Animal Legal Defense Fund • Animal Welfare Institute
Center for Biological Diversity • Cetacean Society International
Conservation Council for Hawai‘i • Earthjustice • Humane Society of the U.S.
International Fund for Animal Welfare • Natural Resources Defense Council
Ocean Care • Ocean Conservation Research • Ocean Mammal Institute
Pacific Environment • Whale and Dolphin Conservation

Via Priority and Electronic Mail

January 12, 2016

Naval Facilities Engineering Command, Pacific
Attention: HSTT EIS/OEIS Project Manager
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Pearl Harbor, HI 96860-3134

Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Re: **Notice of Intent To Prepare an Environmental Impact Statement/Overseas Environmental Impact Statement for Hawaii-Southern California Training and Testing, 80 Fed. Reg. 69,952 (Nov. 12, 2015)**

Dear HSTT EIS/OEIS Project Manager and Ms. Harrison:

On behalf of our organizations and our millions of members and activists, we submit these scoping comments to inform the U.S. Navy (“Navy”) and National Marine Fisheries Service’s (“NMFS”) preparation of an Environmental Impact Statement/Overseas Environmental Impact Statement (“EIS”) for the Navy’s training and testing activities in Hawai‘i and Southern California and for NMFS’s potential permitting of that activity pursuant to the Marine Mammal Protection Act. *See* 80 Fed. Reg. 69,952 (Nov.12, 2015). Please include these comments and attachments in the administrative record.

It is clear that a new approach to the agencies’ alternatives and impact analyses is needed. Last year, as you know, a federal district court held that the Navy and NMFS had violated the National Environmental Policy Act (“NEPA”), along with the Marine Mammal Protection Act (“MMPA”) and Endangered Species Act (“ESA”), in authorizing Navy activities within the HSTT Study Area. Indeed, the court expressly declined to “engage in fine-tuning” the agencies’ compliance documents because it found their flaws to be “so fundamental” as to require total revision. At the same time, the Navy and environmental plaintiffs were able to negotiate a settlement agreement that demonstrated the Navy’s ability to protect important marine mammal habitat while preserving military readiness and national security—a change of approach that bears significant promise. Finally, the past few years have seen an increasing (and increasingly more sophisticated) focus in both the United States and Europe on the cumulative impacts of acoustic disturbance (see, *e.g.,* Simmonds et al. 2014), with mitigation efforts aimed at habitat-based management and noise reduction. All of these developments underscore the necessity of a changed approach to the agencies' impact and alternatives analyses.

To this end, we offer general comments on NEPA's requirements, comments on the most recent set of deficiencies identified by the federal court, and comments on changes to the Navy and NMFS's methodology that would bring the agencies closer to alignment with the best available scientific information and the law.

I. The National Environmental Policy Act

Enacted by Congress in 1969, NEPA establishes a national policy to "encourage productive and enjoyable harmony between man and his environment" and "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." 42 U.S.C. § 4321. In order to achieve its broad goals, NEPA mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [NEPA]." 42 U.S.C. § 4332. As the Supreme Court explained,

> NEPA's instruction that all federal agencies comply with the impact statement requirement – and with all the requirements of § 102 – "to the fullest extent possible" [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle.

Flint Ridge Development Co. v. Scenic Rivers Ass'n, 426 U.S. 776, 787 (1976). Central to NEPA is its requirement that, before any federal action that "may significantly degrade some human environmental factor" can be undertaken, agencies must prepare an environmental impact statement. *Steamboaters v. F.E.R.C.,* 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original).

The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at a particular action – at the agency's need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it – before the decision to proceed is made. *See* 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC,* 462 U.S. 87, 97 (1983). This "hard look" requires agencies to obtain high-quality information and accurate scientific analysis. *See* 40 C.F.R. § 1500.1(b). "General statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." *Klamath-Siskiyou Wilderness Center v. Bureau of Land management,* 387 F.3d 989,994 (9th Cir. 2004) (quoting *Neighbors of Cuddy Mountain v. United States Forest Service,* 137 F.3d 1372, 1380 (9th Cir. 1998)). The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral document, not a work of advocacy to justify an outcome that has been foreordained.

To comply with NEPA, an EIS must *inter alia* include a "full and fair discussion" of direct and indirect environmental impacts (40 C.F.R. § 1502.1), consider the cumulative effects of reasonably foreseeable activities in combination with the proposed action (*id.* § 1508.7), analyze all reasonable alternatives that would avoid or minimize the action's adverse impacts (*id.* § 1502.1), address measures to mitigate those adverse effects (*id.* § 1502.14(f)), and assess possible conflicts with other federal, regional, state, and local authorities (*id.* § 1502.16(c)).

II. *Conservation Council for Hawai'i v. National Marine Fisheries Service* and *NRDC v. National Marine Fisheries Service*

As you know, in March of 2015, the federal district court in Hawai'i held that the EIS for Hawaii-Southern California Training and Testing ("HSTT") activities from December 2013 to December 2018 violated NEPA. *See Conservation Council for Hawai'i v. National Marine Fisheries Serv. and NRDC v. National Marine Fisheries Serv.*, 97 F. Supp. 3d 1210, 1236-38 (D. Haw. 2015) (hereinafter cited as "*Conservation Council*"). We present the following to help the Navy and NMFS avoid a repeat of these mistakes in preparing their next EIS for HSTT activities.

The Hawai'i district court focused on the agencies' failure to discuss alternatives to the proposed training and testing, in compliance with NEPA. As noted, the regulations implementing NEPA identify the alternatives section as "the heart of the environmental impact statement." 40 C.F.R. § 1502.14. In this section, the agencies must "[r]igorously explore and objectively evaluate all reasonable alternatives," devoting "substantial treatment to each alternative considered in detail ... so that reviewers may evaluate their comparative merits." *Id.* § 1502.14(a), (b); *see also Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 814 (9th Cir. 1999) ("viable but unexamined alternative renders [EIS] inadequate"); *'Īlio'ulaokalani Coalition v. Rumsfeld*, 464 F.3d 1083, 1101 (9th Cir. 2006) (failure to consider reasonable alternative "renders the Army's EISs inadequate"). Further, the regulations specify that the final EIS must "[i]nclude the alternative of no action." 40 C.F.R. § 1502.14(d).

The Ninth Circuit has explained:

> Congress wanted each federal agency spearheading a major federal project to put on the table, for the deciding agency's and for the public's view, a sufficiently detailed statement of environmental impacts and alternatives so as to permit informed decision making. The purpose of NEPA is to require disclosure of relevant environmental considerations that were given a "hard look" by the agency, and thereby to permit informed public comment on proposed action and any choices or alternatives that might be pursued with less environmental harm.

Lands Council v. Powell, 395 F.3d 1019, 1027 (9th Cir. 2005).

After carefully reviewing the Navy's last HSTT EIS, the Hawai'i district court concluded that it failed to include a true "no action" alternative, which the NEPA regulations mandate to "provide a baseline against which the action alternatives are evaluated." *Friends of Southeast's Future v. Morrison*, 153 F.3d 1059, 1065 (9th Cir. 1998). The court focused on the EIS's failure to evaluate "a true 'no action' alternative from [the National Marine Fisheries Service's ('NMFS's')] perspective," involving "the scenario in which, under the [Marine Mammal Protection Act

('MMPA'), NMFS denied the Navy's request for an incidental take authorization." *Conservation Council*, 97 F. Supp. 3d at 1236. In preparing their next EIS, the agencies must cure this "glaring deficiency," especially if, as in the past, NMFS intends to adopt the EIS to satisfy its NEPA obligations. *Id.* at 1237.

The Hawai‘i district court further held that, by limiting the range of action alternatives considered in detail to only (1) more training and testing and (2) yet more training and testing, the last EIS failed to present "any choices or alternatives that might be pursued with less environmental harm." *Lands Council*, 395 F.3d at 1027; *see Conservation Council*, 97 F. Supp. 3d at 1237-38. The court specifically faulted the Navy for refusing to consider alternatives that would reduce harm to marine mammals by prohibiting or restricting HSTT activities in specific areas identified as biologically important. The court rejected as "pure hyperbole" the Navy's claim that, "out of an ocean area bigger than the land mass occupied by the entire United States, it is simply not feasible to say that there is [not] even a single square mile outside of the Humpback National Marine Sanctuary that the Navy could possibly avoid using for any period without reducing military readiness." *Conservation Council*, 97 F. Supp. 3d at 1238. It concluded that "the Navy's categorical and sweeping statements, which allow for no compromise at all as to space, time, species, or condition, do not constitute the 'hard look' required by NEPA." *Id*.

Following the court's summary judgment ruling, the Navy and NMFS voluntarily entered into a settlement agreement that imposed time and geographic restrictions on HSTT activities to protect marine areas identified as biologically important to various marine mammal populations. In so doing, the agencies acknowledged the feasibility of adopting time/area restrictions to reduce adverse impacts on marine mammals. In preparing their next EIS, the Navy must thoroughly analyze a range of alternatives involving varying levels of restrictions in sensitive marine habitat "to permit informed public comment on" not only the agencies' preferred course of action, but also "any choices or alternatives that might be pursued with less environmental harm." *Lands Council*, 395 F.3d at 1027. To aid this process, we outline below some of the best scientific information that is currently available regarding biologically important areas for marine mammals populations threatened by HSTT activities. *The Navy's EIS must "put on the table, for the deciding agency's and for the public's view," a detailed analysis of alternate ways to prohibit – or, at least, substantially minimize – harmful activities in these areas. Id.*

In its March 2015 decision, the Hawai‘i district court concluded that, in addition to violating NEPA, NMFS's authorization of the Navy's HSTT activities also violated the MMPA and the Endangered Species Act ("ESA"). NEPA's implementing regulations require agencies, "[t]o the fullest extent possible," to integrate the EIS process with the analysis required under the MMPA and the ESA. 40 C.F.R. § 1502.25(a). Accordingly, in preparing their EIS for the next round of HSTT permitting, the Navy and NMFS should include information that is essential to evaluate the compliance of the Navy's proposed activities with the MMPA and ESA. Such information includes, but is not limited to, the following:

- The impact on marine mammal stocks of the levels of take for which the Navy seeks MMPA and ESA authorization, not some lower level of take that the Navy alleges is "anticipated," *see Conservation Council*, 97 F. Supp. 3d at 1220-1222, 1232-33;

- The effect of the Navy's and NMFS's proposed activities "not only on affected species, but also on affected stocks of marine mammals;" *id.* at 1222;

- Species- or stock-specific information supporting findings for each affected marine mammal species or stock, as NMFS may not conclude, under the Marine Mammal Protection Act, that an activity will have only a "negligible impact" on a particular species or stock if it has no information on which to do so, *see id.* at 1225;

- A comparison of levels of incidental mortality to each marine mammal stock's potential biological removal ("PBR") level and an evaluation of potentially non-negligible impacts where incidental mortality exceeds PBR, *see id.* at 1225-28;

- Thorough "analysis of ways to mitigate the negative effects of the Navy's activities on affected species and stocks," *id.* at 1229, including consideration of time/area restrictions or "measures of equivalent effect," *id.* at 1231; and

- The impact on endangered sea turtles of the levels of take for which the Navy seeks ESA authorization, *id.* at 1234-35.

III. Alternatives and Mitigation

At bottom, an EIS must "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. This requirement has been described in regulation as "the heart of the environmental impact statement." *Id.* § 1502.14. The courts describe the alternatives requirement equally emphatically, citing it early on as the "linchpin" of the EIS. *Monroe County Conservation Council v. Volpe*, 472 F.2d 693 (2d Cir. 1972). The agencies must therefore "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." *Id.* § 1502.14(a). Consideration of alternatives is required by (and must conform to the independent terms of) both sections 102(2)(C) and 102(2)(E) of NEPA. In addition, agencies must discuss measures designed to mitigate their action's impact on the environment. *See* 42 C.F.R. § 1502.14(f).

A. Alternatives That "Avoid or Minimize Adverse Impacts"

In the past, the Navy's EISs for Southern California and Hawai'i have suffered from alternatives analyses that were not based on factors related to the proposed activities' environmental impacts. That is, the alternatives were not selected to "inform decision-makers and the public" of how the agencies could "avoid or minimize adverse impacts or enhance the quality of the human environment," as NEPA requires. 40 C.F.R. § 1502.1. Instead, alternatives have been designed primarily on the basis of factors unrelated to addressing environmental concerns, such as convenience, cost, and timing of planned range enhancements and installations. The presentation of such alternatives does not give decision makers a choice between reasonable alternatives that all meet the agencies' purposes and needs, but with different environmental impacts associated with each alternative.

Unfortunately, it appears that the Navy is following past patterns on the development of reasonable alternatives. Materials presented to the public for this EIS state the following: "The Navy is developing alternatives based on the levels and types of training and testing activities needed to meet future requirements. Proposed activities would begin in 2018. Refurbishment of existing undersea instrumented ranges is also being considered" (U.S. Department of the Navy 2015). This approach seems to mirror the approach taken during the first and second rounds of NEPA compliance for Pacific Fleet, in which the Navy's alternatives were based narrowly on possible future operational tempos and not on factors related to environmental impact. By contrast, we urge the Navy to develop reasonable alternatives that "inform decision-makers and the public" of how the agencies can, in accordance with CEQ's regulations, "avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. The Navy has taken such an approach before, in the EIS that Atlantic Fleet, through NAVFAC Atlantic, prepared for the Fleet's active sonar training ("AFAST") activities in 2008.

In the case of NMFS—as the court found in *Conservation Council*—the EISs have suffered by failing to identify NMFS' independent purpose and need for the actions it proposes to take and by failing to present any reasonable alternatives related to that purpose and need. If NMFS intends to adopt the Navy's EIS, it must ensure that the purpose and need statement adequately reflects NMFS' independent legal responsibilities—including but not limited to the prescription of mitigation achieving the least practicable adverse impact on marine mammals and their habitat—and that it includes alternatives that meet those needs and its independent obligations under NEPA.

B. Time-Area Management

Time and place restrictions designed to protect important habitat are one of the most effective available means to reduce the potential impacts of noise and disturbance on marine mammals, including mid-frequency sonar and noise resulting from other naval activities (*see, e.g.*, Agardy et al. 2007; Dolman et al. 2009; OSPAR Commission 2009; Lubchenco 2010; Convention on Biological Diversity 2012). The inadequacy of other Navy mitigation measures was noted by NOAA following its review of naval sonar mitigation measures in 2010, a conclusion that led to the establishment of the CetSound project aimed at defining important marine mammal habitat for management purposes (Lubchenco 2010). Analogously, proper siting, in conjunction with an effective real-time monitoring protocol, can reduce risk of marine mammal injury and mortality from underwater detonations.

Time-area management represents a flexible tool to mitigate the impacts of noise and other disturbances originating from naval activities to marine mammals. Closures may be implemented year-round (*e.g.*, to protect resident populations) or seasonally (*e.g.*, to protect breeding aggregations) and, depending on the importance of the area and the Navy's operational flexibility, can be used to broadly restrict potentially harmful sonar and explosives activities, or to selectively limit certain activities while allowing the continuation of others. The management objectives for each time-area closure must be based on the best available science and must be precautionary in nature.

Consistent with such an approach, the sections below outline some habitat for which time-area management should be considered as a mitigation tool, followed by methods to integrate habitat-based management into the agencies' alternatives analysis. Time-area management should be considered for both active acoustics, including mid-frequency sonar, and explosive ordnance, such as projectiles, missiles, and bombs. Collectively, these activities are associated with a variety of environmental impacts on marine mammals and other marine biota, including disruptions in foraging and other vital behaviors, hearing loss, physical injury, and mortality. The same areas should likewise be considered for management measures, such as speed reduction, intended to reduce ship-strike risk.

While the settlement in *Conservation Council* focused on habitat management of hull-mounted sonar, given the higher source levels associated with those systems, the latest science indicates a need to extend management to dipping sonar, which is deployed via cable from manned and unmanned aircraft. Dipping sonar, like hull-mounted sonar, appears on the basis of preliminary data to be a significant predictor of deep-dive rates in beaked whales, with the dive rate falling heavily (*e.g.*, to 35% of that individual's control rate) on sonar exposure, and likewise appears associated with habitat abandonment; but perhaps most notably, these effects were documented at substantially greater distances (*e.g.*, ~30 km) than would otherwise be expected given the systems' source levels and the response thresholds developed from research on hull-mounted sonar (Falcone 2015). Researchers have hypothesized that the inherently unpredictable nature of dipping sonar—the inability of whales to track its progress in the water—make it a disproportionately powerful stressor (Falcone 2015). This finding is consistent with the wider stress literature, for which predictability is a significant factor in determining stress-response from acoustic and other stimuli (Wright et al. 2007). Relatedly, it should go without saying that, as in the *Conservation Council* settlement, the agencies should consider habitat-based management for unit-level training as well as for major exercises.

(1) CetMap Biologically Important Areas

Last year, the Cetacean Density and Distribution Mapping (CetMap) Working Group—part of NOAA's CetSound program—formally identified Biologically Important Areas (BIAs) for 24 cetacean species, stocks, or populations in seven regions within U.S. waters, including Hawai'i and the West Coast. These BIAs were based on extensive review and synthesis of published and unpublished information by more than 70 experts. BIAs represent reproductive areas, feeding areas, migratory corridors, and areas in which small and resident populations are concentrated, and are region-, species-, and time-specific (Ferguson et al. 2015). Therefore, BIAs not only define areas where individuals of a species, stock, or population are likely to be aggregated in space and time, but also where and when they are engaged in biologically important behaviors, such as breeding or feeding. As such, anthropogenic impacts to BIAs would be expected to have disproportionately negative consequences for the species, stock, or population in question.

Notably, BIAs were created to aid NOAA, other federal agencies, and the public, in the analyses and planning that are required under multiple U.S. statutes, including the statutes at issue here (e.g., NEPA, ESA, and MMPA), to characterize and minimize the impacts of anthropogenic activities on cetaceans, and to achieve conservation and protection goals (Ferguson et al. 2015).

In Hawai‘i, 20 year-round BIAs have been delineated for small, resident populations of 11 odontocete species: dwarf sperm whale, Blainville's beaked whale, Cuvier's beaked whale, pygmy killer whale, short-finned pilot whale, melon-headed whale, false killer whale, pantropical spotted dolphin, spinner dolphin, rough-toothed dolphin, and common bottlenose dolphin (Baird et al. 2015). In addition, a single reproductive BIA was recognized for humpback whales between December and April (Baird et al. 2015). With the exception of spinner dolphin habitat, all BIAs are located among the main Hawaiian Islands, although this is likely to be, in part, a product of disproportionate research effort, with relatively little survey data available for the Northwest islands. In the Southern California Range Complex, four feeding BIAs for blue whales from June to October and one migratory BIA for gray whales from October to July have been delineated (Calambokidis et al. 2015). We recommend that the Navy and NMFS identify and assess various time-area management measures that could be implemented to limit the use of training and testing activities in these areas, either year-round or seasonally, depending on the type of BIA designation and the anticipated naval operations.

(2) Additional habitat areas of importance within HSTT

It is important to note that NOAA's present list of BIAs is not intended to be comprehensive. The four criteria intended to guide BIA delineation focus exclusively on "small and resident populations" and on migratory species for which there is evidence that a considerable portion uses a spatially restricted location for breeding, feeding, or migrating (Ferguson et al. 2015). Moreover, the identification of BIAs is intended as an iterative process and thus represents a baseline to which additional areas can be added (Ferguson et al. 2015). Thus, in presenting its BIAs, NOAA explicitly stated the need to identify additional areas of importance to marine mammals based on habitat-based density maps and other data, such as acoustic, sighting, genetic, and tagging data (Ferguson et al. 2015).

Recognizing that the current list of BIAs is not comprehensive and should be viewed as a baseline to be augmented with additional data, the agencies should consider other scientifically-supported areas of biological importance for marine mammals within HSTT for time-area management measures. Below, we describe a number of areas for which there is a sufficient scientific basis for protection. (This list is not intended to foreclose consideration of other areas.)

a. Cross Seamount (Hawai‘i)

Cross Seamount is located at approximately 18°40' N. latitude and 158°10' W. longitude and rises to a charted depth of 330 m, representing the shallowest of the Navigator Seamounts that lie south of O‘ahu and southwest of the island of Hawai‘i (Itano 1998). Cross Seamount has a strong influence on the abundance, biomass, and community composition of micronekton, the diverse assemblage of small (<20 cm) fish, shrimp, and squid that form a key trophic link between zooplankton and top predators (Drazen et al. 2011). Higher densities of squid and fish are observed over the seamount summit and flanks relative to those in ambient water, particularly in the upper 200 m of the water column and near the seafloor of the seamount (Johnston et al. 2008). These prey fields represent important foraging habitat for top predators: bigeye tuna caught at Cross Seamount have fuller stomachs and more diverse prey base, including a high percentage of cephalopods, than those caught in the open ocean (Grubbs et al. 2002). Acoustic studies have revealed that beaked whales forage year-round at Cross Seamount on most nights, primarily at the summit (Johnston et al. 2008; MacDonald et al. 2009). Importantly, the beaked whales found at Cross Seamount are not Blainville's or Cuvier's beaked whale—the species expected to be found in this region—but are either a geographic variant of these species, or Longman's beaked whale, or another beaked whale species not yet known to occur in the region (MacDonald et al. 2009). The absence of other beaked whale echolocation sounds at Cross Seamount also provides evidence of niche differentiation at this location (MacDonald et al. 2009). From November to May, feeding buzzes from other non-beaked whale species were also detected, suggesting a seasonal increase in other species during this time (MacDonald et al. 2009).

As Cross Seamount represents important foraging habitat for a potentially rare or evolutionary distinct species of beaked whale, we recommend that the EIS assess the designation of a year-round management area to protect the seamount. Such a designation would have secondary benefits for a variety of other odontocete species foraging at Cross Seamount seasonally between November and May.

While Cross Seamount is the only seamount in the main Hawaiian Islands EEZ capable of supporting a commercial offshore handline tuna fishery, several of the deeper seamounts nearby (including Bishop, Brigham, Clark, Daly, Day, Dutton, Ellis, Finch, Indianapolis, Jagger, McCall, Palmer, Pensacola, Perret, Powers, Swordfish, and Washington seamounts) are productive longline fishing grounds for larger sized yellowfin and bigeye tuna, and swordfish (Itano 1998). In general, seamounts are now well known to alter prey distributions and abundances through behavioral and top-down trophic forcings (Pusch et al. 2004; Porteiro & Sutton 2007; De Forest & Drazen 2009). Due to these effects, seamounts are considered hotspots for pelagic biodiversity and associations between top predators, including marine mammals, and seamounts are now considered to be the norm (Morato et al. 2010). Cross Seamount, for the reasons stated above, has greatest conservation priority; but given the scientific basis for the generalization of marine mammal-seamount associations, and given evidence that a number of other seamounts within the HSTT Study Area exhibit levels of productivity capable of supporting commercial fisheries, the agencies should also consider habitat-based management measures for these other nearby seamounts.

b. Important beaked whale habitat in the Southern California Bight

Southern California represents important habitat for beaked whales, with species diversity that is as great as any area in the world, substantial population structure, high densities in some locations, and the occurrence of at least one apparently endemic species (Perrin's). This remarkable ecology is likely due to oceanographic conditions, the cyclonic eddies formed at the southern edge of the California Current, and to the bathymetry of the area, which is well suited to beaked whales. At the same time, beaked whale populations in the California Current have shown significant, possibly drastic declines in abundance over the last twenty years (Moore & Barlow 2013). Finally, as we all recognize, beaked whales are among the most sensitive of all species to sonar disturbance. For these reasons, it is important to focus substantial management efforts on beaked whales within the Navy's Southern California range.

San Nicholas Basin.— Satellite telemetry data and eight years' worth of photo-identification and mark-recapture data indicate that San Nicholas Basin likely represents an area of high site fidelity, and possible residency, for a small population of Cuvier's beaked whales associated with San Clemente Island (Falcone & Schorr 2014). This study also indicates that the population is relatively small, with abundance estimated at 235 individuals, and that its sex ratio is skewed towards adult females, including individuals with calves (Falcone & Schorr 2014). The population's primary habitat overlaps directly with the Southern California Anti-submarine Warfare Range (SOAR), a broad, multi-sensor hydrophone array where exercises including the use of MFAS regularly occur; its secondary habitat, apparently used in part when the whales are excluded from their primary range, consists of Tanner Canyon to the south and Santa Cruz Basin to the north (Falcone & Schorr 2014). Many factors—their repeated exposure to Navy activities, their clear, foraging-related responses to both controlled sonar playbacks (*e.g.*, DeRuiter et al. 2013) and live exercises (Falcone 2015), and their small abundance and apparently limited range—raise obvious concerns about population-level consequences for these whales. Indeed, without meaningful additional mitigation, we do not see how NMFS can credibly reach a finding of negligible impact with respect to this population. The settlement agreement in *Conservation Council* established a "refuge" from sonar and explosives activities in a portion of the whales' secondary habitat, but more management effort is needed in the long term. The agencies should consider all possible habitat-based management efforts to address impacts on the population.

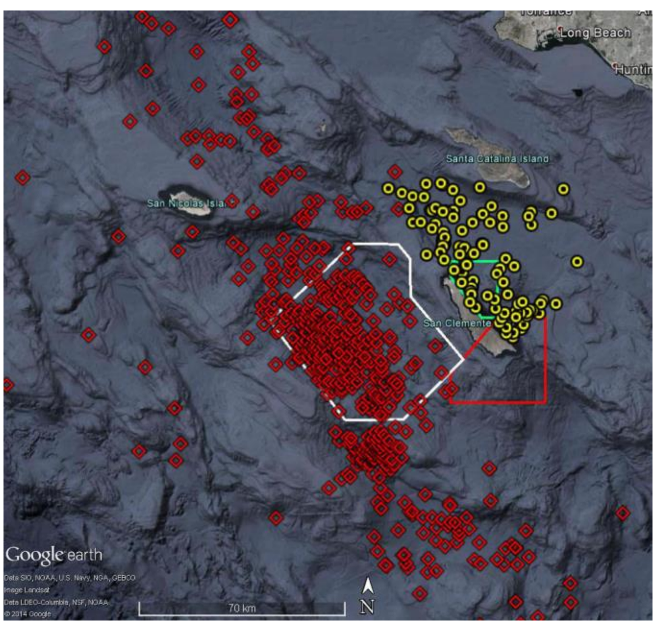

Fig. 1. *Satellite telemetry locations of San Nicholas Basin (red) and Catalina Basin (yellow) beaked whales. Boundaries of SOAR in white, SHOBA in red, 3803XX in green. (Modified from Falcone & Schorr 2014.)*

Santa Catalina Basin.— Satellite telemetry data demonstrate a high degree of site fidelity of Cuvier's beaked whales to the Santa Catalina basin with little evidence of movements to the San Nicholas Basin, despite its close proximity to the west (Falcone & Schorr 2014). It is likely that a small and resident population of Cuvier's beaked whales also resides in the Santa Catalina Basin. This population is subject to regular acoustic disturbance due to the presence of the Shore Bombardment Area (SHOBA) and 3803XX; for the two individuals satellite tagged in Santa Catalina Basin, 20% and 27% of locations were within these two areas, respectively (Falcone & Schorr 2014). It may also be exposed to training activities using waters between Santa Catalina and San Clemente Islands. As with the San Nicholas population, the settlement agreement in *Conservation Council* established a "refuge" from sonar and explosives activities in the northern portion of the Basin. The agencies should consider this and other approaches for reducing sonar exposures to this population.

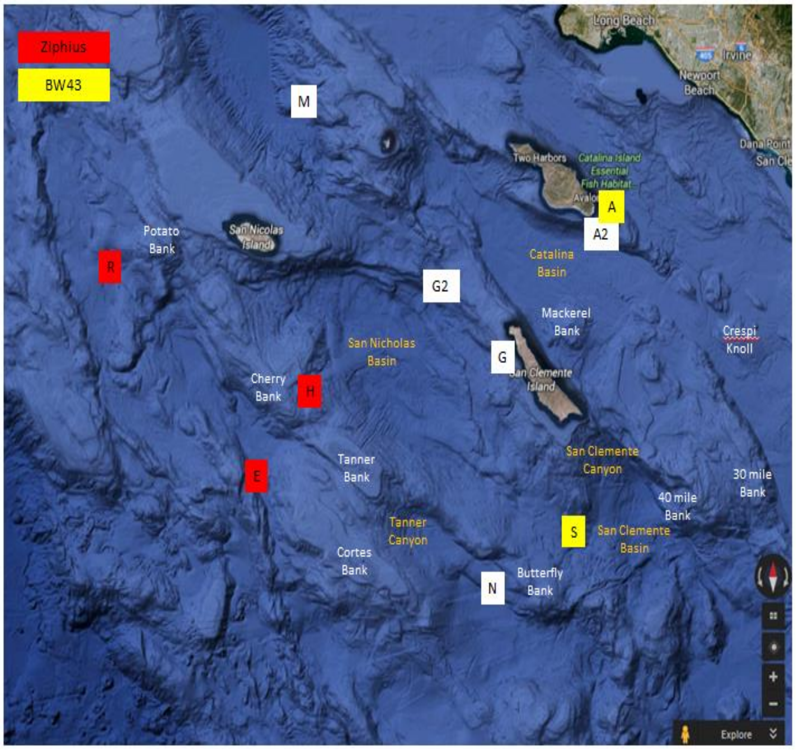

Fig. 2. *Locations of long-term HARP recording sites in the Southern California Bight. Sites with disproportionately high recordings of Cuvier's beaked whale in red; Perrin's beaked whale in yellow. (Modified from Baumann-Pickering et al. 2014, 2015.)*

Southernmost edge of California Current, west of Tanner and Cortez Banks.— Emerging evidence based on 28 years of acoustic data in the Southern California Bight (Baumann-Pickering et al. 2014) suggests that southern offshore waters, west of SOAR and Tanner and Cortez Banks, represent biologically important habitat for beaked whales (Baumann-Pickering et al. 2015). HARP systems were placed in 17 sites across the region, from Point Conception to an area south of San Diego, in a variety of bathymetries and distances from shore; of these sites, the sites to the west had the highest rate of acoustic detections of beaked whales, with the site marked "E," in Figure 2, having a daily detection average of 45 minutes (Baumann-Pickering et al. 2015). (Cuvier's beaked whales represented 99.6% of all acoustic detections at all sites.) This area is located at the southernmost edge of the California Current (Baumann-Pickering et al. 2015; Venrick 2000), where the Current meets the Ensenada Front, and the enhanced primary productivity resulting from the interaction between bathymetry and oceanography likely supports biologically important foraging habitat for this species. Notably, the substantial majority of these calls were detected between November and June.

In light of the importance of this area, we recommend assessing the designation of the southern offshore waters of the Southern California Bight as a seasonal time-area management area for Cuvier's beaked whales between November and June. The approximate lat./long. coordinates of site "E," in Baumann-Pickering et al. (2014, 2015), are 32.75 N., 119.46 W. As part of this assessment, we recommend that the boundaries be refined via expert consideration of acoustic and other relevant information pertaining to beaked whale biology and bathymetric and oceanographic data.

Northern Catalina Basin and San Clemente Basin.— The same long-term passive acoustic study of the Southern California Bight (Baumann-Pickering et al. 2014) also suggests that southern-central waters represent biologically important habitat for Perrin's beaked whale (Baumann-Pickering et al. 2015). This species has been found nowhere outside Southern California and may be unique to the region. Perrin's calls (*i.e.*, those with a "BW43" signal type) were detected for 41 hours, primarily within the southern-central waters of the Bight, in the northern Catalina Basin, including south-east of Santa Catalina Island, and the San Clemente Basin (Baumann-Pickering et al. 2015). These areas area likely to be biologically important feeding habitat resulting from the influence of the Southern California Eddy, a surface counterclockwise gyre that carries water northward through the central Bight, increasing levels of primary productivity (National Research Council 1990; Venrick 2000; Baumann-Pickering et al. 2015).

We recommend that the northern Catalina basin and the waters southeast of Santa Catalina Island (approximate lat./ long. coordinates of 33.28 N., -118.25 W., based on location of HARP deployment per Baumann-Pickering et al. 2015) and the San Clemente Basin (approximate lat./ long. of 32.52 N., -118.32 W., based on location of HARP deployment per Baumann-Pickering et al. 2015), be examined as possible time-area management areas for Perrin's beaked whales until additional information on possible seasonality becomes available. The relevant HARP deployments appear in Fig. 2 as sites "A" and "S," respectively. Again, we recommend that the boundaries of any restrictions be established via expert consideration.

c. Fin whales off Southern California

Since 2009, fin whales on the Southern California Range Complex have aggregated during the winter months in waters just off the mainland shelf, between the 200 m and 1000 m isobaths (Falcone & Schorr 2014; G. Schorr, pers. Comm. 2015). This population is at particular risk of ship-strike on the naval range given their shallower-water foraging in relatively deep water (Falcone & Schorr 2014), and they have been known to be struck by vessels in the recent past. As such, we recommend that the waters between the 200 m and 1000 m isobaths be assessed for time-area management so that, at minimum, ship-strike risk-reduction measures for fin whales can be implemented during the months of November through February.

(3) *Integration of important habitat areas into the development and analysis of alternatives*

The delineation of BIAs by NOAA and evidence of additional important habitat areas within HSTT provides the opportunity for the Navy and NMFS to improve upon their current approach to the development of alternatives by improving density-based estimates of Level A and B harassment, improving resolution of analysis of operations, and establishing "mitigation areas" for focal species. We offer the following thoughts for consideration.

a. Improving density-based take estimates

To ensure compliance with U.S. regulations including the Endangered Species Act (ESA), the MMPA, and NEPA, among others, the Navy and NMFS are responsible for reviewing and evaluating the potential environmental impacts of conducting at-sea training and testing operations. A quantitative impact analysis, based on knowledge of the abundance and density of a species in the areas where those activities will occur, is required to estimate Level A and B take. Density (*i.e.*, the number of animals present per unit area) is therefore a fundamental metric in the estimation, and reduction, of harm to marine mammals.

To estimate species-specific densities within HSTT, the Navy compiles data from several sources in the Pacific Navy Marine Species Density Database (NMSDD) and estimates density using a hierarchy of approaches, ranked by the most accurate method that can be applied to the data available (Hanser et al. 2014). Important marine mammal habitat areas represent either seasonal or year-round bounded areas of (typically) higher species density that are at a finer spatial scale than the density data currently included in the NMSDD for HSTT.[1] It is therefore imperative that this scientific information be incorporated into the NMSDD to improve current density maps. Failure to integrate this information will likely lead to under- or over-estimates of density which will, subsequently, undermine the estimates of Level A and B take derived therefrom.

Currently, the NMSDD hierarchy of density data sources comprises five "Levels" considered "most preferred" (Level 1) to "least preferred" (Level 5). For the Hawai'i Range Complex, Level 1 data (habitat-based density models) are available for ten species and species groups within NMFS SWFSC survey areas for the summer and fall seasons. Uniform density estimates are available for an additional five species and guilds that had too few sightings for modeling. These estimates are derived from systematic line-transect surveys conducted by NMFS SWFSC typically between July and November, in the Central Pacific (CENPAC) Study Area, which overlaps a large portion of the Hawai'i Range Complex and includes the Hawaiian Islands (based on survey data from 1991-2008). While the models derived from these data are considered the "most preferred," there remain obvious limitations in the use of a single data collection method, the restricted seasonality of surveys, and the relatively few species for which models are available.

The inclusion of important habitat areas in the NMSDD hierarchy of density data sources would provide an important, complementary information source for the existing hierarchy. For example, within the Hawai'i Range Complex, NOAA-recognized BIAs are available for eleven species of odontocete, only six of which currently have Level 1 habitat-based density data available (*i.e.*, spotted dolphin, spinner dolphin, rough-toothed dolphin, common bottlenose dolphin, false killer whale, and short-finned pilot whale). Three BIAs have been identified for species for which only uniform density estimates are currently available (*i.e.*, pygmy killer whale, Blainville's beaked whale, and Cuvier's beaked whale), and two BIAs have been recognized for species with no currently available Level 1 density data (*i.e.*, dwarf sperm whale and melon-headed whale).

Similar limitations exist for the SOCAL Range Complex, where the habitat-based density models considered to be a "most preferred," Level 1 data source are derived from the NMFS SWFSC surveys in the California Current Ecosystem (CCE) Study Area, conducted during 1997-

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[1] Some habitat, however, is considered important not necessarily for their higher species density, but for their use by small, resident populations or their importance to the life histories of certain species, which may or may not correspond to higher relative density.

2006. Coverage of the SWFSC surveys within the SOCAL Range Complex is fairly limited, encompassing only the northernmost and westernmost portions. The significant gap in coverage across the greater part of the Range Complex is likely to undermine the accuracy of density estimates produced for this area. As described above, NOAA-recognized BIAs and important habitat areas for beaked whales and other species are present within the SOCAL Range Complex and should be incorporated into the NMSDD hierarchy of density data.

Therefore, to ensure that the best available scientific information is being used to estimate density, and thus instances of sonar exposure and harassment, we recommend that the NMSDD hierarchy of density data be revised. Specifically, we suggest that "Level 1" data be sub-partitioned into "Level 1(a)", which would continue to represent the current Level 1 requirement of "peer-reviewed published studies of density models that provide spatially explicit density estimates" (Hanser et al. 2014), and "Level 1(b)", which would represent spatially and temporally explicit important marine mammal habitat areas as defined by published studies and expert opinion.

b. Improving resolution of analysis of operations

The Navy currently estimates acoustic impacts to marine mammals through the Navy Acoustic Effects Model, or "NAEM" (Marine Species Modelling Team 2012). The NAEM aims to calculate the likely propagation for various levels of energy (sound or pressure) resulting from each non-impulsive or impulsive acoustic source used during a training or testing event. The events that are included in the analysis, and from which estimates of Level A and B harassment are derived, are not based on the specific events planned under each of the alternatives, however. Rather, the model uses "typical" platform speeds and event durations; moving source platforms either travel along a predefined track or move along straight-line tracks from a "random" initial course; and the locations of events are chosen based on historical data, where activities have taken place in the past and thus where similar events "might" occur in the future.

Recognizing that important habitat areas imply the non-random distribution and density of marine mammals in space and time, both the spatial location and the timing of training and testing events in relation to those areas is a significant determining factor in the estimation of acoustic impacts. Levels of acoustic impact derived from the NAEM are likely to be under- or over-estimated depending on whether the location of the modeled event is further from the important habitat area, or closer to it, than the actual event. Thus there is a need for the Navy to collect more information regarding the number, nature, and timing of testing and training events that take place within, or within close proximity to, important habitat areas, essentially refining the scale of the analysis of operations to match the scale of the habitat areas considered to be important. Current and ongoing efforts to identify important habitat areas for marine mammals should be used by the Navy as a guide to the most appropriate scale(s) for the analysis of operations.

c. Reducing take of focal species

During Phases I and II of the Navy's environmental compliance, the Atlantic Fleet undertook several efforts to develop habitat-based mitigation alternatives in order to reduce take of focal species, particularly of the southeastern North Atlantic right whale, Bryde's whale, beaked whales, and the West Indian manatee (U.S. Department of the Navy 2008, 2013). The identification of important habitat areas within HSTT now presents a similar opportunity. This mitigation approach requires four stages: 1) the selection of particularly vulnerable focal species or populations based upon, for example, their conservation status, range limitation, or degree of sensitivity to acoustic disturbance; 2) the development of explicit, measurable take-reduction targets for each focal species or population that are aimed at reducing or limiting risk of population-level consequences; 3) the implementation of specific mitigation measures (*e.g*, restriction or limitation of events within important habitat areas, or implementation of certain management measures, such as vessel speed reduction within those areas), ensuring that the take-reduction targets being met; and 4) the explicit reporting by the Navy of efforts made and results obtained for each of the take-reduction targets

C. Other Mitigation and Mitigation-Related Research

(1) Research into sonar signal modifications

Behavioral response studies on harbor porpoises and gray seals have yielded preliminary insights into how different characteristics of the sonar signal may differentially affect marine mammals in terms of impact. Importantly, this research highlights ways in which the sonar signal might be modified to reduce the level of impact at the source.

For example, research to date suggests that behavioral response to up-sweep and down-sweep signals vary, depending on the presence or absence of harmonics (*i.e.*, side-bands). For 1 to 2 kHz sweeps with harmonics, harbor porpoises were observed to swim further away from the sound source in response to the up-sweeps than to the down-sweeps; in the absence of harmonics, however, sweep type (up-sweep and down-sweep) caused no significant difference in the response. For simulated naval sonar sounds with fundamental frequencies in the 1 to 2 kHz range containing harmonics, using down-sweeps appears to affect harbor porpoise less than up-sweeps (Kastelein et al. 2014). A related study showed that for 1-2 kHz sweeps without harmonics, a 50% startle response rate occurred at maximum received levels (mRLs) of 133 dB re 1 μPa; for 1-2 kHz sweeps with strong harmonics at 99 dB re 1 μPa; and for 6-7 kHz sweeps without harmonics at 101 dB re 1 μPa (Kastelein et al. 2012). And follow-up study quantifying the behavioral effects of 25-kHz FM signals with high frequency side bands showed that harbor porpoise respiration rate, a probable indicator of stress-response, increased by ~39% compared to signals without side bands at an average received sound pressure level of 148 dB re 1 μPa (Kastelein et al. 2015).

Based on these studies, mitigating active sonar impacts could be achieved by employing down-sweeps with harmonics or by reducing the level of side bands (or harmonics) (Kastelein 2014, 2015). In addition, results indicate that low-frequency (1-2 kHz) active naval sonar systems without harmonics can therefore operate at higher source levels than mid-frequency (6-7 kHz) active sonar systems without harmonics with similar startle effects on porpoises (Kastelein et al. 2012). To our knowledge, the Navy is not presently investigating signal modification as a potential mitigation measure. Given the tangible management implications of this research, however, and the potentially broad benefits to multiple species through modification at the signal source, we recommend that more research of this nature should be carried out in order to understand the extent to which these results can be generalized across species. In parallel, the feasibility of implementing signal modifications (such as those recommended above) into Navy operations should be explored.

Other signal characteristics may also be of interest. For example, short rise times (*i.e.*, rise times less than or equal to 15 ms) are correlated across mammalian species with startle response, raising concerns about sensitization. In a 2011 study, researchers demonstrated that sounds with short rise times elicited an acoustic startle response in captive grey seals, followed by "rapid and pronounced" sensitization, taking hold after about 3 playbacks, whereas sounds with longer rise times failed to induce a startle response and did not sensitize the animals (Götz & Janik 2011). The startled seals then displayed sustained spatial avoidance, rapid flight responses, and "clear signs of fear conditioning," and, once sensitized, even avoided food that was proximate to the sound source. According to the authors, sounds with short rise times thus have "the potential to cause severe effects on long-term behavior, individual fitness and longevity of individuals in wild animal populations" (Götz & Janik 2011). In a follow-on study, high-frequency echosounders with short rise times were found to produce a strong behavioral response in the same species, leading the researchers to conclude that it could produce startle responses, and therefore potentially sensitization, as well (Hastie et al. 2014). Here, too, we recommend further research and exploration of the feasibility of signal modification.[2]

(2) Thermal detection systems

Because mitigation measures based on visual observation, such as safety zone maintenance, results in highly limited risk reduction for most species and under most conditions (*e.g.*, Leaper et al. 2015; see Impacts section for further discussion), we view alternative detection measures as a significant area for development. Thermal detection offers a supplement to visual detection measures and has been demonstrated to outperform observers in number of detected whale blows and ship-whale encounters due to its ability to continuously monitor a 360° field of view during both daylight and nighttime hours (Burkhardt et al. 2012; Zitterbart et al. 2013; Peckham et al. 2015). In addition, aerial-mounted infrared cameras have proven able to detect thermal 'trails' up to 300 m behind humpback whales, formed by the thermal mixing of the stratified water that persists for up to 2 minutes (Churnside et al. 2009). The emerging development of automated whale blow detection systems for infrared video (Zitterbart et al. 2013; Santhaseelan & Asari 2015) also indicate this technology can feasibly be used for real-time whale detection and mitigation.

Given the multiple potential benefits of employing thermal detection as a mitigation tool, the agencies should explore its application in Navy activities as a supplement to visual monitoring. We recommend that the Navy conduct a limited trial of thermal detection during the EIS

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[2] Other factors associated with acoustic effects on humans, such as rise-time in the time-frequency domain of complex signals, kurtosis in frequency and amplitude variability, and non-linear harmonic interactions within complex signals, may also be relevant but have not been studied in the marine mammal context.

preparation period, to determine the potential benefit for marine mammal detectability and to explore how such a system might be integrated into the Navy's present real-time marine mammal monitoring measures.

(3) Research on Navy ship speeds during transit

The speed at which Navy vessels operate during testing and training exercises, and during general transit between exercises, has direct implications for the probability of mortality from a ship strike (Conn & Silber 2013; Laist et al. 2014) as well as for the size of the ship's acoustic footprint (NOAA 2004; Gryba 2015). A vessel speed of 15 knots is estimated to result in an 80% probability of mortality if a ship strike were to occur, and this probability approaches 100% at a speed of 20 knots or higher (Conn & Silber 2013). Slowing ships below 10 knots can reduce collision rates by 90% and decrease the probability of serious injuries or death (Wiley et al. 2011, Conn & Silber 2013, Laist et al. 2014). The acoustic footprint of vessels also widens dramatically with speed; an increase from a ~7 km footprint at a speed of 10 knots to a ~14 km footprint at 12 knots was observed for commercial shipping vessels in waters off British Columbia (Gryba 2015).

Swimming behavior of certain species in the HSTT Study Area makes them highly vulnerable to ship strikes. For example, North Pacific blue whales engage in dramatic surfacing behaviors that increase their vulnerability to ship strikes (Monnahan et al. 2015) and, as noted above, fin whales on the SOCAL range often engage in shallower-water foraging in relatively deep water (Falcone & Schorr 2014). Given that the speed of Navy ships during all aspects of their operations potentially impacts marine mammals, we recommend that the Navy collect data on ship speed and report them to NMFS as part of the EIS process. This will allow for objective evaluation by NMFS of ship-strike risk, of harassment resulting from vessel activity, and of the potential benefit of *additional* speed-focused mitigation measures.

IV. Impact Assessment

Fundamental to satisfying NEPA's requirement of fair and objective review, agencies must ensure the "professional integrity, including scientific integrity," of the discussions and analyses that appear in environmental impact statements. 40 C.F.R. § 1502.24. To this end, they must make every attempt to obtain and disclose data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. *See* 40 C.F.R. § 1502.22(a). Agencies are further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about an activity's impacts depend on newly emerging science. Finally, NEPA does not "permit agencies to falsify data or to ignore available information that undermines their environmental impact conclusions." *Hoosier Environmental Council v. U.S. Department of Transportation*, 2007 WL 4302642 *13 (S.D. Ind. Dec. 10, 2007). Thus, the Navy and NMFS's review must be thorough and they may not "sweep[] negative evidence under the rug." *National Audubon Society v. Department of the Navy*, 422 F.3d 174, 194 (4th Cir. 2005).

Various stressors associated with the Navy's activities will directly, indirectly, and cumulatively impact marine mammals and other marine species. These stressors include but are not limited to:

(1) Acoustic impacts (sonar, explosives, pile driving, airguns, weapons firing, vessel engine noise, and aircraft noise);

(2) Impacts from explosives and other non-acoustic energetic sources (explosives, electromagnetic devices, and high-energy lasers);

(3) Vessel strikes and other physical disturbance (vessels, in-water devices, military expended materials, and seafloor equipment);

(4) Entanglement (cables, wires, and parachutes);

(5) Ingestion of materials (non-explosive munitions, fragments from high explosive munitions, military expended materials other than ordnance); and

(6) Secondary effects (explosives and byproducts, metals, chemicals, and transmission of diseases and parasites).

The agencies must analyze how these stressors affect the habitat as well as the physiology and behavior of marine life within the HSTT Study Area. In addressing these issues, the agencies should, *inter alia*:

- *Revise their assumptions about the effectiveness of visual monitoring.*— The Navy's previous EIS uses the species-specific g(0) factors applied in professional marine mammal abundance surveys to assess the effectiveness of the Navy's safety zone mitigation. Yet the Navy's sighting effectiveness is likely to be much poorer than that of experienced biologists dedicated exclusively to marine mammal detection, operating under conditions that maximize sightings. At least two recent papers provoke serious questions about the estimates used in the most recent EIS. The agencies must account for the significant decrements in species sightability documented above Beaufort 1 during large-vessel abundance surveys (Barlow 2014) and for various other factors inhibiting marine mammal detection (Leaper et al. 2015).

- *Account for the apparently disproportionate impacts of dipping sonar.*— As noted above, dipping sonar, like hull-mounted sonar, appears on the basis of preliminary data to be a significant predictor of deep-dive rates in beaked whales on SOAR, with the dive rate falling significantly (*e.g.*, to 35% of that individual's control rate) during sonar exposure, and likewise appears associated with habitat abandonment. Importantly, these effects were observed at substantially greater distances (*e.g.*, ~30 km) from dipping sonar than would otherwise be expected given the systems' source levels and the beaked whale response thresholds developed from research on hull-mounted sonar (Falcone 2015). Researchers have hypothesized that the inherently unpredictable nature of dipping sonar—the inability of whales to track its progress in the water—make it a disproportionately powerful stressor (Falcone 2015).

- *Revise their thresholds and weighting system for auditory impacts.*— The draft criteria that SPAWAR has produced to estimate temporary and permanent threshold shift in marine mammals (Finneran 2015) are erroneous and non-conservative. Wright (2015) has identified several statistical and numerical faults in the Navy's approach, such as pseudo-replication and inconsistent treatment of data, that tend to bias the proposed criteria towards an underestimation of effects. Similar and additional issues were raised by a dozen scientists during the public comment period on the draft criteria held by NMFS (Racca et al. 2015a, b). At the root of the problem is the Navy's broad extrapolation from a small number of individual animals, mostly bottlenose dolphins, without taking account of what Racca et al. (2015b) have succinctly characterized as a "non-linear accumulation of uncertainty." The auditory impact criteria should be revised.

- *Revise their behavioral impact thresholds to incorporate best available science.*— Apart from the thresholds it devised for beaked whales and harbor porpoises, the Navy's behavioral risk functions for most marine mammal species are based on three data sets obtained more than a decade ago: right whale responses to alarm signals (Nowacek et al. 2004), the response of captive bottlenose dolphin to tones generated in a study of temporary threshold shift, and killer whale exposures to sonar in Haro Strait, Washington. Even then, the Navy's risk function excluded some readily available data on behavioral responses, such as from the 2004 mass embayment of melonheaded whales in Hanalei Bay, and included a captive animal study that numerous expert commentators considered inapposite to the experience of marine mammals in the wild. Since 2004, a significant amount of additional data has been obtained through the Navy's SOCAL Behavioral Response Study; the 3S project funded jointly by the U.S., French, and Norwegian navies; and other sources. The behavioral risk function should be revised conservatively, bearing in mind that even minor responses to sonar could have significant effects when repeated over time on these two active Navy ranges.

- *Assume that beaked whales, at minimum, are vulnerable to behaviorally-mediated DCS-like pathologies.*— In the past, the agencies have discounted the leading explanation about the mechanism of sonar-related pathologies, maladaptive alteration of the dive pattern, as one of several controversial hypotheses. But this explanation has now been supported by numerous studies, including post-stranding pathology, laboratory study of organ tissue, and theoretical work on dive physiology, as well as by expert reviews, and is clearly best available science (*e.g.*, Fernández et al. 2005; Zimmer & Tyack 2007; Hooker et al. 2012; Fahlman et al. 2014). Experiments on common bottlenose dolphin to test for nitrogen bubble formation after sudden repetitive dives have found no evidence of gas bubble formation (Houser et al. 2010). But beaked whales, which are adapted to perform long and deep dives, show saturation of nitrogen levels at the surface, making them particularly vulnerable (Hooker et al. 2009, 2012; Costidis & Rommel 2016). For purposes of analysis, the agencies should assume that beaked whales are subject to both acute and chronic injury from gas-bubble formation under certain conditions of sonar exposure.

- *Include offsets for undetected and unreported collisions in assessing ship-strike risk.*— According to NMFS, eight humpback whales, fourteen blue whales, eleven fin whales, thirty grey whales, and one sperm whale were reported struck in ship collisions in waters off California between 1991 and 2010 (NMFS Stranding Database 2011). Mortality from ship strikes is difficult to estimate, however, because most struck whales are not monitored after impact. Vessel collisions are generally underreported in part because they can be difficult to detect, especially for large vessels. In assessing ship-strike risk and alternatives to address that risk, the agencies should include offsets to account for potentially undetected and unreported collisions.

- *Incorporate vessel noise into their analysis of acoustic impacts.*— Numerous studies associate vessel noise and vessel movement with behavioral effects, physiological stress response, and masking in cetaceans (*e.g.*, Noren et al. 2009; Castellote et al. 2012; Pirotta et al. 2012; Rolland et al. 2012), and, over time, the disruption of normal foraging and communication behaviors may have important long-term population level effects (Lusseau et al. 2009, Noren et al. 2009). Significant effects, such as habitat displacement, loss of anti-predator response, and chronic stress, have been documented in a variety of fish and invertebrates. The agencies should advance its analysis and carefully assess and quantify the impacts of the Navy's considerable vessel deployments within the HSTT Study Area.

- *Assess the cumulative impacts of Navy activity on marine biota.*— Past analyses of Navy training and testing have tabulated exposures and takes of marine mammal species but not assessed cumulative impacts. On the contrary, the agencies have simply assumed, without explanation, that the accumulated annual mortalities, injuries, energetic costs, temporary losses of hearing, chronic stress, and other impacts would not affect individuals or populations, even though the Navy's activities would affect the same populations over time. The residency of certain populations, such as beaked whales on the SOCAL range and multiple odontocetes around the main Hawaiian islands, and the importance of on-range habitat to the life histories of some migratory populations, such as blue whales off Southern California, only underscore the need for a conservative assessment of cumulative effects through expert elicitation or other means.

- *Quantify the contribution of carbon pollution from projected military activities.*— Carbon emissions from shipping worldwide contribute almost three percent of the global emissions of carbon dioxide (IPCC 2013), and fuel consumption of the U.S. naval fleet represents about 10 % of global marine fuel consumption (EPA 2015). But the contribution of carbon emissions from U.S. Navy training and testing to the global carbon budget have not been quantified. This is an important issue to address, since military vessels and aircrafts have very low fuel efficiency (*e.g.*, 90-100 gallons/ mile at 10-20 knots) and may produce disproportionately large amounts of carbon emissions (Chu et al. 2013). Since the Department of Defense acknowledges that climate change is an important issue that threatens national security (Department of Defense 2015), the Navy has a responsibility to analyze the carbon contribution of its proposed activities.

These are a few examples of significant issues for consideration and reassessment, and are in no way comprehensive.

V. Conclusion

For all the above reasons, we urge the agencies to prepare an EIS that corrects the significant problems identified in *Conservation Council* and that substantially reduces impacts on marine mammals within the HSTT Study Area, particularly through the use of time-area management.

We welcome the opportunity to meet with you, your staff, and other relevant offices at any time to discuss these matters. For further discussion, please contact Michael Jasny at NRDC (mjasny@nrdc.org) or David Henkin at Earthjustice (dhenkin@earthjustice.org).

Very truly yours,

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