CENTER FOR BIOLOGICAL DIVERSITY – EARTHJUSTICE
FRIENDS OF THE EARTH – NATURAL RESOURCES DEFENSE COUNCIL
OCEAN FUTURES SOCIETY – ORCA NETWORK
WHALE AND DOLPHIN CONSERVATION – WHALE SANCTUARY PROJECT

Via NWTTEIS.com

June 12, 2019

Naval Facilities Engineering Command Northwest
Attention: NWTT Supplemental EIS/OEIS Project Manager
3730 N. Charles Porter Ave., Building 385
Oak Harbor, WA 98278-3500

Re: *Draft Supplemental EIS for Northwest Training and Testing*

Dear Sir or Madam:

On behalf of the Natural Resources Defense Council ("NRDC"), Center for Biological Diversity, Earthjustice, Friends of the Earth, Orca Network, Whale and Dolphin Conservation, and Whale Sanctuary Project, and Ocean Futures Society and, separately, its founder and president, Jean-Michel Cousteau, as well as our millions of members and activists, we are writing to submit comments on the Draft Supplemental Environmental Impact Statement ("DSEIS") for Northwest Training and Testing. 84 Fed. Reg. 11,936 (Mar. 29, 2019); 84 Fed. Reg. 16,250 (Apr. 18, 2019).

We are deeply concerned about the effect of Navy training and testing on the region's wildlife populations. Since its last EIS was prepared, the science has become clear that many marine mammal species are more vulnerable to underwater noise than the Department had accounted for in its prior analyses. Given this new information, as well as some increases in systems testing, the Navy now estimates that its activities in the Pacific Northwest would cause almost 1.8 million instances of marine mammal "take" over seven years, from November 2020 to November 2027, including more than 1.2 million cases of biologically significant disruption of behavior, about 550,000 instances of temporary hearing loss, and about 2,800 instances of permanent hearing loss from exposure to sonar and explosives. *See* DSEIS at E-2 to E-37. In sum, this represents a roughly 250% increase in the total number of takes estimated to occur during the current 2015-20 authorization cycle—a disturbing picture of harm.[1]

Our overriding concern is with the impact of the Navy's proposed activities on certain highly vulnerable marine mammal populations. First among these is the Southern Resident orca, a population of enormous cultural importance for Tribes and First Nations and for the region as a whole, which, as the Navy (and, indeed, the world) knows, is endangered and declining. Loss of prey has left the whales unable to reproduce, and some are starving; they are unable to withstand additional human stressors, including disruptions of essential behavior such as foraging. Another

[1] This increase accounts for the difference in the periods covered by the two documents, five years in the prior EIS and seven in the present DSEIS.

iconic population, the California gray whale, is experiencing a major die-off caused apparently by a contraction of its prey base and is stranding in alarming numbers along the west coast. Disrupting the behavior of a whale struggling with inanition can have severe consequences beyond what the Navy has considered. And, according to the Navy's analysis, Washington's inland population of harbor porpoises would be frequently exposed to noise that disrupts important behavior and would be intense enough, in many instances, to cause permanent hearing loss.

These concerns highlight why it is so important that the Navy's SEIS fully complies with the law. As Congress intended when it passed NEPA, an environmental impact statement must help decision makers make fully informed decisions on the proposed activities; after reviewing the draft analysis, decision makers must understand the breadth of harm to impacted species, must be able to choose a course of action from a range of alternatives that provide options for meeting the Navy's goals while still reducing harm to species, and must have at their disposal a range of mitigation measures that will significantly lessen environmental impacts. 40 C.F.R. § 1502.1. For the reasons discussed in detail below, we believe that the DSEIS fails to meet these fundamental requirements.

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 "to the fullest extent possible" 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. IMPACT ANALYSIS

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.[2] 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; 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 acoustic impacts; impacts from explosives and other non-acoustic energetic sources; vessel strikes and other physical disturbance; entanglement in cables, wires, and parachutes; ingestion of materials such non-explosive munitions and expended materials; and secondary effects such as transmission of diseases and parasites.

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[2] That science includes Tribal Traditional Knowledge (sometimes referred to as "Traditional Ecological Knowledge" or "TEK"), which represents a vitally important complement to the western science that the Navy must also employ. Tribal Traditional Knowledge should be solicited and meaningfully accounted for in the Final EIS.

A. Incorporation of Latest Species Information

As the Navy is aware, the NWTT Study Area is home to a number of highly vulnerable populations of marine mammals, including the Southern Resident orca and California gray whale—two of the most iconic wildlife species on the planet. It is imperative that the Navy be rigorous, transparent, and conservative in assessing potential impacts on these populations. 40 C.F.R. §§ 1502.22, 24 (requiring agencies, *inter alia*, to obtain information essential to a reasoned choice among alternatives and to ensure the professional integrity of their analyses).

1. Southern Resident orcas

The Southern Resident orca (*Orcinus orca*) population of the Pacific Northwest is one of the most critically imperiled populations of marine mammals on the planet. With the death of the population's oldest matriarch (J2) and ten other individuals in the past three years, the population now stands near a 30-year low of 76 individual animals.[3] In both the United States and Canada, the whales have been formally protected, because of their high risk of extinction, for well over a decade. The United States listed the whales as endangered under the Endangered Species Act in 2005,[4] and Canada formally designated the whales as endangered under the Species at Risk Act in 2003.[5]

Since reaching a peak of 98 whales in 1995—the highest recorded since the first population census in 1974, but still far below the estimated historic abundance—the Southern Resident population has been in a general state of decline. In its 2016 Status Review, NOAA projected an average decline of 0.65 percent per year if demographic rates (such as lower fecundity) remain as they have been during the 2011–2016 period,[6] resulting in an estimated extinction risk of 49 percent within the next 100 years.[7] The whales had not had successful recruitment in three years prior to the two calves recently born into J and L pod, and one of the population's three pods have not produced any surviving calves since 2011; in recent years, the calves that have been born have been disproportionately male.[8] The small size of the population puts them at increased risk of reduced resilience to disease or pollution, reduced population fitness, inbreeding, and extinction from a catastrophic event.[9] A recent genetic analysis found that only two adult males fathered 52 percent of the calves born since 1990.[10]

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[3] Orca Network, "Southern Resident orca community demographics, composition of pods, births, and deaths since 1998," available at https://www.orcanetwork.org/Main/index.php?categories_file=Births%20and%20Deaths (available as June 9, 2019).

[4] Endangered status for Southern Resident killer whales, 70 Fed. Reg. 69,903 (Nov. 18, 2005).

[5] *See* Fisheries and Oceans Canada, Recovery strategy for the Northern and Southern Resident killer whales (*Orcinus orca*) in Canada, *Species at Risk Act Recovery Strategy Series* (2011).

[6] NMFS, Southern Resident killer whales (*Orcinus orca*) 5-year review: Summary and evaluation (Dec. 2016).

[7] Vélez-Espino, L.A., Ford, J.K.B., Araujo, H.A., Ellis, G., Parken, C.K., and Balcomb, K.C., Comparative demography and viability of Northeastern Pacific resident killer whale populations at risk (2014) (Canadian Technical Report of Fisheries and Aquatic Sciences 3084).

[8] NMFS, Southern Resident killer whales (*Orcinus orca*) 5-year review, s*upra*.

[9] *Id.*

[10] Ford, M.J., Parsons, K.M., Ward, E.J., Hempelmann, J.A., Emmons, C.K., Hanson, M.B., Balcomb, K.C., and

The Southern Residents use the Salish Sea year-round, and in most years the whales are continuously present in the central Salish Sea from May through September or October. The whales are drawn to the region because these fish-eating predators feed almost exclusively on salmonids,[11] and the Strait of Juan de Fuca, Haro Strait, and Georgia Strait are relatively narrow channels that concentrate salmon returning from the Pacific Ocean to spawn in U.S. and Canadian rivers.[12] Given the manifest importance of this area, both the United States and Canada have designated the waters of the Salish Sea as "critical habitat" for the Southern Residents under their respective endangered species laws.[13] The Southern Residents also make extensive use of the waters along the outer coast of Washington, Oregon, and Northern California, particularly during the winter and spring months, when they range as far south as Monterey Bay in search of chinook salmon.

Yet over the past several decades salmon abundance in the region has dropped dramatically, and the whales regularly appear visibly thin with an emaciated, peanut-shaped head and ribs showing.[14] Several recent calf and adult-female Southern Resident Killer Whale mortalities have been attributed, at least in part, to poor body condition and starvation.[15] For example, reproductive-age female J28 (or "Polaris") was noted to be losing body condition in January 2016 after birthing a calf, and she died in the Strait of Juan de Fuca in October of 2016.[16] Shortly thereafter, her 10-month-old calf, J54, died as well.[17] Declines in body condition were documented in six reproductive females before their deaths between 2008 and 2016.[18]

Lack of adequate prey is directly exacerbated by physical and acoustic disturbance from vessels, which has long been recognized by both the United States and Canada as one of three principal threats to the survival and recovery of the Southern Resident population.[19] Killer whales rely on

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Park, L.K., Inbreeding in an endangered killer whale population, *Animal Conservation* 10.1111/ acv.12413 (2018).

[11] Ford, M.J., Hempelmann, J., Hansen, M.B., Ayres, K.L., Baird, R.W., Emmons, C.K., Lundin, J.I., Schorr, G.S., Wasser, S.K., and Park, L.K., Estimation of killer whale (*Orcinus orca*) population's diet using sequencing analysis of DNA from feces, *PLoS ONE* 11(1): e0144956 (2016).

[12] Hanson, M.B., Baird, R.W., Ford, J.K.B., Hempelmann-Halos, J., Van Doornik, D.M., Candy, J.R., Emmons, C.K., Schorr, G.S., Gisborne, B., Ayres, K.L., Wasser, S.K., Balcomb, K.C., Balcomb-Bartok, K., Sneva, J.G., and Ford, M.J., Species and Stock Identification of Prey Consumed by Endangered Southern Resident Killer Whales in Their Summer Range, *Endangered Species Research* 11: 69-82 (2010).

[13] Designation of critical habitat for Southern Resident killer whale, 71 Fed. Reg. 69,054 (Nov. 29, 2006); Fisheries and Oceans Canada, Identification of habitats of special importance to resident killer whales (*Orcinus orca*) off the west coast of Canada (2017) (DFO Canadian Science Advisory Secretariat).

[14] Fearnbach, H., Durban, J.W., Ellifrit, D.K., and Balcomb, K.C., Using aerial photogrammetry to detect changes in body condition of endangered Southern Resident killer whales, *Endangered Species Research* 35: 175-80 (2018).

[15] Matkin, C.O., Moore, M.J., and Gulland, F.M.D., Review of recent research on Southern Resident killer whales (SRKW) to detect evidence of poor body condition in the population (2017) (Independent Science Panel Report to the SeaDoc Society).

[16] Balcomb, K., "J28 Obituary," available at https://www.whaleresearch.com/j28 (last accessed June 9, 2019).

[17] *Id.*

[18] Matkin, C.O., et al., Review of recent research, *supra*.

[19] *E.g.*, NMFS, Recovery plan for Southern Resident killer whales (*Orcinus orca*) (2008); Fisheries and Oceans

sound for orientation and navigation, for communication vital to group cohesion, and for hunting of salmon.[20] The underwater noise produced by vessels and the vessels' physical presence mask the acoustic cues that the whales depend on and disrupt these vital behaviors. Notably, researchers have reported that, on exposure to vessel noise, the whales increase their swimming speeds, engage in evasive swimming patterns, increase their time spent traveling, alter their dive lengths, and significantly reduce their foraging time.[21] Reduction in foraging efficiency translates to lower intake of food energy, which in turn compromises fitness and survival, lowers birthrates, and increases mortality. An independent population viability analysis found that if it were possible to eliminate acoustic disturbance while maintaining current levels of Chinook abundance, annual population growth would increase to 1.7 percent.[22]

In May 2003, the U.S. Navy vessel USS *Shoup* was conducting a mid-frequency sonar exercise while passing through Haro Strait, between Washington's San Juan Islands and Canada's Vancouver Island. According to one contemporaneous account, "[d]ozens of porpoises and killer whales seemed to stampede all at once . . . in response to a loud electronic noise echoing through" the Strait.[23] Several field biologists present at the scene reported observing a pod of endangered orcas bunching near shore and engaging in very abnormal behavior consistent with avoidance, a minke whale "porpoising" away from the sonar ship, and Dall's porpoises fleeing the vessel in large numbers.[24] Eleven harbor porpoises—an abnormally high number given the average stranding rate of six per year—were found beached in the area of the exercise.[25] As a result, the Navy has generally kept sonar and explosives activities out of Southern Resident critical habitat in the Salish Sea, with the exception of pierside testing and one or two apparently inadvertent uses of sonar that were observed and publicly reported by the research community.

The DSEIS contemplates activities within the range of the Southern Resident population, including the Salish Sea. These include bombing and missile exercises in the Navy's offshore operations area, including in Area W-237; sonar exercises in offshore area generally; and various

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Canada, Recovery strategy, *supra*; Fisheries and Oceans Canada, Action plan for the Northern and Southern Resident killer whales (*Orcinus orca*) in Canada (2017) (Species at Risk Act Action Plan Series).

[20] Ford, J.K.B., Ellis, G.M., and Balcomb, K.C., *Killer Whales: The Natural History and Genealogy of* Orcinus orca *in British Columbia and Washington, 2nd ed.* (2000).

[21] Williams, R., Lusseau, D., and Hammond, P.S., Estimating relative energetic costs of human disturbance to killer whales (Orcinus orca), *Biological Conservation* 133: 301-11 (2006); Lusseau, D., Bain, D.E., Williams, R., and Smith, J.C., Vessel traffic disrupts the foraging behavior of Southern Resident killer whales *Orcinus orca*, *Endangered Species Research* 6: 211-21 (2009).

[22] Lacy, R.C., Williams, R., Ashe, E., Balcomb, K.C., Brent, L.J.N., Clark, C.W., Croft, D.P., Giles, D.A., MacDuffee, M., and Paquet, P.C., Evaluating anthropogenic threats to endangered killer whales to inform effective recovery plans, *Scientific Reports* 7: art. 14119 (2017).

[23] Christopher Dunagan, "Navy sonar incident alarms experts," *Bremerton Sun*, May 8, 2003.

[24] NMFS, Assessment of acoustic exposures on marine mammals in conjunction with *USS Shoup* active sonar transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington—5 May 2003 at 6, 9 (2005).

[25] NMFS, Preliminary report: Multidisciplinary investigation of harbor porpoises (*Phocoena phocoena*) stranded in Washington State from 2 May – 2 June 2003 coinciding with the mid-range sonar exercises of the *USS Shoup*, at 53-55 (2004) (conclusions unchanged in final report). Unfortunately, according to the report, freezer artifacts and other problems incidental to the preservation of tissue samples made the cause of death in most specimens difficult to determine; but the role of acoustic trauma could not be ruled out. *Id.*

activities in the Salish Sea, although Navy units would be required to obtain approval from a "designated" Command authority before using mid-frequency active sonar during training or pierside maintenance or testing. DSEIS at 2-28 to 2-38, K-12. Notably, according to the Navy's analysis, the Washington Inland Waters population of harbor porpoises and of the Hood Canal population of harbor seals will be subjected to some of the highest estimated take (DSEIS to E-2 to E-37), suggesting that some activities with the potential to harm the orcas are concentrated in the Salish Sea and the interior waters of Puget Sound. Given this overlap, and given the potential for grievous harm from Navy activities, the Washington State Southern Resident Orca Task Force specifically included the Navy in its recommendations, advising that the governor meet with the region's commanding officer "to address the acoustic and physical impacts to Southern Resident orcas from Naval exercises in waters and air of Washington state" and request the Navy's participation in the second year of the Task Force, to "identify actions to reduce the Navy's impacts to Southern Resident orcas."[26]

It is not clear how the Navy conducted its impact analysis on the Southern Resident population. The suggestion that its training activities would impact individual orcas only twice each year under its preferred alternative (DSEIS at E-3) makes little sense, given that the Southern Residents travel together in pods, making it far more likely that every member of the pod would be affected; nor does it make sense that take estimates for Washington Inland Waters harbor porpoises and Hood Canal harbor seals would number in the hundreds of thousands, while Southern Residents account for a handful; nor does it make sense that the 2019 modeling would result in the same numbers of whales taken as in 2015, when the Navy's impact thresholds were substantially higher and the types and numbers of some activities were different. The Navy intends to conduct missile training and other explosives activities with an impact zone that is extremely difficult to monitor, yet, as discussed below, it assumes that its mitigation will preclude mortalities. And in the past, the number of mid-frequency active sonar events that have occurred within the whales' range is not trivial.[27] These apparent defects in the Navy's modeling run counter to the "hard look" required by NEPA and are extremely concerning given the plight of this endangered and declining population. *See* 40 C.F.R. §§ 1500.1(b); *Baltimore Gas & Electric*, 462 U.S. at 97.

2. *California gray whales*

The California gray whale is presently experiencing a major die-off. As of June 6, the total number of strandings across the whales' range in 2019 exceeded 150 animals, a number that appears roughly comparable to the strandings experienced during the 1998-99 and 1999-2000 seasons, when 283 and 368 whales were reported.[28] Indeed, strandings have exceeded the 1999

[26] Southern Resident Orca Task Force, Report and Recommendations, at 60 (2018) (Rec. 25, in final report of task force convened by the Washington State Governor).

[27] Emmons, C.K., Hanson, M.B., and Lammers, M.O., Monitoring the occurrence of Southern Resident killer whales, other marine mammals, and anthropogenic sound in the Pacific Northwest (2019) (report for Pacific Fleet, prepared by NMFS Northwest Fisheries Science Center).

[28] *Compare* NMFS, "2019 gray whale Unusual Mortality Event along the west coast," available at https://www.fisheries.noaa.gov/national/marine-life-distress/2019-gray-whale-unusual-mortality-event-along-west-coast (accessed June 10, 2019) *with* Gulland, F.M.D., Perez-Cortes, M., Urban, J., Rojas-Bracho, L., Ylitalo, G.,

numbers during each of the past several months.[29] Many, if not all, of the necropsied whales were considered emaciatied, and more than 50% of the animals observed in their calving lagoons, in Baja California, this year have shown signs of "skinniness,"[30] such as a post-cranial depression and protruding scapula. On May 31, NMFS deemed the die-off an "Unusual Mortality Event" pursuant to the Marine Mammal Protection Act (16 U.S.C. § 1421c), triggering an investigation.

While the cause remains unknown, the skinniness and emaciation of the whales strongly suggests a fall in prey availability. The 1998-2000 die-off was associated with strong El Niño and La Niña events and a regime shift in the benthic prey base of the Bering Sea.[31] For the scientific community, the present-day concern is that warming seas—caused by climate change—are reducing primary productivity in the whales' northern foraging range and that vanishing sea ice is constricting populations of ice-associated amphipods.[32] If so, the die-off may be a "harbinger of things to come," in the words of one NOAA ecologist,[33] a diminished, more tenuous future for the species rather than a one-or-two-year anomaly.

It is well established that animals already exposed to one stressor may be less capable of responding successfully to another; and that stressors can combine to produce adverse synergistic effects.[34] Here, disruption in gray whale behavior can act adversely with the inanition caused by lack of food, increasing the risk of stranding and lowering the risk of survival in compromised animals. Further, starving gray whales may travel into unexpected areas in search of food—a likely contributing cause of some of the ship-strikes observed in recently stranded animals.[35] The Navy estimates that its activities will cause as many as 80 takes of gray whales each year, including two cases of temporary hearing loss caused by underwater explosives. *See passim*

Weir, J., Norman, S.A., Muto, M.M., Rugh, D.J., Kreuder, C., and Rowles, T., Eastern North Pacific gray whale (Eschrichtius robustus) Unusual Mortality Event, 1999-2000 (2005) (NOAA Tech. Memo. NMFS-AFSC-150).

[29] NMFS, "2019 gray whale Unusual Mortality Event," *supra*.

[30] NMFS, "Frequent question: 2019 gray whale Unusual Mortality Event along the west coast," available at https://www.fisheries.noaa.gov/national/marine-life-distress/frequent-question-2019-gray-whale-unusual-mortality-event-along-west (accessed June 10, 2019).

[31] Le Boeuf, B.J., Pérez-Cortés H., Urbán, J., Mate, B.R., and Ollervides, F., High gray whale mortality and low recruitment in 1999: Potential causes and implications, Journal of Cetacean Research and Management 2(2): 85-99 (2000); Moore, S.E., Urbán, J., Perryman, W.L., Gulland, F., Perez-Cortes, H., Wade, P.R., Rojas-Bracho, L., and Rowles, T., Are gray whales hitting "K" hard? *Marine Mammal Science* 17: 954-58 (2001); Moore, S.E., Grebmeier, J.M., and Davies, J.R., Gray whale distribution relative to forage habitat in the northern Bering Sea: Current conditions and retrospective summary, *Canadian Journal of Zoology* 81: 734-42 (2003).

[32] L.V. Mapes, "Researchers seek answers to gray whale deaths after 57 are stranded this year," *Seattle Times*, May 17, 2019; *see also* Swartz, S., The sentinels of the sea: Gray whales respond to climate change (undated presentation).

[33] Mapes, "Researchers seek answers," *supra*.

[34] Wright, A.J., Soto, N.A., Baldwin, A.L., Bateson, M., Beale, C.M., Clark, C., Deak, T., Edwards, E.F., Fernández, A., Godinho, A. and Hatch, L.T., Anthropogenic noise as a stressor in animals: a multidisciplinary perspective. *International Journal of Comparative Psychology* 20(2): 250-73 (2007).

[35] *See, e.g.*, The Marine Mammal Center, The Marine Mammal Center confirms ship strike as cause of death for gray whale at San Francisco's Ocean Beach (May 7, 2019) (press release containing necropsy results for recently stranded gray whales).

DSEIS at E-2 to E-37. In addition to improving the transparency of its analysis (see "Selection of Modeled Locations," below), the Navy must carefully consider the biological context of behavioral disruption in that species and evaluate the potential for severe consequences in exposed whales.

B. Analysis of Injury and Mortality

The Navy acknowledges the potential for marine mammals to experience non-auditory injury and mortality as a result of its activities. Nonetheless, the assumptions it has made in modeling these types of harm result in take estimates that both underestimate effects and are inconsistent with the Marine Mammal Protection Act.

1. Use of means in injury estimations

The Navy, following the criteria set forth in its 2017 technical report,[36] has elected to base its estimates of mortality and non-auditory injury (such as lung damage) from explosives on a 50% averaging of risk rather than on the onset of risk. *See* DSEIS at 3.4-294 (Table 3.4-72). Both the 50% average and onset criteria account for variability in water depth and body mass; the difference between them appears to stem from natural variability in the data produced by the 45-year-old study on which the Navy's criteria is founded, a study that exposed a range of terrestrial species to underwater explosives.[37] Remarkably, the Navy uses the 50% average for its impact analysis while using onset for purposes of assessing the effectiveness of the Navy's mitigation zones. DSEIS at 3.4-293 to 3.4-294.

This approach is not consistent with the probability standards set forth in the Marine Mammal Protection Act ("MMPA"). The MMPA incorporates a standard of "significant potential" into its definition of "injury" for military readiness activities; this standard plainly differs from the higher "likelihood" standard that applies to behavioral disruption. *Compare* 16 U.S.C. §§ 1362(18)(B)(i) *and* (B)(ii). And while the probability standard for mortality is not specifically defined in the Act, Congress expressly amended the MMPA in 1994 to incorporate a "potential" standard in the wake of the Ninth Circuit decision in *U.S. v. Hiyashi*, 22 F.3d 859 (9th Cir. 1993). If the DSEIS is intended to serve NMFS' purposes in rulemaking under the Marine Mammal Protection Act, as well as to represent a more conservative estimate of harm, the Navy cannot base its mortality and injury estimates on the mean.

2. Disregard of behaviorally-mediated injury in beaked whales

The Navy, while appearing finally to accept the strong evidentiary basis for decompression sickness in some sonar-exposed whales (DSEIS at 3.4-87), nonetheless discounts the leading explanation about the mechanism of sonar-related pathologies—maladaptive alteration of dive patterns—as uncertain. DSEIS at 3.4-88 to 3.4-89 (concluding, "It is uncertain as to whether

[36] SSC Pacific, Technical report: Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis (Phase III) (June 2017).

[37] *Id.* at 90-96.

there is some more easily-triggered mechanism for [bubble and fat emboli] specific to beaked whales or whether the phenomenon occurs only following rapidly occurring stranding events”). 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.[38] As the Navy notes, experiments on common bottlenose dolphin to test for nitrogen bubble formation after sudden repetitive dives have found no evidence of gas bubble formation.[39] But beaked whales, which are adapted to perform long and deep dives, show saturation of nitrogen levels near the ocean surface, making them particularly vulnerable.[40] Even if some uncertainty exists around the physiological mechanism for bubble formation, with several viable models set forth by researchers (at described at DSEIS at 3.4-88), the science still indicates that the effect is likely to be behaviorally mediated and occurs in beaked whales apart from strandings.[41]

The DSEIS concludes its discussion of gas-bubble formation by arguing, in a single dismissive sentence, that “the rarity of observations of bubble pathology” makes it “discountable” for purposes of the Navy’s impact analysis here. In fact, the rarity of those observations is easily attributable to many factors that limit the availability of beaked whales to analysis, including the offshore, deep-water occurrence of these species and the short window that exists for assaying tissue for the purpose, as the literature has made clear.[42] The Navy’s one-sentence

[38] *See, e.g.*, Fernández, A., Edwards, J.F., Rodríguez, F., Espinosa de los Monteros, A., Herráez, P., Castro, P., Jaber, J.R., Martín, V., and Arbelo, M., “Gas and fat embolic syndrome” involving a mass stranding of beaked whales (Family *Ziphiidae*) exposed to anthropogenic sonar signals, *Veterinary Pathology* 42: 446-57 (2005); Hooker, S.K., Fahlman, A., Moore, M.J., Aguilar de Soto, N., Bernaldo de Quirós, Y., Brubakk, A.O., Costa, D.P., Costidis, A.M., Dennison, S., Falke, J., Fernandez, A., Ferrigno, M., Fitz-Clarke, J.R., Garner, M.M., Houser, D.S., Jepson, P.D., Ketten, D.R., Kvadsheim, P.H., Madsen, P.T., Pollock, N.W., Rotstein, D.S., Rowles, T.K., Simmons, S.E., Van Bonn, W., Weathersby, P.K., Weise, M.J., Williams, T.M., and Tyack, P.L., Deadly diving? Physiological and behavioural management of decompression stress in diving mammals, *Proceedings of the Royal Society of London B: Biological Sciences* 279: 1041–50 (2012); Fahlman, A., Tyack, P.L., Miller, P.J.O., and Kvadsheim, P.H., How man-made interference might cause gas bubble emboli in deep diving whales, *Frontiers in Physiology* 5: 13 (2014).

[39] Houser, D.S., Dankiewicz-Talmadge, Stockard, T.K., and Ponganis, P.J., Investigation of the potential for vascular bubble formation in a repetitively diving dolphin, *Journal of Experimental Biology* 213: 52-62 (2010).

[40] Hooker S.K., Baird, R.W., and Fahlman, A., Could beaked whales get the bends? Effect of diving behaviour and physiology on modelled gas exchange for three species: *Ziphius cavirostris*, *Mesoplodon densirostris* and *Hyperoodon ampullatus*, *Respiratory Physiology and Neurobiology* 167: 235-246 (2009); Hooker et al., Deadly diving?, *supra*; Costidis, A.M., and Rommel, S.A., The extracranial arterial system in the heads of beaked whales, with implications on diving physiology and pathogenesis, *Journal of Morphology* 277: 5-33 (2016).

[41] *E.g.*, Fernández et al., “Gas and fat embolic syndrome,” *supra.*

[42] *E.g.*, Faerber, M.M., and Baird, R.W., Does a lack of observed beaked whale strandings in military exercise areas mean no impacts have occurred? A comparison of stranding and detection probabilities in the Canary and main Hawaiian Islands, *Marine Mammal Science* 26: 602-13 (2010); Bernaldo de Quiros, Y., Gonzalez-Diaz, O., Arbelo, M., Sierra, E., Sacchini, S., and Fernandez, A., Decompression vs. decomposition: Distribution, amount, and gas composition of bubbles in stranded marine mammals. *Frontiers in Physiology* 3: art. 177 (2012); Bernaldo de Quiros, Y., Gonzalez-Diaz, O., Mollerlokken, A., Brubakk, A.O., Hjelde, A., Saavedra, P., and Fernandez, A., Differentiation at autopsy between in vivo gas embolism and putrefaction using gas composition analysis, *International Journal of Legal Medicine 127*(2): 437–45 (2013).

dismissal of these impacts is arbitrary. For purposes of analysis, the Navy must assume that some number of beaked whales are subject to injury from gas-bubble formation, and will suffer gas-bubble formation, under certain conditions of sonar exposure.

3. Basic errors in auditory injury thresholds

The criteria that the Navy's SPAWAR command has produced to estimate temporary and permanent threshold shift in marine mammals,[43] and that the Navy applies here, are erroneous and non-conservative. Wright (2015)[44] has identified several statistical and numerical faults in the Navy's approach, such as pseudo-replication, use of means rather than onset, 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.[45] 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)[46] have succinctly characterized as a "non- linear accumulation of uncertainty." The auditory impact criteria should be revised.[47]

Further, in estimating the number of instances of injury and mortality, the DSEIS makes two *post hoc* adjustments, significantly reducing the totals based on presumed animal avoidance and mitigation effectiveness. These two reductions are arbitrary and non-conservative.

4. Adjustment for avoidance

By itself, the Navy's avoidance adjustment effectively reduces the number of estimated auditory injuries by 95%, on the assumption that marine mammals initially exposed to three or four sonar transmissions at levels below those expected to cause permanent injury would avoid injurious

[43] Finneran, J.J., Auditory weighting functions and TTS/ PTS exposure functions for cetaceans and marine carnivores (2015) (SPAWAR No. TR 3026).

[44] Wright, A.J., Sound science: Maintaining numerical and statistical standards in the pursuit of noise exposure criteria for marine mammals, *Frontiers in Marine Science* 2: art. 99 (2015).

[45] Letter from Racca, R., Hannay, D., Yurk, H., McPherson, C., Austin, M., MacGillivray, A., Martin, B., Zeddies, D., Warner, G., Delarue, J., and Denes S., JASCO, to N. LeBoeuf, NMFS (Sept. 14, 2015) (Comment Letter on National Marine Fisheries Service's 31 July 2015 notice (80 Fed. Reg. 45642)); Letter from Racca, R., Yurk, H., Zeddies, D., Hannay, D., Austin, M., MacGillivray, A., Warner, G., Martin, B. and McPherson, C., JASCO, and Tyack, P., University of St. Andrews, to A.R. Scholik-Schlomer, NMFS (Sept. 11, 2015) ("Request for an extension of the public comment period on the proposed acoustic guidelines for assessing the effects of anthropogenic sound on marine mammals").

[46] Letter from Racca, R., et al. (Sept. 14, 2015), *supra*.

[47] Additionally, the criteria should be revised to incorporate, as appropriate, new data that were not available at the time they were developed. These new data include Branstetter, B.K., St. Leger, J., Acton, D., Stewart, J., Houser, D., Finneran, J.J., and Jenkins, K., Killer whale (Orcinus orca) behavioral audiograms, *Journal of the Acoustical Society of America* 141: 2387-98 (2017); Kastelein, R.A., Helder-Hoek, L., and Van de Voorde, S., Effects of exposure to sonar playback sounds (3.5-4.1 kHz) on harbor porpoise (Phocoena phocoena) hearing, *Journal of the Acoustical Society of America* 142(2): 1965-75 (2017). For further discussion of these and other issues, see comment letters on NMFS' draft auditory impact criteria submitted to NMFS by NRDC et al.

exposures.[48] While it is certainly true that some marine mammals will flee the sound, there are no data to inform how many would do so, let alone that 95% would move as expeditiously as the Navy presumes. Marine mammals may remain in important habitat, and the most vulnerable individuals may linger in an area, notwithstanding the risk of harm; marine mammals cannot necessarily predict where an exercise will travel; and Navy vessels engaged in certain activities may move more rapidly than a marine mammal that is attempting to evacuate.

Avoidance adjustments were first used in 2012, for an environmental impact report prepared under the California Environmental Quality Act; in that case, the authors, to compensate for their non-conservative assumptions about avoidance, presumed that *every instance* of permanent threshold shift would result in biological removal of the individual.[49] As the Marine Mammal Commission has repeatedly advised, the Navy should not adjust for avoidance here.

5. Adjustment for mitigation

The Navy's adjustment of mortality numbers for "mitigation effectiveness," which incorporates the methodology set forth in a 2018 technical report (DSEIS at 3.4-297 to 3.4-298), is also arbitrary.

The Navy's analysis starts with the species-specific g(0) factors applied in professional marine mammal abundance surveys, then multiplies them by a simple factor to reflect the relative effectiveness of its lookouts in routine operating conditions.[50] 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.

In the first place, the sighting conditions that may obtain during Navy activities are substantially inferior to those used to generate g(0) factors in abundance surveys. As one NOAA paper observed, abundance survey rates decline significantly as sea states rise above Beaufort 1.[51] Yet most Navy activities would be allowed to occur in all sea conditions and hours of day (*see* DSEIS at Ch. 5 ("Mitigation"), and Beaufort sea states in areas proximate to Navy activities within the Northwest Study Area averaged Beaufort 5 across the previous three years—a point at which detection power is a small fraction of g(0) for most species.[52] (*See* Table 1 below for averages at representative NOAA buoy stations.)

[48] Blackstock, S.A., Fayton, J.O., Hulton, P.H., Moll, T.E., Jenkins, K., Kotecki, S., Henderson, E., Bowman, V., Rider, S., and Martin, C., Quantifying acoustic impacts on marine mammals and sea turtles: Methods and analytical approach for Phase III testing and training (2018) (NUWC-NPT Tech. Rep.). As noted below under "Adjustment for mitigation," the DSEIS incorporates the methodology set forth in this report.

[49] Wood, J., Southall, B.L., and Tollit, D.J., PG&E Offshore 3-D Seismic Survey Project EIR: Marine Mammal Technical Report, Appendix H (2012) (CSLC EIR No. 758).

[50] Blackstock, S.A., et al., Quantifying acoustic impacts on marine mammals and sea turtles, *supra*.

[51] Barlow, J., Inferring trackline detection probabilities, g(0), for cetaceans from apparent densities in different survey conditions, *Marine Mammal Science* 31: 923-43 (2015).

[52] *Id.*

Second, the impact radius of many of the Navy's explosives extends far beyond the limited sighting distances used in vessel abundance surveys. The g(0) factor is predicated on sightings occurring directly on the trackline of the vessel, with detection rates dropping significantly as distance from the trackline increases.[53] Yet the distances expected to cause permanent hearing loss in "high-frequency cetaceans" (i.e., porpoises) can run thousands of kilometers in all directions from both explosive sonobuoys and explosive torpedoes, and in both cases the mobile source can be kilometers away from Navy watchstanders when it detonates.

Finally, Navy watchstanders have been shown to be significantly less effective than biologists, of the sort used in professional abundance surveys, in detecting marine mammals. We know from the Navy's own studies that watchstanders charged with implementing exclusion zones appear to fare much poorer in detecting marine mammals than do trained protected species observers, who are generally not allowed aboard ship.[54] Given this—and given that)—Navy visual surveys can seldom approximate the sighting effectiveness of a large-vessel abundance survey. In any case, the public has no meaningful way to evaluate the Navy's adjustment further since the DEIS does not provide the scores used to generate the effectiveness factor, nor does it provide pre-adjustment take numbers.

The Navy's *post hoc* adjustment for operational mitigation effectiveness is not a trivial or an abstract issue. It has the apparent effect of eliminating risk of mortality from explosives known to be of a power to kill marine mammals. Some experts have raised concerns that one Southern Resident orca mortality (L112) was caused by naval explosives or ordnance.[55] We urge the Navy to provide more transparency about its modeling adjustment so that the public has the opportunity to comment on the Navy's analysis (40 C.F.R. §§ 1502.9(a), 1503.1(a), 5 U.S.C. § 706(2)(D)), and to provide unadjusted mortality estimates.

Buoy	Location	Wave Height (m)				B.S.S. (Mean [Range])
		Mean	S.D.	Min.	Max.	
Station 46100 – OOI Westport Offshore	46.851 N, 124.972 W	2.31	1.20	0.47	11.29	5 [2-10]

[53] *See* Barlow, J., Balance, L.T., and Forney, K.A., Effective strip widths for ship-based line-transect surveys of ceteaceans (2011) (NOAA Tech. Memo NMFS-SWFSC-484).

[54] Watwood, S., Rider, S., Richlen, M., and Jefferson, T., *Cruise report: Marine species monitoring & lookout effectiveness study*, Submarine Commanders Course, February 2015, Hawaii Range Complex (2016) (prepared under Navy contract); *see also* comments of Rebecca Lent, Marine Mammal Commission, to Naval Facilities Engineering Command, Pacific (Nov. 13, 2017) (citing various combined cruise reports and lookout effectiveness studies from 2010 through 2014).

[55] *See* Sarah Petrescu, "Baby killer whale investigation flawed," *Vancouver Sun*, Mar. 10, 2014 (citing Southern Resident experts Ken Balcomb and Scott Veirs).

Station 46089 (LLNR 689) – TILLAMOOK OR – 85 NM WNW of Tillamook, OR	45.925 N, 125.771 W	2.40	1.23	0.43	9.74	5 [2-9]
Station 46098 – OOI Waldport Offshore	44.381 N, 124.956 W	2.46	1.26	0.42	10.33	5 [2-10]
Station 46213 – Cape Mendocino, CA (94)	40.295 N, 124.732 W	2.56	1.09	0.60	9.43	5 [2-9]

Table 1. Mean, standard deviation (S.D.), minimum (min.), and maximum (max.) wave height (m), and mean and range on Beaufort Sea State (B.S.S.) values for data collected at four buoys positioned within the Northwest Study Area from 2016 through 2018. Data source: NOAA National Buoy Data Center (NBDC) (2019).[56]

C. Behavioral Response Thresholds

For its new EISs, the Navy has finally abandoned the narrowly conceived behavioral risk function that it employed in its first two rounds of programmatic environmental review. In lieu of a simple dose-response curve, the Navy applies a biphasic function that assumes an unmediated dose-response relationship at higher received levels and a context-influenced response at lower received levels. And instead of limiting its data sources to three studies, at least one of which— the response of captive bottlenose dolphins to tones generated in a temporary threshold shift experiment—was inapposite and should not have been used, the Navy has incorporated data from a broader set of behavioral response studies, including the SOCAL BRS and the 3S project funded jointly by the U.S., French, and Norwegian navies. This methodology, while only referenced in the main text of the DSEIS, is set forth in the Navy's 2017 technical report, "Criteria and Thresholds for U.S. Navy Acoustic and Explosives Effects Analysis (Phase III)," and is consistent across its new round of programmatic environmental impact statements for testing and training activities. *See* DSEIS at 3.4-136.[57]

We agree with the Navy that a biphasic approach is better suited to the data and incorporates contextual factors far better than the simple approach it used in previous analyses; and we

[56] NOAA, "National Buoy Data Center," available at: https://www.ndbc.noaa.gov (accessed June 10, 2019).
[57] Our analysis in this section is based primarily on the Navy's 2017 technical report on acoustic "criteria and thresholds," whose assumptions were incorporated into the DSEIS. *See* SSC Pacific, Technical report: Criteria and thresholds, *supra*.

concur with its expansion of data sources along with its removal of the threshold shift experiment as a basis for analysis, as we have recommended. The resulting functions, however, depend on a number of inappropriate assumptions that tend to underestimate effects.

1. Data sources

For example, two of the proposed behavioral response functions rely substantially on captive animal studies, even though it is generally accepted that captive animals, especially (but not limited to) those that have previously been trained, are likely to be less responsive to intrusive sound.[58] More specifically, every data point that informs the pinniped function, and nearly two-thirds of the data points informing the odontocete function (30/49), are derived from a captive study.[59] In the case of the odontocete function, the reliance on captive studies exacerbates that function's heavy dependence on the bottlenose dolphin, a species that is generally considered relatively insensitive, to represent a diverse set of taxa with divergent sensitivity and reactiveness to mid- frequency anthropogenic noise. If, for example, the number of wild killer whale data points (n=8) and captive bottlenose dolphin data points (n=30)—a discrepancy that owes itself to the greater accessibility of captive animals—were exchanged, such that killer whales represented the larger and bottlenose dolphins the lesser amount of data, the resulting response function would differ substantially. That result is entirely arbitrary.

Additionally, the risk functions do not incorporate (nor does the Navy apparently consider) a number of relevant studies on wild marine mammals, such as a passive acoustic study on blue whale vocalizations and a tagging study on behavioral responses to dipping sonar, even though received levels from these studies are either available or can be estimated.[60] Some were included in the only published quantitative synthesis of behavioral response data, Gomez et al. (2016);[61] others, like the dipping sonar study, appeared after that synthesis was published, and after the Navy produced its behavioral take functions two years ago. Exclusion of those studies fails to meet regulatory requirements that base evaluation of impacts on research methods generally accepted in the scientific community. *See* 40 C.F.R. § 1502.22(b)(4).

It is not clear from the DSEIS or from the Navy's associated technical report on acoustic "criteria and thresholds" exactly how each of the studies the Navy employed were applied in the

[58] *E.g.*, Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A. and Burns, W.C.G., Navy sonar and cetaceans: Just how much does the gun need to smoke before we act? *Marine Pollution Bulletin 56*(7): 1248-57 (2008).

[59] SSC Pacific, Technical report: Criteria and thresholds, *supra*.

[60] *E.g.*, Melcon, M.L., Cummins, A.J., Kerosky, S.M., Roche, L.K., and Wiggins, S.M., Blue whales respond to anthropogenic noise *PLoS ONE* 7(2): e32681 (2012); Falcone, E.A., Associating patterns in movement and diving behavior with sonar use during military training exercises: A case study using satellite tag data from Cuvier's beaked whales at the Southern California Anti-submarine Warfare Range (2017) (presentation given at Society for Marine Mammalogy Biennial Conference, Halifax, N.S., Oct. 23, 2017); Falcone, E., Schorr, G.S., Watwood, S.L., DeRuiter, S.L., Zerbini, A.N., Andrews, R.D., Morrissey, R.P., and Moretti, D.J., Diving behavior of Cuvier's beaked whales exposed to two types of military sonar, *Royal Society Open Science* 4: 170629 (2017).

[61] Gomez, C., Lawson, J.W., Wright, A.J., Buren, A.D., Tollit, D., and Lesage, V., A systematic review on the behavioural responses of wild marine mammals to noise: The disparity between science and policy, *Canadian Journal of Zoology* 94: 801-19 (2016).

analysis, or how the functions were fitted to the data, but the available evidence on behavioral response raises concerns that—notwithstanding the DSEIS' claims to the contrary—the functions are not conservative for some species. For this reason and others, we ask the Navy to make additional technical information available, including expert elicitation and peer review (if any), so that the public can fully comment pursuant to NEPA.

2. Incorporating effects 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 the Navy's SOAR range, 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 or more 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.[62] 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.[63] Yet all the data sources used to produce the Navy's behavioral response functions concern hull-mounted sonar, an R/V-deployed sonar playback, or an in-pool source.

The Navy's generic behavioral response function for beaked whales thus does not incorporate their heightened response to these sources, although such a response would be presumed to shift the function "leftward." Nor do the response functions for other species account for this difference, although unpredictability is known to exacerbate stress response in a diversity of mammalian species[64] and should conservatively be presumed, in this case, to lead to a heightened response in marine mammal species other than beaked whales.

3. Use of distance-based "cut-offs"

As with injury and mortality, the Navy applies cut-offs in estimating the number of behavioral impacts on marine mammals. It is evident that these cut-offs significantly affect the Navy's estimates. The DSEIS postulates that the cutoffs would zero-out take estimates at a point where, using the Navy's response functions, 25% of all odontocetes other than beaked whales and harbor porpoises, 13% of all mysticetes, and 18% of all pinnipeds and mustelids (i.e., sea otters) would be considered to have a potentially significant behavioral response. DSEIS at 3.4-150 (Table 3.4-13).

Applying this *post hoc* adjustment makes no sense theoretically, as the Marine Mammal Commission pointedly observes in its comments, since distance is already incorporated in the Navy's new behavioral response functions as a contextual factor. In other words, distance is already accounted for in the data and analyses from the which the behavioral response

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[62] Falcone, E.A., et al., Diving behaviour of Cuvier's beaked whales, s*upra.*

[63] *Id*.

[64] Wright, A.J., et al., Anthropogenic noise as a stressor in animals, *supra*.

functions were derived.[65] More than this, the Navy's chosen cut-offs, which for each hearing class were grounded in little to no information, are plainly inconsistent with the available data, including but not limited to blue whale feeding response, blue whale vocalization response, controlled exposures of beaked whales, and opportunistic data from at least one mass stranding, of melon-headed whales, associated with sonar use.[66] Indeed, a recent controlled exposure study of Northern bottlenose whales designed to investigate this very issue concluded that received level, and not distance, drove responses to sonar in this beaked whale species even at distances somewhat beyond the cutoffs used by the Navy here.[67] The Navy appears to respond to this criticism by doubling its cutoffs where higher-intensity sonar or multi-platform sonar activities are concerned, but these adjustments do not cure the inconsistencies with the data we have cited above.

As the Marine Mammal Commission notes, "Use of cut-off distances could be perceived as an attempt to reduce the numbers of takes."[68] We urge the Navy to abandon this arbitrary, consequential, and highly concerning element in its new analysis.

4. Behavioral thresholds for explosives

For purposes of take estimation, the DSEIS assumes that marine mammals do not respond behaviorally to single explosive detonations, beyond a brief alerting response that would not constitute a significant alteration in behavior. This assumption appears to derive from final rules issued under the Marine Mammal Protection Act for ship-shock trials in the late 1990s and 2000s, and is entirely without empirical support.

The Navy's preferred alternative provides for detonations with net explosive weights up to 650 lbs. There is no reason for the Navy to assume, as the Marine Mammal Commission observes, that a marine mammal "would exhibit a significant behavioral response to two 5-lb. charges detonated within a few minutes of each other but would not exhibit a similar response for a single detonation of 50 lbs., let alone detonations of more than 500 lbs."[69] In response to comments made on other Draft Environmental Impact Statements, concerned with other

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[65] Comments of Peter O. Thomas, Executive Director, Marine Mammal Commission, to Naval Facilities Engineering Command, Northwest, at 4-5 (Apr. 15, 2019).

[66] Southall, B.L., Braun, R., Gulland, F.M.D., Heard, A.D., Baird, R.W., Wilkin, S.M., and Rowles, T.K., Hawaiian melon-headed whale (*Peponacephala electra*) mass stranding event of July 3-4, 2004 (2006) (NOAA Tech. Memo. NMFS-OPR-31); Melcon, M.L., et al. (2012). Blue whales respond to anthropogenic noise, *supra*; Goldbogen, J.A., Southall, B.L., DeRuiter, S.L., Calambokidis, J., Friedlaender, A.S., Hazen, E.L., Falcone, E.A., Schorr, G.S., Douglas, A., Moretti, D.J., Kyburg, C., McKenna, M.F., and Tyack, P.L., Blue whales respond to simulated mid-frequency military sonar, *Proceedings of the Royal Society B* 280: 20130657 (2013); Wensveen, P.J., Isojunno, S., Hansen, R.R., von Benda-Beckmann, A.M., Kleivane, L., van IJsselmuide, S., Lam, F.-P.A., Kvadsheim, P.H., DeRuiter, S.L., Curé, C., Narazaki, T., Tyack, P.L., and Miller, P.J.O., Northern bottlenose whales in a pristine environment respond strongly to close and distant navy sonar signals, *Proceedings of the Royal Society B* 286: 20182592 (2019).

[67] Wensveen et al., Northern bottlenose whales in a pristine environment respond strongly, *supra*.

[68] Comments of Peter O. Thomas, *supra*, at 5.

[69] *Id.* at 6.

ranges, the agency justified its position by claiming it had not observed significant behavioral responses to single detonations in the course of its observations since the 1990s. Yet the Navy's monitoring effort around underwater explosives is often limited and is focused, where it occurs, on preventing injuries and mortalities within the blast radius, not on detecting marine mammal behavioral responses.

The literature on responses to explosions does not distinguish between single and multiple detonations.[70] It is arbitrary for the Navy, in estimating takes and assessing impacts, to assume that only multiple rounds of in-water detonations can cause behavioral takes.

D. Selection of Modeled Locations

The delineation of Biologically Important Areas by NOAA, the updates made by the Navy to its predictive habitat models,[71] and evidence of additional important habitat areas within the Northwest Study Area, provide the opportunity for the agencies to improve upon their current approach to the development of alternatives by improving resolution of their analysis of operations.

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 assessment of acoustic impacts. Levels of acoustic impact 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 compile and provide more information regarding the number, nature, and timing of testing and training events that take place within, or in close proximity to, important habitat areas, and to refine its scale of analysis of operations to match the scale of the habitat areas that are considered to be important.

While the DSEIS, in assessing environmental impacts on marine mammals, breaks down estimated impacts by population, little detail is provided about assumptions concerning modeled locations and times of year, making it impossible for the public to assess the reasonableness of the Navy's impact analysis in capturing the distribution of the activities proposed in the document. See, e.g., DSEIS at 2-28 TO 2-38 (*e.g.*, defining numerous activities as simply occurring "[o]ffshore"). Furthermore, without knowing more about the modeled sites, it is impossible to assess the reasonableness of the Navy's "take" numbers in representing the amount of take that the Navy will propose for authorization under the Marine Mammal Protection Act. This is important in ensuring that the Navy's activities do not exceed annual levels of authorized take—and that sufficient measures are taken to protect particularly vulnerable marine mammal

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[70] *See* Gomez, C., et al., A systematic review, *supra*.

[71] *E.g.*, the incorporation of the densities models derived by Roberts, J.J., Best, B.D., Mannocci, L., Fujioka, E., Halpin, P.N., Palka, D.L., Garrison, L.P., Mullin, K.D., Cole, T.V.N., Khan, C.B., McLellan, W.M., Pabst, D.A., and Lockhart, G.G., Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico, *Scientific Reports* 6: 22615 (2016); and Mannocci, L., Roberts, J.J., Miller, D.L., and Halpin, P.N., Extrapolating cetacean densities to quantitatively assess human impacts on populations in the high seas, *Conservation Biology* 31: 601-14 (2017).

populations, such as the critically endangered Southern Resident orca and the struggling California gray whale.

We recommend that the Navy provide further information on modeled locations, and determine the worst-case take estimate if activities take place in the highest-density areas that are authorized and not excluded from use through geographic mitigation.

E. Impacts of Overflights

The Navy states that its DSEIS "evaluate[s] the potential environmental impacts of training and testing activities within the NWTT Study Area involving different types of platforms and weapons systems, including EA-18G Growler aircraft." DSEIS at 1-10. Yet the Navy's purported evaluation is deficient in several vital respects.

As a threshold matter, it is unclear where in the DSEIS this analysis of the environmental effects of Growler training in the offshore area appears. For example, while the Navy points to its cumulative effects discussion for this analysis, that chapter is limited to the observation that "[t]hese proposed operations, when considered with the Proposed Action, could add to the cumulative impacts on air quality, birds, noise, socioeconomic resources, cultural resources, and American Indian and Alaska Native Traditional resources." DSEIS at 4-4 (Table 4.3-1). Nor does Appendix J, which summarizes the modeled noise impacts to human health, recreational, and aesthetic values, discuss the impacts of Growler operations within the training range.

Second, as the Navy admits, its analysis of the impacts from Growler overflights has been parceled out into multiple actions and multiple EISs. DSEIS at 1-10. The Navy attempts to justify these segmented analyses based on its belief that each of the Growler expansion and training activities—as well as the training purportedly considered in the SDEIS itself—are disconnected from one another but "cumulatively" addressed in each of these documents. DSEIS at 1-10, 4-1, 4-4. Federal agencies, however, cannot segment or manipulate the scope of their actions in order to evade the full environmental impact analysis that NEPA demands. 40 C.F.R. § 1508.27(b)(7) ("Significance cannot be avoided by … breaking [an action] down into small component parts."). Rather, when determining the scope of its environmental review under NEPA, an agency must consider "connected, cumulative, and similar actions" together to prevent an agency from "dividing a project into multiple 'actions,' each of which individually has an insignificant environmental impact, but which collectively have a substantial impact." 40 C.F.R. § 1508.25; *see, e.g.*, *Earth Island Inst. v. U.S. Forest Serv.*, 351 F.3d 1291, 1305 (9th Cir. 2003).[72] The Navy's attempt to subdivide its analysis of these impacts violates these requirements and impermissibly risks masking significant effects to terrestrial and marine wildlife because the sum of these parts does not make a whole. Neither the Growler EIS, nor the

[72] Actions are connected if they: "(i) Automatically trigger other actions which may require environmental impact statements; (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously; or (iii) Are interdependent parts of a larger action and depend on the larger action for their justification." 40 C.F.R. § 1508.25. "Cumulative actions" include those that "when viewed with other proposed actions have cumulatively significant impacts," and "similar actions" that "when viewed with other reasonably foreseeable or proposed agency actions have similarities that provide a basis for evaluating their environmental consequences together." *Id.*

electronic warfare EA, nor the NWTT EIS adequately and completely analyzes the impacts of Growler overflights and training on marine and terrestrial wildlife.

Third, the Navy's limited discussion in the DSEIS, and in the other NEPA documents, of the impacts of Growler training and overflights in the NWTT area fails to satisfy NEPA's "hard look" requirements. It is clear that the presence of Growlers and other aircraft throughout this region can disrupt wildlife, including marine mammals. Multiple studies and literature reviews have documented effects of aircraft on the behavior of cetaceans.[73] These effects range from diving in response to the presence of aircraft to defensive behaviors and directional change.

It is also clear from the literature that noise from aircraft transfers to the water column at biologically meaningful volumes.[74] Indeed, as the Navy notes in the DSEIS, but does not bring forward for analysis, modeling specific to Growlers demonstrates that sound levels from overflights can range from 152 dB re 1 µPa at 2 meters below the water surface for a subsonic flight at 1,000 ft., to 128 dB re 1 µPa at 2 meters below the water surface for subsonic flight at 10,000 ft. DSEIS at 3-19 (Table 3.0-4). These levels plainly exceed, for example, the 120 dB re 1 µPa threshold that coincided in one study with the onset of behavioral responses, in orcas, to vessel noise.[75] And sonic booms from Growlers can also produce noise at levels far above those causing behavioral changes.[76]

Growlers will be using the Olympic MOAs and Warning Areas 237A and B, and transiting to and from these areas to Whidbey Island NAS tens to hundreds of thousands of times during the period evaluated in the DSEIS.[77] This offshore area and those in the Salish Sea represent a significant part of Southern Resident orca habitat—much of it designated as critical habitat—but the Navy does not discuss effects to this habitat or to cetaceans or other marine mammals anywhere in the DSEIS, or any of the other NEPA analyses prepared for this overflight activity.

For the above reasons, the Navy must provide further information on the noise impacts from aircraft. 40 C.F.R. § 1502.22. Further, we recommend that the Navy consult with NMFS to

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[73] Luksenburg, J.A., and Parsons, E.C.M., The effects of aircraft on cetaceans: implications for aerial whalewatching, *Proceedings of the 61st Meeting of the International Whaling Commission* (2009).

[74] *Id.* (noting that "sound pressure levels produced by even small-sized aircraft may be extremely high (exceeding 120 dB re 20 µPa at 1m) and thus could have profound effects on cetacean populations near e.g. airports and along busy flight trajectories"); Erbe, C., Williams, R., Parsons, M., Parsons, S.K., Hendrawan, I.G., and Dewantama, I.M.I., Underwater noise from airplanes: An overlooked source of ocean noise, *Marine Pollution Bulletin* 137: 656-61 (2018) (noting that noise levels under the flight path of an airport "sometimes exceeded the 120 dB re 1 µPa (broadband, root-mean-square) found to coincide with the onset of behavioural responses in a killer whale dose-response study to ship noise").

[75] Williams, R., Erbe, C., Ashe, E., and Beerman, A., Severity of killer whale behavioral responses to ship noise: A dose–response study, *Marine Pollution Bulletin* 79(1-2): 254-260 (2014).

[76] Naval Sea Systems Command, Northwest Training and Testing Activities Final Environmental Impact Statement/ Overseas Environmental Impact Statement,.at 3.0-39 (Table 3.0-14) (2015) (predicting in-water received peak pressure levels from sonic booms at various depths almost all above 130 dB, even at 50-100m deep).

[77] Department of the Navy, Record of Decision for the Final Environmental Impact Statement (EIS) for EA-18G "Growler" Airfield Operations at Naval Air Station Whidbey Island Complex, Island County, Washington, at 8 (Mar. 12, 2019).

determine the effects of this significant aggregate of overflights on marine mammals, including, but not limited to, critically endangered Southern Resident Killer Whales.

F. Cumulative Impacts

In order to satisfy NEPA, an EIS must include a "full and fair discussion of significant environmental impacts." 40 C.F.R. § 1502.1. It is not enough, for purposes of this discussion, to consider the proposed action in isolation, divorced from other public and private activities that impinge on the same resource; rather, it is incumbent on the Navy to assess cumulative impacts as well, including the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future significant actions." *Id.* § 1508.7. A meaningful cumulative impact analysis must identify (1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions—past, present, proposed, and reasonably foreseeable—that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate. *Grand Canyon Trust v. FAA*, 290 F.3d 339, 345 (D.C. Cir. 2002) (quotation and citation omitted).

As with past analyses, the present DSEIS tabulates exposures and takes of marine mammal species but has not adequately assessed the aggregate impacts. On the contrary, it assumes, without explanation, that the accumulated annual mortalities, injuries, energetic costs, temporary losses of hearing, chronic stress, and other impacts would not affect vital rates in individuals or populations, even though the Navy's activities would affect the same populations over time. This assumption seems predicated, for many species, on the unsupported notion that transient activity will not accumulate into population-level harm. The DSEIS makes this assertion even for species such as harbor porpoises (see DSEIS at 3.4-232 to 3.4-237), for which it estimates auditory injury, temporary hearing loss, and behavioral disruption at extraordinarily high numbers relative to the size of individual populations. *See Motor Veh. Mfrs. Ass'n v. State Farm Ins.*, 463 U.S. 29, 43 (1983) (holding an agency arbitrary and capricious where, inter alia, it "offered an explanation for its decision that runs counter to the evidence before [it]"). Ultimately, the DSEIS states, "The best assessment of long-term consequences from Navy training and testing activities will be to monitor the populations over time within the Study Area" (DSEIS at 3.4-133). But while we strongly concur with the Navy that long-term monitoring is critical, that monitoring cannot substitute for an adequate assessment of the aggregate effects of those activities. Nor can the Navy's summary dismissal of impacts substitute for the more robust population consequences analyses performed by other parties for an increasing number of other actions, such as for harbor porpoises exposed to pile-driving in the North Sea. 40 C.F.R. § 1502.22(b)(4) (requiring use of "theoretical approaches or research methods generally accepted in the scientific community").

Nor does the Navy's treatment of cumulative impacts, adding the impacts of other reasonably foreseeable activities to its own projected training and testing, result in an adequate analysis. The DSEIS begins by listing numerous other military, commercial, and industrial activities in the region (DSEIS at 4-3 to 4-40), including Navy activities, such as Growler operations, that were purportedly covered in other NEPA documents; pier extensions and replacements; commercial fishing; and substantial maritime traffic. Unfortunately, in assessing the additive and synergistic impacts of these activities, the Navy provides only abstract rationalization.

In the case of marine mammals, for example, the Navy relies on its findings from the 2015 EIS, to conclude that "the incremental contribution of the Proposed Action would be negligible" and to rule out any further analysis of marine mammals. DSEIS at 4-43. Yet this misstates the actual conclusion of the Navy's previous analysis. The 2015 EIS recognized that "the current aggregate impacts of past and present actions and reasonably foreseeable future actions are expected to result in recoverable impacts to most marine mammal species, and significant impacts on some in the Study Area"; that, "[t]herefore, cumulative impacts on marine mammals would be significant" even without consideration of the additional impacts caused by the proposed training and testing activities; but that, compared to other actions, the Navy's "relative contribution would be low."[78] The fact that an activity's "relative contribution would be low" does not mean that it is "negligible," as the Navy concludes here, and not in need of further analysis. *See Klamath-Siskiyou Wildlands Ctr. v. BLM*, 387 F.3d 989, 994 (9th Cir. 2004) (stating that "[a] proper consideration of the cumulative impacts of a project requires some quantified or detailed information"). On the contrary, NEPA requires review of the cumulative impacts resulting from "individually minor but collectively significant actions taking place over a period of time" (40 C.F.R. 1508.7). That requirement is all the more important where, as the Navy previously acknowledged, cumulative impacts from past, present, and reasonably foreseeable future actions are already "significant" for some species. Furthermore, as noted above, the Navy's conclusion that its "relative contribution would be low" does not follow from the facts presented for some of the region's marine mammal populations, such as harbor porpoises.

At present, the Navy's analysis of cumulative impacts is arbitrary and does not meet NEPA's requirement to assess the overall impact of the accumulation of individual impacts.

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 Navy 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, the Navy

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[78] Naval Sea Systems Command, Northwest Training and Testing Activities Final Environmental Impact Statement, *supra*, at 4-40 to 4-41.

must discuss measures designed to mitigate its action's impact on the environment. *See* 42 C.F.R. § 1502.14(f).

A. Development of Reasonable Alternatives to the Proposed Action

Responding to the court's decision in *Conservation Council*, the Navy has modified its alternatives analysis to incorporate a true "no-action" alternative (DSEIS at 2-23 to 2-24) and has set forth a preferred alternative that limits some activities to a "representative" amount (DSEIS at 2-25).

There is no question that the Navy's alternatives analysis is improved by the addition of a true "no-action" alternative. The Hawai'i District Court, in reviewing the Navy's most recent EIS for Hawai'i and Southern California training and testing ("HSTT") activities, concluded that that document failed to include such an alternative, which the NEPA regulations mandate to "provide a baseline against which the action alternatives are evaluated." *Conservation Council*, 97 F. Supp. 3d at 1236 (citing *Friends of Southeast's Future v. Morrison*, 153 F.3d 1059, 1065 (9th Cir. 1998)). The present DSEIS, in including the alternative—though immediately rejecting it as unreasonable (see DSEIS at 2-24)—purports to cure this clear deficiency. Describing the "no action" option cannot by itself, however, provide the choice among the full range of reasonable alternatives required by law.

In an effort to provide that range, the Navy has developed a preferred alternative ("Alternative 1") based on a "representative year of training" and "an annual level of testing that reflects the fluctuations in testing programs." DSEIS at 2-25. The maximum level of training and testing is captured in the Navy's only other action alternative ("Alternative 2"). *Id.* According to the DSEIS, the effect is to "reduce[] the amount of hull-mounted mid-frequency active sonar estimated to be necessary to meet training requirements" (*id.*), which would be a welcome change.

It does not appear, however, that the Navy's preferred alternative will actually reduce the amount of sonar activity that takes place in the NWTT Study Area, as opposed to reflecting a pre-defined status quo. Indeed, the description provided in the DSEIS suggests that Alternative 1 better captures the "fluctuations" in activity that the Navy expects to occur. *Id.* at 2-25. Thus, for example, Alternative 1 anticipates that a particular anti-submarine warfare exercise will be run 75 times in the first year and 100 times in the second, and so forth, rather than the less realistic 100 times per year contemplated by Alternative 2. *Id.* at 2-29. The Navy's preferred alternative provides a more accurate estimate of sonar and explosives activity, which is a significant improvement for analysis; yet its Alternative 2 is not a true alternative, in that it does not "avoid or minimize adverse impacts or enhance the quality of the human environment" 40 C.F.R. § 1502.1 (stating purpose of an environmental impact statement). We urge the Navy to develop a fuller range of reasonable alternatives.

B. Geographic Mitigation

Time and place restrictions designed to protect important habitat are one of the most effective available means to reduce the potential impacts of naval activities on marine wildlife, including from underwater explosives and high-intensity active sonar.[79] We therefore support the designation of mitigation areas specifically aimed at protecting marine mammals and marine protected areas.

Notwithstanding these efforts, for Mitigation Areas to effectively protect marine mammals they must be properly sited, and the management objectives for each must be based on the best available science and be precautionary in nature. Furthermore, if the EIS is meant to satisfy NMFS' purpose and need under the Marine Mammal Protection Act ("MMPA"), its mitigation measures must achieve the "least practicable adverse impact" on these species. 16 U.S.C. § 1371(a)(5)(A). Protecting marine mammal habitat is "of paramount importance" under the MMPA (*NRDC v. Pritzker*, 828 F.3d 1125, 1138 (9th Cir. 2016)), and the Act has established a "stringent standard" for mitigation. *NRDC v. Pritzker*, 828 F.3d at 1133; *Conservation Council*, 97 F.Supp.3d at 1231.

1. General comments

Below are our general comments on the Navy's approach to geographic mitigation in the DSEIS, followed by our comments on the Navy's analysis of specific areas for mitigation.

(a) Extension of mitigation area restrictions

The latest science, including the Navy's own analysis, indicates an urgent need to extend mitigation to dipping sonar, which is deployed via cable from manned and unmanned aircraft.

Dipping sonar, like hull-mounted sonar, appears on the basis of available data to be a significant predictor of deep-dive rates in beaked whales. Evidence indicates that beaked whales dive deeper and stay at depth during exposure to mid-frequency active sonar (possibly to escape from the sound, as the lowest sound pressure levels occur at depth), behavior that also extends the inter-deep-dive-interval ("IDDI," a proxy for foraging disruption).[80] IDDIs were found to significantly lengthen upon exposure to MFAS, with the longest, lasting 541 and 641 minutes, recorded during helicopter-deployed mid-frequency active sonar at distances of

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[79] *See, e.g.*, Agardy, T., Aguilar, N., Caňadas, A., Engel, M., Frantzis, A., Hatch, L., Hoyt, E., Kaschner, K., LaBrecque, E., Martin, V., Notarbartolo di Sciara, G., Pavan, G., Servidio, A., Smith, B., Wang, J., Weilgart, L., Wintle, B., and Wright, A., A global scientific workshop on spatio-temporal management of noise (2007) (Report of workshop held in Puerto Calero, Lanzarote, June 4-6, 2007); Dolman, S., Aguilar Soto, N., Notarbartolo di Sciara, G., and Evans, P., Technical report on effective mitigation for active sonar and beaked whales (2009) (report of working group convened by European Cetacean Society); OSPAR Commission, Assessment of the environmental impact of ocean noise (2009) (OSPAR Biodiversity Series, London, UK); Memorandum from Dr. Jane Lubchenco, NOAA Administrator, to Ms. Nancy Sutley, CEQ Chair (Jan. 19, 2010); Convention on Biological Diversity, Scientific synthesis on the impacts of underwater noise on marine and coastal biodiversity and habitats (2012) (U.N. Doc. UNEP/CBD/SBSTTA/16/INF/12).

[80] Falcone, E.A., et al., Diving behavior of Cuvier's beaked whales, *supra*.

~17 and ~11 kilometers, respectively.[81] These effects have been documented at substantially greater distances (~30 km) than would otherwise be expected given the systems' source levels and the response thresholds developed from research on hull-mounted sonar. Deep-dive duration increases as distance to the helicopter decreases.[82]

Helicopters deploy mid-frequency active sonar from a hover in bouts generally lasting under 20 minutes, moving rapidly between sequential deployments in an unpredictable pattern, and thus whales may react more strongly to these sudden, close-range exposures even though their duration of use and source level (217 dB) are generally well below those of hull-mounted mid-frequency active sonar (235 dB).[83] Dipping sonar is also deployed at depth, which may be another reason why it is relatively more impactful.[84] 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).[85] It should thus be presumed conservatively to apply to marine mammal species other than beaked whales.

The DSEIS projects a substantial increase in activities involving dipping sonar, from 14 annual events during the current cycle (2015-20) to 53 to 75 annual events under the Navy's preferred alternative and 80 annual events under Alternative 2. DSEIS at 3-13 (bin MF4). The Navy must consider restricting or limiting use of dipping sonar during the present NEPA process.

(b) Stand-off distances

The Navy does not incorporate stand-off distances of any size within its management requirements for its proposed Mitigation Areas, providing only that activities not take place "within" the defined areas. *See* DSEIS at K-11 to K-13. Thus, activities that are otherwise restricted or limited within an Area could occur directly along the boundary and ensonify the Area at levels that can cause injury and increase the risk or severity of behavioral disruption. Stand-off distances are a reasonable mitigation measure that is routinely required by NMFS in authorizing take under the Marine Mammal Protection Act. 40 C.F.R. §§ 1502.14(f), 1503.3(d). The Navy must consider establishing stand-off distances around its Mitigation Areas to the greatest extent practicable, allowing for variability in size given the location of the Area, the type of operation at issue, and the species of concern.

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[81] Falcone, E., et al., Diving behavior of Cuvier's beaked whales, *supra*; Schorr G., Falcone, E., Watwood, S., DeRuiter, S., Zerbini, A., Andrews, R., Morrissey, R., McCarthy, E., and Moretti, D., Factors associated with unusually strong responses to mid-frequency active sonar in Cuvier's beaked whales (2017) (presentation at Society of Marine Mammalogy Biennial Conference, Halifax, Canada, Oct. 23 2017).

[82] Falcone, E., Schorr, G., Watwood, S., DeRuiter, S., Zerbini, A., Andrews, R., Morrissey, R., and Moretti, D., Go long! Behavioral changes in satellite-tagged Cuvier's beaked whales exposed to two types of military mid-frequency active sonar (2017) (presentation at Society of Marine Mammalogy Biennial Conference, Halifax, Canada, Oct. 23, 2017).

[83] Falcone, E.A., et al., Diving behavior of Cuvier's beaked whales, *supra*.

[84] Falcone, E., et al., Go long! Behavioral changes in satellite-tagged Cuvier's beaked whales, *supra*.

[85] Wright, A.J., et al., Anthropogenic noise as a stressor in animals, *supra*.

(c) National security exception

As with the consent order entered by the court in *Conservation Council for Hawaiʻi v. NMFS*, 97 F.Supp.3d 1210 (D. Haw. 2015), the present DSEIS would allow the Navy to derogate from the measures associated with its mitigation areas, where necessary for national security, if certain conditions are met. Specifically, authorization must be granted, the Navy must provide NMFS with advance notice of the derogation and data on the activities conducted after the completion of events, and the Navy must provide information on those activities in its annual reports. *See* DSEIS at K-11 to K-12 (Table K-2). Unlike the consent order, however, the DSEIS does not clearly restrict derogation authority to highest-level officers.

Under the consent order, authority could be invoked only by certain named officers representing the highest command authority, namely the Commander or Acting Commander of the Pacific Fleet, for training activities, and the Commander or Acting Commander of the various research branches for testing activities, and then only when the Navy "deems it necessary for national defense." Stipulated Settlement Agreement and Order, *Conservation Council*, *supra* (Sept. 14, 2015). Similarly, at least some of the geographic areas adopted by the Navy in prior NEPA processes, such as the Humpback Whale Cautionary Area established in previous Hawaii-Southern California Training and Testing EISs, allowed for derogation only upon approval of the Pacific Fleet Commander. This requirement made it more likely that derogation decisions would be taken with the greatest seriousness and consideration. By contrast, the DSEIS is unclear in its designation, generally allowing units to obtain permission from "the appropriate *delegated* Command authority." DSEIS at K-11 to K-12 (emphasis added). The Navy should clarify that authorization may be given only by the highest-level Command authorities, consistent with the consent order in *Conservation Council*.

2. *Comments on specific areas for geographic mitigation*

(a) Marine Species Coastal Mitigation Area (year-round)

The Navy's Marine Species Coastal Mitigation Area is intended to avoid or reduce potential impacts from explosives, non-explosive practice munitions, and active sonar on ESA-listed fish and bird species, as well as on marine mammals that inhabit, feed in, or migrate through this area, including killer whales, humpback whales, and gray whales. DSEIS at K-14. The Navy proposes three tiers of mitigation measures, to be applied within 50 nm, 20 nm, and 12 nm from shore, respectively. Within 50 nm from shore, the Navy will not conduct explosive training and testing activities (with the exception of explosive Mine Countermeasures and Neutralization Testing Activities), non-explosive missile training activities, and non-explosive torpedo training activities. Within 20 nm from shore, the Navy will not conduct non-explosive large-caliber gunnery training activities and non-explosive bombing training activities. Within 12 nm from shore, the Navy will not conduct non-explosive small- and medium-caliber gunnery training activities and Anti-Submarine Warfare Tracking Exercise – Helicopter, Maritime Patrol Aircraft, Ship, or Submarine training activities. In all cases, should national security present a requirement to conduct these activities in the mitigation area, naval units will obtain permission from the "designated Command authority" prior to commencement of the activity, provide NMFS with advance notification, and include information about the event in its annual activity reports to NMFS. DSEIS at K-11.

The proposed Marine Species Coastal Mitigation Area would provide protection for a large portion of the NWTT Study Area, including the proposed revised critical habitat area for the highly endangered Southern Resident orca to reflect essential foraging and wintering area. 80 Fed. Reg. 9,682 (Feb. 24, 2015). That protection, however, though improved on the current NMFS authorization, would not be comprehensive, particularly for the Southern Resident orca population. Best available scientific information indicates that this population of orcas uses waters of the Pacific Ocean between Cape Flattery, Washington, and Point Reyes, California, extending approximately 47 miles offshore, between December and June. *Id.* In light of the observed impacts of noise disturbance, including active sonar, on Southern Resident orcas (*see* Section II.A.1), we recommend the Navy consider prohibiting or at least significantly limiting the use of mid-frequency active sonar from all sources, including dipping sonar, within the Marine Species Coastal Mitigation Area, at least between December and June; and, similarly, to further limit other activities that have the potential to result in species take. If prohibiting or limiting mid-frequency active sonar (and/or other activities) is not possible across the entire Mitigation Area, we recommend that the Navy at least carefully consider a prohibition in the waters within the Mitigation Area extending between Cape Flattery, Washington, and Tillamook Head, Oregon, including the waters offshore of the Columbia River mouth, to protect an area of highest relative habitat use for Southern Residents, as indicated by presently available satellite telemetry data.[86]

(b) Olympic Coast National Marine Sanctuary Mitigation Area (year-round)

The Olympic Coast National Marine Sanctuary Mitigation Area is intended to avoid or reduce potential impacts from mid-frequency active sonar, explosives during Mine Countermeasure and Neutralization testing activities, and non-explosive practice munitions on marine mammals that inhabit the National Marine Sanctuary, including killer whales, humpback whales, and gray whales. DSEIS at K-15. Specifically, the Navy will not conduct more than 32 hours of MF1 mid-frequency active sonar training or 33 hours of MF1 mid-frequency active sonar testing annually, except for within the portion of the mitigation area that overlaps with the Navy's Quinault Range Site); will not conduct explosive Mine Countermeasure and Neutralization Testing activities; and will not conduct non-explosive bombing exercises. The same derogation procedures for reasons of national security would apply. DSEIS at K-11. *Id.* at K-11. Since the Navy's Olympic Coast National Marine Sanctuary Mitigation Area is located entirely within its Marine Species Coastal Mitigation Area, both sets of mitigation will apply. *Id.* at K-15.

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[86] Center for Biological Diversity, Petition to revise the critical habitat designation for the Southern Resident killer whale (Orcinus orca) under the Endangered Species Act (submitted to NMFS on Jan. 16, 2014); *see also* NMFS, "Southern Resident killer whale satellite tagging," available at http://www.nwfsc.noaa.gov/research/divisions/cb/ecosystem/marinemammal/satellite_tagging/blog.cfm (accessed June 10, 2019).

In addition to the proposed restrictions, the Navy must consider prohibiting or restricting air-deployed mid-frequency active sonar (*i.e.*, dipping sonar) within the Olympic Coast National Marine Sanctuary Mitigation Area, as well as other activities involving sources of mid-frequency active sonar, including unit-level training and maintenance and system checks while vessels are in transit.

In particular, the deployment of all forms of mid-frequency active sonar should be restricted within the vicinity of the Quinault Canyon. Both visual and passive acoustic surveys have demonstrated the importance of the canyon for a diversity of marine mammal species. Remarkably, the extremely rare and endangered North Pacific right whale has been acoustically detected within the canyon,[87] as have humpback whales, sperm whales, offshore, transient, and resident killer whales, Pacific white-sided dolphins, and Risso's dolphins,[88] and a variety of beaked whale species.[89] Dall's porpoise, Cuvier's beaked whale, northern right whale dolphin, and northern fur and elephant seals have also been sighting in the vicinity of the Quinault Canyon (Oleson *et al*. *supra*; Oleson & Hildebrand, NPS-OC-12-001CR, pp. 56, 2012), and Southern Resident orcas have been satellite tracked in this area (NOAA Fisheries, 2015).

We recognize that the Quinault Canyon lies within the Quinault Range Site and that the practicability of implementing comprehensive mitigation may be limited; however, we recommend the Navy fully explore opportunities for applying additional mitigation measures to protect the Quinault Canyon to the full extent practicable. First and foremost, such measures should include further restrictions on activities. For those activities that the Navy concludes, after probing analysis, cannot be reduced or shifted, the Navy (1) should undertake year-round monitoring of the Canyon to ascertain the seasonality of species presence and habitat use and adaptively plan to reduce operations during periods of greater biological importance; and (2), as a last resort, should employ enhanced monitoring techniques, including the use of passive acoustics, to avoid protected species.

(c) Stonewall and Heceta Bank Humpback Whale Mitigation Area (May-November)

The Stonewall and Heceta Bank Humpback Whale Mitigation Area is intended to avoid or reduce potential impacts on humpback whales in a seasonally important feeding area. It is also intended to avoid or reduce potential impacts on other marine mammals that may inhabit or migrate through this area, including killer whales and gray whales. Specifically, the Navy will not use MF1 mid-frequency active sonar or explosives during training and testing from May to November. The same derogation procedures for reasons of national security would apply. DSEIS

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[87] Široviç, A., Johnson, S.C., Roche, L.K., Varga, L.M., Wiggins, S.M., and Hildebrand, J.A., North Pacific right whales (*Eubalaena japonica*) recorded in the northeastern Pacific Ocean in 2013, *Marine Mammal Science* 31: 800-807 (2015).

[88] Oleson, E., Calambokidis, J., Falcone, E., Schorr, G., and Hildebrand, J.A., Acoustic and visual monitoring for cetaceans along the outer Washington coast (2009) (Naval Postgraduate School rep. no. OC-19-001).

[89] Baumann-Pickering, S., Roch, M.A., Brownell, Jr., R.L., Simonis, A.E., McDonald, M.A., Solsona-Berga, A., Oleson, E.M., Wiggins, S.M., and Hildebrand, J.A., Spatio-temporal patterns of beaked whale echolocation signals in the North Pacific, *PLoS ONE* 9: e86072 (2014) (reporting occurrence of Baird's, Blainville's, and Stenjeger's beaked whales).

at K-11. The Stonewall and Heceta Bank Humpback Whale Mitigation Area is located within the Marine Species Coastal Mitigation Area and, as such, will also be subject to the mitigation measures proposed within 20 nm and 50 nm of shore. DSEIS at K-11, K-13.

The Navy should expand the proposed mitigation measures to more comprehensively protect humpback whales at Stonewall and Heceta Banks between May and November. The Navy should prohibit air-deployed mid-frequency active sonar (*i.e.*, dipping sonar) within the Stonewall and Heceta Bank Humpback Whale Mitigation Area, as well as other activities involving sources of mid-frequency active sonar, including unit-level training and maintenance and system checks while vessels are in transit. The expanded mitigation measures would benefit a variety of species, including noise-sensitive harbor porpoise, that are likely to be found in relatively higher densities within the Mitigation Area. The Navy should also include mitigation measures that limit vessel speeds to reduce the likelihood of vessel strike.

(d) Point St. George Humpback Whale Mitigation Area (July-November)

The Point St. George Humpback Whale Mitigation Area is designed to avoid or reduce potential impacts on humpback whales in a seasonally important feeding area. DSEIS at K-15. Specifically, the Navy will not use MF1 mid-frequency active sonar or explosives during training and testing from May to November. The same derogation procedures for reasons of national security would apply. DSEIS at K-11. The Point St. George Humpback Whale Mitigation Area is located within the Marine Species Coastal Mitigation Area and, as such, will be subject to the mitigation measures proposed within 20 nm and 50 nm of shore. DSEIS at K-11, K-13.

As with the Stonewall and Heceta Bank Humpback Whale Mitigation Area, the Navy should expand the proposed mitigation measures to more comprehensively protect humpback whales at Point St. George Humpback Whale Mitigation Area, here between July and November. The Navy should prohibit air-deployed mid-frequency active sonar (*i.e.*, dipping sonar), as well as other activities involving sources of mid-frequency active sonar, including unit-level training and maintenance and system checks while vessels are in transit. The Navy should also include mitigation measures that limit vessel speeds to reduce the likelihood of vessel strike.

(e) Puget Sound and Strait of Juan de Fuca Mitigation Area (year-round)

The Puget Sound and Strait of Juan de Fuca Mitigation Area encompasses, in the Navy's description, "the full extent of the NWTT Inland Waters portion of the Study Area." DSEIS at K-16. Mitigation within the Puget Sound and Strait of Juan de Fuca Mitigation Area is intended to avoid or reduce potential impacts on marine mammals that inhabit, feed in, or migrate through this area. *Id.* Specifically, the Navy will require units to obtain approval from the designated Command authority prior to (1) the use of hull-mounted mid-frequency active sonar during training, and (2) conducting ship and submarine active sonar pierside maintenance or testing. In addition, for Civilian Port Defense—Homeland Security Anti-Terrorism/ Force Protection Exercises, Navy event planners will coordinate with Navy biologists during the event planning process. Navy biologists are required to work with NMFS to determine the likelihood of gray whale and Southern Resident orca presence in the planned training location, and then notify event planners as they plan specific details of the event (*e.g.*, timing, location, duration). The Navy will ensure environmental awareness of event participants, alerting participating ship and aircraft crews to the possible presence of marine mammals in the training location. *Id.* at K-12.

As noted elsewhere in these comments, the Salish Sea, including the inland waters of Puget Sound, constitutes critical habitat for the Southern Resident orca and is a focus of extensive conservation effort, on both sides of the border, to sustain and recover the population. The high numbers of takes estimated, in the DSEIS, for both the Washington Inland Waters harbor porpoise and the Hood Canal harbor seal indicates that considerable activity would take place in the whales' critical habitat. This appears true notwithstanding the requirement that units obtain approval from the "designated Command authority" before undertaking certain activities in the area, which differs notably from the derogation procedures proposed for other Navy Mitigation Areas in not incorporating a "national security" standard. *See id.* at K-12. Navy impacts are intolerable to the public

We urge the Navy to engage in a more rigorous analysis of alternatives and mitigation options in this area, with the aim of eliminating potential impacts on Southern Residents. The Navy should consider (1) completely prohibiting activity during periods of higher residency or occurrence of the population, *viz,* roughly May through October for the Salish Sea and roughly October through mid-February for the inland waters of Puget Sound;[90] (2) using existing methods, and working with Navy engineers, to isolate noise from its activities, particularly for activities such as pierside testing and maintenance that are concentrated in particular location; and (3) setting a transparent, rigorous protocol for ensuring that Southern Residents will not be exposed to noise that can cause behavioral disruption, before an activity proceeds, including by using the region's existing real-time hydrophone networks and by establishing additional hydrophone sites in key areas as needed.[91] Finally, the Navy (4) must consider measures to mitigate the impacts of its Growler overflights on Southern Residents and other marine species—an issue that the DSEIS does not squarely address (*see* above at sec. II.E).

(f) Northern Puget Sound Gray Whale Mitigation Area (March-May)

The Northern Puget Sound Gray Whale Mitigation Area is intended to avoid or reduce potential impacts from active sonar on gray whales within a seasonally important feeding area, and to also afford protection to other marine mammal species within the area. DSEIS at K-16. Specifically, the Navy will not conduct Civilian Port Defense—Homeland Security Anti-Terrorism/Force Protection Exercises from March to May. The same derogation procedures for reasons of national security would apply. *Id.* at K-12.

[90] Olson, J.K., Wood, J., Osborne, R.W., Barrett-Lennard, L., and Larson, S., Sightings of Southern Resident killer whales in the Salish Sea 1976-2014: The importance of a long-term opportunistic dataset, *Endangered Species Research* 37: 105-18 (2018).

[91] The mere assurance (*see* DSEIS at K-12) that Navy biologists will work with NMFS to determine the likelihood of species occurrence—a statement that does not imply use of any real-time detection systems—is not sufficient.

As noted above, gray whales are undergoing a major die-off of uncertain duration, with large percentages showing signs of "skinniness" and some stranded whales exhibiting emaciation; in animals suffering from such stress, the addition of another stressor could have severe consequences. The Navy should expand its proposed mitigation measures to more comprehensively protect gray whales at Northern Puget Sound Gray Whale Mitigation Area between March and May. It should not conduct any testing and training activities within the Mitigation Area from March through May. In addition, the Navy should include mitigation measures that limit vessel speeds to reduce the likelihood of vessel strike.

(g) Additional areas for mitigation: Important feeding habitat associated with the Grays, Guide, Willapa, Astoria, and Eel submarine canyons

Five submarine canyons are present within the NWTT Study Area: Grays Canyon, Guide Canyon, Willapa Canyon, Astoria Canyon, and Eel Canyon. The biological importance of these areas for marine mammals is expected to be comparable to the Quinault Canyon, and available survey data support this assumption.

Located approximately 60 km west of Grays Harbor, Washington, Grays Canyon represents seasonal feeding habitat for high densities of humpback whales.[92] In addition, sightings of Dall's porpoise, fin whale, and the first sighting of a blue whale in the region in several decades have been made in the vicinity of the Grays Canyon.[93] Guide and Willapa Canyon, located to the west of Willapa Bay, Washington, have been shown to represent biologically important foraging habitat for female northern fur seals.[94]

Astoria Canyon, Oregon, is located directly west of the Columbia River mouth, coincident with the Columbia River plume. Astoria Canyon has a rich prey field that supports an important groundfish fishery[95] and falls within the recently recorded expansion in the range of jumbo squid in the California Current,[96] a primary prey species for endangered sperm whales. This highly productive environment provides biologically important feeding habitat for marine mammals, including humpback whales,[97] and has led to the site being designated as an Important Bird

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[92] Calambokidis, J., et al., Biologically Important Areas for selected cetaceans, *supra*.

[93] Oleson, E., and Hildebrand, J., Marine mammal demographics off the outer Washington coast and near Hawaii (2012) (Naval Postgraduate School rep. no. OC-12-001CR).

[94] Pelland, N.A., Sterling, J.T., Lea, M.-A., Bond, N.A., Ream, R.R., Lee, C.M., and Eriksen, C.C., Fortuitous encounters between seagliders and adult female northern fur seals (*Callorhinus ursinus*) off the Washington (USA) coast: Upper ocean variability and links to top predator behavior, *PLoS ONE* 9: e101268 (2014).

[95] Genin, A., Bio-physical coupling in the formation of zooplankton and fish aggregations over abrupt topographies, *Journal of Marine Systems* 50(1-2): 3-20 (2004) (citing Pereyra, W.T., Pearcy, W.G., Carvey, F.E., *Sebastodes flavidus*, a shelf rockfish feeding on mesopelagic fauna, with consideration of the ecological implications, *Journal of the Fisheries Research Board of Canada* 26: 2211-15 (1969)).

[96] Field, J.C., Baltz, K., Phillips, A.J., and Walker, W.A., Range expansion and trophic interactions of the jumbo squid, *Dosidicus gigas*, in the California Current, *CalCOFI Report* 48: 131-45 (2007).

[97] Brueggeman, J.J., ed., Oregon and Washington marine mammal and seabird surveys (1992) (report for Minerals Management Service, Pacific OCS Region OCS Study MMNS 91-0093).

Area.[98] In addition, there is evidence from satellite telemetry that Southern Resident killer whales use the topography of the Astoria Canyon during navigation along the Oregon/Washington coastline.[99] Humpback whale, Risso's dolphin, and harbor porpoise have been sighted within the Eel River Canyon, northern California.[100]

The five canyon systems fall within the 50 nm and, in some cases, the 20 nm boundaries of the Marine Species Coastal Mitigation Area and are thus afforded protection from most explosive and several non-explosive training and testing activities, as discussed above. We recommend that, additionally, the Navy conduct no training or testing activities with mid-frequency sonar within the vicinity of the canyons at any time of year to provide protection for deep-diving and/or noise-sensitive species, including endangered sperm whales and harbor porpoise.

C. Other Mitigation Measures

NMFS should consider the following additional measures, whether as mitigation measures to prescribe or as research.

(1) Avoidance of underwater detonations at night and in other low-visibility conditions

At night and during periods of low visibility, the Navy's ability to detect marine mammals within its safety zone declines significantly.[101] Additionally, some endangered species engage in rest or shallow diving during the night, increasing their vulnerability to ship collision and to injury from explosives and ordnance.[102] Many individual Navy exercises, tests, and maintenance activities last eight hours or fewer,[103] making avoidance of nighttime activity practicable, at least in some cases. Yet, with the exception of mine neutralization exercises involving Navy divers (DSEIS at 5-45, 67), the Navy does not require, nor does it consider, avoidance of underwater detonations at night and/or during other low-visibility conditions. *See* DSEIS at Ch. 5 ("Mitigation").

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[98] Suryan, R.M., Phillips, E.M., So, K., Zamon, J.E., Lowe, R.W., and Stephensen, S.W., Marine bird distribution along the Oregon Coast, (2012) (Northwest National Marine Renewable Energy Center, Report No. 2).

[99] NMFS, "Southern Resident killer whale satellite tagging," *supra*.

[100] Halpin, P.N., Read, A.J., Fujioka, E., Best, B.D., Donnelly, B., Hazen, L.J., Kot, C., Urian, K., LaBrecque, E., Dimatteo, A., Cleary, J., Good, C., Crowder, L.B., and Hyrenbach, K.D., OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions, *Oceanography* 22: 104-15 (2009).

[101] *E.g.*, Barlow, J., Gerrodette, T. and Forcada, J., Factors affecting perpendicular sighting distances on shipboard line-transect surveys for cetaceans, *Journal of Cetacean Research and Management* 3: 201-12 (2001); Barlow, J., and Gisiner, R., Mitigation and monitoring of beaked whales during acoustic events, *Journal of Cetacean Research and Management* 7: 239-49 (2006).

[102] Goldbogen, J.A., Calambokidis, J., Oleson E., Potvin, J., Pyenson, N.D., Schorr, G., and Shadwick, R.E., Mechanics, hydrodynamics and energetics of blue whale lunge feeding: efficiency dependence on krill density, *The Journal of Experimental Biology* 214(1): 131-46 (2011); *see also*, *e.g.*, Calambokidis, J., Schorr, G.S., Steiger, G.H., Francis, J., Bakhtiari, M., Marshal, G., Oleson, E.M., Gendron, D. and Robertson, K., Insights into the underwater diving, feeding, and calling behavior of blue whales from a suction-cup attached video-imaging tag (CRITTERCAM), *Marine Technology Society Journal* 41: 19-29 (2007).

[103] U.S. Department of the Navy, Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for Hawaii-Southern California Training and Testing, at App. A (2017).

(2) Research into sonar signal modifications

NOAA's Ocean Noise Strategy puts an emphasis on source modification, along with habitat management, as an important means of reducing acoustic impacts on marine life.[104] In the case of naval activities, 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. 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.[105] 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.[106] A 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.[107]

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).[108] 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.[109] To our knowledge, the Navy is not

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[104] Gedamke, J., Harrison, J., Hatch, L., Angliss, R., Barlow, J., Berchok, C., Caldow, C., Castellote, M., Cholewiak, D., De Angelis, M.L., Dziak, R., Garland, E., Guan, S., Hastings, S., Holt, M., Laws, B., Mellinger, D., Moore, S., Moore, T.J., Oleson, E., Pearson-Meyer, J., Piniak, W., Redfersn, J., Rowles, T., Scholik-Schlomer, A., Smith, A., Soldevilla, M., Stadler, J., Van Parijs, S., and Wahle, C., *Ocean Noise Strategy Roadmap* (2016).

[105] Kastelein, R.A., Schop, J., Gransier, R., Steen, N., and Jennings, N., Effect of series of 1 to 2 kHz and 6 to 7 kHz up-sweeps and down-sweeps on the behavior of a harbor porpoise (*Phocoena phocoena*), *Aquatic Mammals* 40: 232-42 (2014).

[106] Kastelein, R.A., Steen, N., Gransier, R., and de Jong, C.A.F., Threshold received sound pressure levels of single 1-2 kHz and 6-7 kHz up-sweeps and down-sweeps causing startle responses in a harbor porpoise (*Phocoena phocoena*), *Journal of the Acoustical Society of America* 131: 2325-33 (2012).

[107] Kastelein, R.A., van den Belt, I., Gransier, R., and Johansson, T., Behavioral response of a harbor porpoise (*Phocoena phocoena*) to 25.5- to 24.5-kHz sonar down-sweeps with and without side bands, *Aquatic Mammals* 41: 400-11 (2015).

[108] Kastelein, R.A., et al., Effect of series of 1 to 2 kHz and 6 to 7 kHz up-sweeps and down-sweeps, *supra*; Kastelein, R.A., et al., Behavioral response of a harbor porpoise (*Phocoena phocoena*) to 25.5- to 24.5-kHz sonar down-sweeps, *supra*.

[109] Kastelein, R.A., et al., Threshold received sound pressure levels of single 1-2 kHz and 6-7 kHz up-sweeps and

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.[110] 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."[111] 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.[112]

Here, too, we recommend further research and exploration of the feasibility of signal modification.[113]

The DSEIS appears both to defer conducting research on how modifying sonar signals (particularly upsweeps and downsweeps) might affect sonar performance until future studies confirm that it could be an effective mitigation measure; and conducting those studies itself. DSEIS at 5-58. This is not acceptable under NEPA. Obtaining information on the viability of this measure is especially important in this region, where, given the extraordinarily large number of takes estimated for harbor porpoises—the very subject of the Kastelein et al. signal modification study—the information is essential to a reasoned choice among alternatives. *See* 40 C.F.R. § 1502.22(a). While the Navy notes that "active sonar signals are designed explicitly to provide optimum performance at detecting underwater objects," it never explains why making the

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down-sweeps, *supra*.

[110] Götz, T., and Janik, V.M., Repeated elicitation of the acoustic startle reflex leads to sensitisation in subsequent avoidance behaviour and induces fear conditioning, *BMC Neuroscience* 12: 30, doi:10.1186/1471-2202-12-30 (2011).

[111] *Id*.

[112] Hastie, G.D., Donovan, C., Götz, T., and Janik, V.M., Behavioral responses by grey seals (*Halichoerus grypus*) to high frequency sonar, *Marine Pollution Bulletin* 79: 205-10 (2014).

[113] 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.

modifications implicated by the marine mammal behavioral studies discussed above would be impracticable. Indeed, some of those modifications, such as converting up-sweeps to down-sweeps, would not alter the system's spectral output in any way. The Navy must obtain information on the viability and effectiveness of this measure. 40 C.F.R. § 1502.22.

(3) 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;[114] 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.[115] 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.[116] The emerging development of automated whale blow detection systems for infrared video[117] also indicate this technology can feasibly be used for real-time whale detection and mitigation.

The Navy has correctly indicated the limitations inherent in thermal detection systems, including its lesser utility in warmer temperatures and foggy conditions, when whale blow is less distinguishable from the ambient air; but such systems are effective in the colder conditions often seen in the Northwest as a supplement to visual monitoring.[118] The Navy should employ thermal detection in optimal conditions, or, at minimum, require the establishment of a pilot program for thermal detection, with annual review under the adaptive management system established in MMPA rulemaking. The Navy states once again, as it has in several previous NEPA reviews, that it "plans to continue researching thermal detection systems to determine their effectiveness and compatibility with Navy applications." DSEIS at 5-63. A pilot program would be consistent with that interest, while allowing for trial use as a monitoring measure.

(4) Mitigation and research on Navy ship speeds

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[114] Leaper, R., Calderan, R.S., and Cooke, J. A simulation framework to evaluate the efficiency of using visual observers to reduce the risk of injury from loud sound sources, *Aquatic Mammals* 41: 375-87 (2015).

[115] Burkhardt, E. Kindermann, L., Zitterbart, D., and Boebel, O., Detection and tracking of whales using a shipborne, 360° thermal-imaging system, *in* Popper, A.N., and Hawkins, A. (eds.), *The Effects of Noise on Aquatic Life* (2012); Peckham, J., O'Young, S.D., and Jacobs, J.T., "Comparison of medium and long wave infrared imaging for ocean based sensing," *Journal of Ocean Technology* 10: 113-28 (2015); Zitterbart, D.P., Kindermann, L., Burkhardt, E., and Boebel, O., Automatic round-the-clock detection of whales for mitigation from underwater noise impacts, *PLoS ONE* 8: art. e71217 (2013).

[116] Churnside, J., Ostrovsky, L., and Veenstra, T., Thermal footprints of whales, *Oceanography* 22: 206-09 (2009).

[117] Santhaseelan, V., and Asari, V.K., "Automated whale blow detection in infrared video," *in* Zhou, J. (ed.), *Computer Vision and Pattern Recognition in Environmental Informatics*, at 58-78 (2015); Zitterbart, D.P., et al., Automatic round-the-clock detection of whales, *supra*.

[118] *E.g.*, Zitterbart, D.P., et al., Automatic round-the clock detection of whales, *supra*.

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[119] as well as for the size of the ship's acoustic footprint.[120] Based on studies of right whales, which NMFS has generally accepted as a proxy for other baleen whale populations, a vessel speed of 15 knots is estimated to result in an 80% probability of mortality if a ship strike were to occur; this probability approaches 100% at a speed of 20 knots or higher.[121] Slowing ships below 10 knots can reduce collision rates by 90% and decrease the probability of serious injuries or death.[122] The acoustic footprint of vessels also widens dramatically with speed, such that speed is one of the leading covariate influences on noise output from vessels.[123]

Ship strikes are a leading cause of large whale mortality off the U.S. west coast.[124] While elsewhere the Navy has indicated a need to operate at higher speeds under certain circumstances, such as when an aircraft carrier must maintain a minimum wind speed relative to ground in order to launch and receive aircraft, there are other conditions when maintaining a 10-knot vessel speed is surely practicable. The Navy should include restrictions to limit vessel speed within some of the mitigation areas cited above, particularly those intended to protect endangered large whales, as it has in certain portions of the Atlantic Fleet Training and Testing (AFTT) Study Area.[125]

Additionally, given that the speed of Navy ships during all aspects of their operations potentially impacts marine mammals, we recommend that the Navy collect and report data on ship speed as part of the EIS process. This will allow for objective evaluation of ship-strike risk, of harassment resulting from vessel activity, and of the potential benefit of additional speed-focused mitigation measures.

IV. ASSESSMENT OF TRIBAL CULTURAL IMPACTS

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[119] Conn, P.B., and Silber, G.K., Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales, *Ecosphere* 4: art. 43 (2013); Laist, D.W., Knowlton, A.R., and Pendleton, D., Effectiveness of mandatory vessel speed limits for protecting North Atlantic right whales, *Endangered Species Research* 23: 133-47 (2014).

[120] *E.g.*, McKenna, M.F., Wiggins, S.M., and Hildebrand, J.A., Relationship between container ship underwater noise levels and ship design, operational and oceanographic conditions, *Scientific Reports*, 3: 1760 (2013).

[121] Conn, P.B., and Silber, G.K., "Vessel speed restrictions reduce risk of collision-related mortality, *supra*.

[122] *Id.*; Wiley D.N., Thompson, M., Pace, R.M., and Levenson, J., Modeling speed restrictions to mitigate lethal collisions between ships and whales in the Stellwagen Bank National Marine Sanctuary, USA, *Biological Conservation* 144: 2377-81 (2011); Laist, D.W., et al., Effectiveness of mandatory vessel speed limits, *supra.*

[123] *E.g.*, McKenna, M.F. et al., Relationship between container ship underwater noise levels, *supra*; Vancouver Fraser Port Authority, ECHO Program voluntary vessel slowdown trial: Summary findings (2018).

[124] Rockwood, R.C., Calambokidis, J., and Jahncke, J., High mortality of blue, humpback and fin whales from modeling of vessel collisions on the US West Coast suggests population impacts and insufficient protection, *PLoS ONE* 12(8): e0183052 (2017).

[125] *See* Department of the Navy, Atlantic Fleet Training and Testing Draft Environmental Impact Statement/ Overseas Environmental Impact Statement (2017).

In addition to a rigorous assessment of the biological impacts discussed above, NEPA (and multiple treaties, laws, and polices) require an assessment of the cultural impacts of the Navy's activities. *See, e.g.*, § 40 C.F.R 1508.8. The vast coastal area affected by the Navy's proposed action holds great cultural and spiritual significance for U.S. Tribes and Canadian First Nations. In addition to emphasizing the Navy's obligation to conduct government-to-government consultation with each of the tribes in this region, we support and incorporate by reference the comments from the InterTribal Sinkyone Wilderness Council and others seeking a full analysis of these cultural effects across the affected area in any final EIS.

V. CONCLUSION

Thank you for considering our comments. 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).

Very truly yours,

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