MARINE MAMMAL COMMISSION

4 January 2021

Naval Facilities Engineering Command, Northwest
GOA Supplemental EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, Washington 98315–1101

Dear Sir or Madam:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the U.S. Navy's (the Navy) Draft Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (DSEIS) for training activities conducted within the Temporary Maritime Activities Area (TMAA) in the Gulf of Alaska (GOA, Phase III; 84 Fed. Reg. 80076). The DSEIS addresses the impacts on marine mammals from conducting training activities in the TMAA and is associated with the letter of authorization (LOA) application that the Navy submitted to the National Marine Fisheries Service (NMFS). NMFS is a cooperating agency for the DSEIS, which would serve as its environmental planning documentation for the rulemaking process under the Marine Mammal Protection Act.

The Navy previously analyzed the various impacts on marine mammals, first under the Tactical Training Theater Assessment and Planning EIS (TAP I) and second under the Phase II SEIS. The Commission recognizes and understands the effort that goes into drafting these documents and appreciates the Navy's response to and incorporation of some of the Commission's previous recommendations.

Background

The Navy proposes to conduct training activities in the waters off Kodiak, Alaska. The activities would involve the use of mid- and high-frequency sonar, weapons systems, explosive and non-explosive practice munitions and ordnance, high-explosive underwater detonations, expended materials, electromagnetic devices, high-energy lasers, vessels, and aircraft. Activities would occur from April–October. Under the No Action Alternative, the Navy would not conduct training activities[1]. Alternative 1, the Preferred Alternative, represents the status quo based on the 2016 final SEIS/OEIS and 2017 record of decision. In addition to potential time-area closures[2], mitigation measures would include visual monitoring[3] to implement delay and shut-down procedures.

[1] The Commission appreciates that the Navy included this alternative for Phase III DEISs and DSEISs consistent with DEISs for the Navy's Surveillance Towed Array Sensor System Low Frequency Active (SURTASS) sonar and the Commission's previous recommendations.
[2] Some of which correspond to documented biologically important areas.
[3] Passive acoustic monitoring would occur only when Navy assets with passive acoustic monitoring capabilities are already participating in an activity.

4340 East-West Highway • Room 700 • Bethesda, MD 20814-4498 • T: 301.504.0087 • F: 301.504.0099
www.mmc.gov

Density estimates

Uncertainty in density estimates—The Commission had recommended in previous letters regarding Navy Phase II activities that the Navy incorporate uncertainty and more refined data in its density estimates, including for cetaceans in regions or seasons that have not been surveyed and for pinnipeds in general. For Phase III activities in the Atlantic Fleet Training and Testing (AFTT) study area and Hawaii-Southern California Training and Testing (HSTT) study area, the Navy used more refined density estimation methods for cetaceans and accounted for uncertainty in those densities and the group size estimates[4] that seeded its animat modeling. Department of the Navy (2018) indicated that uncertainty in group size estimates for the Marianas Island Training and Testing (MITT) study area and Northwest Training and Testing (NWTT) study area was based on either Poisson or lognormal distributions, but did not indicate whether uncertainty was incorporated in the density estimates and what, if any, distribution was used[5]. Instead, Department of the Navy (2018) merely noted that a compound Poisson-gamma distribution was used for incorporating uncertainty in density estimates for AFTT and a lognormal distribution was used for densities associated with HSTT. Department of the Navy (2018) made no mention of incorporating measures of uncertainty—CVs were stipulated for numerous underlying density estimates in Department of the Navy (2020b)—in either the density or group size estimates for GOA. As such, the Commission assumes that the Navy did not incorporate uncertainty in either estimate.

As noted in the Commission's 15 September 2014 letter on Phase II activities in GOA, many of the CVs associated with the underlying density estimates that were used then and that have been used again for Phase III activities were quite large. For example, the densities for killer whales were 0.005 whales/km^2 (CV=0.59) for the inshore stratum, 0.002 whales/km^2 (CV=0.72) for the offshore stratum, 0.002 whales/km^2 (CV=0.77) for the seamount stratum, and 0.020 whales/km^2 (CV=0.92) for the slope stratum (Rone et al. 2017[6]). Using only the mean densities would very likely result in an underestimation of takes due to the CVs being so much greater than the mean point estimates. The abundance estimates for unidentified large whales also were prorated among blue, fin, and humpback whales within each stratum and incorporated proportionally into the blue whale density estimate that the Navy used from Rone et al. (2014). A high level of uncertainty and variability is inherent in using such prorated methods. In addition, some density estimates were based on data from Waite (2003) that included (1) a single sighting, for which the Navy noted the confidence in the density value was low and/or (2) f(0) and g(0) values derived from other surveys in the North Pacific[7] (Department of the Navy 2009).

For pinnipeds, many of the abundance estimates that informed the Navy's density estimates include CVs or other measures of uncertainty (e.g., standard error (SE), 95 percent confidence

[4] Using means and standard deviations that varied based on either a compound Poisson-gamma or lognormal distribution for densities and Poisson, lognormal, or inverse Gaussian distribution for group sizes.
[5] NMFS did clarify in the preamble to the NWTT final rule that uncertainty was incorporated into the density estimates. Specifically, a coefficient of variation (CV) was used to represent uncertainty in the species-specific density estimates, when available (85 Fed. Reg. 72325). However, NMFS did not clarify what type of distribution was used consistent with AFTT and HSTT.
[6] Which includes data from Rone et al. (2014).
[7] Waite (2003) did not provide survey-specific f(0) and g(0) values; therefore, those values originated from other surveys that occurred in the North Pacific. Waite (2003) data also were collected in summer (June and July) but were applied to other seasons.

intervals (CIs)) that can be incorporated as well (see NMFS's stock assessment reports (SARs) and Fritz et al. 2016). The Commission recommends that the Navy (1) clarify whether and how it incorporated uncertainty in both its density *and* group size estimates for its animat modeling specific to GOA and specify the distribution(s) used in the final SEIS and, (2) if uncertainty was not incorporated, re-estimate the numbers of marine mammal takes based on the uncertainty inherent in the density estimates provided in Department of the Navy (2020b) or the abundance estimates in the underlying references (NMFS SARs, Fritz et al. 2016, etc.). If the Navy chooses not to incorporate uncertainty in its density and group size estimates, the Commission recommends that the Navy specify why it did not do so in the final SEIS. The Commission further recommends that, when the Navy uses a single document such as Department of the Navy (2018) as the basis for its analytical methods, incorporate the relevant information regarding the analytical methods for *all* DEISs and DSEISs at the outset or revise the document accordingly to include such information as it becomes available—this would apply to upcoming Phase IV documents as well.

Gray whale densities—The Navy acknowledged that gray whales migrate through, as well as feed in, the Gulf of Alaska (Department of the Navy 2020b). However, it based the gray whale density estimates in the Gulf of Alaska on migrating whales, specifically the overall density of north and southbound migrating whales off the coast of San Clemente Island in California in 1998 and 1999 (Carretta et al. 2000)[8] prorated based on the occurrence of southbound migrating whales in two offshore zones (0–5 km and 5–37 km from shore) of coastal California near Granite Canyon (Sheldon and Laake 2002). The resulting densities the Navy used were 0.04857 and 0.00243 whales/km^2 for inshore and offshore densities, respectively. The Commission notes multiple issues with the assumptions and resulting densities.

First, Carretta et al. (2000) provided inshore and offshore densities[9] (0.115 and 0.032 whales/km^2, respectively), so the Navy did not need to prorate the overall density based on delineations from a completely different area in California. Second, the Navy assumed, both for migrating and feeding gray whales, that the density delineations for NWTT were 0–10 km for inshore and 10–47 km for offshore based on DeAngelis et al. 2011 (Department of the Navy 2020c). Third, the Navy's GOA densities do not consider gray whales feeding farther offshore than 37 km, which is known to occur in the TMAA within the Kodiak Island biologically important area (BIA; Ferguson et al. 2015). Ferguson et al. (2015) specified that gray whales have been observed year-round off the east coast of Kodiak Island, with greatest densities from June through August. The Navy confirmed that gray whale calls have been recorded from July through October within the TMAA, primarily on the continental shelf (Department of the Navy 2020b).

Based on the densities the Navy used for gray whales, it estimated zero takes of any type. Given that there are no density estimates available for gray whales in the TMAA but they could occur there within the timeframe that the Navy's activities are proposed to occur, the Navy should request a small number of gray whale takes, regardless of whether its model estimated zero takes. If the Navy considers the density data from Carretta et al. (2000) to be the best available for gray whales in GOA, the Commission recommends that the Navy (1) use the inshore density of 0.115 whales/km^2 for 0–5.5 km from shore and the offshore density of 0.032 whales/km^2 for 5.5–45 km from shore provided in Carretta et al. (2000) and re-estimate the numbers of gray whale takes

---

8 0.051 whales/km^2.

9 Inshore densities extended out to 5.5 km and to approximately 45 km for offshore densities.

accordingly and (2), if zero takes are estimated, request a small number of Level B harassment behavior takes of gray whales in its LOA application that it submits to NMFS.

Beaked whale densities—Baird's, Stejneger's, and Cuvier's beaked whales have been detected using various passive acoustic monitoring devices in the TMAA, while only Baird's and Cuvier's beaked whales have been observed visually. For the 2013 survey in the TMAA, Rone et al. (2014) documented six on-effort sightings of 49 Baird's beaked whales[10] and one sighting of a single Cuvier's beaked whale. The researchers also documented 47 acoustic encounters of Cuvier's beaked whales, 32 acoustic encounters of Baird's beaked whales, and six encounters of Stejneger's beaked whales (Rone et al. 2014). Yack et al. (2015) were able to derive stratum-specific[11] density estimates for Cuvier's beaked whales but were unable to do so for the other two species due to insufficient sample sizes. The Navy assumed that the pooled density estimate of 0.0021 whales/km^2 from Yack et al. (2015) should be applied to the three depth strata for Stejneger's beaked whales (Department of the Navy 2020b). That approach is reasonable.

However, rather than applying the same approach for Baird's beaked whales, the Navy used a presumed density of 0.0005 whales/km^2 from Waite (2003) based on a single sighting of four Baird's beaked whales. That density estimate is of little value based on the Commission's critique of data that originated from Waite (2003) in a previous section herein. In addition, the Navy itself specified that six visual sightings and numerous acoustic detections of Baird's beaked whales occurred during the 2013 survey in the TMAA (Department of the Navy 2020b). Rone et al. (2014) also noted that Baird's beaked whales often travel in large groups. The Navy further specified average group size as 8.08 for Baird's beaked whales, 2.04 for Cuvier's beaked whales, and 6 for Stejneger's beaked whales (see Table 26 in Department of the Navy 2020a). As such, the density from Waite (2003) is a vast underestimate.

Further, Rone et al. (2014) documented the first fine-scale habitat use of a tagged Baird's beaked whales in the region. The tagged individual demonstrated the importance of seamount habitat, remaining approximately nine days, presumably foraging, within a relatively small geographic range inside the GOA TMAA, with approximately six of those days spent in the vicinity of a single seamount (Rone et al. 2014). The greatest density of Cuvier's beaked whales also was attributed to the seamount stratum based on Yack et al. (2015). At a minimum, the stratum-specific densities for Cuvier's beaked whales should have been used as surrogates for Baird's beaked whales, with the understanding that the Cuvier's beaked whale densities may still be an underestimate based on the larger group size of Baird's beaked whales. The Commission recommends that the Navy use the three stratum-specific densities of Cuvier's beaked whales as surrogates for Baird's beaked whales and re-estimate the numbers of takes accordingly.

Harbor porpoise densities—The Navy indicated that it used data derived from Hobbs and Waite (2010) to characterize harbor porpoise density in various strata based on published depth distributions (Department of Navy 2020b). The Navy did not stipulate where those depth strata delineations originated or what density from Hobbs and Waite (2010) was used. Hobbs and Waite (2010)

[10] Ranging from 2–16 whales in each group.
[11] For 0.002 whales/km^2 for the offshore stratum, 0.003 whales/km^2 for the seamount stratum, and 0.008 whales/km^2 for the slope stratum.

provided an uncorrected density of 0.062 porpoises/km^2 for the Gulf of Alaska and a corrected abundance of 31,046 porpoises[12] for the 158,733 km^2 area surveyed (see Table 2), which would result in a corrected density of 0.198 porpoises/km^2. Both densities are greater than the 0.0473 porpoises/km^2 that Navy used for GOA[13] (Department of the Navy 2020b). If the Navy considers the data in Hobbs and Waite (2010) to be the best available science, the Commission recommends that the Navy use the corrected density of 0.198 porpoises/km^2 from Hobbs and Waite (2010) for the 100- to 200-m isobath stratum and re-estimate the numbers of takes accordingly for harbor porpoises.

Pinniped densities—In previous Commission letters regarding Phase II activities, the Commission recommended that the Navy incorporate telemetry data, appropriate age and sex assumptions, and relevant haul-out correction factors appropriately[14] to better refine its density estimates. The Navy did so for Phase III activities at NWTT but to a much lesser degree for GOA. As was the case for Phase II activities for GOA, the Navy again used abundance estimates divided by given areas to estimate densities and the areas again were inconsistent among species. For example, the Navy used—

- the GOA Large Marine Ecosystem (LME) area for northern fur seals,
- the critical habitat designated areas for the Eastern and Central Gulf of Alaska for western Steller sea lions (western distinct population segment (wDPS)),
- an approximation of the area of the eastern distinct population segment (eDPS) for eastern Steller sea lions,
- U.S. Geological Survey's (USGS) definition of the Gulf of Alaska for northern elephant seals, and
- the continental shelf area extending to the 500-m isobath for harbor seals (Department of the Navy 2020b).

Those areas may be appropriate for some species or stocks but not for others. Specifically, it is unclear why the Navy did not use the GOA LME area for elephant seals, as both density estimates incorporated telemetry data over given areas.

For northern fur seals, the information the Navy provided in the text for delineating juveniles by sex does not match the information in Table 10-2 (Department of the Navy 2020b). The abundances for juvenile males and females in each of the five months that are provided in Table 10-3 cannot be recreated by using either the information in the text or the information in Table 10-2 of Department of the Navy (2020b). More importantly, the Navy assumed that juveniles would not occur in the Gulf of Alaska after August. However, some juveniles could be migrating south in October (Zeppelin et al. 2019). As such, the Navy potentially underestimated the numbers of juvenile fur seals that could be taken during September and October by assuming none would be taken. The Commission recommends that the Navy (1) ensure that the information in the text and in Table 10-2 in Department of the Navy (2020b) is consistent regarding the assumed delineations of juvenile northern fur seals by sex and that the abundances provided in Table 10-3 are correct for those assumptions, (2) apply to September and October the same assumptions that were made

[12] Based on both perception and availability biases.
[13] From 100- to 200-m isobaths.
[14] Thus, the percentage of time at sea.

regarding juveniles of both sexes for August , and (3) re-estimate the numbers of takes of northern fur seals accordingly.

Similar to previous Commission comments on the Navy's pinniped densities, it is unclear why the Navy did not forward-project the abundance estimates of wDPS and eDPS Steller sea lions to at least 2021, as trend data are available in NMFS's 2019 stock assessment reports. It also is unclear why the Navy used Fritz et al. (2016) for the abundance estimates for western and eastern Steller sea lions. Those abundances were from surveys conducted in 2015 and have been updated by Sweeney et al. (2017 and 2018) as referenced in NMFS's 2019 stock assessment reports. In addition, the Navy indicated that it derived densities for eDPS Steller sea lions, which would result in 0.376 sea lions/km^2 for the strata out to the 500-m isobath following the method described in Department of the Navy (2020b). However, the Navy indicated that the densities were zero for eDPS Steller sea lions in Table 10-6. This makes no sense if, as the Navy stated, it derived a density for a small portion of the range that would overlap with the eDPS to determine quantitatively whether Navy activities would impact eastern Steller sea lions. The number of takes may in fact be zero, but the density out to the 500-m isobath would not. The Commission recommends that the Navy (1) re-estimate Steller sea lion densities for the wDPS and eDPS based on abundance data from Sweeney et al. (2017 and 2018) rather than Fritz et al. (2016) and forward-project the abundance estimates into 2021 using the trend data provided in NMFS's 2019 stock assessment report, (2) revise Table 10-6 in Department of the Navy (2020b) to include the actual eDPS density out to the 500-m isobath, and (3) revise the numbers of Steller sea lion takes for both the wDPS and eDPS accordingly.

In addition to the Navy's use of an inconsistent geographical area for elephant seals, the Commission notes that the Navy did not forward-project the abundance estimate. The abundance estimate the Navy used for elephant seals is from 10 years ago and should have been forward-projected into 2021 based on the growth rate included in NMFS's 2019 SARs. The abundance that the Navy used is underestimated by more than 100,000 seals or by 56 percent, which is not insignificant. The Commission recommends that the Navy (1) specify why it chose to use the USGS GOA area rather than the GOA LME area, (2) re-estimate the density of elephant seals based on abundance data forward-projected into 2021 using the trend data provided in NMFS's 2019 stock assessment report, and (3) re-estimate the number of elephant seal takes accordingly.

Lastly for harbor seals, the Navy indicated that it derived the proportion of the total population estimates in Table 10-11 from data provided by model A in Table 2 of Hastings et al. (2012). While Hastings et al. (2012) provided survival estimates of various age classes for seals on Tugidak Island in Table 2, they did not provide relative age-class proportions for the population. The Navy also used abundance estimates from 2015–2018 for the four stocks[15]. As for other pinniped species, those estimates should have been forward-projected into 2021 based on the trend data available in NMFS's 2019 SARs. In addition, the Navy did not provide any references regarding its assumption that harbor seals would be in the water for 50 percent of the time from June through September and for 60 percent of the time in April, May, and October. Boveng et al. (2012) indicated that the proportion of seals hauled out in Cook Inlet peaked at 43 percent in June compared to 32 percent in October. Those haul-out proportions would equate to 57 percent of seals in the water in

[15] North Kodiak and South Kodiak stocks have increased, while Prince William Sound and Cook Inlet/Shelikof Strait stocks have decreased. However, there would be a net increase in the overall abundance.

June and 68 percent of the seals in the water in October—both of which are greater than the Navy's assumptions. For simplicity, the Navy could have used 60 and 70 percent rather than 50 and 60 percent. The Commission recommends that the Navy (1) re-estimate the densities of harbor seals based on the abundance data forward-projected into 2021 using the trend data provided in NMFS's 2019 stock assessment report and based on 60 percent of seals being in the water from June through September and 70 percent of the seals being in the water in April, May, and October as denoted in Boveng et al. (2012) and (2) re-estimate the number of harbor seal takes accordingly.

Criteria and thresholds

Thresholds in general—As stated in letters related to "NMFS's Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: Underwater acoustic thresholds for onset of permanent and temporary threshold shifts" (PTS and TTS, respectively; NMFS 2018), the Commission has supported the weighting functions and associated thresholds used for Navy Phase III activities (Department of the Navy 2017). Numerous more recent studies provide additional information on behavioral audiograms (e.g., Branstetter et al. 2017, Cunningham and Reichmuth 2015, Kastelein et al. 2017b and 2019b) and TTS (e.g., Kastelein et al. 2017a and c, Popov et al. 2017, Kastelein et al. 2018a and b, 2019c, d, and e, and 2020a, b, and c). The Navy discussed some of these references in its DSEIS and indicated that either the composite audiograms were consistent with the recently-reported behavioral audiograms or the criteria, presumably the TTS (and thus PTS) thresholds, were still considered conservative as compared to the recently-reported TTS data. However, the Navy did not include Kastelein et al. (2020c) in the DSEIS or discuss how a few of those researchers' other recent studies compared to the TTS thresholds the Navy used for harbor porpoises and harbor seals. The Commission recommends that the Navy specify in the final SEIS whether TTS data from Kastelein et al. (2019c and e and 2020 a, b, and c) support the continued use of the current weighting functions and PTS and TTS thresholds.

Behavior thresholds for non-impulsive sources—To further define its behavior thresholds for non-impulsive sources[16], the Navy developed multiple[17] Bayesian biphasic dose response functions[18] (Bayesian BRFs) for Phase III activities. The Bayesian BRFs were a generalization of the monophasic functions previously developed[19] and applied to behavioral response data[20] (see Department of the Navy 2017 for specifics). The biphasic portions of the functions are intended to describe both level- and context-based responses as proposed in Ellison et al. (2011). At higher amplitudes, a level-based response relates the received sound level to the probability of a behavioral response; whereas, at lower amplitudes, sound can cue the presence, proximity, and approach of a sound source and stimulate a context-based response based on factors other than received sound level[21]. The

[16] Acoustic sources (i.e., sonars and other transducers).
[17] For odontocetes, mysticetes, beaked whales, and pinnipeds. The Navy used the 120-dB re 1 μPa unweighted, step-function threshold for harbor porpoises as it had done for Phase II activities.
[18] Comprising two truncated cumulative normal distribution functions with separate mean and standard deviation values, as well as upper and lower bounds. The model was fitted to data using the Markov Chain Monte Carlo algorithm.
[19] By Antunes et al. (2014) and Miller et al. (2014).
[20] From both wild and captive animals.
[21] e.g., the animal's previous experience, separation distance between sound source and animal, and behavioral state including feeding, traveling, etc.

Commission agrees that the Bayesian BRFs are reasonable and a much-needed improvement on the two dose response functions (BRFs)[22] that the Navy had used for both TAP I and Phase II activities.

The Commission, however, remains concerned that following the development of the BRFs, the Navy then implemented various cut-off distances beyond which it considered the potential for significant behavioral responses to be unlikely (Table C.4 in Department of the Navy 2017). The Navy indicated it was likely that the context of the exposure is more important than the amplitude at large distances[23] (Department of the Navy 2017)—that is, the context-based response dominates the level-based response. The Commission agrees with that notion but notes that the Bayesian BRFs specifically incorporate those factors. Thus, including additional cut-off distances *contradicts* the data underlying the Bayesian BRFs, *negates* the intent of the functions themselves, and *underestimates* the numbers of takes.

The actual cut-off distances used by the Navy also appear to be unsubstantiated. For example, the Navy indicated that data were not available regarding the response distances of harbor porpoises to sonar or other transducers, so it based the cut-off distances on harbor porpoise responses to pile-driving activities. The Commission disagrees with that choice, given that pile driving is an impulsive rather than non-impulsive source and unrelated to the Bayesian BRFs. For pinnipeds, the Navy indicated there are limited data on pinniped behavioral responses in general, and a total lack of data beyond 3 km from the source. However, the Navy arbitrarily set the cut-off distance at 5 and 10 km depending on the source. In response to the Commission's comments regarding those cut-off distances, the Navy indicated that pinnipeds do not exhibit strong reactions to sound pressure levels up to 140 dB re 1 μPa based on Southall et al. (2007; 83 Fed. Reg. 65230). The Commission notes, as did the Navy, that data from Southall et al. (2007) were limited, based on sources that did not have characteristics similar to mid-frequency active (MFA) sonar[24], and did not include exposures at higher received levels. Data on pinniped behavioral responses now exist for both sound sources similar to MFA sonar and at higher received levels. Those data ultimately were used by the Navy to develop the Bayesian BRF for pinnipeds (see Table 3-2 in Department of the Navy 2017 for specifics), while none of the data cited in Southall et al. (2007) were used. Some of the pinnipeds did in fact exhibit 'strong' reactions based on the Southall et al. (2007) severity scale[25] to received levels less than and equal to 140 dB re 1 μPa, and those data were used to inform the context portion of the Bayesian BRF.

For cetaceans other than harbor porpoises, the Navy based the cut-off distances on scant acoustic data from a single species each for beaked whales and mysticetes and tag data from Risso's dolphins. Interestingly, Risso's dolphins tens of kilometers from the source exhibited similar

---

[22] One for odontocetes and pinnipeds and one for mysticetes.
[23] For example, the Navy indicated that the range to the basement level of 120 dB re 1 μPa for the BRFs from TAP I and Phase II sometimes extended to more than 150 km during activities involving the most powerful sonar sources (e.g., AN/SQS-53).
[24] Some sources emitted sound at much lower frequencies (the acoustic thermometry of the ocean climate (ATOC) sound source emitted signals at a center frequency of 75 Hz) and at a greater repetition rate than MFA sonar (Costa et al. 2003). Other sources emitted sound at higher frequencies (the Airmar™ acoustic harassment device (AHD) emitted signals at 10 kHz or higher and acoustic communication signals were emitted at 12 kHz with higher frequency harmonics) and at a greater repetition rate with shorter pulse durations (specifically the AHD) than MFA sonar (Jacobs and Terhune 2002, Kastelein et al. 2006).
[25] Equating to significant behavioral responses as specified by the Navy.

responses to those that were within hundreds of meters of the source (Southall et al. 2014). That is, the dolphins did not exhibit any clear, overt behavioral response to either the real MFA source or the scaled MF source at either distance, and the scaled MF source had to be shut down from full power when the dolphins entered the 200-m shut-down zone. Accordingly, the Commission remains unconvinced of the appropriateness of the Navy's proposed cut-off distances.

Moreover, depending on the activity and species, the cut-off distances could effectively eliminate a large portion of the estimated numbers of takes. For sonar bin MF1 (the most powerful MFA sonars), the estimated numbers of takes would be reduced to zero beginning where the probability of response is between 40 and 58 percent for odontocetes and 45 and 66 percent for beaked whales (Table 3.8-8 in the DSEIS). For mysticetes, takes would be eliminated for MF1 sources at a received level of 154 to 160 dB re 1 μPa equating to a probability of response of approximately 18 percent. While that percentage may seem inconsequential, the received level is in fact greater than the level at which actual context-based behavioral responses were observed for feeding blue whales (see Figure 3 in Goldbogen et al. 2013[26]). The Navy attempted to assuage the Commission's concerns[27] in its response to comments regarding the AFTT DEIS[28] by asserting that the use of the Bayesian BRFs in conjunction with the cut-off distances is currently the best-known method for providing the public and regulators with a more realistic (but still conservative where some uncertainties exist) estimate of impacts and potential takes. The Commission disagrees. Use of the cut-off distances is neither conservative nor realistic and effectively discounts the underlying data, including Goldbogen et al. (2013), upon which the BRFs are based.

Tyack and Thomas (2019) compared results between setting a threshold where 50 percent of the animals respond and using the actual Bayesian BRF—setting the threshold at a 50-percent response led to an underestimation of effect by greater than two orders of magnitude[29]. Although the arbitrary cut-off distance in the Navy's example occurred where up to 45 percent of the animals respond, the behavioral impacts and takes of the various species have been underestimated as well. As noted by Tyack and Thomas (2019), given the shape of the dose-response function and how efficiently sound propagates in the ocean, the number of animals that are predicted to have a low probability of response may in fact represent the dominant impact from a given sound source. Given that Dr. Thomas developed the Bayesian BRFs for the Navy and has highlighted the shortcomings associated with assuming only a portion of the animals respond[30] rather than using the Bayesian BRFs as intended, it would be prudent for the Navy to heed the results provided in Tyack and Thomas (2019). For all these reasons, the Commission strongly recommends that the Navy refrain from using cut-off distances in conjunction with the Bayesian BRFs and re-estimate the numbers of marine mammal takes based solely on the Bayesian BRFs. Use of cut-off distances is continuing to be perceived by the public as an attempt to reduce the numbers of takes (85 Fed. Reg. 72326), which is discussed in a subsequent section of this letter. Furthermore, the Commission contends that alternatives to the Navy's cut-off distances need not be provided, as their use is unnecessary.

---

[26] Data that also were used to derive the Bayesian BRFs. Southall et al. (2019) showed similar results.
[27] See its 2 August 2017 letter on AFTT.
[28] Similar responses were provided for HSTT, NWTT, and MITT final EIS/SEISs.
[29] By a factor of 280.
[30] Which corresponds to using various arbitrary cut-off distances.

Behavior thresholds for explosives—The Navy assumed a behavior threshold 5 dB lower than the TTS threshold for each functional hearing group for explosives. As noted in Department of the Navy (2017), that value was derived from observed *onset* behavioral responses of captive bottlenose dolphins during non-impulsive TTS testing[31] (Schlundt et al. 2000). Basing an impulsive threshold on responses of dolphins to a non-impulsive source is questionable, but more concerning is that the Navy continues to claim that marine mammals do not exhibit behavioral responses to single detonations (Department of the Navy 2017)[32]. The Navy has asserted that the most likely behavioral response would be a brief alerting or orienting response and significant behavioral reactions would not be expected to occur if no further detonations followed. Although there are no data to substantiate that assertion, the Navy notes that the same reasoning was used in previous ship shock trial final rules in 1998, 2001, and 2008. Without such data, there is no reason to continue to ascribe validity to assumptions made 10 to 20 years ago. Larger single detonations (such as bombing exercises[33]) would be expected to elicit 'significant behavioral responses'[34]. The Navy provided no evidence regarding why an animal 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 100 lbs., let alone detonations of up to 1,000 lbs.

In response to the Commission's comments on the AFTT and HSTT DEISs[35], the Navy indicated that there is no evidence to support that animals have significant behavioral reactions to temporally and spatially isolated explosions and that it has been monitoring detonations since the 1990s and has not observed those types of reactions. Due to human safety concerns, the Navy has never, as far as the Commission is aware, stationed personnel at the target site to monitor marine mammal responses during large single detonations. In other instances (i.e., bombs dropped from aircraft), the lookout is tasked primarily with clearing the mitigation zone and realistically only observes for animals in the central portion of that zone immediately prior to the activity commencing. Lookouts are not responsible for documenting an animal's behavioral response to the activity, but rather are responsible for minimizing serious injury to and mortality of any observed animal. Additionally, the Navy was not required to conduct post-activity monitoring for any of its activities under the Phase II final rules (e.g., 50 C.F.R. § 218.144) and post-activity monitoring is conducted primarily to document injured and dead marine mammals, not behavioral responses.

In response to the Commission's comments on the NWTT proposed rule, NMFS acknowledged that individuals exposed *above* the TTS threshold also may be harassed by behavioral disruption, that those potential impacts are considered in the negligible impact determination, and that neither NMFS nor the Navy is aware of evidence to support the assertion that animals will have significant behavioral responses (i.e., those that would rise to the level of a take) to temporally or spatially isolated explosions at received levels below the TTS threshold (85 Fed. Reg. 72325). Delineation of behavior takes occurring above the TTS threshold is irrelevant to those that occur

---

[31] Based on 1-sec tones.
[32] Including certain gunnery exercises that involve several detonations of small munitions within a few seconds.
[33] With net explosive weights of 251–600 lbs for bin E10 and 651–1,000 lbs for bin E12.
[34] Including the animals (1) altering their migration path, speed and heading, or diving behavior; (2) stopping or altering feeding, breeding, nursing, resting, or vocalization behavior; (3) avoiding the area near the source; or (4) displaying aggression or annoyance (e.g., tail slapping). These factors were described in Department of the Navy (2017) and used by the Navy to differentiate behavioral response severity.
[35] See its 13 November 2017 letter on the HSTT DEIS.

below the TTS threshold[36]. Furthermore, a lack of evidence, particularly when concerted monitoring is not occurring for any portion of the Level B harassment zones for behavior during detonations, does not equate to behavior takes not potentially occurring. Behavior takes from numerous types of activities have not been documented, but are presumed to occur, including for low-level activities such as those involving high-resolution geophysical and other mapping devices and ice breaking. Moreover, the Navy routinely requests and NMFS routinely authorizes behavior takes of marine mammals associated with exposure to *single* in-air explosive events (e.g., missile launch noise and sonic booms; 84 Fed. Reg. 28462). In fact, NMFS has based its take estimates on the numbers of animals that have responded behaviorally to single launch events (84 Fed. Reg. 28470). Continuing to dismiss the fact that a single explosive event, including that of a 1,000-lb bomb, has the potential to cause behavior takes to marine mammals underwater is bordering on the absurd, given that an animal exposed to such an event is expected to exhibit the factors the Navy differentiated as a behavioral response in Department of the Navy (2017b) *and* behavior takes are routinely authorized for such events when exposed in air. <u>The Commission</u> continues to maintain that the Navy, and in turn NMFS, has not provided adequate justification for dismissing the possibility that single underwater detonations can cause a behavioral response and therefore again <u>recommends</u> that the Navy estimate and ultimately request behavior takes of marine mammals during *all* explosive activities, including those that involve single detonations consistent with in-air explosive events.

Mortality and injury thresholds for explosives—The Commission notes that the constants and exponents[37] associated with the impulse metrics for both onset mortality and onset slight lung injury have been amended from those used in TAP I and Phase II activities. The Navy did not explain why the constants and exponents have changed when the underlying data[38] have remained the same. The modifications yield smaller zones[39] in some instances and larger zones in other instances[40]. These results are counterintuitive since the Navy presumably amended the impulse metrics to account for lung compression with depth, thus the zones would be expected to be smaller rather than larger the deeper the animal dives.

The Commission provided similar comments in its letters regarding the other Phase III DEIS/DSEISs. However, the Navy did not provide an explanation regarding the constants and exponents or specify the assumptions made in either final EIS. The Navy merely directed the Commission to Department of the Navy (2017)—the document from which the Commission's comments originated. NMFS, however, did provide a response in the preamble to the NWTT final rule. It stated that the numerical coefficients are slightly larger in Phase III than in Phase II, resulting in a slightly greater threshold near the surface and the rate of increase for the Phase II thresholds with depth is greater than the rate of increase for Phase III thresholds with depth because the Phase III equations take into account the corresponding reduction in lung size with depth (making an animal more vulnerable to injury per the Goertner model; 85 Fed. Reg. 72327). NMFS's response does not explain why *lower* absolute thresholds prevail below 8 m in depth and why, if lung compression is accounted for in Phase III, the rate of *increase* of the Phase II thresholds with depth

[36] That is, animals are expected to respond behaviorally to stressors that also can cause auditory impairment and other types of injuries. In those instances, it is the more adverse impact that is considered.
[37] The constants have increased and the exponents have decreased from 1/2 to 1/6.
[38] Based on Richmond et al. (1973), Yelverton et al. (1973), Yelverton and Richmond (1981), and Goertner (1982).
[39] When animals occur at depths between the surface and 8 m, yielding higher absolute thresholds.
[40] When animals occur at depths greater than 8 m, yielding lower absolute thresholds.

would be greater when lung compression was not accounted for. The Commission again recommends that the Navy explain why the constants and exponents for onset mortality and onset slight lung injury thresholds[41] for Phase III that consider lung compression with depth result in lower rather than higher absolute thresholds when animals occur at depths greater than 8 m.

The Navy again used the onset[42] mortality and onset slight lung injury criteria to determine only the range to effects[43], while it used the 50 percent mortality and 50 percent slight lung injury criteria to estimate the numbers of marine mammal takes[44]. That approach is inconsistent with the manner in which the Navy estimated the numbers of takes for PTS, TTS[45], and behavior[46] for explosive activities. All of those takes have been and continue to be based on onset, not 50-percent values.

Although the effectiveness of the Navy's mitigation measures[47] has yet to be determined, the circumstances of the deaths of multiple common dolphins during one of the Navy's underwater detonation events in March 2011 (Danil and St. Leger 2011) indicate that the Navy's mitigation measures are not fully effective, especially for explosive activities. It would be more prudent for the Navy to estimate injuries and mortalities based on onset rather than a 50-percent incidence of occurrence. The Navy indicated that it is reasonable to assume for its impact analysis—thus its take estimation process—that extensive lung hemorrhage[48] is a level of injury that would result in mortality for a wild animal (Department of the Navy 2017). Thus, it is unclear why the Navy did not estimate the numbers of takes based on onset rather than the 50-percent criterion.

What is clear is that the 50-percent rather than onset criteria underestimate both predicted mortalities and injuries. The Navy's response in the Phase III final EIS/SEISs, and NMFS's responses in the corresponding preamble to the final rules, that overpredicting impacts by using onset values would not afford extra protection to any animal[49] is irrelevant from an impact analysis standpoint. The intent of an impact analysis is to estimate and evaluate impacts (i.e., takes) from the proposed activities accurately. There is no logical reason for basing the estimated impacts on onset of PTS, TTS, and behavioral response for sublethal effects; while for lethal and injurious effects, the impacts are based on a 50-percent criterion. NMFS's additional response in the preamble to the NWTT final rule that estimating takes based on the onset values would overpredict effects because many of those exposures would not happen because of effective mitigation (85 Fed. Reg.72328) is unsubstantiated. The Navy has not determined the effectiveness of any of its mitigation measures, and explosive activities for which mitigation measures were implemented still resulted in the deaths of multiple common dolphins. Potential mortalities and injuries must be fully accounted for rather

[41] Equations 11 and 12 in Department of the Navy (2017).
[42] Defined as the 1-percent risk in the HSTT FEIS.
[43] To inform the mitigation zones.
[44] A similar approach was taken for gastrointestinal (GI) tract injuries.
[45] In the preamble to the NWTT final rule, NMFS appeared to conflate onset values with the amount of a threshold shift necessary to be deemed TTS, which is 6 dB (85 Fed. Reg. 72328).
[46] Contrary to NMFS's assertion that the behavior thresholds are not based on onset values in the preamble to the NWTT final rule, the Navy specified that the behavior thresholds for explosives were derived from observed *onset* behavioral responses of captive bottlenose dolphins during non-impulsive TTS testing based on Schlundt et al. (2000; see Department of the Navy 2017).
[47] Which is discussed further herein.
[48] i.e., onset mortality; see Table 4-1 in Department of the Navy (2017).
[49] And yet the mitigation zones are based on the onset values, so the animals would in fact be afforded 'extra protection'.

than erroneously discounted in any impact analysis. The Commission again recommends that the Navy use onset mortality, onset slight lung injury, and onset GI tract injury thresholds rather than the 50-percent thresholds to estimate both the numbers of marine mammal takes *and* the respective ranges to effect. If the Navy does not implement the Commission's recommendation, the Commission further recommends that the Navy (1) specify why it is inconsistently basing its explosive thresholds for Level A harassment on onset PTS and Level B harassment on onset TTS and onset behavioral response, while the explosive thresholds for mortality and Level A harassment are based on the 50-percent criteria for mortality, slight lung injury, and GI tract injury, (2) provide scientific justification supporting the assumption that slight lung and GI tract injuries are less severe than PTS and thus the 50-percent rather than onset criteria are more appropriate for estimating Level A harassment for those types of injuries, and (3) justify why the number of estimated mortalities should be predicated on at least 50 percent rather than 1 percent of the animals dying.

As noted in the following section, many of the mitigation zones are not sufficient to protect the various functional hearing groups. Further complicating this issue is the fact that the effectiveness of the various mitigation measures has yet to be proven. Thus, continuing to espouse the presumed effectiveness of those measures is unfounded.

Mitigation measures

The Navy's proposed mitigation zones are similar to the zones[50] previously used during Phase II activities and are intended, based on the Phase III DSEIS, to avoid the potential for marine mammals to be exposed to levels of sound that could result in injury (i.e., PTS). However, the Phase III proposed mitigation zones would not protect several functional hearing groups[51] from PTS. For example, the mitigation zone for an explosive bomb[52] is 2,286 m (Table 5.3-5 in the DSEIS), but the mean PTS zone is 4,327 m for HF cetaceans[53]. The appropriateness of such zones is further complicated by aircraft deploying bombs at surface targets directly beneath the aircraft, minimizing the ability to observe the entire extent of the zone(s). In addition, explosive projectiles (both medium-sized and large projectiles) are fired from vessels at targets 3.7 and 11.1 km away from the firing platform, respectively. Ships do not clear the target area before launching the various projectiles. In either case, marine mammals could be present in the target area at the time of the launch unbeknownst to the Navy.

In addition, the Navy indicated in the DSEIS that lookouts would not be 100 percent effective at detecting all species of marine mammals for every activity because of the inherent limitations of observing marine species and because the likelihood of sighting individual animals is largely dependent on observation conditions (e.g., time of day, sea state, mitigation zone size, observation platform) and animal behavior (e.g., the amount of time an animal spends at the surface

[50] The Commission appreciates that the Navy has provided the estimated mean, minimum, and maximum distances for all impact criteria (i.e., behavior, TTS, PTS, onset slight lung injury, onset slight gastrointestinal injury, and onset mortality) for the various proposed activity types and for all functional hearing groups of marine mammals. That approach is consistent with the Commission's recommendations on Phase II activities.
[51] This routinely occurs for high-frequency (HF) cetaceans within GOA and can occur for low-frequency cetaceans and phocids in other Navy study areas.
[52] Bin E12 in DSEIS.
[53] The maximum range extends to 7,275 m for HF cetaceans (Table 3.8-31 in the DSEIS).

of the water). The Commission agrees and has made repeated recommendations to the Navy regarding the effectiveness of visual monitoring. Since 2010, the Navy has been collaborating with researchers at the University of St. Andrews to study Navy lookout effectiveness. The Navy does not appear to have mentioned that study in its DSEIS for Phase III. For its Phase II DEISs, the Navy noted that the data that had been collected could not be analyzed in a statistically significant manner[54]. The Navy has been conducting those studies for more than a decade but on a scale and in a manner that apparently has been insufficient to provide useful results. The most recent lookout effectiveness report posted on the Navy's monitoring website is from four years ago (Department of the Navy 2016). According to the Navy's monitoring website it has allocated only $40K to $60K to the effort for the period from 2010 to 2019, while other projects range from 100s of thousands to $1.4M over shorter timeframes[55]. Moreover, many of the lookout effectiveness cruises have occurred in areas where few marine mammals are present, which has delayed statistically-meaningful data analyses.

In response to previous recommendations from the Commission regarding the lookout effectiveness study, NMFS included a term and condition in the incidental take statements issued under the Endangered Species Act (ESA) for MITT and NWTT requiring the Navy to provide a final report 90 days after 31 December 2021 that includes a statistical assessment of the data available to date characterizing the effectiveness of Navy lookouts relative to trained marine mammal observers for the purposes of implementing the mitigation measures (85 Fed. Reg. 72350). The Commission appreciates that NMFS's section 7 ESA biologists believed it prudent to elicit some response from the Navy on this long-standing project. However, the Navy should allocate the necessary resources to ensure that sufficient data have been collected to conduct a statistically meaningful analysis. If sufficient data are not yet in hand, then the Navy should reallocate resources and effort in areas where marine mammals are known to occur. To ensure that it has sufficient data to be analyzed in a statistically meaningful manner, the Commission recommends that the Navy (1) consult with the University of St. Andrews to determine what additional data are necessary to allow for statistically meaningful analyses, (2) develop a plan to maximize the number of sightings (e.g., conducting cruises in Southern California rather than Hawaii), and (3) allocate additional resources or reallocate available resources to the lookout effectiveness study to ensure sufficient sample sizes are available and adequate analyses can be conducted before the final lookout effectiveness report is submitted to NMFS in 2022.

The Commission continues to assert that a precautionary approach should be taken until such time that sufficient data are available and that the Navy should supplement its visual monitoring measures with other monitoring measures rather than simply reducing the size of the zones it plans to monitor. The Navy did not propose to supplement visual monitoring with passive acoustic monitoring during any of its acoustic or explosive activities. Rather, it indicated that passive acoustic monitoring would occur only when Navy assets with passive acoustic monitoring capabilities are already participating in any such activity. The Navy uses visual, passive acoustic, and active acoustic monitoring (via HF/M3)[56] during SURTASS LFA sonar activities to augment its mitigation efforts over large areas. The Navy indicated in its Phase III DSEIS that it is not able to

[54] That is, sufficient data had not yet been collected to allow for a meaningful statistical analysis.
[55] The funding amount was only reported for Hawaii. It has not been reported for Southern California, where very few lookout cruises have occurred (https://www.navymarinespeciesmonitoring.us/regions/).
[56] Similar to a fish-finding sonar as described by the Navy.

use HF/M3 during training and testing activities due to impacts on speed and maneuverability that can affect safety and mission requirements based on costs associated with designing, building, installing, maintaining, and manning the equipment.

The Navy also stated that it did not have sufficient resources to construct and maintain additional passive acoustic monitoring systems or platforms for each training and testing activity. The Commission again points out that sonobuoys, which are deployed and used during many of the Navy's activities, could be deployed and used without having to construct or maintain additional systems. For example, multiple sonobuoys could be deployed with the target prior to an activity to better determine whether the target area is clear and remains clear until the munition is launched. The Navy went on to state that passive acoustic detections would not provide range or bearing to detected animals and therefore cannot be used to determine an animal's location or confirm its presence in a mitigation zone. The Commission does not agree, as Directional Frequency Analysis and Recording (DIFAR) sonobuoys[57] perform both functions and are routinely used by the Navy.

The Navy itself has drawn attention to the success of using sonobuoys to detect bottlenose dolphins in real-time during mine exercises and provides sonobuoys to researchers for the same purpose of detecting and localizing marine mammals.[58] Contrary to NMFS's assertion in the preamble to the NWTT final rule that sonobuoys have a narrow band that does not overlap with the vocalizations of all marine mammals (85 Fed. Reg. 72349), the Navy has highlighted numerous instances of sonobuoys being used to detect and locate baleen whales, delphinids, and beaked whales[58]. All instances represent detection of a broadband, rather than narrow band, repertoire of frequencies. NMFS also indicated that bearing or distance of detections cannot be provided based on the number and type of devices typically used (85 Fed. Reg. 72349). This too is incorrect[58].

The Commission further notes that personnel who monitor the hydrophones and sonobuoys used by the Navy on the operational side also have the ability to monitor for marine mammals[59]. Department of the Navy (2013) confirmed that ability exists—four independent sightings were made not by the Navy lookouts but by the passive acoustic technicians. Similarly, Department of the Navy (2014) reported that echolocation clicks of short-finned pilot whales were reported to the bridge by the sonar technician prior to mitigation being implemented. And, although aircraft may not have passive or active acoustic capabilities, aircraft carriers or other vessels from which the aircraft originated very likely do have such capabilities. The Commission has supported for quite some time the use of the instrumented ranges[60], operational hydrophones and active acoustic sources[61], and sonobuoys[62] to fulfill mitigation implementation and contends that localizing certain species (or genera) acoustically provides more effective mitigation than localizing none at all.

Given that the effectiveness of Navy lookouts conducting visual monitoring has yet to be determined, the Commission contends that passive[62] or active acoustic[61] monitoring should be used

[57] As well as likely other types.
[58] Including DIFAR sonobuoys.
http://navysustainability.dodlive.mil/files/2014/05/Spr14_Sonobuoys_Research_Monitoring.pdf
[59] For example, the engineer monitoring the hydrophones during a U.S. Air Force (USAF) activity at PMRF also listened for any signs of marine mammal life post (aerial clearance) survey and leading up to weapon impact (USAF 2016).
[60] Which are not an option for GOA.
[61] Including tactical sonars that are already used during the actual activity and other sources similar to fish-finding sonars.
[62] Including DIFAR and other types of sonobuoys.

to supplement visual monitoring, especially for activities that could injure or kill marine mammals. Therefore, the Commission again recommends that the Navy use passive (i.e., DIFAR and other types of sonobuoys) and active acoustic (i.e., tactical sonars that are in use during the actual activity or other sources similar to fish-finding sonars) monitoring, whenever practicable, to supplement visual monitoring during the implementation of its mitigation measures for all activities that could cause injury or mortality—at the very least, sonobuoys deployed and active sources and hydrophones used during an activity should be monitored for marine mammals.

Level A harassment and mortality takes

The Navy used various post-model analyses to estimate the numbers of marine mammal takes during acoustic and explosive activities that are similar to methods used in its Phase II DEISs. Those analyses effectively reduced the model-estimated numbers of Level A harassment (i.e., PTS) and mortality takes. The analyses were based on (1) animal avoidance, (2) mitigation effectiveness, and (3) cut-off distances. The Commission has discussed the first two aspects at length in letters regarding Phase II activities. That information is not repeated herein but should be reviewed in conjunction with this letter (see the Commission's 15 September 2014 letter). The Commission has a few additional comments on those analyses.

For avoidance, the Navy assumed that animals present beyond the range to onset PTS for the first three to four pings would avoid any additional exposures at levels that could cause PTS (Department of the Navy 2018). That equated to approximately 5 percent of the total pings or 5 percent of the overall time active; therefore, 95 percent of marine mammals predicted to experience PTS due to sonar and other transducers were instead assumed to experience TTS (Department of the Navy 2018). The Navy should have been able to query the dosimeters of the animats to verify whether its 5-percent assumption was valid[63], but on its face that assumption has no scientific basis. Given that sound sources are moving, it may not be until later in an exercise that the animal is close enough to experience PTS and it is those few close pings that contribute to the potential to experience PTS. Since both sources and animals are moving during an exercise, whether an animal is initially beyond the PTS zone has no bearing on whether it will later come within close range. Behavioral response studies (BRS) have shown this as well. For example, Southall et al. (2014) indicated that Risso's dolphins and California sea lions approached the 200-m shut-down zone when a source[64] was operating at full power, resulting in having to shut down the source. Both instances occurred well after the first three or four pings. Department of the Navy (2010 and 2012) also noted multiple instances in which dolphins were observed 27 to 460 m from a vessel emitting mid-frequency active sonar, in some instances several hours after the source was active. Those dolphins did not receive only the first three or four pings emitted, nor did they avoid the source. Avoidance aside, Navy vessels may move faster than animals are capable of moving to evacuate the area, exposing such animals to pings after the first three or four as well.

Regarding mitigation effectiveness, the Commission notes that the specific mitigation effectiveness scores for the various activities were provided for Phase II but not for Phase III

[63] That is, whether the first three to four pings equated to 5 percent of the total pings *and* 5 percent of the overall time active, not whether the animals avoided the source since horizontal animal movement was not incorporated in the Navy's modeling.
[64] For both simulated and scaled sources. Similar results were observed with Risso's dolphins, California sea lions, and common dolphins during previous BRSs (Southall et al. 2011, 2012, 2013, and 2015).

activities. For Phase III, the Navy included more detail regarding how the scores were determined (including species sightability, observation area extent, visibility factors, and whether sound sources were under positive control) but did not specify what the actual scores were for those four factors or as a whole. The Navy also did not include model-estimated numbers of takes. The lack of information makes it difficult for the Commission and the public to assess the appropriateness of the mitigation scores or their effect on the overall numbers of marine mammal takes. And, although the Navy did not reduce the numbers of injury (slight lung and GI tract) and PTS takes for explosive activities as it had for Phase II analyses, it still assumed its model-estimated mortality takes would not occur, zeroed out those takes, and enumerated them as injury takes. Since the Navy has yet to determine the effectiveness of its mitigation measures, it is premature to include *any* related assumptions to reduce the numbers of marine mammal takes.

The Commission further points out inconsistencies in NMFS's most recent response regarding the Navy's post-model analysis. In the preamble to the NWTT final rule, NMFS indicated that it disagreed with suggestions that there was not enough information by which to evaluate the Navy's post-modeling calculations or that the methods were arbitrary or non-conservative. NMFS then went on to say that the Navy's report described how the factors were considered but that it wasn't necessary to view the many tables of numbers generated in the assessment to evaluate the method (85 Fed. Reg. 72333). If the *numbers or scores* associated with the Navy's post-model analysis were not provided, then clearly the necessary information was not made available to the public for evaluating the *calculations*. NMFS also indicated that the information is not readily available in a format that could be shared and it would take extensive work to provide the necessary description of this data (85 Fed. Reg. 72333). Given that the mitigation effectiveness scores and assumptions were provided for Phase II, NMFS's rebuttal is inaccurate. Regardless, numerous commenters have pointed out the lack of transparency and arbitrary appearance of the Navy's post-model analysis (85 Fed. Reg. 73332). The Commission agrees and reiterates the point made by another commenter that NMFS's failure to make the Navy's analysis transparent has prevented the public from effectively commenting on it, in contravention of the Administrative Procedures Act and on a matter of obvious significance to the agency's core negligible impact determination findings (85 Fed. Reg. 73332). Furthermore, the National Environmental Policy Act (NEPA), being a procedural statute, has similar requirements regarding transparency such that sufficient detail must be provided about the assumptions made to reach the agency's final conclusion. The Council on Environmental Quality repeatedly noted in its recently revised implementing regulations for NEPA that one of the goals of the revisions was to bring about greater transparency in the process (85 Fed. Reg. 43304), thus providing greater transparency and access to the underlying analyses. Therefore, <u>the Commission recommends</u> that the Navy provide details on how it reduced the various takes based on avoidance and the specific mitigation effectiveness scores, along with examples of how the model-estimated takes were reduced.

These issues taken together with the Commission's concerns regarding the Navy's use of cut-off distances, as provided in a previous section of this letter, underscore the fact that the Navy's post-model analyses underestimate the various numbers of takes. <u>The Commission again recommends</u> that the Navy (1) specify the total numbers of model-estimated Level A harassment (PTS) and mortality takes rather than reduce the estimated numbers of takes based on the Navy's post-model analyses and (2) include the model-estimated Level A harassment and mortality takes in its LOA application to inform NMFS's negligible impact determination analyses.

Most, if not all, of the Commission's recommendations would apply to the Navy's LOA application as well and should be considered as such. Please contact me if you have questions concerning the Commission's recommendations or rationale.

Sincerely,

Peter O. Thomas, Ph.D.,
Executive Director

cc: Jolie Harrison, NMFS

References

Antunes, R., P.H. Kvadsheim, F.P. Lam, P.L. Tyack, L. Thomas, P.J. Wensveen, and P.J. Miller. 2014. High thresholds for avoidance of sonar by free-ranging long-finned pilot whales (*Globicephala melas*). Marine Pollution Bulletin 83(1):165–180.

Boveng, P.L., J.M. London, and J.M. VerHoef. 2012. Distribution and abundance of harbor seals in Cook Inlet, Alaska. Task III: Movements, marine habitat use, diving behavior, and population structure, 2004-2006. BOEM Report 2012-065, Bureau of Ocean Energy Management, Alaska Outer Continental Shelf Region, Anchorage, Alaska. 58 pages.

Branstetter, B.K., J. St. Leger, D. Acton, J. Stewart, D. Houser, J.J. Finneran, and K. Jenkins. 2017. Killer whale (*Orcinus orca*) behavioral audiograms. The Journal of the Acoustical Society of America 141:2387–2398. http://dx.doi.org/10.1121/1.4979116.

Carretta, J.V., M.S. Lowry, C.E. Stinchcomb, M.S. Lynn, and R.E. Cosgrove. 2000. Distribution and abundance of marine mammals at San Clemente Island and surrounding offshore waters: Results from aerial and ground surveys in 1998 and 1999. Administrative Report LJ-00-02, Southwest Fisheries Science Center, La Jolla, California. 45 pages.

Costa, D.P., D.E. Crocker, J. Gedamke, P.M. Webb, D.S. Houser, S.B. Blackwell, D. Waples, S.A. Hayes, and B.J. Le Boeuf. 2003. The effect of a low-frequency sound source (Acoustic Thermometry of Ocean Climate) on the diving behavior of juvenile northern elephant seals, *Mirounga angustirostris*. Journal of the Acoustical Society of America 113:1155–1165.

Cunningham, K.A., and C. Reichmuth. 2015. High-frequency hearing in seals and sea lions. Hearing Research 331:83–91.

Danil, K., and J.A. St. Ledger. 2011. Seabird and dolphin mortality associated with underwater detonation exercises. Marine Technology Society Journal 45(6):63–87.

DeAngelis, M., L. Saez, J. MacNeil, B. Mate, T. Moore, D. Weller, and W. Perryman. 2011. Spatio-temporal modeling of the eastern Pacific gray whale's (*Eschrichtius robustus*) migration through California, Oregon, and Washington. Southwest Fisheries Science Center, La Jolla, California.

Department of Navy. 2009. Appendix E: Marine mammal density report. *in* Gulf of Alaska Navy training activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement. Department of the Navy, U.S. Pacific Fleet. 46 pages.

Department of the Navy 2010. Cruise report, marine species monitoring and lookout effectiveness study: Southeastern Antisubmarine Warfare Integrated Training Initiative (SEASWITI), June

2010, Jacksonville Range Complex. Department of the Navy, U.S. Fleet Forces Command, Norfolk, Virginia. 32 pages.

Department of the Navy. 2012. Cruise report, marine species monitoring and lookout effectiveness study: Koa Kai, November 2011, Hawaii Range Complex. *in* Marine species monitoring for the U.S. Navy's Hawaii Range Complex 2012 Annual Report. Department of the Navy, U.S. Pacific Fleet, Honolulu, Hawaii. 12 pages.

Department of the Navy 2013. Final cruise report, marine species monitoring and lookout effectiveness study: Submarine Commanders Course, February 2013, Hawaii Range Complex. Department of the Navy, U.S. Pacific Fleet, Honolulu, Hawaii. 20 pages.

Department of the Navy. 2014. Final cruise report, marine species monitoring and lookout effectiveness study: Submarine Commanders Course, February 2014, Hawaii Range Complex. Department of the Navy, U.S. Pacific Fleet, Honolulu, Hawaii. 12 pages.

Department of the Navy. 2016. Cruise report, marine species monitoring and lookout effectiveness study: Submarine Commanders Course, February 2016, Hawaii Range Complex. Department of the Navy, U.S. Pacific Fleet, Honolulu, Hawaii. 16 pages.

Department of the Navy. 2017. Technical report: Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis (Phase III). SSC Pacific, San Diego, California. 194 pages.

Department of the Navy. 2018. Quantifying acoustic impacts on marine mammals and sea turtles: Methods and analytical approach for Phase III Training and Testing. Naval Undersea Warfare Center, Newport. 51 pages.

Department of the Navy. 2020a. Dive distribution and group size parameters for marine species occurring in the U.S. Navy's Gulf of Alaska Study Area. Naval Undersea Warfare Center Division Newport, Newport, Rhode Island. 67 pages.

Department of the Navy. 2020b. U.S. Navy Marine Species Density Database Phase III for the Gulf of Alaska Temporary Maritime Activities Area. Final technical report. Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii. 157 pages.

Department of the Navy. 2020c. U.S. Navy Marine Species Density Database Phase III for the Northwest Training and Testing Study Area: Final technical report. Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii. 272 pages.

Ellison, W.T., B.L. Southall, C.W. Clark, and A.S. Frankel. 2011. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology 26(1):21–28.

Ferguson, M.C., C. Curtice, and J. Harrison. 2015. Biologically important areas for cetaceans within U.S. waters–Gulf of Alaska region. Aquatic Mammals 41(1):65–78.

Fritz, L., K. Sweeney, R. Towell, and T. Gelatt. 2016. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) conducted in Alaska in June–July 2013 through 2015, and an update on the status and trend of the western distinct population segment in Alaska. NMFS-AFSC-321, Alaska Fisheries Science Center, Seattle, Washington. 81 pages.

Goertner, J.F. 1982. Prediction of underwater explosion safe ranges for sea mammals. Naval Surface Weapons Center, Dahlgren, Virginia. 31 pages.

Goldbogen, J.A., B.L. Southall, S.L. DeRuiter, J. Calambokidis, A.S. Friedlaender, E.L. Hazen, E.A. Falcone, G.S. Schorr, A. Douglas, D.J. Moretti, C. Kyburg, M.F. McKenna, and P.L. Tyack. 2013. Blue whales respond to simulated mid-frequency military sonar. Proceedings of the Royal Society B 280(1765):20130657.

Hastings, K.K., R.J. Small, and G.W. Pendleton. 2012. Sex- and age-specific survival of harbor seals (*Phoca vitulina*) from Tugidak Island, Alaska. Journal of Mammalogy 93(5):1368–1379.

Hobbs, R.C., and J.M. Waite. 2010. Abundance of harbor porpoise (*Phocoena phocoena*) in three Alaskan regions, corrected for observer errors due to perception bias and species misidentification, and corrected for animals submerged from view. Fishery Bulletin 108(3): 251–267.

Jacobs, S.R., and J.M. Terhune. 2002. The effectiveness of acoustic harassment devices in the Bay of Fundy, Canada: Seal reactions and a noise exposure model. Aquatic Mammals 28:147–158.

Kastelein, R.A., S. van der Heul, W.C. Verboom, R.V.J. Triesscheijn, and N.V. Jennings. 2006. The influence of underwater data transmission sounds on the displacement behaviour of captive harbor seals (*Phoca vitulina*). Marine Environmental Research 61:19–39.

Kastelein, R.A., L. Helder-Hoek, and S. Van de Voorde. 2017a. Effects of exposure to sonar playback sounds (3.5–4.1 kHz) on harbor porpoise (*Phocoena phocoena*) hearing. The Journal of the Acoustical Society of America 142(4):1965–1975. https://doi.org/10.1121/1.5005613.

Kastelein, R.A., L. Helder-Hoek, and S. Van de Voorde. 2017b. Hearing thresholds of a male and a female harbor porpoise (*Phocoena phocoena*). The Journal of the Acoustical Society of America 142(2):1006–1010. http://doi.org/10.1121/1.4997907.

Kastelein, R.A., L. Helder-Hoek, S. Van de Voorde, A.M. von Benda-Beckmann, F.-P. A. Lam, E. Jansen, C.A.F. de Jong, and M.A. Ainslie. 2017c. Temporary hearing threshold shift in a harbor porpoise (*Phocoena phocoena*) after exposure to multiple airgun sounds. The Journal of the Acoustical Society of America 142(4):2430–2442. https://doi.org/10.1121/1.5007720.

Kastelein, R.A., L. Helder-Hoek, A. Kommeren, J. Covi, and R. Gransier. 2018a. Effect of pile-driving sounds on harbor seal (*Phoca vitulina*) hearing. The Journal of the Acoustical Society of America 143(6):3583–3594. https://doi.org/10.1121/1.5040493.

Kastelein, R.A., L. Helder-Hoek, S. Van de Voorde, S. de Winter, S. Janssen, and M.A. Ainslie. 2018b. Behavioral responses of harbor porpoises (*Phocoena phocoena*) to sonar playback sequences of sweeps and tones (3.5-4.1 kHz). Aquatic Mammals 44(4):389–404.

Kastelein, R.A., M.A. Ainslie, and R. van Kester. 2019a. Behavioral responses of harbor porpoises (*Phocoena phocoena*) to U.S. Navy 53C sonar signals in noise. Aquatic Mammals 45(4): 359–366. https://doi.org/10.1578/AM.45.4.2019.359.

Kastelein, R. A., R. Gransier, M. Brouwers, L. Helder-Hoek, and. 2019b. Hearing thresholds of two harbor seals (*Phoca vitulina*) for helicopter dipping sonar signals (1.3-1.4 kHz). Aquatic Mammals 45(3): 349-355. https://doi.org/10.1578/AM.45.3.2019.349.

Kastelein, R.A., L. Helder-Hoek, S. Cornelisse, L.A.E. Huijser, and R. Gransier. 2019c. Temporary hearing threshold shift in harbor porpoises (*Phocoena phocoena*) due to one-sixth octave noise band at 32 kHz. Aquatic Mammals 45(5): 549–562. https://doi.org/10.1578/AM.45.5.2019.549.

Kastelein, R.A., L. Helder-Hoek, and R. Gransier. 2019d. Frequency of greatest temporary hearing threshold shift in harbor seals (*Phoca vitulina*) depends on fatiguing sound level. The Journal of the Acoustical Society of America 145(3):1353–1362. https://doi.org/10.1121/1.5092608

Kastelein, R.A., L. Helder-Hoek, R. van Kester, R. Huisman, and R. Gransier. 2019e. Temporary hearing threshold shift in harbor porpoises (*Phocoena phocoena*) due to one-sixth octave noise band at 16 kHz. Aquatic Mammals 45(3):280–292. https://doi.org/10.1578/AM.45.3.2019.280.

Kastelein, R.A., S.A. Cornelisse, L.A. Huijser, and L. Helder-Hoek. 2020a. Temporary hearing threshold shift in harbor porpoises (*Phocoena phocoena*) due to one-sixth-octave noise bands at 63 kHz. Aquatic Mammals 46(2):167–182. https://doi.org/10.1578/AM.46.2.2020.167.

Kastelein, R.A., L. Helder-Hoek, S.A. Cornelisse, L.A.E. Huijser, and J.M. Terhune. 2020b. Temporary hearing threshold shift in harbor seals (*Phoca vitulina*) due to a one-sixth-octave noise band centered at 32 kHz. The Journal of the Acoustical Society of America 147(3):1885–1896. https://doi.org/10.1121/10.0000889.

Kastelein, R.A., C. Parlog, L. Helder-Hoek, S.A. Cornelisse, L.A.E. Huijser, and J.M. Terhune. 2020c. Temporary hearing threshold shift in harbor seals (*Phoca vitulina*) due to a one-sixth octave noise band centered at 40 kHz. The Journal of the Acoustical Society of America 147(3):1966–1976. https://doi.org/10.1121/10.0000908.

Miller, P.J., R.N. Antunes, P.J. Wensveen, F.I. Samarra, A.C. Alves, P.L. Tyack, P.H. Kvadsheim, L. Kleivane, F.P. Lam, M.A. Ainslie, and L. Thomas. 2014. Dose-response relationships for the onset of avoidance of sonar by free-ranging killer whales. The Journal of Acoustical Society of America 135(2):975–993.

NMFS. 2018. 2018 Revision to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: Underwater acoustic thresholds for onset of permanent and temporary threshold shifts. Office of Protected Resources, Silver Spring, Maryland. 178 pages.

Popov, V.V., E.V. Sysueva, D.I. Nechaev, V.V. Rozhnov, and A.Y. Supin. 2017. Influence of fatiguing noise on auditory evoked responses to stimuli of various levels in a beluga whale, *Delphinapterus leucas*. Journal of Experimental Biology 220(6):1090–1096.

Richmond, D.R., J.T. Yelverton, and E.R. Fletcher. 1973. Far-field underwater-blast injuries produced by small charges. Lovelace Foundation for Medical Education and Research, Defense Nuclear Agency, Washington DC. 95 pages.

Rone, B.K., A.B. Douglas, T.M. Yack, A.N. Zerbini, T.N. Norris, E. Ferguson, and J. Calambokidis. 2014. Report for the Gulf of Alaska Line-Transect Survey (GOALS) II: Marine mammal occurrence in the Temporary Maritime Activities Area (TMAA). Cascadia Research Collective, Olympia, Washington; Alaska Fisheries Science Center, Seattle, Washington; and Bio-Waves, Inc., Encinitas, California. 186 pages.

Rone, B. K., A. N. Zerbini, A. B. Douglas, D. W. Weller, and P. J. Clapham. 2017. Abundance and distribution of cetaceans in the Gulf of Alaska. Marine Biology 16423:1–23.

Schlundt, C.E., J.J. Finneran, D.A. Carder, and S.H. Ridgway. 2000. Temporary shift in masked hearing thresholds of bottlenose dolphins, *Tursiops truncatus*, and white whales, *Delphinapterus leucas*, after exposure to intense tones. The Journal of Acoustical Society of America 107(6):3496–3508.

Shelden, K.E.W., and J.L. Laake. 2002. Comparison of the offshore distribution of southbound migrating gray whales from aerial survey data collected off Granite Canyon, California, 1976–96. Journal of Cetacean Research and Management 4(1):53–56.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendation. Aquatic Mammals 33:411–521.

Southall, B., J. Calambokidis, P. Tyack, D. Moretti, J, Hildebrand, C. Kyburg, R. Carlson, A. Friedlaender, E. Falcone, G. Schorr, A. Douglas, S. DeRuiter, J. Goldbogen, and J. Barlow. 2011. Biological and behavioral response studies of marine mammals in Southern California, 2010 (“SOCAL-10”). U.S. Navy Pacific Fleet, Pearl Harbor, Hawaii. 29 pages.

Southall, B., J. Calambokidis, P. Tyack, D. Moretti, A. Friedlaender, S. DeRuiter, J. Goldbogen, E. Falcone, G. Schorr, A. Douglas, A. Stimpert, J. Hildebrand, C. Kyburg, R. Carlson, T. Yack, and J. Barlow. 2012. Biological and behavioral response studies of marine mammals in Southern California, 2011 (“SOCAL-11”). U.S. Navy, Washington, District of Columbia. 55 pages.

Southall, J. Calambokidis, J. Barlow, D. Moretti, A. Friedlaender, A. Stimpert, A. Douglas, K. Southall, P. Arranz, S. DeRuiter, E. Hazen, J. Goldbogen, E. Falcone, and G. Schorr. 2013. Biological and behavioral response studies of marine mammals in Southern California, 2012 ("SOCAL-12"). U.S. Navy, Washington, District of Columbia. 40 pages.

Southall, B., J. Calambokidis, J. Barlow, D. Moretti, A. Friedlaender, A. Stimpert, A. Douglas, K. Southall, P. Arranz, S. DeRuiter, J. Goldbogen, E. Falcone, and G. Schorr. 2014. Biological and behavioral response studies of marine mammals in Southern California, 2013 ("SOCAL-13"). U.S. Navy, Washington, District of Columbia. 54 pages.

Southall, B., J. Calambokidis, D. Moretti, A. Stimpert, A. Douglas, J. Barlow, J. Keating, S. Rankin, K. Southall, A. Friedlaender, E. Hazen, J. Goldbogen, E. Falcone, G. Schorr, G. Gailey, and A. Allen. 2015. Biological and behavioral response studies of marine mammals in Southern California, 2014 ("SOCAL-14"). U.S. Navy, Washington, District of Columbia. 41 pages.

Southall, B.L., S.L. DeRuiter, A. Friedlaender, A.K. Stimpert, J.A. Goldbogen, E. Hazen, C. Casey, S. Fregosi, D.E. Cade, A.N. Allen, C.M. Harris, G. Schorr, D. Moretti, S. Guan, and J. Calambokidis. 2019b. Behavioral responses of individual blue whales (*Balaenoptera musculus*) to mid-frequency military sonar. Journal of Experimental Biology 222:190637. https://doi:10.1242/jeb.190637.

Sweeney, K., L. Fritz, R. Towell, and T. Gelatt. 2017. Results of Steller sea lion surveys in Alaska, June–July 2017. Memorandum to the Record, Marine Mammal Laboratory, Seattle, Washington. 17 pages.

Sweeney, K., R. Towell, and T. Gelatt. 2018. Results of Steller sea lion surveys in Alaska, June–July 2018. Memorandum to the Record, Marine Mammal Laboratory, Seattle, Washington. 19 pages.

Tyack, P.L., and L. Thomas. 2019. Using dose-response functions to improve calculations of the impact of anthropogenic noise. Aquatic Conservation: Marine and Freshwater Ecosystems 29(S1):242–253.

USAF. 2016. Protected species monitoring and mitigation results for 2016 Long Range Strike Weapon System Evaluation Program operational testing: Pacific Missile Range Facility, Kaua'i, HI. Department of the Air Force, Eglin Air Force Base, Florida. 8 pages.

Waite, J. 2003. Cetacean Assessment and Ecology Program: Cetacean survey. Alaska Fisheries Science Center's quarterly research reports-July to September 2003. https://www.afsc.noaa.gov/Quarterly/jas2003/divrptsNMML2.htm.

Yack, T.M., T. Norris, E. Ferguson, S. Coates, and B.K. Rone. 2015. From clicks to counts: Using passive acoustic monitoring to estimate the density and abundance of Cuvier's beaked whales in the Gulf of Alaska (GoA). Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii.

Yelverton, J.T., and D.R. Richmond. 1981. Underwater explosion damage risk criteria for fish, birds, and mammals. Paper presented at the 102nd Meeting of the Acoustical Society of America, Miami Beach, Florida. 35 pages.

Yelverton, J.T., D.R. Richmond, E.R. Fletcher, and R.K. Jones. 1973. Safe distances from underwater explosions for mammals and birds. Lovelace Foundation for Medical Education and Research, Albuquerque, New Mexico. 64 pages.

Zeppelin, T., N. Pelland, J. Sterling, B. Brost, S. Melin, D. Johnson, M. A. Lea, and R. Ream. 2019. Migratory strategies of juvenile northern fur seals (*Callorhinus ursinus*): Bridging the gap between pups and adults. Scientific Reports 9:13921.