



Request for Incidental Take Authorization
Pursuant to the Marine Mammal Protection Act

Submitted to:

Permits, Conservation, and Education Division
Office of Protected Resources
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Silver Spring, Maryland

Submitted by:

Monterey Bay National Marine Sanctuary
Office of National Marine Sanctuaries
National Ocean Service
National Oceanic and Atmospheric Administration
Monterey, California

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Section 1. Description of Specified Activity

Monterey Bay National Marine Sanctuary (MBNMS or sanctuary) was designated as the ninth national marine sanctuary (NMS) in the United States on September 18, 1992. Managed by the Office of National Marine Sanctuaries (ONMS) within the National Oceanic and Atmospheric Administration (NOAA), the MBNMS adjoins 240 nautical miles of central California's outer coastline (overlying 25 percent of state coastal waters), and encompasses 4,601 square nautical miles of ocean waters from mean high tide to an average of 26 nautical miles offshore between Rocky Point in Marin County and Cambria in San Luis Obispo County.

Federal regulations governing activities within MBNMS became effective on January 1, 1993. The MBNMS was the first NMS to be designated along urban shorelines and, when first designated, became the largest marine sanctuary in the United States, equal in area to 77 percent of all other federal marine sanctuaries in existence at the time. As a result of its large size and near proximity to urban areas, MBNMS has addressed many regulatory issues not previously encountered by the NMS program. Authorization of professional fireworks displays is one such issue that has required a steady refinement of policies and procedures to limit the location, timing, and composition of professional fireworks events as more has been learned about impacts to the sanctuary and effects on the environment. The sanctuary has monitored individual displays over the years to improve its understanding of their characteristics and potential impacts to sanctuary resources.

Fireworks displays have been conducted over current sanctuary waters for many years as part of national and community celebrations (e.g., Independence Day, municipal anniversaries), and to foster public use and enjoyment of the marine environment. Marine venues are the preferred setting for fireworks in central California, in order to optimize public access and avoid the fire hazard associated with terrestrial display sites. Many fireworks displays occur at the height of the dry season in central California, when area vegetation is particularly prone to ignition from sparks or embers. MBNMS has worked diligently to balance these needs with its primary mandate for marine resource protection.

The activity to be conducted is the display of commercial-grade fireworks in the atmosphere and at ground or sea level. The number of displays will be limited to not more than ten events per year in four specific areas along 276 miles of coastline. Debris fallout from fireworks events constitutes a discharge into the sanctuary, and is thus a violation of sanctuary regulations, unless written authorization is secured from the sanctuary superintendent. Therefore, sponsors of fireworks displays conducted in MBNMS are required to obtain sanctuary authorization permits due to the discharge of materials (spent pyrotechnic materials) into sanctuary waters (15 CFR 922.132).

Since MBNMS began issuing permits for fireworks discharge in 1993, it has received a total of 102 requests for professional fireworks displays, the majority of which have been associated with large community events such as Independence Day and municipal festivals. The number of fireworks displays within the sanctuary remained relatively constant although we've seen a slight decrease of the number of displays since the economic downturn of 2008. MBNMS has permitted, on average, approximately five fireworks displays per year, however, only 2 to 4 displays were hosted annually between 2009 and 2015.

In considering requests for fireworks displays, MBNMS has consulted biologists from state and federal agencies and universities, local property managers and residents, environmental sensitivity index maps prepared for California Department of Fish and Wildlife and NOAA, other environmental maps, and both published and unpublished resources. As a result, MBNMS crafted permit terms and conditions that are

designed to minimize fireworks impacts on the sanctuary and outline the locations, frequency, and conditions under which MBNMS will authorize marine fireworks displays. The permit terms and conditions were jointly developed by MBNMS, National Marine Fisheries Service (NMFS) Southwest Regional Office (SWRO), and the United States Fish and Wildlife Service (USFWS) to assure that protected species and habitats are not jeopardized by this activity.

Description of Pyrotechnic Devices

Professional pyrotechnic devices used in firework displays can be grouped into three general categories: aerial shells (paper and cardboard spheres or cylinders ranging from two inches to twelve inches in diameter and filled with incendiary materials), low-level comet and multi-shot devices similar to over-the-counter fireworks such as roman candles, and set piece displays that are mostly static in nature and are mounted on the ground.

Aerial shells are launched from tubes (called mortars), using black powder charges, to altitudes of 200 to 1,000 feet where they explode and ignite internal burst charges and incendiary chemicals. Most of the incendiary elements and shell casings burn up in the atmosphere; however, portions of the casings and some internal structural components and chemical residue fall back to the ground or water, depending on prevailing winds. An aerial shell casing is constructed of paper/cardboard or plastic and may include some plastic or paper internal components used to compartmentalize chemicals within the shell. Within the shell casing is a burst charge (usually black powder) and a recipe of various chemical pellets (stars) that emit colored light when ignited. Table 1 describes a list of chemicals that are commonly used in the manufacturing of pyrotechnic devices. Manufacturers consider the amount and composition of chemicals within a given shell to be proprietary information and only release aggregate descriptions of internal shell components. The arrangement and packing of stars and burst charges within the shell determine the type of effect produced upon detonation.

| | | | |
|-----------------------|---------------------|----------------|----------------------|
| Potassium Chlorate | Strontium Nitrate | Iron | Ammonium Perchlorate |
| Potassium Perchlorate | Strontium Carbonate | Titanium | Polyvinyl Chloride |
| Potassium Nitrate | Sulfur | Shellac | Aluminum |
| Sodium Benzoate | Charcoal | Dextrine | |
| Sodium Oxalate | Copper Oxide | Phenolic Resin | |

Table 1. List of chemicals commonly used in manufacture of pyrotechnic devices

Attached to the bottom of an aerial shell is a lift charge of black powder. The lift charge and shell are placed at the bottom of a mortar that has been buried in earth/sand or affixed to a wooden rack. A fuse attached to the lift charge is ignited with an electric charge or heat source, the lift charge explodes, and propels the shell through the mortar tube and into the air to a height determined by the amount of powder in the lift charge and the weight of the shell. As the shell travels skyward, a time-delay secondary fuse is burning that eventually ignites the burst charge within the shell at peak altitude. The burst charge detonates, igniting and scattering the stars, which may, in turn, possess small secondary explosions. In addition to color shells (also known as designer or starburst shells), a typical fireworks show will usually include a number of aerial “salute” shells. The primary purpose of salute shells is to announce the beginning and end of the show and produce a loud percussive audible effect. These shells are typically two to three inches in diameter and packed with black powder to produce a punctuated explosive burst at high altitude. From a distance, these shells sound similar to cannon fire when detonated.

Low-level devices consist of stars packed linearly within a tube, and when ignited, the stars exit the tube in succession producing a fountain effect of single or multi-colored light as the stars incinerate through the course of their flight. Typically, the stars burn rather than explode, thus producing a ball or trail of sparkling light to a prescribed altitude where they simply extinguish. Sometimes they may terminate with a small explosion similar to a firecracker. Other low-level devices emit a projected hail of colored sparks or perform erratic low-level flight while emitting a high-pitched whistle. Some emit a pulsing light pattern or crackling or popping sound effects. In general, low-level launch devices and encasements remain on the ground or attached to a fixed structure and can be removed upon completion of the display. Common low-level devices are multi-shot devices, mines, comets, meteors, candles, strobe pots and gerbs. They are designed to produce effects between 0 and 200 feet AGL.

Set piece or *ground level* fireworks are primarily static in nature and remain close to the ground. They are usually attached to a framework that may be crafted in the design of a logo or familiar shape, illuminated by pyrotechnic devices such as flares, sparklers and strobes. These fireworks typically employ bright flares and sparkling effects that may also emit limited sound effects such as cracking, popping, or whistling. Set pieces are usually used in concert with low-level effects or an aerial show and sometimes act as a centerpiece for the display. It may have some moving parts, but typically does not launch devices into the air. Set piece displays are designed to produce effects between 0 and 50 feet AGL.

Each display is unique according to the type and number of shells, the pace and length of the show, the acoustic qualities of the display site, and the weather and time of day. The vast majority (95 percent) of fireworks displays authorized in the sanctuary are aerial displays that usually include simultaneous low-level displays. An average large display will last twenty minutes and include 700 aerial shells and 750 low-level effects. An average smaller display lasts approximately seven minutes and includes 300 aerial shells and 550 low-level effects. There is a declining trend in the total number of shells used in aerial displays, due to increasing shell costs and/or fixed entertainment budgets. Low-level displays sometimes compensate for the absence of an aerial show by squeezing a larger number of effects into a shorter timeframe. This results in a dramatic and rapid burst of light and sound effects at low level. A large low-level display may expend 4,900 effects within a seven-minute period, and a small display will use an average of 1,800 effects within the same timeframe. Some fireworks displays are synchronized with musical broadcasts over loudspeakers and may incorporate other non-pyrotechnic sound and visual effects. Table 2 provides a comparison of fireworks displays performed within the sanctuary in the past.

| Display Types | Duration of Display | Number of Aerial Effects | Number of Low-level Effects | Number of Set-Piece Devices |
|-------------------------|---------------------|--------------------------|-----------------------------|-----------------------------|
| Aerial, Small | 5 Minutes | 300 | 550 | 0 |
| Aerial, Large | 20 Minutes | 700 | 750 | 1 |
| Aerial, Largest to Date | 40 Minutes | 1700 | 1800 | 0 |
| Low-level, Small | 7 Minutes | 0 | 1800 | 0 |
| Low-level, Large | 7 Minutes | 0 | 4900 | 1 |

Table 2. Comparison of fireworks displays performed within MBNMS

Interactions with the physical and biological environment

Small numbers of harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*) may be incidentally and unintentionally taken by Level B harassment as a result of fireworks displays. Potential incidental harassment of individuals of these species is associated with noise from fireworks displays or from associated human activity. Any Level B harassment that may occur will be short in duration, and is not expected to result in injury, or mortality, or have long-term negative consequences for pinniped populations, their habitat, or prey species.

MBNMS issued a report entitled Assessment of Pyrotechnic Displays and Impacts within the Monterey Bay National Marine Sanctuary 1993-2001 (Fireworks Assessment Report 2002). In addition, as required in previous authorizations, MBNMS has submitted annual monitoring reports to NMFS and USFWS since 2005. These reports comprise the sum of the information MBNMS has assembled on the nature and impact of fireworks displays within the sanctuary and contains most of the information required by NMFS for an incidental take request.

Section 2. Dates, Duration and Specified Geographic Region

Authorizing fireworks displays above MBNMS may potentially disturb marine mammals. Accordingly, in 2002 MBNMS submitted an application requesting an IHA under section 101(a)(5)(D) of the MMPA and, subsequently, the issuance of regulations governing authorizations for a five-year period under section 101(a)(5)(A) of the MMPA. On July 4, 2005, NMFS issued an IHA to MBNMS (70 FR 39235; July 7, 2005), which was valid for a period of one year. Subsequent regulations governing the taking of small numbers of marine mammals, by Level B harassment only, were issued from July 4, 2006 to July 3, 2011 (71 FR 40928; July 19, 2006) and from July 4, 2012 to July 3, 2017 (77 FR 31537, May 29, 2012). These regulations include mitigation, monitoring, and reporting requirements for the incidental taking of marine mammals during fireworks displays within the sanctuary boundaries. The MBNMS is requesting five-year regulations governing the issuance of Letters of Authorization (LOAs) for potential harassment of individuals of two marine mammal species during fireworks displays permitted by MBNMS, from July 4, 2017 through July 3, 2022.

Up to two shows per year can be an hour in length but all other fireworks displays will not exceed thirty minutes in duration and will occur with an average frequency less than or equal to once every two months within each of four prescribed display areas (Figure 1). Fireworks will not be authorized during the primary spring breeding season for marine wildlife (March 1 to June 30).

Firework display areas in Monterey Bay National Marine Sanctuary

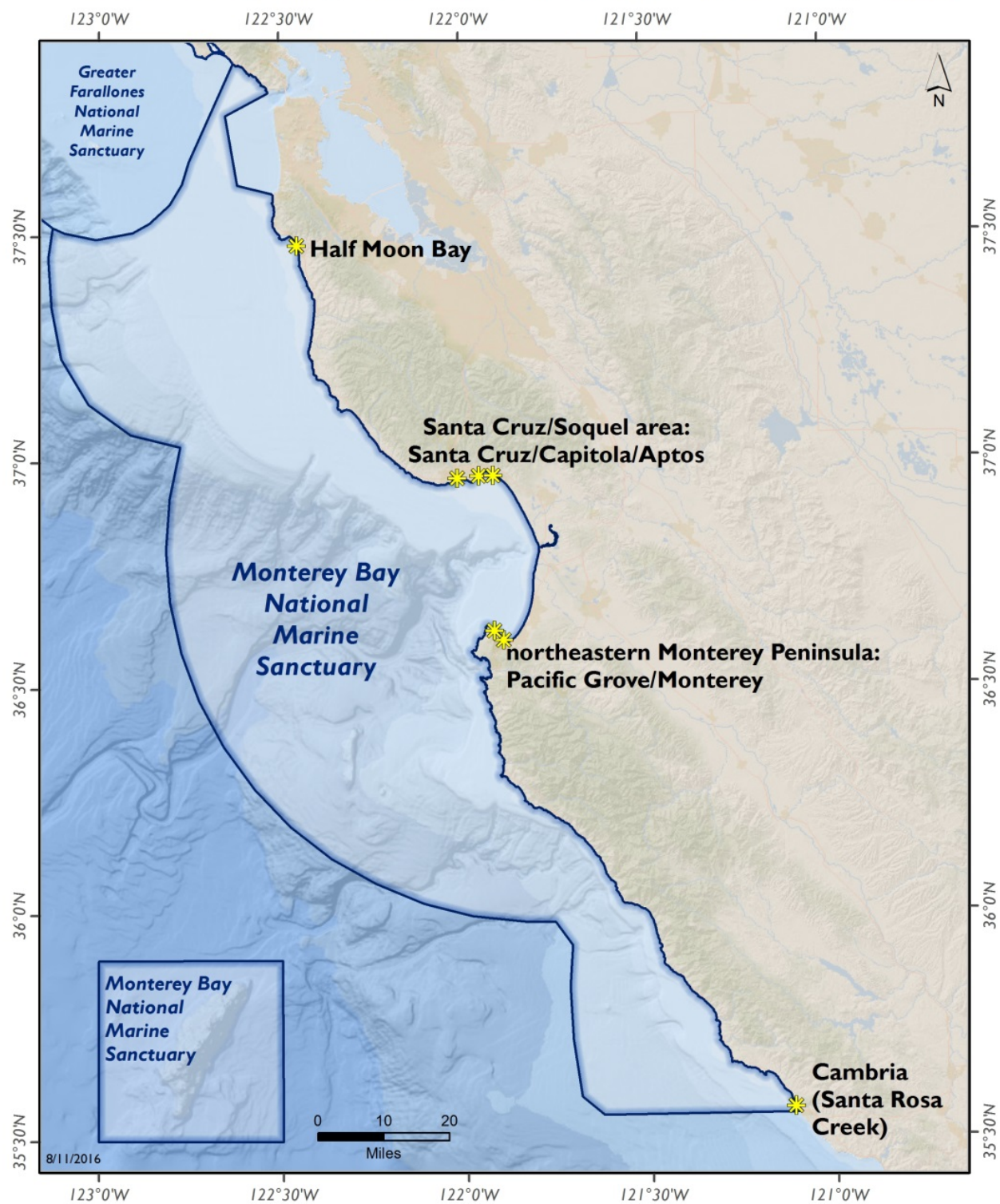


Figure 1. Four conditional firework display areas in Monterey Bay National Marine Sanctuary.

MBNMS has traditionally limited permitted fireworks to four prescribed areas of the sanctuary effectively protecting 95 percent of the MBNMS coastline from commercial fireworks impacts. The conditional display areas are located at Half Moon Bay, the Santa Cruz/Soquel area, the Monterey Peninsula, and Cambria (Santa Rosa Creek) (Figure 1). These display areas are located adjacent to urban centers where wildlife has often acclimated to human disturbances including boating, low-flying aircraft, personal watercraft operations and historical firework displays. Detailed descriptions of each display area are available in the 2006 Environmental Assessment of the Issuance of a small take regulations and letters of Authorization and the issuance of National marine Sanctuary Authorizations for Coastal Commercial Fireworks Displays within Monterey Bay National Marine Sanctuary, CA. Detailed descriptions of each display area are also available on pages 15-22 and maps B-H and J of the Fireworks Assessment Report 2002.

Section 3. Species and Numbers of Marine Mammals

Based on the stock assessments by the National Marine Fisheries Service, most marine mammals (e.g., whales, dolphins, seals, sea lions) that are residents or seasonal visitors to MBNMS are stable or increasing in abundance at the population level (Carretta et al. 2013). The local abundance of mammal species that migrate to the sanctuary to forage (e.g., humpback, blue and fin whales) is strongly influenced by the abundance and distribution of their prey, such as krill, sardine and anchovy.

Table 3 which indicates the marine mammal species of special interest in MBNMS below is adapted from Table 7 from The Natural Resources of Monterey Bay National Marine Sanctuary: A Focus on Federal Waters (Brown et al 2013).

| Taxonomic Group | Scientific Name | Common Name | E/T | Population Status | | Habitat | | | |
|----------------------|--------------------------------|--------------------------------|-----|---------------------|--------------------|------------|-------|-------|------------|
| | | | | Relative Biomass | Recent Trend | Open Water | Slope | Shelf | Near-Shore |
| Baleen Whales | <i>Eschrichtius robustus</i> | Whale, Gray | | high ^{1,3} | NS or ↑1 | x | | x | x |
| Baleen Whales | <i>Megaptera novaeangliae</i> | Whale, Humpback | E | unk ^{1,4} | ↑1,2 | x | | | |
| Baleen Whales | <i>Balaenoptera musculus</i> | Whale, Blue | E | unk ^{1,4} | NS ^{1,2} | x | | | |
| Baleen Whales | <i>Balaenoptera physalus</i> | Whale, Fin | E | unk ^{1,4} | ↑10 | x | | | |
| Baleen Whales | <i>Balaenoptera borealis</i> | Whale, Sei | E | unk ¹ | unk ^{1,2} | x | | | |
| Baleen Whales | <i>Eubalaena japonica</i> | Whale, North Pacific Right | E | <1% ¹ | unk ¹ | | | | |
| Toothed Whales | <i>Physeter macrocephalus</i> | Whale, Sperm | E | unk ^{1,4} | unk ^{1,2} | x | x | | |
| Dolphins | <i>Orcinus orca</i> | Whale, Killer ^c | E | ~43% ¹ | NS ¹ | x | | | |
| Porpoises | <i>Phocoena phocoena</i> | Porpoise, Harbor ^d | | unk ^{1,4} | NS ¹ | x | | x | x |
| Porpoises | <i>Phocoena phocoena</i> | Porpoise, Harbor ^e | | unk ^{1,4} | NS ¹ | x | | x | x |
| Porpoises | <i>Phocoena phocoena</i> | Porpoise, Harbor ^f | | unk ^{1,4} | ↑1 | x | | x | x |
| Seals | <i>Phoca vitulina</i> | Seal, Harbor ^a | | high ^{1,3} | NS ¹ | x | | x | x |
| Seals | <i>Mirounga angustirostris</i> | Seal, Northern Elephant | | high ^{1,3} | ↑1 | x | x | x | |
| Sea Lions, Fur Seals | <i>Callorhinus ursinus</i> | Fur Seal, Northern | | N/A ⁷ | ↑1 | x | | | |
| Sea Lions, Fur Seals | <i>Eumetopias jubatus</i> | Sea Lion, Steller ^b | T | <50% ^{1,6} | NS ^{1,6} | x | x | x | |
| Sea Lions, Fur Seals | <i>Arctocephalus townsendi</i> | Fur Seal, Guadalupe | T | unk ¹ | ↑1 | x | | | |
| Sea Lions, Fur Seals | <i>Zalophus californicus</i> | Sea Lion, California | | high ^{1,3} | ↑1 | x | | x | x |
| Sea Otters | <i>Enhydra lutris nereis</i> | Sea Otter, Southern | T | ~17% ^{8,9} | NS or ↓8 | x | | | x |

Table 3. Marine mammals in MBNMS that receive relatively greater interest and attention from resource managers, including Endangered and Threatened species (E/T). When available, the current population size/biomass relative to the historically high population size/biomass and the recent trend in population size are included; increasing (↑), decreasing (↓), trend not significant (NS), or unknown (unk). Population status information in red ink denotes information that is more than 5 years old (pre-2007).

a California Stock; b Eastern Stock; c Eastern North Pacific Southern Resident Stock; d San Francisco-Russian River stock; eMonterey Bay stock; fMorro Bay stock;

1 NOAA Fisheries OPR Marine Mammals Stock Assessment Reports by Species/Stock website

<http://www.nmfs.noaa.gov/pr/sars/species.htm> accessed in June 2012; 2 based on estimates for the stock off the U.S. west coast; 3 population may be approaching carrying capacity; 4 historic population size unknown; 5Appendix G in CDFG 2008a; 6

for the population in central California only; 7 colony on San Miguel Island established in late 1960s; 8 Tinker et al. 2006; 9USGS Western Ecological Research Center California Sea Otter Survey Results website <http://www.werc.usgs.gov/ProjectSubWebPage.aspx?SubWebPageID=16&ProjectID=91> accessed in June 2012; 10Moore and Barlow 2011

Table 4 shows the seasonalities of selected marine mammals (information captured from “Seasonal activities of selected marine mammals on the Central California Coast (9/13/2016):

<http://www.seasonsintthesea.com/timelines/mammals.shtml>)

| Jan/Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov/Dec |
|--|------------------|-------------------|-------------------|-------------------|-----------------|---------------------------|---------------------|----------------------|----------------------|
| Gray Whale (<i>Eschrichtius robustus</i>) | | | | | | | | | |
| Peak S Migration | Migrating S & N | Peak N migration | Late N migration | | Feed in Arctic | | | | S migration |
| Orca (killer whale) (<i>Orcinus orca</i>) | | | | | | | | | |
| | Hunt gray whales | Hunt gray whales | Hunt gray whales | | | | | | |
| Humpback whale (<i>Megaptera novaeangliae</i>) | | | | | | | | | |
| | Arrive | Arrive | Feeding | Feeding | Feeding | Peak pops in Monterey Bay | | | S migration |
| Blue whale (<i>Balaenoptera musculus</i>) | | | | | | | | | |
| | | | | Arrive | | Peak | Peak | S migration | |
| California sea lion (<i>Zalophus californianus</i>) | | | | | | | | | |
| Adult males migrate S | Juveniles arrive | | Peak in juveniles | Pupping in S. CA | | Adult males return | Peak in adult males | Peak in adult males | |
| Harbor seal (<i>Phoca vitulina</i>) | | | | | | | | | |
| | Females gather | Peak pupping | Pupping, nursing | Weaning, training | Mating, molting | Molting | | | |
| Northern elephant seal (<i>Mirounga angustirostris</i>) | | | | | | | | | |
| Pupping, mating | Adults leave | Pups leave | Adults molt | | | | Pups return | | Adults arrive |
| Steller sea lion (<i>Eumetopias jubatus</i>) | | | | | | | | | |
| | | First arrivals | Females arrive | Pupping | | Pups weaning | Males leave | Females & pups leave | |
| Sea otter (<i>Enhydra lutris</i>) | | | | | | | | | |
| Peak pupping | Pupping, nursing | Weaning, training | | | | Peak mating | Peak mating | | Pupping |
| Dall's porpoise (<i>Delphinus capensis</i>) and Harbor porpoise (<i>Phocoena phocoena</i>) | | | | | | | | | |
| | | First arrivals | Migrate North | | Peak pops | Peak pops | | | Migrate South |
| Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>), Risso's dolphin (<i>Grampus griseus</i>), and Long-beaked common dolphin (<i>Delphinus capensis</i>) | | | | | | | | | |
| Congregate nearshore | Leave area | | | | Give birth? | Arrive from south | Peak pops | Peak pops | Congregate nearshore |
| Jan/Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov/Dec |

Table 4. Seasonal activities of selected marine mammals on the Central California Coast. Dark blue means organism is likely to be present, light blue shading means that the organism may be present and white boxes indicate that there are few or no individuals present. Adapted from: <http://www.seasonsintthesea.com/timelines/mammals.shtml>

Other cetaceans found in MBNMS are Minke Whale (*Balaenoptera acutorostrata*), a variety of beaked whales (*Berardius bairdi*, *Ziphius cavirostris*, *Mesoplodon carlhubbsi*), Short-finned pilot whale (*Globicephala macrorhynchus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Risso's dolphin (*Grampus griseus*), short-beaked common dolphin (*Delphinus Delphinus*), long-beaked common dolphin (*Delphinus capensis*), bottlenose dolphin (*Tursiops truncatus*), striped dolphin (*Stenella coeruleoalba*), Dall's porpoise (*Phocoenoides dalli*).

MBNMS staff consulted with the Protected Resources Division of the NMFS SWRO and determined that the only marine mammal species under NMFS' jurisdiction likely to be impacted by fireworks displays within the sanctuary are the California sea lion and the harbor seal which are both present year-round. Both are protected under the MMPA, but neither is listed under the Endangered Species Act (ESA). For further description of these and other nearshore marine mammal species in the affected area, see pages 11-13 of the Fireworks Assessment Report (2002) and the Environmental Assessment of the Issuance of a small take regulations and letters of Authorization and the issuance of National Marine Sanctuary Authorizations for Coastal Commercial Fireworks Displays within the Monterey Bay National Marine Sanctuary, CA (June 2006). There are no elephant seals around the area of Santa Rosa Creek in Cambria. It is possible that individual elephant seals may enter the Half Moon Bay site area from breeding sites at Año Nuevo Island and the Farallon Islands but breeding occurs in the winter and so the elephant seals are not usually around during Independence Day fireworks on July 4th which is when a display could be permitted (see Table 5).

Section 4. Affected Species Status and Distribution

NMFS conducts regular stock assessments, as mandated by the MMPA, to determine the status of marine mammal stocks in the United States. The majority of the information below was compiled by NMFS and published in annual stock assessment reports (Carretta et al. 2015).

CALIFORNIA SEA LION (*Zalophus californianus*): U.S. Stock

The entire population of U.S. stock of California sea lions cannot be counted because all age and sex classes are not ashore at the same time. In lieu of counting all sea lions, pups are counted during the breeding season (because this is the only age class that is ashore in its entirety), and the number of births is estimated from the pup count. Population size is then estimated from the number of births and the proportion of pups in the population. To estimate the number of pups born, the pup count for rookeries in southern California in 2008 giving an estimated 68,740 live births in the population and a total population estimate of 296,750. More recent pup counts made in 2011 totaled 61,943 animals, the highest recorded to date and estimates of total population size based on these counts are currently being developed. Fig. 2 shows the trends in pup counts from 1975-2011 and the data shows the effect of El Niño events on the sea lion population as pup production decreased during the four El Niño events during that time period.

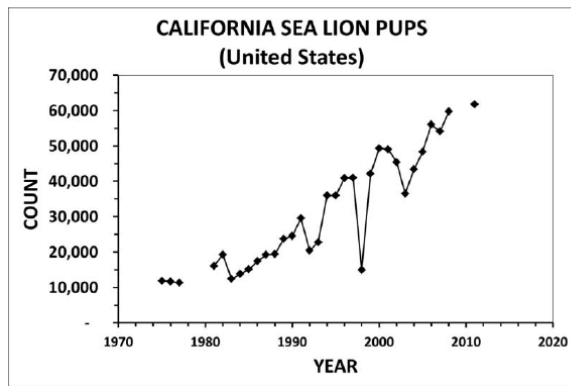


Figure 2. U.S. pup count index for California sea lions (1975-2011). Trends in pup counts from 1975 through 2011 are shown for four rookeries in southern California and for haulouts in central and northern California. (Figure 2. From Carretta et al. 2015)

California sea lions in the U.S. are not listed as "endangered" or "threatened" under the ESA or as "depleted" under the MMPA. California sea lions are killed in a variety of trawl, purse seine, and gillnet fisheries along the U.S. west coast. California sea lions are also incidentally killed and injured by hooks from recreational and commercial fisheries. Live strandings and dead beach-cast California sea lions are regularly observed with gunshot wounds in California. A summary of stranding records for 2008 to 2012 from California, Oregon, and Washington shows the following non-fishery related human-caused mortality and serious injuries: boat collisions (13), car collisions (3), entrainment in power plants (59), shootings (151), marine debris entanglement or ingestion (37), research-related (18), and other sources, including dog attacks, harassment, seal bombs, stabbings, and, blunt force trauma (10). Stranding records are a gross underestimate of mortality and serious injury because many animals and carcasses are never recovered. The minimum number of non-fishery related deaths and serious injuries during 2008-2012 was 291 sea lions, or an annual average of 58 animals. The average annual research-related mortality and serious injury of California sea lions from 2008 to 2012 is 4.0 animals.

The optimum sustainable population (OSP) status of this population has not been formally determined. The average annual commercial fishery mortality is 331 animals per year. Other sources of human-caused mortality (shootings, direct removals, recreational hook and line fisheries, tribal takes, entrainment in power plant intakes, etc.) average 58 animals per year. Total human-caused mortality of this stock is at least 389 animals per year. California sea lions are not considered "strategic" under the MMPA because total human-caused mortality is less than the PBR (9,200). The total fishery mortality and serious injury rate (389 animals/year) for this stock is less than 10% of the calculated PBR and, therefore, is considered to be insignificant and approaching a zero mortality and serious injury rate.

A minimum of 12,000 California sea lions are probably present at any given time in the MBNMS region. Año Nuevo Island is the largest single haul-out site in the sanctuary, hosting as many as 9,000 California sea lions at times (Weise 2000; Lowry 2001). In general the US population of sea lions has increased since 2001, but oceanographic conditions play a big role on how many are found in the sanctuary on any given year. During 2012 and 2013 surveys, 16,137 (mostly non-pups) were counted (Lowry 2016 via email). Most individuals of this species breed on the Channel Islands off southern California (100 miles south of the MBNMS) and off Baja and mainland Mexico (Odell 1981), although pups have been born on Año Nuevo Island (Keith et al. 1984, Lowry 2016 via email). Populations peak in the Monterey Bay area in fall and winter and are at their lowest numbers in spring and early summer.

HARBOR SEAL (*Phoca vitulina richardii*): California Stock

Population size is estimated by counting the number of seals ashore during the peak haul-out period (May to July) and by multiplying this count by a correction factor equal to the inverse of the estimated fraction of seals on land. Based on the most recent harbor seal counts during May-July of 2012 (20,109 animals) (NMFS unpublished data) and the Harvey and Goley (2011) correction factor, the harbor seal population in California in 2012 is estimated to number 30,968 seals. Nicholson (2000) studied the stage structure of harbor seals on the northeast Monterey Peninsula (an area with the largest single concentration of animals within the Sanctuary) for two years and reported a stage structure comprising 38% adult females, 15% adult males, 34% sub-adults, and 13% yearlings or juveniles.

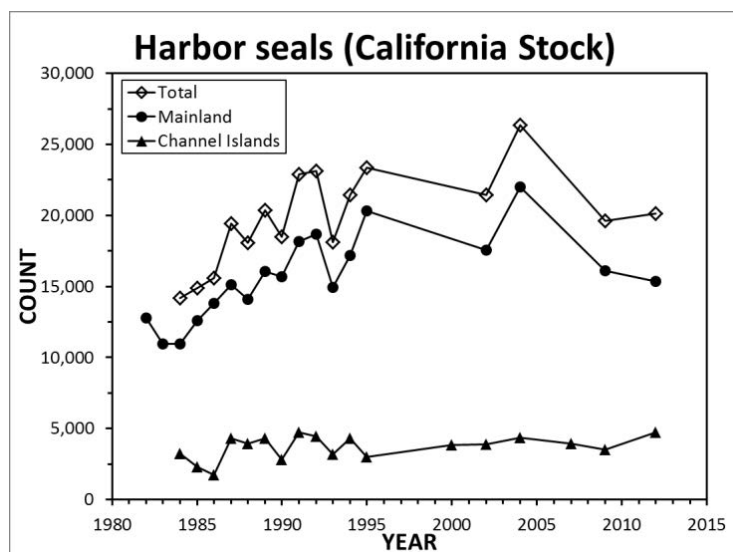


Figure 3. Harbor seal haulout counts in CA during May to July (Fig.2 on pg.9 in Caretta et al 2015.)

A review of harbor seal dynamics through 1991 concluded that their status relative to OSP could not be determined with certainty (Hanan 1996). California harbor seals are not listed as "endangered" or "threatened" under the Endangered Species Act nor designated as "depleted" under the MMPA. Annual human-caused mortality from commercial fisheries (30/yr) and other human-caused sources (12.8/yr) is 42.8 animals, which is less than the calculated PBR for this stock (1,641), and thus they are not considered a "strategic" stock under the MMPA. The average annual rate of incidental commercial fishery mortality (30 animals) is less than 10% of the calculated PBR (1,641 animals); therefore, fishery mortality is considered insignificant and approaching zero mortality and serious injury rate. The population size has increased since the 1980s when statewide censuses were first conducted. The highest population counts occurred in 2004 and subsequent counts in 2009 and 2012 have been lower. During an aerial survey by Mark Lowry in June 2012, 4093 Pacific Harbor Seals were counted in the water and on land in MBNMS. Expanding pinniped populations in general have resulted in increased human-caused serious injury and mortality, due to shootings, entrainment in power plants, interactions with recreational hook and line fisheries, separation of mothers and pups due to human disturbance, dog bites, and vessel and vehicle strikes.

There are no known habitat issues that are of particular concern for this stock. Pupping within the sanctuary occurs primarily during March and April followed by a molt during the summer. Harbor seals are residents in MBNMS throughout the year, occurring mainly near the coast. Although harbor seals off California do not migrate, radio-tagged individuals have moved distances of 480 km from Point Reyes, California (Allen et al. 1987). In the MBNMS, harbor seals often move substantial distances (10-20 km) to foraging areas each night (Oxman 1995; Trumble 1995). An area off Sunset State Beach is used

consistently by harbor seals tagged in Elkhorn Slough and off Monterey (Oxman 1995; Trumble 1995).

The USFWS is responsible for regulating the take of southern sea otters. The USFWS issued a biological opinion on June 22, 2005, which concluded that the authorization of fireworks displays, as proposed in the preferred alternative, is not likely to jeopardize the continued existence of endangered and threatened species within the sanctuary or to destroy or adversely modify any listed critical habitat. The USFWS further found that MBNMS would be unlikely to take any southern sea otters, and therefore issued neither an incidental take statement under the ESA nor an IHA. Further information may be found in the 2005 USFWS' Biological Opinion for the Authorization of Fireworks Displays Within the Monterey Bay National Marine Sanctuary, San Mateo, Santa Cruz, Monterey, and San Luis Obispo Counties, California (1-8-02F-33).

Section 5. Type of Incidental Taking Authorization Requested

Take will be limited only to the incidental behavioral harassment of California sea lions and harbor seals due to temporary evacuation of usual and accustomed haul-out sites for as little as fifteen minutes and as much as fifteen hours during any fireworks event. The primary causes of disturbance are light flashes and sound effects from exploding fireworks. As a fireworks presentation progresses, most marine mammals and birds generally evacuate the impact area. Increased recreational use (terrestrial and marine) in the fireworks display area during the hours immediately prior to the show may also prompt wildlife to temporarily evacuate the area.

Reaction of California Sea Lions to fireworks displays

Of all the display sites in the Sanctuary, California sea lions are only present in significant concentration at Monterey but no signs of physical impairment or mortality have been detected for this species as a result of fireworks displays. The following is an excerpt from a 1998 MBNMS staff report (Appendix F in MBNMS 2002) of the reaction of sea lions to a large aerial fireworks display in Monterey:

In the first seconds of the display that was monitored in Monterey in 1998, the sea lion colony becomes very quiet, vocalizations cease, and younger sea lions (non-adult) and all marine birds evacuate the breakwater. The departing sea lions swim quickly toward the open sea. Most of the colony remains intact until the older bulls evacuate, usually after a salvo of overhead bursts in short succession. Once the bulls depart, the entire colony follows suit, swimming rapidly in large groups toward the open sea. A select few of the largest bulls may sometimes remain on the breakwater. Sea lions have been observed attempting to haul out onto the breakwater during the fireworks display, but most are frightened away by the continuing aerial bursts.

Sea lions begin returning to the breakwater within 30 minutes following the conclusion of the display but have been observed to remain quiet for some time. The colony usually reestablishes itself on the breakwater within 2-3 hours following the conclusion of the display, during which vocalization activity returns. Typically, the older bulls are the first to renew vocalization behavior (within the first hour), followed by the younger animals. By the next morning, the entire colony seems to be intact and functioning with no visible sign of abnormal behavior.

MBNMS staff monitored another event in 1998 (Appendix G in MBNMS 2002) during which the 10 minute fireworks display began at approximately 8:15 PM in Monterey. Staff noted that the breakwater was filled with roosting marine birds and California sea lions by 9:30 PM and that no visible signs of disturbance or reduction in pre-display numbers were evident. Also, a 2012 report from a fireworks show on the cement ship noted that sea lions and harbor seals are best served when firework displays occur during high tide

when they are least likely to use the cement ship as a haul-out area. In 2012 the event coincided with low tide but the recovery of wildlife in the area was still rapid as everything appeared normal less than 24 hours after the event and some birds (brown pelicans and cormorants) were observed returning to the ship less than an hour after the conclusion of the fireworks show. This was similarly observed in 2005 at the same site where the monitoring report states “The fireworks show had an immediate impact on birds roosting on the end of the cement ship. Everything appeared normal less than 24 hours after the event was concluded.”

Reaction of Harbor Seals to fireworks displays

A survey of harbor seal reactions to fireworks displays in the sanctuary was conducted during monitoring of a display at Aptos in October 2000 (Appendix H in MBNMS 2002). The staff report made the following finding: Harbor seals could not be seen during and immediately after the event. It’s likely, based on the reaction of the birds and the noise of the display, that the seals evacuated the area on and around the cement ship. Harbor seals were sighted hauled out on the ship and in the water the following morning. In general, harbor seals are more timid and easily disturbed than California sea lions. Thus, based on past observations of sea lion disturbance thresholds, it is very likely that harbor seals evacuate the acute impact area during fireworks displays.

A monitoring report from the 2006 Pacific Grove Feast of Lanterns fireworks display states that harbor seals were observed along the 400 m area adjacent to the event during the pre-event census on July 28, 2006. Sea lions were not observed at any of the stations. A non-mandatory, supplemental, census conducted directly before the fireworks event on July 29 noted no harbor seals, likely due to music, festivities, and human presence on land and in the water following the high tide. The observer presumes that no harbor seals were present for the actual fireworks display. No dead or injured wildlife was reported.

Since harbor seals have a smaller profile than sea lions and are less vocal, their movements and behavior are often more difficult to observe at night. In general, harbor seals are more timid and easily disturbed than California sea lions. Thus, based on past observations of sea lion disturbance thresholds and behavior, it is very likely that harbor seals evacuate exposed haul outs in the impact area during fireworks displays, though they may loiter in adjacent surface waters until the fireworks have concluded (NMFS 2006).

Section 6. Take Estimates for Marine Mammals

Total number of take events will not exceed ten per year along the entire sanctuary coastline. Number of animals taken in individual events is expected to vary considerably due to factors such as tidal state, seasonality, shifting prey stocks, climatic phenomenon (e.g., El Niño events), and the number, timing, and location of future displays. Table 5 identifies the average and maximum number of California sea lions and harbor seals expected to be taken by harassment for each location, as well as the maximum number of events that might occur at each location. Average and maximum numbers of animals at each location were derived from the following primary data sources:

Half Moon Bay: Lowry 2001, 2012, 2013; Read and Reynolds 2001

North Monterey Bay: Lowry 2001, 2012, 2013; Read and Reynolds 2001; Hall 2000; Weise 2000

South Monterey Bay: Lowry 2001, 2012, 2013; Read and Reynolds 2001; Weise 2000; Nicholson 2000; Nicholson 2002; Hall and Threlhoff 2001

Cambria: Lowry 2001, 2002; Read and Reynolds 2001

| Display Location | Time of Year | Estimated Number of events | Sea Lions Average Take | Sea Lions Maximum Take | Harbor Seals Average Take | Harbor Seals Maximum Take |
|---------------------------------|--------------|----------------------------|------------------------|------------------------|---------------------------|---------------------------|
| Half Moon Bay | July | 1 | 20 | 100 | 15 | 65 |
| Santa Cruz/Soquel | October | 1 | 100 | 190 | 0 | 5 |
| Santa Cruz/Seacliff State Beach | October | 1 | 0 | 5 | 15 | 50 |
| North Monterey Bay | - | 1 | 100 | 190 | 15 | 50 |
| South Monterey Bay | July | 1 | 250 | 800 | 7 | 60 |
| South Monterey Bay | January | 1 | 700 | 1500 | 15 | 60 |
| South Monterey Bay | - | 1 | 400 | 800 | 15 | 60 |
| Pacific Grove | July | 1 | 0 | 150 | 50 | 100 |
| Cambria (Public) | July | 1 | 0 | 50 | 20 | 60 |
| Cambria (Private) | July | 1 | 0 | 25 | 20 | 60 |
| Total | | 10 | 1570 | 3810 | 172 | 570 |

Table 5. Estimated Incidental Take by Display Area and Event per year. Total take estimates derived from average and maximum animals expected, per location, multiplied by the estimated maximum number of events at that location per year.

Ten fireworks events per year could disturb an average of 1570 California sea lions and a maximum of 3810 California sea lions within the Sanctuary (Table 5). Ten fireworks events per year would disturb an average of 172 harbor seals and a maximum of 570 harbor seals within the Sanctuary.

MBNMS requests routine monitoring of pre- and post-event censuses to record the number of incidentally taken marine mammals and to note any injury, serious injury, or mortality that occurs as a result of fireworks displays. The authorization holder is requested to record the number of California sea lions, harbor seals, elephant seals, and any other pinnipeds in addition to sea otters in the vicinity (400 meters to the north and south of the firework detonation area) within 24 hours both prior and after the authorized fireworks display. The authorization holder is provided with data sheets for the pre- and post-display surveys. In addition, the authorization holder shall record species and location data for any injured or dead wildlife observed during debris beach cleanup efforts. The pre-display survey should be conducted the day before the event, at or near the same time of the scheduled start of the fireworks the following day. This will assure that the census survey occurs during a tide state similar to that in existence at the time of the fireworks display. The state of the tide has a significant influence on the number of animals present at a particular haul-out site. Also, since firework displays occur in the dark, it is very challenging to impossible to get an accurate count of the wildlife right before the display and to observe their behavior. In addition, wildlife abundance could be impacted by an increase of human activity before firework displays, e.g. 4th of July BBQ's on the beach.

Past monitoring of fireworks displays indicates that these take estimates are extremely conservative, in part because actual demand for permits has not matched the estimated maximum number of displays that MBNMS would permit. Under previous authorizations, from 2006- 2010, only twenty-one permitted events in total have taken place and from 2010- 2015, only fifteen permitted events in total have taken place (Table 6). All the events were monitored as required by the permits' terms and conditions. The twenty-one events combined from 2006-2010 have resulted in the behavioral harassment (Level B harassment) of only an estimated 138 harbor seals and 843 California sea lions in total. The fifteen events combined from 2010-2015 have resulted in the behavioral harassment (Level B harassment) of only an estimated 31 harbor seals and 130 California sea lions in total (Table 6). However, the scenario described above remains representative of the maximum number of events, and subsequent takes, that could occur. As such, MBNMS requests take authorization for 3810 California sea lions and 570 harbor seals per year.

| Site | 2006 Harbor seal / CA sea lion presence | 2007 Harbor seal / CA sea lion presence | 2008 Harbor seal / CA sea lion presence | 2009 Harbor seal / CA sea lion presence | 2010 Harbor seal / CA sea lion presence |
|---|--|--|--|--|--|
| Half Moon Bay | no event | 1/0 | 2/0 | 5/45 | no event |
| Aptos (Santa Cruz/Seacliff State Beach) | 4/0 | 2/0 | 2/24 | 10/24 | 18/0 |
| Monterey (South Monterey Bay) | 9 / 61 | 31/291 | 10/394 | no event | no event |
| Pacific Grove | 17/0 | 8/0 | 0/0 | 7/4 | no event |
| Cambria | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 |
| Capitola (North Monterey Bay) | no event | no event | no event | 12/0 | no event |
| City of Santa Cruz (Santa Cruz/Soquel) | no event | no event | no event | no event | no event |
| Total Events | 4 | 5 | 5 | 5 | 2 |

(Table 6 continues on next page)

| Site | 2011 Harbor seal / CA sea lion presence | 2012 Harbor seal / CA sea lion presence | 2013 Harbor seal / CA sea lion presence | 2014 Harbor seal / CA sea lion presence | 2015 Harbor seal / CA sea lion presence |
|---|--|--|--|--|--|
| Half Moon Bay | 0/0 | no event | no event | no event | no event |
| Aptos (Santa Cruz/Seacliff State Beach) | 0/0 | 0/0 | no event | no event | no event |
| Monterey (South Monterey Bay) | no event | no event | no event | no event | no event |
| Pacific Grove | 2/0 | 8/0 | 11/0 | 2/0 | 5/0 |
| Cambria | 0/0 | 0/0 | 0/0 | 0/0 | no event |
| Capitola (North Monterey Bay) | no event | no event | no event | 1/0 | 0/0 |
| City of Santa Cruz (Santa Cruz/Soquel) | no event | no event | no event | 2/130 | no event |
| Total Events | 4 | 3 | 2 | 4 | 2 |

Table 6. Estimated number of pinnipeds temporarily disturbed by fireworks in MBNMS each calendar year

Section 7. Anticipated Impact of the Activity

Past monitoring by MBNMS has shown that fireworks displays result in only short-term behavioral harassment of animals, at most. There have been no reports of injury or mortality of animals during post display surveys. Most animals depart affected haul-out areas at the beginning of the display and return to previous levels of abundance within 4-15 hours following the event. This information is based on observations made by sanctuary staff and by volunteer monitors over more than a dozen years of monitoring data from fireworks displays (e.g., Appendices C-I, Fireworks Assessment Report 2002), detailed quantitative surveys in 2001 and 2007, and pre- and post-event monitoring conducted for every event permitted under authorizations issued by NMFS. For a full assessment of fireworks effects within the sanctuary, see pages 5-12, and maps B-H and J, of the Fireworks Assessment Report (2002).

Between 1980 and 1983, an intensive aerial survey effort was commissioned by the U.S. Minerals Management Service (now Bureau of Ocean Energy Management (BOEM)) to record abundance and distribution of marine mammals throughout California (Bonnell et al. 1983). Over the three year survey, the number of California sea lions present at the Monterey Breakwater in the week preceding July 4 averaged ten animals. Between 1997 and 1998, a graduate researcher from Moss Landing Marine Laboratories conducted air and ground surveys at the Monterey Breakwater during July of each year and recorded a mean population of 270 animals (Weise 2000). Between 1998 and 1999, the NMFS SWRO conducted aerial surveys of major California sea lion haul-out sites in California and recorded a mean July

census of 56 sea lions at the Monterey Breakwater (Lowry 2001). Though the sample sizes are low in number, they indicate a significant increase in the July population of sea lions at the Monterey Breakwater between the early 1980 surveys (prior to the commencement of annual fireworks displays by the City of Monterey in 1988) and the late 1990 surveys. This increased sea lion presence at the Monterey Breakwater during the month of July occurred despite the initiation and annual repetition of fireworks displays in the area. Similarly, no long-term decrease in habitat utilization by pinnipeds in MBNMS has been recorded during the continued fireworks displays under the current authorization.

MBNMS has been unable to find any peer-reviewed research that specifically investigates the response of California sea lions and harbor seals to commercial fireworks displays. However, extensive studies have been conducted at Vandenberg Air Force Base (VAFB) to determine responses by pinnipeds to the effects of periodic rocket launches. The light and sound effects of the launches would be roughly similar to the effects of pyrotechnic displays, but with much greater intensity. Also, harbor seals were counted during a study focused on seabird responses to a firework display at Gualala Point Island in Sonoma County, CA between May and August in 2007. The authors of that study state that the low-tide counts were the lowest on July 7th, right after the fireworks display, but no harbor seals had been counted on the Island right before the fireworks so there is no conclusive link between the decline in numbers and the fireworks (Weigand and McChesney 2008).

An ongoing scientific research program has been conducted since 1997 to determine the long-term cumulative impacts of space vehicle launches on the haul-out behavior, population dynamics and hearing acuity of harbor seals at VAFB. In addition, pinniped populations were studied at identified haul-out sites in the northern Channel Islands in order to determine the impact of sonic booms on pinniped behavior.

The response of harbor seals to rocket launch noise depended on the intensity of the noise (dependent on the size of the vehicle and proximity) and the age of the seal. In order to obtain details on the launch noise reaching harbor seals on VAFB, acoustic measurements were collected near the haul-out site. Not surprisingly, the highest noise levels are typically from launch vehicles with launch pads closest to the haul-out sites. When launch noise was below an A-weighted sound exposure level of 100 decibels (re: 20 μ Pa), not all seals fled the haul-out site, although those that remained were exclusively adults. Given the high degree of site fidelity among harbor seals, it is likely that those seals that remained on the haul-out site during rocket launches had previously been exposed to launches; that is, it is possible that adult seals have become acclimated to the launch noise and react differently than the younger, less experienced seals. Of the twenty seals tagged at VAFB, eight (forty percent) were exposed to at least one launch disturbance but continued to return to the same haul-out site. Three of those seals were exposed to two or more launch disturbances. Of those seals exposed to launch noise, most six (75 percent) appeared to remain in the water adjacent to the haul-out site and then returned to shore within 2-22 minutes after the launch disturbance. Of the two remaining seals that left the haul-out after the launch disturbance, both had been on shore for at least six hours and returned to the haul-out site on the following day.

In order to further determine if harbor seals experience any change in their hearing sensitivity as a result of launch noise, researchers conducted Auditory Brainstem Response (ABR) testing on ten harbor seals prior to and after the launches of three Titan IV rockets (one of the loudest launch vehicles at the south VAFB haul-out site). Detailed analysis of the changes in waveform latency and waveform replication of the ABR measurements showed that there were no detectable changes in the seals' hearing sensitivity as a result of the launch noise (SRS Technologies 2001).

The launches at VAFB do not appear to have had long-term effects on the harbor seal population in this area. The total population of harbor seals at VAFB is estimated to be 1,040 animals and has been

increasing at an annual rate of 12.6 percent. Since 1997, there have been 5-7 space vehicle launches per year and there appears to be only short-term disturbance effects to harbor seals as a result of launch noise (SRS Technologies 2001). Harbor seals will temporarily leave their haul-out when exposed to launch noise; however, they generally return to the haul-out within one hour.

There are fewer studies that document disturbances to California sea lions. However, sea lions in general are more tolerant to noise and visual disturbances compared to harbor seals. In addition, pups and juveniles are more likely to be harassed when exposed to disturbance compared to the older animals. Adult sea lions have likely habituated to many sources of disturbance and are therefore much more tolerant to human activities nearby.

On San Miguel Island, when California sea lions and elephant seals were exposed to sonic booms from vehicles launched on VAFB, sea lion pups were observed to enter the water, but usually remained playing in the water for a considerable period of time. Some adults approached the water, while elephant seals showed little to no reaction. This short-term disturbance to sea lion pups has not caused any long-term effects to the population.

The conclusions of the five-year VAFB study are almost identical to our observations of pinniped response to commercial fireworks displays. Observed impacts have been limited to short-term disturbance only.

In 2001, MBNMS and USFWS intensively monitored the July 4 Monterey fireworks display. Monitors recorded species abundance before, during, and after the event and measured the decibel level of exploding fireworks. A hand-held decibel meter was located aboard a vessel adjacent to the Monterey Breakwater which is where the sea lions located, approximately one half mile from the fireworks launch site. The highest reading observed on the decibel meter during the fireworks display was 82 decibels, 18 decibels lower than the A-weighted sound exposure level of 100 decibels (re: 20 μ Pa) measured in the VAFB studies, where only short-term effects were detected. The typical decibel levels for the display ranged from 70-78 decibels, and no salute effects were used in the display. An ambient noise level of 58 decibels was recorded at the survey site thirty minutes following the conclusion of the fireworks display.

In the 2001 Monterey survey, most animals were observed to evacuate haul-out areas upon the initial report from detonated fireworks. Surveys continued for 4.5 hours after the initial disturbance and numbers of returning California sea lions remained at less than one percent of pre-fireworks numbers. When surveys resumed the next morning (thirteen hours after the initial disturbance), sea lion numbers on the breakwater equaled or exceeded pre-fireworks levels. The sea lions returned within 4-13 hours following the end of the fireworks display.

Only two harbor seals were observed on and near the rocks adjacent to Fisherman's Wharf prior to the display. Neither were observed to haul out after the initial fireworks detonation, but remained in the water around the haul-out. The haul-out site was only surveyed until the conclusion of the fireworks display; therefore, no animal return data is available. However, the behavior of the seals after the initial disturbance and during the fireworks display is similar to the response behavior of seals during the VAFB rocket launches, where they loitered in the water adjacent to their haul-out site during the launch and returned to shore within 2-22 minutes after the launch disturbance.

Section 8. Anticipated Impacts on Subsistence Uses

Not applicable. There are no subsistence uses of California sea lions or harbor seals within or adjacent to MBNMS.

Section 9. Anticipated Impacts on Habitat

Fireworks displays do not alter ocean areas or haul-out sites used by California sea lions and harbor seals, nor do they impact the availability of prey species. During the course of a display, some fireworks will fail to detonate (duds) and fall down intact. The freefalling dud could pose a physical risk to wildlife within the area, but wildlife tends to avoid the area during the display so the risk of that occurring is very low (Fireworks Assessment Report 2002). MBNMS staff conducted surveys of solid debris on the surface water, beaches and subtidal habitat after several firework shows and noted no visual evidence of acute or chronic impacts to the environment. Also, MBNMS permit terms and conditions require the permittee to clean the beaches of firework debris for up to two days following the displays. The receiving water fallout area affected by the fireworks residue can vary depending on wind speed and direction, the size of the shells and the type and height of the fireworks explosions.

MBNMS has found several scientific studies directed specifically at the potential impacts of fireworks chemical residue upon the environment. One report, prepared for the Walt Disney Corporation in 1992, presented the results of a 10- year study of the impacts of fireworks decomposition products (chemical residue) upon a small lake in Florida subjected to 2000 fireworks shows over a ten year period. The report concluded that detectable amounts of barium, strontium, and antimony had increased in the lake but not to levels considered harmful to aquatic biota. The report further suggested that environmental impacts from fireworks decomposition products typically will be negligible in locations that conduct fireworks displays infrequently and that the infrequency of fireworks displays at most locations, coupled with a wide dispersion of constituents, make detection of fireworks decomposition products difficult (DeBusk et al. 1992).

SeaWorld San Diego has conducted annual fireworks related monitoring for sediment and water quality parameters since 2001 in accordance with its National Pollutant Discharge Elimination System (NPDES) permits. SeaWorld may present up to 150 fireworks per year in the same general location in Mission Bay which is shallow and has restricted circulation. Water chemistry sampling of the typical events show little evidence of pollutants, with the exception of perchlorate and bis-phthalate, within the receiving water column at levels above applicable water quality criteria. However, based on the water quality data from the SeaWorld samples obtained to date, NPDES permit Fact Sheet indicates that single fireworks events of smaller size than SeaWorld's Fourth of July and Labor Day events are unlikely to cause or contribute to water quality criteria exceedances (NPDES CAG999002).

Based on the findings of these report and the lack of any evidence that fireworks displays within the sanctuary have degraded water quality, the MBNMS believes that chemical residue from fireworks does not pose a significant risk to the marine environment.

Section 10. Anticipated Effects of Habitat Impacts on Marine Mammals

Not applicable. No impacts to habitat for marine mammals are anticipated.

Section 11: Mitigation Measures

MBNMS has worked with USFWS and NMFS to craft sanctuary permitting terms and conditions that protect MBNMS resources and qualities, while allowing the continuation of traditional coastal fireworks displays. The permitting terms and conditions implement five broad approaches for managing fireworks displays: establish four conditional display areas and prohibit displays along the remaining 95 percent of

sanctuary coastal areas; create a per-annum limit on the number of displays allowed in each display area; establish a Sanctuary-wide seasonal prohibition to safeguard reproductive periods; and retain permitting requirements and general and special restrictions for each event.

The permitting protocols also specify that fireworks displays will not exceed thirty minutes in duration, with the exception of two longer displays per year not to exceed one hour each, and will occur with an average frequency of less than or equal to once every two months within each of the four prescribed display areas

An equal number of private and public displays will be considered for authorization within each display area. The sanctuary will continue to assess displays on a case-by-case basis, using standard permit conditions to address concerns unique to each planned display. These terms and conditions have evolved as the Sanctuary has sought to improve its understanding of the potential impacts that fireworks displays have upon marine wildlife and the environment. Displays are not authorized between March 1 and June 30 of each year, since this period is the primary reproductive season for many marine species. Remote areas and areas where professional fireworks have not traditionally been conducted will not be considered for fireworks approval. MBNMS fireworks permitting protocols are designed to prevent an incremental proliferation of fireworks displays and disturbance throughout the Sanctuary and minimize area of impact to primary traditional use areas. Traditional display areas are located adjacent to urban centers where wildlife has been acclimated to human disturbances.

MBNMS will continue to implement special conditions for fireworks when authorizing fireworks displays at the MBNMS, that include the following restrictions and terms: Delay of aerial "salute" effects until five minutes after the commencement of any fireworks display, Removal of all plastic and aluminum labels and wrappings from pyrotechnic devices prior to use and required recovery of all fireworks-related debris from the launch site and afflicted beaches. MBNMS also requires the permitted entities to conduct a census of all pinnipeds in the impact area on the day prior to the displays (with observations for at least 30 minutes) and require the permitted entities to report all marine mammal injury or mortality observed in the display area. The monitoring results from those reports are combined in an annual report to NMFS and USFWS and include the dates and locations of the firework events.

If properly managed, a limited number of fireworks displays conducted in areas already heavily impacted by human activity can occur with sufficient safeguards to prevent any long-term or chronic impacts upon local natural resources. Also, permittees are encouraged to use alternative fireworks which are produced with new pyrotechnic formulas that replace perchlorate with other oxidizers and propellants that burn cleaner, produce less smoke and reduce pollutant waste loading to surface waters.

In June 2016, USFWS staff provided MBNMS staff with a link (<http://travel.excite.co.uk/town-in-italy-starts-using-silent-fireworks-as-a-way-of-respecting-their-animals-N52632.html>) regarding silent fireworks. Neither of us had heard of silent fireworks before, but it seems like it could be an excellent way to eliminate most of the potential for negative impacts on wildlife (and also very young children, elderly people, veterans, and pets) caused by fireworks while still allowing a dramatic and beautiful spectacle to proceed. Silent fireworks appear to be a relatively new concept as no information on use of them in the US was found through multiple on-line searches or requests to various fireworks experts and companies such as Pyro Spectaculars by Souza. One MBNMS fireworks permittee had heard of silent fireworks and was going to check in to the availability, cost and feasibility of using them for their 2017 event. MBNMS and USFWS staff agree that most people would view the use of silent fireworks as entirely consistent with the purposes of a marine sanctuary and hence reasonable to require permittees to adhere to this higher standard for wildlife-friendly fireworks in the future. Unfortunately due to the paucity of information available at this time in terms of availability and cost, it does not seem to be a feasible mitigation option at

this time but MBNMS staff will continue to work with permittees and other contacts to discover more about silent fireworks, their costs and availability.

Section 12: Arctic Plan of Cooperation

Not applicable.

Section 13: Monitoring and Reporting

A substantial body of monitoring data exists for fireworks displays in MBNMS, with more than a dozen years of monitoring effort, as well as in-depth acoustic and visual monitoring that occurred as part of the 2007 City of Monterey July 4th monitoring event. The impacts of fireworks displays, as permitted by MBNMS, are well-understood. As such, MBNMS requests that routine monitoring only, consisting of pre- and post-event censuses, be required in order to record the number of incidentally taken marine mammals and to ensure that no injury or mortality occurs as a result of fireworks displays. More intensive monitoring effort is unlikely to yield new information commensurate with the resources required to undertake such monitoring.

Section 14: Suggested Means of Coordination

MBNMS will continue to incorporate updated census data from government and academic surveys into its analysis and will make its information available to other marine mammal researchers upon request. MBNMS coordinates a Research Activities Panel comprised of 21 marine research institutions and organizations adjacent to the sanctuary and receives constant updates of ongoing research within the sanctuary that might be related to this issue. MBNMS is coordinating with researchers at NMFS, USFWS, the California Department of Fish and Wildlife, and various specific research institutions concerning the status and local trends of pinnipeds in the sanctuary. As stated previously, MBNMS has identified no other directed research or monitoring efforts (within California or elsewhere) that specifically address the impacts of fireworks on pinnipeds.

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