasonic imaging [note: (R) means animals will be sampled with remote device on rookery]					
ADFG	2 mos to 3 yrs	300	2	year-round	Alaska-wide
	> 3 yrs	30	2	year-round	Alaska-wide
NMML-1768	> 2 mo to 3 yrs	120	4	year-round	Alaska-wide
	> 3 yrs	60	2	year-round	Alaska-wide
ASLC	> 5 days to 1 yr	60 (R)	4	year-round '05	Chiswell Is
		250 (R)	4	year-round '06, '07	Alaska-wide
	>1 yr to 4 yrs	100 (R)	4	year-round '05	Chiswell Is
		400 (R)	4	year-round '06, '07	Alaska-wide
		134	1	year-round '05, '06, '07	Alaska-wide
	Adult female	60 (R)	4	year-round '05	Chiswell Is
240 (R)		4	year-round '06, '07	Alaska-wide	
Adult male	20 (R)	4	year-round '05	Chiswell Is	
	80 (R)	4	year-round '06, '07	Alaska-wide	
	1 year to 4 yrs	134	1	year-round	Alaska-wide
Davis	6 mos to 3 years	30	4	year-round	GOA & Aleutian Is.
	females > 3 years	15	4	year-round	GOA & Aleutian Is.
Removal from wild with temporary captivity at ASLC and associated sampling (see Table 2 for captive procedures) -- see Table 2 for associated sampling activities					
ASLC	>1 yr to 4 yrs	16	1	Year round	Alaska-wide

Proposed Action Activity Table 2. This table represents activities that would be conducted with juvenile Steller sea lions (ages >1 year to 4 years) captured in Alaska and brought to the Alaska SeaLife Center for temporary captivity under Permit No. 881-1668.

			Frequency
1. Transport and temporary maintenance at ASLC for up to 3 months followed by return to wild	16 ¹ (not more than 4 at once)	1	Capture may occur at any time of year
2. Physical Restraint	16	Up to 13	Up to weekly as needed for “health assessments” and activities #20-23
3. Anesthesia	16	Up to 13	Up to weekly as needed for “health assessments” and activities #20-23
4. Sedatives	16	Up to 13	Up to weekly as needed for “health assessments” and activities #20-23
5. Body mass/morphometrics/3D-photogrammetry for “health assessment”	16	Up to 13	At entrance, exit, and weekly in between
6. Blood sampling for “health assessment”	16	Up to 13	At entrance, exit, and weekly in between
7. Blubber/skin biopsy for “health assessment”	16	2	At entrance and exit
8. Inject labeled water & collect serial blood samples for “health assessment”	16	4	At entrance and exit, plus twice more according to research timetable of the group
9. Inject Na Br and collect serial blood samples for “health assessment”	16	Up to 4	At entrance and exit, plus twice more according to research timetable of the group
10. Bioelectric impedance analysis for “health assessment”	16	Up to 13	At entrance, exit, and weekly in between
11. Diagnostic ultrasound for “health	16	Up to 13	At entrance and

assessment”			exit, and weekly in between
12. Fecal collection (fecal loop) for “health assessment”	16	Up to 13	At entrance and exit, and weekly in between
13. Skin & mucosal swabs for “health assessment”	16	Up to 13	At entrance, exit, and weekly in between
14. Diagnostic x-ray for “health assessment”	16	2	At entrance and exit
15. Diagnostic endoscopy for “health assessment”	16	2	At entrance and exit
16. Urinalysis (with catheter) for “health assessment”	16	2	At entrance and exit
17. Flipper tag	16	1	Once – before exit
18. Hot brand	16	1	Once – before exit
19. Attach external data logger	16	1	Once – before exit
20. Food assimilation and protein turnover studies with 48 hours dry holding, dosing with Cr ² O ³ and Co-EDTA and injection of ¹⁵ [N]Glycine and associated blood sampling	Up to 10 over duration of permit	Up to 2 trials ²	Up to 10 trials ² over 3 years with no animal undergoing more than 2 trials
21. Doubly-labeled water technique validation study with 4 days dry holding, injection of isotopes and serial blood samples	4 out of 16 in #1	1	Once over life of permit
22. Controlled fasting (includes pre/post D ₂ O and 3 pre-fast and 3 post-fast blubber biopsies)	4 out of 16 in #1	1	Up to 8 animals over duration of permit ³
23. ACTH challenge (includes serial blood samples over 2 hour period plus one more sample 24-hrs post dosing)	4 out of 16 in #1	1	Up to 8 animals over duration of permit ⁴
24. Surgically implant dual “Life History Transmitters”	16	1	Once – before exit

1. Animals captured in field by ASLC under Permit No. 881-1668. See Proposed Action Activity Table 1.

2. For the “food assimilation and protein turnover studies” in Activity #20, a trial is one complete sequence of dosing (with Cr²O³ and Co-EDTA and injection of ¹⁵[N]Glycine) and associated 48 hour dry holding and blood sampling.

3. Note the ASLC has already completed this study with 4 animals in 2004 so they would not use more than 4 more over the duration of the permit.

4. Note the ASLC has already completed this study with 4 animals in 2004 so they would not use more than 6 more over the duration of the permit.

APPENDIX F: EFFECTS OF RESEARCH ACTIVITIES ON INDIVIDUAL SEA LIONS

The following is a description of the potential short-term, or immediate, effects on individual Steller sea lions from the various types of research activities authorized and proposed. The tables in Appendices C and E summarize the numbers of Steller sea lions that would be affected by each of these types of takes for both Alternatives. There have been no studies dedicated to documenting and assessing the effects of research on Steller sea lion stocks or populations. The cumulative effects of various research activities on Steller sea lions, including the possibility of cumulative effects that may not become evident for some time, are uncertain. The effects discussed below may, in some cases, represent the “worst case” scenario. It should be understood that while some degree of stress, pain and suffering, as well as some amount of serious injury and mortality, is unavoidable during the types of procedures described, the conscientious application by experienced personnel of the mitigation measures that are considered “good practice”, in conjunction with appropriate monitoring, would minimize the occurrence of serious injury and mortality for many procedures. Nevertheless, it is important to consider the probability or possibility of such “worst cases” in order to adequately assess the potential for significant effects.

Effects of Aerial surveys: Disturbance from aircraft and vessel traffic has been observed to have highly variable effects on Steller sea lions that are hauled out (Calkins and Pitcher 1982). Reactions ranged from none to complete and immediate departure from the haulout, i.e. a stampede. Researchers report that the sound change associated with banking the aircraft increases the likelihood of disturbing the animals. When Steller sea lions are frightened off rookeries in this way, pups may be trampled, or even abandoned. Juvenile and adult animals can also be injured during stampedes as animals run over each other or slide or crash into cliff facings or underwater rocks in their haste to escape the researchers. The flight response in pinnipeds has been described as “unrelenting and reckless” such that animals that are chased before capture (or which flee in response to the presence of researchers or low-flying aircraft) are placed in significant jeopardy, not only from the excessive metabolic heat generated from the flight itself, but also from a variety of potentially dangerous situations encountered in their escape attempts (Sweeney 1990). In two separate instances, captive sea lions jumping from elevations of 4-5 feet landed on their chest areas, rupturing the brachiocephalic vein located in the left shoulder area (Sweeney 1990). The hemorrhage resulting from this injury was fatal for one animal and severely debilitating in the other. Jaw fractures, which could impede feeding, are also a common result of the flight response. (See also “Ground Counts” below for additional detail on potential adverse effects of stampedes.). In the absence of adequate post-activity monitoring, such serious injuries or deaths would not be recorded.

The incidence and probability of stampedes in response to aerial surveys flown as described in the application are not known. Researchers report that only a small percentage (less than 1%) of animals are observed to be affected by the approaching survey planes, but the magnitude or type of the response is not reported. In addition, the cumulative effects of aerial surveys on Steller sea lions in Alaska, both within a season and over years of research, have not been documented.

Effects of ground counts: The possible effects of a stampede are similar to those described for aerial surveys, i.e. serious injuries and mortality are possible. Parturition in Steller sea lions occurs from mid-May until mid-July, with the highest frequency of births occurring mid-June. Thus, the majority of pups on a rookery at the time these ground counts occur would be a few days to six weeks old, depending on the timing. Because the motor skills of pups at this age are not as well developed as in older pups, they would likely be unable to move out of the way and may get trampled or knocked into the water if adults stampeded. Young pups are not adept swimmers and are usually unable to climb the rocky cliffs common to many rookeries. Even pups who are successful at climbing back onshore may suffer subsequent hypothermia and respiratory complications as a result of aspirating water while being tossed about in intertidal waves. A study of Mediterranean monk seal (*Monachus monachus*) pup survival found that most pups washed from their beaches died from multiple skull fractures as a result of impact against rocks, and those pups that managed to arrive back onshore still alive likely died shortly thereafter (Gazo et al. 2000).

If sufficient pre-disturbance monitoring is not conducted, it is not possible to identify mother-pup pairs. If researchers have not identified which mothers are in attendance and which are at sea, there is no way to determine whether a pup has been abandoned as the result of the disturbance unless they remain to monitor the rookery for several days. Foraging trips of lactating females may last several days or more (Brandon 2000). Even if mother-pup pairs have been identified, if researchers do not monitor a rookery after the disturbance until all the adult females that entered the water return to their pups, it will not be possible to determine if pups have been abandoned as a result of the disturbance. Fostering is very rare in Steller sea lions, thus the majority of abandoned pups will starve to death. Further, if pups (or adults) were injured during a stampede, they may not die from their injuries immediately. Death may not occur for several days, or weeks, in the case of infections or hemorrhages resulting from injuries, or injuries that affect an animal's ability to forage.

The disturbance associated with ground counts can result in aggressive interactions among sea lions. Steller sea lions in Alaska demonstrate site fidelity with respect to rookeries. The arrivals of males and pre-parturient females are closely timed and fairly predictable from one year to the next. Large males of reproductive age are usually the first to arrive, establishing territories by aggressive competition with other males. Presumably, the holders of the "best" territories gain access to more females, and are therefore more successful at mating. When adult animals are displaced from the rookery during breeding season at least some males will likely have to re-establish their territories by fighting with other males. Thus, each disturbance that displaces the males from their territories increases the likelihood of aggressive interactions among males and the possibility of injury. Adult male Steller sea lions have large canines and powerful jaws and are capable of inflicting serious puncture and laceration wounds on opponents. These wounds may become infected. In addition, other sea lions on the rookery, including pups, may be injured during these aggressive competitions among males. Along with the possibility of physical trauma, the heightened aggressive interactions and resulting psychological effects can result in secondary disease manifestations (Sweeney 1990).

A recent study on the social calls of South American fur seal (*Arctocephalus australis*) mothers and pups revealed that the postpartum fasting period is a critical time for establishing mother-pup

bonds (Phillips and Stirling 2001). South American fur seal mothers and pups, like Steller sea lions and other otarrids, use individualistic calls to reunite and maintain contact in dense breeding colonies. Crowding and social disturbance on rookeries can lead to high levels of maternal aggression and associated pup mortality (e.g. females will bite and throw pups that are not their own), thus pups must make few recognition errors in reuniting with their mothers. The mechanism by which a pup acquires its unique call is not known, but it does not appear to be inherited from its mother or a mimic of its mother's call. Mothers must, therefore, learn their pup's individual call during the days immediately following birth in order to assure recognition and reuniting following foraging trips at sea. A similar study has not been done for Steller sea lions but if the process is similar, disturbance of rookeries during the postpartum period that result in separation of mothers and pups could result in pup abandonment or mortality from aggressive females.

The magnitude of the disturbance effects on the animals may be influenced by the number of personnel who come ashore, the amount of time the rookery or haulout is occupied by researchers (which usually means the amount of time the animals remain in the water or the pups are separated from their mothers), the frequency of these disturbances (both intra- and inter-annually), and the timing of the disturbance (with respect to breeding, pupping, etc.).

Effects of incidental disturbance during scat collection, capture, observational activities, or other studies: This typically disturbs animals in the same way, and has the same potential affects, as described for ground counts above. The majority of scat collection coincides with other shore-based activities, so disturbance is often incidental to these activities rather than the direct result of the scat collection itself, with the exception of some samples collected in winter when no capture activities are planned.

General Effects of Capture and Restraint: "Restraint procedures constitute one of the most stressful incidents in the life of an animal, and intense or prolonged stimulation can induce detrimental responses (Fowler 1978)." Each restraint incident has some effect on the behavior, life, or activities of an animal. A variety of somatic, psychological, and behavioral stressors can be associated with capture and restraint of wild animals. These include strange sounds, sights, and odors, the effects of chemicals or drugs, apprehension (which may intensify to become anxiety, fright, or terror), and territorial or hierarchical upsets associated with displacement of animals by researchers who come onto rookeries and haulouts.

Animals that are stressed can incur contusions, concussions, lacerations, nerve injuries, hematomas, and fractures in their attempts to avoid capture or escape restraint (Fowler 1978). The stress response can change an animal's reaction to many drugs, including those commonly used for chemical restraint, which can have lethal consequences. The annual reports from the current and previous permits held by NMML and ADF&G indicate that some animals showing distress and/or adverse reactions to drugs or handling that were not immediately released, subsequently died. Continuous stimulation of the adrenal cortex, as from stress associated with chronic disturbance or repeated capture, can cause muscle weakness, weight loss, increased susceptibility to bacterial infections, and poor wound healing, and can lead to behavioral changes including increased aggressive and antisocial tendencies (Fowler 1986).

Capture myopathy is a possible consequence of the stress associated with chase, capture, and handling in numerous mammal species (Fowler 1978). Capture myopathy is characterized by degeneration and necrosis of striated and cardiac muscles and usually develops within 7 to 14 days after capture and handling. It has been observed both in animals that exert themselves maximally and those that remain relatively quiet, and occurs with either physical or chemical restraint. Fear, anxiety, overexertion, repeated handling, and constant muscle tensions such as may occur in protracted alarm reaction are among the factors that predispose an animal to this disease. A variety of factors may function in concert or individually. The muscle necrosis is likely due to acidemia resulting from a build up of lactic acid following profound muscle exertion: once necrosis has occurred, the prognosis for recovery is not favorable. The number of times an animal is captured, the method(s) of restraint, as well as the age and general condition of the animal are all factors that will affect an animal's response to capture.

Effects of Chemical Immobilization (Anesthesia/Sedation): A fairly high mortality rate has been associated with anesthesia in otariids (Gage 1993). Delivery of anesthesia in pinnipeds can be complicated by their particular anatomical and physiological specializations to the marine environment and by the logistics of working with wild animals. Determining the proper dose is dependent on a fairly accurate assessment of the animal's weight and condition, as miscalculation of an animal's weight can lead to an overdose, which can have lethal consequences (Fowler 1986).

The typical induction time for most chemical restraint agents is 10 to 20 minutes following intramuscular injection. Thus, darting can be dangerous because it can spook an animal into the water before the immobilization has taken affect, which can result in drowning. In February 1993, under Permit No. 771 (64), an adult female darted with Telazol died.¹² Although the animal was "one of the farthest from the water" among the animals on the beach, she moved toward the water within 30 seconds of being darted. Within 5 minutes she had rolled over into the surf and appeared unable to swim. By the time the researchers reached the animal she was not breathing and was given Dopram (a respiratory stimulant). She resumed breathing and began moving her head side to side and moving her foreflippers slightly. When these movements on the part of the animal began to interfere with the researcher's efforts to collect samples and attach a transmitter, the animal's head was covered in an attempt to calm her. By the time attachment of the transmitter was nearly completed it was noted that the female had been still for about a minute. Upon removing the rain jacket it was discovered that her pupils were dilated and she had no blink reflex. Attempts at resuscitation were unsuccessful and it was believed that the animal's immersion in sea water after darting may have triggered the dive response (breath holding, decreased heart rate, and reduced peripheral blood flow) and/or she may have aspirated sea water. It was also suggested that covering the animal's head may have contributed to her death by making her condition difficult to monitor and/or by pushing her back into the dive reflex.

¹² Memorandum for the Record from R.L. Merrick, dated 10 March 1993, RE: Steller sea lion mortalities during field work, February 1993. Permit No. 771(64)

The safest injection site for projectile syringes (darts) are in the deep muscle areas of the hind limbs (Scott and Ayars 1980). However, the blubber layer on pinnipeds can make delivery of an injectable drug into the muscle, where needed for proper absorption and distribution, difficult. In addition, inadvertent injection of drugs into the blubber frequently results in aseptic necrosis, sometimes leading to large abscesses (Geraci and Sweeney 1986). Injections into the chest cavity or stomach region can result in puncture of the lungs or stomach, which may kill the animal. In February 1993, under Permit No. 771(64), issued to NMML, a pup that was accidentally darted with Telazol when it unexpectedly moved in front of the target adult animal died, apparently as a result of inadvertent intravenous injection of a drug intended for intramuscular administration in a larger animal.¹³ According to the report, the dart struck on the left flank, about 5 inches forward of the hip and about 2 inches off the spine, which apparently, as indicated by necropsy, entered the kidney, effectively causing an intravenous injection. Necropsy also revealed slight trauma to the kidney. The pup had also regurgitated approximately a liter or more of milk following the darting and may have aspirated some, which could have contributed to the death.

Hyperthermia (over-heating) can occur in animals under anesthesia because the blubber layer can make heat dissipation a problem, even at ambient temperatures that are comfortable for the researchers: otariids over 25 kg tend to become hyperthermic during anesthesia (Gage 1990). Hypothermia can also occur in sedated animals, during anesthesia or post-recovery, as many drugs can affect thermoregulation. In hypothermia, the reduction in body temperature reduces tissue metabolism, while hyperthermia increases it. Both of these can have implications for the animal's reaction to any drugs administered, as well as any pathological conditions that may exist.

About 10% of animals induced with Telazol (tiletamine-zolazepam) or gas were observed to become apneic (stop breathing) within five minutes of induction (Gage 1990). Tiletamine is a cyclohexamine, which is a dissociative anesthetic that induces catatonia. It also has an analgesic effect through its action on the spinal cord, but it does not block visceral pain. Both hyperthermia and hypothermia are possible consequences of immobilization with tiletamine, depending on ambient temperatures. Respiratory depression is also possible, as is hypersalivation, which can lead to choking or aspiration of fluid.

There is an excitatory phase seen with tiletamine characterized by occasional muscle spasms resembling seizures, due to spinal reflex firings, which can be minimized by using tiletamine in combination with diazepam. Zolazepam is a benzodiazepine, or antianxiety drug, that has a sedative effect and is a skeletal muscle relaxant. Zolazepam slightly depresses cardiovascular function. Both tiletamine and zolazepam are excreted in the kidneys and are contraindicated in animals with severe renal or hepatic disease.

The safety of these drugs is adversely affected in animals that are ill, stressed, or which have suffered from physical exertion (e.g. have been chased) prior to administration of the drug. There is no antidote (reversal agent) for tiletamine. Diazepam, which is a benzodiazepine similar to zolazepam, is metabolized slowly, with clinical effects typically disappearing within 60 to 90

¹³ Memorandum for the Record from R.L. Merrick, dated 10 March 1993, RE: Steller sea lion mortalities during field work, February 1993. Permit No. 771(64)

minutes (Fowler 1986). There is a reversal agent for zolazepam, flumazenil. However, because zolazepam is used in combination with tiletamine to reduce the effects of the excitatory phase, reversing the effects of zolazepam in the absence of a reversal agent for tiletamine could result in convulsions and other side effects.

Inhalation anesthetics such as isoflurane gas are used to induce anesthesia in animals that can be manually restrained, and are commonly used to augment analgesia or increase the depth of anesthesia in animals previously immobilized by injectable agents. Prolonging immobilization by administering repeated doses of injectable agents is associated with a high risk of mortality, and an additional dose of Telazol should never be given (Gage 1990).¹⁴ Isoflurane, a halogenated ether with potent anesthetic action (Stedman's Medical Dictionary 2000), is an inhaled general anesthetic that induces reversible depression of the central nervous system, resulting in unconsciousness, analgesia, voluntary muscular relaxation, and suppression of reflex activity (Fowler 1986). Isoflurane is especially useful for short procedures in which rapid recovery and few aftereffects are desirable. The effects of inhalation anesthetics increase predictably with increased dose, unlike injectable agents, which tend to be unpredictable and idiosyncratic among animals (Fowler 1986). In general, captive animals have been observed to fully recover from anesthesia with isoflurane after 8 hours (Gage 1990). Isoflurane gas appears to have the best recovery characteristics, and be safe and reliable, in otariids (Haulena and Heath 2001).

Effects of blood collection (venipuncture): The risks of blood collection are largely incidental to capture and restraint, as are described above. However, multiple attempts to obtain a blood sample are not only stressful and cause some degree of pain, they can result in damage to the vein, clotting, and abscess. Removing a volume of blood too large relative to the animal's mass and ability to replace what was taken can result in fatigue, anemia, weakened immunity, and problems with clotting.

Effects of skin and blubber biopsy: The effects of the capture and restraint necessary for obtaining these samples are described above. In addition, as with any wound, there is always the potential for infection after any of these procedures, particularly given the unsanitary environment of the rookeries. An otherwise healthy animal should be able to heal and recover from a properly performed procedure, but animals with compromised immune systems may develop major complications. This procedure may cause more than momentary pain.

Effects of muscle biopsy: The small diameter of the wound, combined with the depth of the biopsy, would create a wound that would tend to close on the surface prior to deep tissue healing. This increases the chances of abscess formation, particularly if the biopsy needle or dart was not properly sterilized. Biopsy wounds, as with any wounds including those acquired during intra-species aggressive interactions, can become contaminated despite use of sterile equipment. Therefore, leaving the wound open to drain should an abscess form, rather than suturing closed, is preferable. As with skin and blubber biopsies, unhealthy animals or those with compromised immune systems may develop major complications from such an infection. The potential

¹⁴ Note that several of the animals that died under previous permits issued to ADF&G were given repeat injections of medetomidine and/or ketamine, the injectable agents used to immobilize them. See annual reports for Permits No. 771 and 965.

adverse effects of this procedure include more than momentary pain, risk of infection, and the stress and risks associated with capture and restraint, as described above.

Effects of ultrasound: This procedure, by itself, poses no risk of injury to an animal. However, there is the possibility for adverse affects from the need for capture and restraint, as described above.

Effects of fecal loops and skin or mucousal swabs: The potential adverse affects relate primarily to the risks of capture and restraint, as described above. In addition, there is the slight potential to introduce or spread infection if the loops and swabs are not used properly. There is the potential for perforation, and subsequent infection, when fecal loops are inserted into the rectum. There is the possibility for damage to the cornea of the eye if ocular swabbing is done incorrectly. When performed by a qualified, experienced person using commonly accepted standards of good practice, these risks are likely negligible.

Effects of tooth extraction: The potential adverse affects relate to the risks of capture, anesthesia, and the possibility of infection following extraction. The procedure may result in more than momentary pain, which could interfere with foraging, at least temporarily.

Effects of collecting vibrissae, hair, and nails: Clipping whiskers, hair and nails is not likely to result in any pain. The effects on the animal of clipping a whisker, toenail or patch of hair are probably largely incidental to the effects of capture and restraint described above. However, the pulling of a whisker may cause more than momentary pain due to the highly sensitive nature of this sensory organ. The area of the snout where the vibrissae follicles are located is highly vascularized and enervated to enable a sea lion to use its vibrissae in search of food even at very cold temperatures (Gee 1998). However, the adverse effects on the animal of pulling a whisker are probably largely incidental to the effects of capture and restraint described above.

General effects of marking (e.g., flipper tags and branding): Marking devices can be divided into natural, temporary, semi-permanent, and permanent. In general, the use of natural marks and individual appearance requires familiarity with the subject animals, which typically means many hours of personal observation. When the use of natural marks to identify individual animals is not suitable or practical for achieving study objectives, there are a variety of methods for marking animals available.

Temporary marks: Paints, bleach, and dyes have been used successfully to temporarily mark Steller sea lions and other pinnipeds. The duration of the mark depends on, among other things, the type of paint, bleach, or dye used, and the season applied, because all pinnipeds molt (shed their coats) annually. Thus, paints, bleach, and dyes can be used to identify individuals for weeks to months. Paint marks can be applied remotely using a paint gun that fires pellets filled with pigment that burst on impact and leave a spot on the animal's fur. This method does not allow use of alphanumeric characters and is therefore not practical when other than the crudest of marks are needed. If animals can be captured and restrained, paints, bleach, and dyes can be used to make unique alphanumeric marks on their fur. This method likely involves more stress to the animal than remote marking, and may cause incidental disturbance of conspecifics. However, the marks can be made large enough to be easily read from a distance, making it

unnecessary to recapture the animal for identification, or cause additional disturbance to conspecifics. A variation on painting or dyeing the animal's fur is to capture animals and glue (using epoxy) a colored tag to their fur. This tag would fall off when the animal molts, and could have unique alphanumeric information written on it that could be read if researchers could get close enough or recapture the animal. Attaching a scientific instrument that emits a unique signal to the fur is also a method of temporary marking that has been used in a variety of species, including Steller sea lions.

Semi-permanent marks: There are numerous plastic, aluminum, and plated-steel tags available in a variety of colors, sizes, and identifying symbols that can be affixed to animals to allow identification of individuals. All of these techniques require capture and restraint of the animal. Plastic cattle ear tags have been used for many years to mark numerous pinniped species, including Steller sea lions. The tags are attached through the flippers. While these tags may remain attached for the life of the animal, they can and do pull out. In addition, they can become faded or otherwise difficult to read over time. These plastic tags cannot necessarily be read from as great a distance as large paint or dye marks, thus recapture of animals may be required for positive identification of individuals. However, when the study objectives require identification of individuals for longer than a few months or a season, or when animals will need to be recaptured for other reasons, plastic tags are the alternative of choice for many researchers. Another method of identifying individual animals is to attach scientific instruments, such as VHF and satellite transmitters, that broadcast signals on unique frequencies and allow tracking of animals or remote monitoring of their movement and activities. In pinnipeds, these tags are glued to the fur, or affixed to plastic tags that are attached through the flippers. These are considered temporary (if glued to fur) or semi-permanent (if affixed to flipper tags) because they will fall off when the animal molts or be lost when the flipper tag pulls out. In addition, the life of the tag is limited by the battery capacity, which, in turn, is limited by the size of the tag.

Permanent marks: When study objectives require recognition of individual animals for more than a season or a few years, temporary or semi-permanent marks must be re-applied, or a permanent mark can be used. As discussed above, applying both temporary and semi-permanent marks usually requires capture and restraint of the animal. Given that each capture event is stressful, and has the potential to injure the animal, when the objective is only to have animals that can be individually recognized from a distance, it is more advantageous to apply a permanent mark from the start. Using permanent marks is also favored over re-applying temporary marks when the interval between capture events is longer than the duration of the temporary mark.

Hot brands have been used for many years to permanently mark domestic livestock and some species of wildlife, including Steller sea lions and other pinnipeds. Cryo-branding, or freeze branding has also been used successfully to permanently mark numerous species, including white-tail deer, horses, and harbor seals. Tattoos have also been used to permanently identify domestic animals (e.g., cattle, dogs, horses) and wildlife (e.g., rabbits, polar bears, deer).

To be clear and legible, tattoos must be applied to a body site free of hair (either a hairless site on the animal, or a site shaved prior to tattoo application), and work best on light-colored skin. The most common sites for tattoos on animals are the ear, inner lip, and inner thigh. The technique

for tattooing animals involves applying tattoo pliers that puncture the skin, followed by rubbing dye into the puncture wound. Thus, as with branding, tattooing involves some degree of pain and risk of infection. The advantage of a brand over a tattoo is that the brand can be made large enough to be visible from a distance, whereas reading tattoos usually requires capture of the animal to read the mark.

Freeze branding is considered by some to be more acceptable for marking wildlife than hot branding because, if done correctly, there is a negligible risk of infection (Day et al., 1980). In the 1993 EA on the effects of branding, hot-branding was said to be preferred over freeze branding because freeze branding required longer restraint times that could result in increased stress on the animals. There was also concern about the safety of using anesthesia to restrain the sea lions. Since 1993, both NMML and ADF&G have been using isoflurane gas to anesthetize Steller sea lions during hot-branding.

There can be more preparation required for producing bald freeze brands than hot brands if animals are clipped or shaved and the skin swabbed with methylated spirits (an alcohol/glycerin mixture) to produce a bald brand rather than an unpigmented brand. However, if animals being hot-branded need to be dried prior to branding, the preparation time may be roughly equivalent to that needed for a freeze-brand. To produce the best results the freeze branding tool needs to remain in contact with the animal's skin for 25-60 seconds per character to produce a bald brand (Hobbs and Russell 1979) versus 2-4 seconds per character for a hot brand (Merrick et al. 1996). Thus, freeze branding could take several minutes longer per animal than hot branding due to the longer contact times required for a bald brand. Since the animals being hot-branded under existing permits are anesthetized, a longer restraint time for a freeze-brand would not necessarily result in more stress. However, the use of anesthesia is not entirely without risks, and the risk of adverse effects increases with the duration of use.

The 1993 EA also found that freeze branding was less preferable than hot branding because of concerns about the visibility of freeze-brands on the "light" pelage of Steller sea lions and evidence that freeze brands may disappear over time and with molting. However, freeze-brands have been effectively used on a variety of livestock, including light-colored horses, as well as cetaceans, sirenians, and pinnipeds, including light-colored harbor seals. In a study on spatial structure of harbor seals in Sweden, 163 harbor seals were freeze-branded as pups (less than one year old) and juveniles/young adults (1-4 years old) and tracked for up to 14 years, including during periods of molting (Härkönen and Harding 2001). Further, cryo-branding or freeze branding is considered by some to be more acceptable for use in marking wildlife because, when done correctly, there is virtually no chance of infection (Scott and Ayars 1980). In addition, no pain reactions were observed in cetaceans during the freeze-branding procedures (Needham 1993).

Effects of flipper tagging: As described above, these types of tags are best considered semi-permanent markers as they can and do pull out because sea lions use their foreflippers in both aquatic and terrestrial locomotion. In addition to the effects of capture and restraint as described above, it is likely that affixing these tags to the flippers of sea lions causes more than momentary pain. When the tag is affixed there is the potential for infection at the wound site, particularly because the environment on the rookery is not aseptic and because the activity of the animal may

prolong or prevent healing by producing repetitive stress on the wound. There is also the potential for infection when a tag pulls out of the flipper, for whatever reason. In moving about on a rookery or haulout, or swimming, there is the potential for a tag to be torn out of the flipper by abrasion on the substrate or by hydrodynamic pressure (Fowler 1986). There is no information on long-term tag retention or average retention rates in the annual reports from NMFS permits holders who use these tags on Steller sea lions. There is also no quantitative information on the rate of infection caused by flipper tagging. Both applicants report that tag-related mortality does not add significantly to natural mortality.

Merrick et al. (1996) report that flipper tags can become difficult to read as the colors and markings on them fade over time and that they are not readily visible from any distance, partially because the gregarious nature of sea lions causes them to group together and obscure the flippers.

Effects of hot-branding: The practicality of hot-branding as a means of permanently marking pinnipeds in the wild has been demonstrated in several studies. However, there has been insufficient resight effort of the more than 15,000 sea lions branded by ADF&G and NMML since 1975 to validate the merits of hot-branding versus the potential for adverse impacts to individual sea lions.

The applicants state there is no evidence suggesting increased mortality of pups after branding. The absence of such evidence cannot be interpreted as evidence of no effect because there has not been sufficient post-activity monitoring to determine whether hot-branding, or other research activities on rookeries, has contributed to increased mortality of pups. Further, Merrick et al. (1996) state that studies of branded Steller sea lions on Marmot Island in Alaska suggest branding may lead to increased mortalities.

In addition to the possible adverse effects of disturbing a rookery, as described for pup counts above, the branding activity itself has the potential for adverse effects. To achieve the desired scarring, the burns must be second-degree, although third-degree burns are possible if the branding is done improperly. Thus, hot branding produces an acute burn wound involving a varying thickness of the skin and underlying tissue. The degree of trauma caused by a brand is dependent upon a variety of factors including the temperature of the branding iron, the pressure with which the brand is applied, the time for which the iron is applied, the position of the brand, the condition, immunological status and behavior of the animal during and after the branding event, and infection rates and types (Gales 2000). Because it is difficult to control for many of these variables in the field, a wide range of wound healing scenarios can be expected.

The procedure likely causes more than momentary pain, and there is the potential for infection of the burned area, especially because the environment on rookeries and haulouts is not aseptic. Further, in order to facilitate branding a large number of pups, researchers gather them into large groups for processing. Moving pups into large groupings and leaving them this way can result in deaths by suffocation as smaller, younger or weaker animals may become buried under others. Some injuries to pups left in these centralized piles may occur when the adult females return to the rookery. Female Steller sea lions are very discriminating about suckling their pup, and only their pup. Females have been observed to grab and toss pups who have come too close and that are not theirs. If the pup lands too close to another lactating female that is not its mother, it may

get tossed again. As noted above, very young pups are not well able to move away from hostile females because their motor skills are not sufficiently developed. Females have also been observed to fight over ownership of a pup following disturbance, by tugging it back and forth between them. Pups sustain injuries during these episodes. On a rookery, females choose and defend “territories” in which they give birth and nurse their young. Females with newborn and very young pups defend their pups, and their space, aggressively. When females with young pups leave on foraging trips the young pups do not usually move far from the spot where their mother left them. Thus, when adults are driven from the rookery and pups are placed in large groups in central locations for branding or other research activities, the potential for injury to or abandonment of pups as females return ashore is greater than if they were left more widely spaced or near their original spots.

In 1993, 399 Steller sea lion pups were branded on Forrester Island in Southeast Alaska.¹⁵ Four to five days after branding six dead, branded pups were collected during pup counts. Necropsy revealed blunt trauma as the probable cause of death for two of the pups, and starvation was the likely cause of death for the other four. Although the pathologist stated that these deaths could not be linked to branding, it is not apparent how this possibility could be ruled out. In a subsequent report from the permit holder, it was stated that it was unclear whether branding operations contributed to abandonment of pups, and their subsequent starvation.¹⁶ An additional 36 dead pups were recovered on this rookery 4-5 days after branding. Five of these pups were from a growth study in which pups were marked to be recaptured regularly for weighing and other measurements: at least four of these pups appeared to have starved, possibly as the result of abandonment. Of the remaining 26 dead pups, 1 was still born, 3 were neonatal deaths of unknown cause, 15-16 were emaciated and probably starved to death, 4 died of trauma, 1 from pneumonia, and 1 drowned. The possibility that the deaths of the emaciated animals, or those that died from trauma, pneumonia or drowning were related to the branding and research activities cannot be ruled out.

During branding of Steller sea lion pups on rookeries in Oregon (under Permit No. 782-1532), approximately 1/3 of the pups present were captured and branded. Several days later 7 pup carcasses were observed on the rookery: 6 of the dead pups were branded.¹⁷ It is not known what percentage of these mortalities could be attributed to the research activities vs. natural causes. Necropsy indicated that one of the dead branded pups probably died as the result of trauma associated with a bite wound on the head.¹⁸ An additional dead pup was recovered during the branding operations whose death was believed to be due to suffocation as a result of being trapped in a crevice beneath another pup: this is being counted against the total number of accidental mortalities allowed under their permit.

¹⁵ A letter reporting on activities conducted under Permit No. 809, issued to NMML, submitted by D. Calkins to H. Braham, NMML on December 14, 1994.

¹⁶ Annual report on research conducted under MMPA Permit No. 809. Submitted December 30, 1994.

¹⁷ David Pitkin, Oregon Coast National Wildlife Refuge Complex, USFWS, Newport, OR., personal communication

¹⁸ Memo from D.P. DeMaster to Ann Terbush, dated July 25, 2001 regarding Steller sea lion pup mortality during and after handling activity at Rogue Reef, Oregon.

Seven pups died during branding operations in 2003. Six of the pups died while researchers were on the rookery. The cause of death for five of the pups was attributed to asphyxiation and terminal aspiration. The sixth pup died of aspiration of milk and asphyxiation post anesthesia. The seventh pup died of fulminant pulmonary edema caused by asphyxiation of cesspool fluids. This seventh pup apparently died before people were even on the island, perhaps as a result of the disturbance caused by the approach of researchers to the rookery. It is important to note that only one of the seven pups was actually handled prior to death. The other pups died as an indirect consequence of the presence and actions of researchers on the rookery.

In their report to NMFS, the researchers explain that the deaths of these pups “can be attributed to the most common problem faced on a rookery, the tendency for pups to pile up on each other when frightened. When this happens around even small pools of water with zero visibility it is impossible to know if a pup is in the pool without draining it. When it occurs while pups are being herded, a pup can suffocate within seconds.”¹⁹

As a result of the deaths in 2003, the holders of the permit modified their protocols to minimize the potential for recurrence of these types of research-related mortalities. In 2004 a single pup was reported to have died from asphyxiation following anesthesia.

Effects of Attachment of scientific instruments: In addition to the effects of capture and restraint described above, the attachment of an instrument can have both short- and long-term adverse effects. Possible chronic, short-term effects can include a reduction in foraging activity or an increase in grooming at the expense of other behaviors (Kenward 1987). These types of effects are likely present after most tagging events and may be as much a delayed result of the capture and handling as of the tag’s presence.

Reactions of pinnipeds fitted with Crittercams ranged from apparent curiosity about the instrument, to attempts to dislodge it, and aggressive reactions (Marshall 1998). Short-term effects can lead to acute problems for animals of various species: the presence of a tag has exacerbated capture shock and led to death in hares; the disturbance of tagging has resulted in desertion by incubating birds; abandonment or rejection of young in birds and ungulates was seen following tagging; and tagging may be enough to stop a dispersing animal from securing a territory, or push an animal over the brink of starvation when food is short (Kenward 1987).

The hydrodynamic drag created by the instrument can exert an additional energetic demand on an animal which could, over time, result in reduced foraging success, increased metabolic load, and resultant stress to the animal.²⁰

The attachment of instruments to the hair with epoxy should not cause any pain if done properly, but may result in discomfort if the placement of the instrument causes pulling of the hair or skin as the animal moves. In addition, if the ratio of resin and catalyst is not correctly measured, the resultant exothermic (heat-producing) reaction can burn the animal’s skin. Both the resin and hardener (catalyst) can cause skin irritation (itching, rashes, hives) and prolonged or repeated

¹⁹ 2003 Annual Report for Permit No. 358-1564, submitted by ADF&G and on-file with NMFS Permits, Conservation and Education Division, Silver Spring, MD.

²⁰ from batched BiOp for 545-1562, 753-1599, etc. re: crittercam tags

skin contact may cause sensitivity (itching, swelling, rashes). The low vapor pressure of the resin by itself makes inhalation unlikely in normal use. There is the possibility that an instrument could be knocked or torn off, pulling out the hair and/or some of the underlying skin, which would then be open to infection.

General Effects of Administering Drugs and Other Substances: As with the other activities, the potential adverse effects of administering drugs in general are related to the effects of capture and restraint, as described above. In addition, because the blubber in some areas is not well vascularized, inadvertent injection of drugs into the blubber frequently results in aseptic necrosis, sometime leading to large abscesses (Fowler 1986). Thus, subcutaneous administration of drugs is usually problematic in marine mammals. There is the possibility of accidentally injecting drugs subdurally (beneath the dura matter, a fibrous membrane covering the central nervous system) when attempting to inject into the extradural vein (Stoskopf 1990).

Effects of deuterium oxide injection: Deuterium oxide ($^2\text{H}_2\text{O}$) is a stable, relatively non-toxic and naturally occurring isotope: up to 20-25% of body water can be replaced by deuterium oxide in mice before toxic effects are observed (Ofstedal and Iverson 1987). The effects of injecting deuterium are probably largely incidental to the capture and restraint as described above. However, because a post-equilibration sample must be collected, the use of deuterium increases the amount of time an individual animal must be held and the amount of time researchers are occupying a rookery. As with any procedure that breaks the skin, there is also the potential to introduce infection during injection.

Effects of valium: The effects are dose-related, and cumulative. It is metabolized by the liver and excreted by the kidneys. Possible side effects include bradycardia (slowed heart rate), respiratory depression, tremor, confusion, photo-phobia, blurred vision, nausea, vomiting, depressed gag reflex, lethargy, and ataxia (inability to coordinate muscle activity during voluntary movement). It should be used with caution in animals experiencing shock.²¹ Injectable valium is irritating to the vein and tissue, and may cause pain during administration. It has a rapid onset when given intravenously.

Effects of injecting Evans blue dye: Evans blue is a diazo dye used for determination of blood volume on the basis of dilution of a standard solution of the dye in plasma following intravenous injection. The dye binds to albumin in the blood stream and remains bound long enough to circulate and distribute in the entire plasma volume of the blood stream. Evans blue was carcinogenic in one study in rats when administered intraperitoneally, the only species and route tested. It produced sarcomas of the reticuloendothelial system in the liver.²² This dye is considered a teratogen at high doses, which can cause abnormal prenatal development.²³ However, although there are no references to the safety of this dye in Steller sea lions, this dye is currently used safely for numerous human medicine applications.²⁴

²¹ <http://www.kcmetro.cc.mo.us/pennvalley/emt/diazep.htm>

²² Animal carcinogenicity data. <http://193.51.164.11/htdocs/Monographs/Vol08/EvansBlue.html>

²³ Aldrich Chemical Catalog, Aldrich, Milwaukee, WI.

²⁴ Numerous references available.

Effects of bioelectric impedance analysis: The effects of this procedure are probably largely incidental to those associated with capture and restraint, as described above. If animals are anesthetized, there would be no pain associated with the insertion of the needles. The insertion of needles does pose a risk of infection: bacteria or other infectious agents that may be present on the animal's skin or hair can be introduced under the skin. When performed by a qualified, experienced person using commonly accepted standards of good practice, these risks are likely negligible. However, the 2000 annual report for Permit No. 881-1443 (Alaska Sea Life Center) reported development of a subcutaneous abscess on a captive adult female Steller sea lion, apparently resulting from tissue necrosis induced by the focal electrical current at the site of a bioimpedance electrode implant. The abscess was opened for drainage and began to heal slowly over the next 5-6 months. However, a scab and area of granulation tissue then formed at the site and was treated with topical antibiotics for several months, resulting in a small area of scar tissue, which will likely remain hairless.

Effects of stomach intubation and enemas: In addition to the effects of capture and restraint, as described above, there is the risk of introduction of liquid into the trachea, initiating aspiration pneumonia or death when performing stomach intubation. There is also a risk of cross-contamination if equipment is not properly disinfected between animals. When performed by a qualified, experienced person using commonly accepted standards of good practice, these risks are likely negligible.

Any time a foreign object is inserted into the rectum there is the possibility of perforation, which can lead to peritonitis that may result in death. When performed by a qualified, experienced person using commonly accepted standards of good practice, these risks are likely negligible. As animals must be restrained for this procedure, and are usually chemically restrained, the risks associated with capture and restraint are also associated with this procedure.

Effects of surgical implant of instruments: In addition to the effects of capture and restraint, as described above, there is a risk of infection and mortality associated with making an incision into the peritoneum. The surgery itself will not result in pain as the animals will be anesthetized. However, a certain amount of post-operative pain and discomfort is likely due to trauma associated with incisions through the abdominal wall. Any pain or discomfort associated with the surgery or subsequent wound healing may adversely affect an animal's ability to forage or escape predation. However, for animals held in captivity during wound healing, both infections and post-operative pain can be treated with appropriate antibiotics and analgesics.