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STAFF RECOMMENDATION

ON CONSISTENCY DETERMINATION

Consistency Determination No.	**CD-113-00**
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FEDERAL AGENCY: **U.S. Navy**

PROJECT LOCATION: California offshore waters

PROJECT DESCRIPTION: Operation of Surveillance Towed Array Sensor System Low-Frequency Active (LFA) Sonar Program (Exhibits 1-2)

SUBSTANTIVE FILE DOCUMENTS: See page 29.

Staff Note: As of the date of publication of this staff report, the Navy had not yet responded to the Commission staff's Oct. 26, 1999, comments on the Draft EIS[1] for this program (Exhibit 7). The Navy has informed Commission staff that it expects to provide responses to staff's comments sometime before the December 12 hearing. Therefore, the staff is recommending that the Commission object to the Navy's consistency determination (CD), based on lack of information. The staff will publish an addendum to this report, with an analysis of the Navy's responses, once they are received.

At the same time, the Navy has stated that it does not expect to publish its responses to other DEIS comments it received until sometime in January 2001. Consequently, the staff has recommended that the Navy extend the time period that the CZMA regulations prescribe for the Commission's consideration of and action on the Navy's CD until after the Navy has published its responses to all public comments on the DEIS.

1 Draft Overseas Environmental Impact Statement/Environmental Impact Statement (OEIS/EIS) Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") Sonar Program, U.S. Navy, July 1999.

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EXECUTIVE SUMMARY

The Navy has submitted a consistency determination for the operation of its high-intensity, low-frequency sound system called Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") system. More commonly known as "LFA," this system is a sophisticated military sonar technology designed to actively detect and track submarines at longer ranges than conventional (higher frequency) active sonar systems. LFA has the potential to emit sounds at volumes well in excess of those generally considered able to cause significant adverse physiological effects on marine mammals and other species. The Navy operated LFA as a classified system before 1996, at which time, due to growing concerns over military and other anthropogenic sounds in the marine environment, the Navy agreed to de-classify and delay further operational use of LFA until completion of an EIS for the program.

To assist the EIS effort, and to increase scientific knowledge of the effects of human-made, low-frequency sound on marine mammals, the Navy designed a three-phased program to study a variety of marine mammal behaviors, including: (1) feeding blue and fin whales off San Nicolas Island; (2) migrating gray whales off Big Sur; and (3) humpback breeding offshore of Hawaii. The first two of these phases were conducted offshore of California, and the Commission concurred with Navy consistency determinations for these phases (CD-95-97 and CD-153-97). While the Commission expressed concerns over the effects of the LFA submarine detection and tracking system itself, the Commission supported this research because it would lead to an improved understanding of the effects of LFA and other underwater sound on marine resources.

The source level (SL) of an individual element of the LFA sonar array is approximately 215 decibels (dB[2]). The research subjected whales to received levels (RL) in the 120-155 ($\pm$ 5) decibel dB range. The point of the research was neither to document a "worst case" scenario, nor to subject whales to sounds in excess of 180 dB (the level the Navy is "mitigating" to and states is the level at which adverse physiological reactions could occur). Rather, the research was intended to expand the knowledge base and clarify thresholds where LFA sounds begin to cause behavioral reactions. Two of the three research phases (Phases II and III) documented the clearest examples of behavioral reactions. The Phase III Hawaii research on humpback whales documented modifications in humpback whale singing during LFA transmissions. 10 of 17 humpback whales stopping singing during playback with a source level (SL) of 155 to 205 dB (received levels (RLs) of 120 to 150 dB). The Phase II Big Sur gray whale research documented deflections in migration patterns by gray whales in order to avoid received levels of 140 dB, but only when the source was inshore of the whales. When the source was located

[2] Note: All decibel references in this report will be based on the water standard (re: 1 micropascal (μPa)). All source level (SL) dB units are referenced to 1 micropascal @ 1 meter. All received level (RL) units are expressed as dB units re 1 uPa root mean squared (rms). (See page 13 for a further explanation of underwater sound principles.)

on the offshore side of the migratory path, there was little evidence of any course deflection, even though the whales were exposed to received levels that would almost certainly have elicited an avoidance reaction had the source been placed in the inshore location.

The Navy believes the LFA research elicited minor, short-term behavioral responses, but no prolonged disruption of biologically important behavior. The Navy maintains (see Exhibit 6) that according to the best available scientific consensus, a 180 dB threshold for potential harm represents the applicable threshold standard for LFA and constitutes the Navy's avoidance goal. To meet this standard, the Navy has committed to operational and geographic restrictions. The operational restrictions consist of monitoring during sonar operations [to?] prevent injury to marine mammals (and possibly sea turtles) by ensuring, to the extent possible, that they are not within the 180-dB mitigation zone during LFA transmissions. Generally, this means avoiding + 180 dB within a radius of 1 kilometer (km) from the source (at full power). The monitoring will be accomplished through a relatively sophisticated three-part monitoring program, using visual, passive acoustic, and active acoustic monitoring. (The Navy has also committed to long term monitoring, as described on page 21.)

The Navy will also assure that the sound field does not exceed: (1) 180 dB within 22 km (12 nm) of any coastline (including islands); and (2) 145 dB in the vicinity of known recreational and commercial dive sites.

In reviewing the LFA research phases, ATOC, and other acoustic projects, the Commission noted growing evidence from the past decade that man-made sounds can disturb marine mammals, including whale strandings this year in the Bahamas. Low-frequency sound was not involved in the military exercises occurring at the time of the Bahamas whale strandings, and it may well have been mid-frequency (rather than low-frequency) NATO LFA sound leading to 1996 whale strandings in the Mediterranean. Nevertheless, both these events reinforce how little is known about marine mammals and noise. The sounds that may have caused the Bahamas strandings were not expected to lead to severe adverse marine mammal reactions, and it may have been a complex synergistic effect of a combination of different sounds that caused the reaction. Either way, serious re-evaluation of current assumptions on the effects of military sonar technology may be warranted.

Marine mammals rely on sound for communication, orientation, and detection of predators and prey. LFA (and ATOC) research efforts documented behavioral responses including silencing, disruption of activity, and movement away from the source. Sound carries so well underwater that animals can be affected at great distances from a loud acoustic source (and low-frequency sources carrying the greatest distances). Because so little is known, NMFS, the Commission, and other regulatory agencies charged with protecting marine resources have been extremely challenged in their efforts to establish regulatory thresholds and policy in the absence of reliable data. To date, and clearly with difficulty, the Commission has, for want of a more reliable standard, accepted 180 dB (RL) as "a reasonable estimate for the level at which potential physiological injury could occur for marine animals." (e.g., USGS Seismic Surveys, NMFS Pulsed Power Experiment, and the Minerals Management Service's High Energy

Seismic Survey (HESS) efforts.) Even *more* challenging, given the long-term scope of the proposed LFA project, and given the fact that behavioral changes can be documented at RLs well below 180 dB, is determining which types of behavioral responses are benign, and which pose adverse population or biological consequences. Both the geographic and temporal scope of LFA use far exceed any of the more limited acoustic activities previously authorized by the Commission. On the other hand, the Navy describes legitimate defense mission needs and has sincerely and objectively attempted both to: (1) answer some of the thorny issues raised; and (2) incorporate measures to protect marine resources. Despite the challenges and limited research available, the Commission needs to weigh the competing military and resource protection needs and arrive at a scientifically justifiable conclusion.

As of the date of this writing, the Navy has not responded to the Commission staff's Oct. 26, 1999, comments on the Draft EIS for this program. Therefore, based on the information needs discussed on pages 23-25 and 29 of this report, at this time the Commission lacks adequate information to determine the consistency of the project with the marine resource protection (Section 30230) and the recreation (diving) (Sections 30213 and 30220) policies of the Coastal Act. The Commission is able to find the project consistent with the commercial and recreational fishing policies (Sections 30234 and 30234.5) of the Coastal Act.

STAFF SUMMARY AND RECOMMENDATION

I. Project Description. The Navy has submitted a consistency determination for the employment of its Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar system for use in offshore California waters. LFA is a military system designed for active detection and tracking of submarines at longer ranges than conventional (higher frequency) active sonar systems. LFA sonar enables the Navy to have an improved capability to detect quieter and harder-to-find foreign submarines at long range, provide U.S. forces with adequate time to react to, and defend against, potential submarine threats while remaining a safe distance beyond a submarine's effective weapons range. The LFA system uses a vertical line array of sound projectors to broadcast specially designed low-frequency (100-500 Hertz (Hz)) sonar pulses at high power levels, and a towed horizontal line array of hydrophones to receive echoes of the pulses from distant targets (Exhibit 1). The Navy defines the word "employment" of the system as used in this document to include the use of LFA sonar during routine training and testing activities, as well as the use of the system during ordinary military operations, but *excluding* use of the system in armed conflict or direct combat support operations, and "... during periods of heightened threat conditions, as determined by the National Command Authorities." The Navy further describes the system as follows:

SURTASS LFA Sonar Technology

SURTASS LFA sonar is a long-range, low frequency (between 100 and 500 Hz), all-weather sonar system composed of both active and passive components.

The active component of the SURTASS LFA system, LFA, is an augmentation to the passive detection system, to be used when passive system performance is inadequate. LFA is a set of acoustic transmitting source elements suspended by cable from underneath a ship. These elements, called projectors, are devices that produce the active sound pulse, or "ping." The projectors transform electrical energy to mechanical energy that set up vibrations or pressure disturbances within the water to produce a "ping." The characteristics and operating features of the active components (LFA) are:

- *The source is a vertical line array (VLA) of up to 18 sound projectors suspended below the vessel. LFA's transmitted beam is omnidirectional (360 degrees) in the horizontal (nominal depth of the center of the array is 122 m [400 ft]), with a narrow vertical beamwidth that can be steered above or below the horizontal.*

- *The source frequency is between 100 and 500 Hz (the LFA system's physical design does not allow for transmissions below 100 Hz). A variety of signal types can be used, including continuous wave (CW) and frequency-modulated (FM) signals. Signal bandwidth is approximately 30 Hz.*

- *The source level (SL) of an individual element of the SURTASS LFA sonar array is approximately 215 decibels (dB) (referenced to 1 micro Pascal [μPa] at 1 meter). The sound field of the array can never be higher than the SL of an individual source projector.*

- *The typical LFA signal is not a constant tone, but rather a transmission of various waveforms that vary in frequency and duration. A complete sequence of sound transmissions is referred to as a "ping" and lasts between 6 and 100 seconds, although the duration of each continuous frequency sound transmission is never longer than 10 seconds.*

- *Average duty cycle (ratio of sound "on" time to total time) is less than 20 percent (20 percent is the maximum physical limit of the LFA system). The typical duty cycle is between 10 and 20 percent.*

- *The time between transmissions is typically from 6 to 15 minutes.*

The passive, or listening, component of the system is SURTASS. SURTASS detects returning echoes from submerged objects, such as threat submarines, through the use of hydrophones. These devices transform mechanical energy (received acoustic sound wave) to an electrical signal that can be analyzed by the processing system of the sonar. The SURTASS hydrophones are mounted on a receive array that is towed behind the ship. The SURTASS LFA sonar ship must maintain a minimum speed of 5.6 kilometers per hour (3 knots) through the water in order to tow the hydrophone array. The return signals, which are usually below background or ambient noise level, are then processed and evaluated to identify and classify potential underwater threats.

Currently, only one Navy ship is capable of LFA deployment. Ultimately (by 2004), the Navy plans to have four ships operational, with a maximum of two in Pacific Ocean waters. A typical ship deployment schedule (Exhibit 8) would involve 270 days at sea, with 30-day missions, within which two 9-day active transmission periods would occur (with a maximum of 4 hours/day of active transmissions). A 9-day mission would entail 36 hours of active transmissions, so the 30-day mission would involve 72 hours of active transmissions. The yearly total (per ship) would be 432 hours of active transmissions.

The primary alternatives considered by the Navy in the Draft OEIS/EIS included the Restricted Operation Alternative (the proposed action), the Unrestricted Operation Alternative, and the No Action Alternative. For the reasons explained below, the Navy determined that the Restricted Operation Alternative (Alternative 1) was the preferred alternative; the Navy states:

Alternative 1 (Restricted Operation, the Navy's Preferred Alternative)

Alternative 1, the Navy's preferred alternative, best meets the program's purpose and need, while minimizing potential environmental effects as compared with unrestricted operations. This alternative would include geographic restrictions and monitoring to prevent injury to potentially affected species while satisfying the stated purpose of the proposed action to meet U.S. need for improved capability to detect quieter and harder-to-find foreign submarines at long range.

The operational restrictions and monitoring programs are described on pages 20-21 of this report.

Alternatives that the Navy rejected include:

(1) Unrestricted Operation, which the Navy rejected due to its potential adverse effects to marine animals and human divers, its inconsistency with other regulations, such as the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA), and its inconsistency with the Chief of Naval Operations' commitment to the protection of the environment and good stewardship of the sea; and

(2) No Action, which the Navy rejected because it would deprive the U.S. Navy of the capability to detect quieter and harder-to-find foreign submarines at long range. The Navy also maintains that the No Action alternative would not give the Navy adequate time to react to, and defend against, potential submarine threats while maintaining a safe distance from a submarine's effective weapon range, "...and, as such, would potentially produce increased environmental impacts and would not accomplish the purpose and need of the proposed action."

II. Background.

A. Heard Island. Arguably the seminal event in the controversy over the use of low-frequency sound in the ocean was the Heard Island Feasibility Test (HIFT) conducted in 1992 (dubbed "the shot heard half way round the world"), during which a sound level of 221 dB and a frequency of 57 Hz was transmitted through the deep sound (SOFAR[3]) channel to receivers over distances of up to 17,000 km. This experiment demonstrated the tremendous potential for transmitting sound at transoceanic distances and served as a prototype for regular observations of the speed of sound in the ocean for measuring the rate of ocean warming due to global climate change (e.g., ATOC).

B. National Research Council (NRC) Review. As a result of issues raised by HIFT, the Office of Naval Research (ONR) requested in 1992 that the National Research Council (NRC) examine the state of knowledge of the effects of low-frequency sounds on marine mammals and assess the trade-offs between the benefits of underwater sound as a research tool and the possible harmful effects on marine mammal populations of introducing additional low-frequency sound into the ocean. In 1994 the NRC issued a report, *Low Frequency Sound and Marine Mammals: Current Knowledge and Research Needs,* which concluded that: (1) very little is known about the effects of low-frequency sound on marine mammals; and (2) it is difficult to establish regulatory policy in the absence of data regarding such effects. The report included a series of recommendations about the kinds of research needed to fill the knowledge gaps.

C. Acoustic Thermometry of Ocean Climate (ATOC). As a follow-up to HIFT, Scripps Institution of Oceanography (Scripps) developed the ATOC program to make regular measurements of the travel times of low-frequency sound throughout the Pacific Ocean, using sound up to 195 dB and a frequency of 75 Hz, transmitted from a source located at Pioneer Seamount, 48 nm (nautical miles) offshore of Half Moon Bay. As a result of concerns about the effects of ATOC low-frequency sound, Scripps agreed to conduct the first several years of transmissions through a Marine Mammal Research Program (MMRP). In June 1995 the Commission concurred with Scripps' consistency certification (and permit) for this program (CC-110-94 & CDP 3-95-40). The California portion of the program is complete (Hawaii's is still underway). A brief assessment of the MMRP results can be found in NRC 2000 cited below. (See also Exhibit 9, first page)

D. NATO LFA/Whale Strandings. In May 1996 12 Cuvier's beaked whales were involved in a mass stranding over a 38 km stretch of coastline during NATO LFA exercises in the Mediterranean Sea, off the west coast of Greece. A March 5, 1998, *Nature* article by Alexandros Frantzis, entitled "Does acoustic testing strand whales," concluded that "... the probability of a mass stranding occurring for other reasons during the period of the LFAS tests is less than 0.07%" and that "Although pure coincidence cannot be excluded, it seems improbable that the two events were independent." This article stimulated NATO to

[3] SOFAR is an acronym for Sound Fixing and Ranging.

convene a Bioacoustics panel (SACLANTCEN) to study the event and review the data; the panel published a Summary Record in June 1998. Unlike current Navy LFA sonar, the NATO LFA sonar used both low- and mid-frequency transmissions (one at 450-700 Hz (low-frequency) and one at 2.8-3.3 kilohertz (kHz) (mid-frequency)), at source levels of just under 230 dB. This combined signal lasted four seconds and was repeated once every minute. The NATO panel's analysis: (1) suggested close timing between the onset of sonar transmissions and the first strandings; (2) was unable to determine the received levels experienced by the stranded whales; (3) noted that received levels as high as 150-160 dB were estimated to occur at ranges of 50 km; and (4) stated that sperm whales were heard within 10-25 km of the sound source, but demonstrated no obvious changes in their clicking patterns before, during, and after sonar transmissions. In the end, though, because autopsies did not provide ear tissue samples, the NATO panel had difficulty coming to definitive conclusions linking LFA to the strandings, although it did rule out natural physical environmental factors. Thus, the NATO panel summary concluded:

An acoustic link can neither be clearly established nor eliminated as a direct or indirect cause for the May 1996 strandings.

Behavioral responses to acoustic transmission must be taken into consideration as a possible cause for strandings; therefore, acoustic characteristics that induce behavioural changes or physical damage to marine animals should be determined.

The effects of sound on marine animals vary according to species; therefore, additional research is needed to determine hearing characteristics and behaviour of the entire range of marine species.

The panel further recommended as follows:

With regard to high intensity acoustic sources, there was a strong recommendation from the panel that appropriate environmental assessment procedures be implemented as soon as possible with a view to recommending suitable mitigation and monitoring protocols.

The panel also noted that the lack of adequate anatomical data on the stranded animals, particularly auditory and other tissue analyses, was a serious obstacle. ...[T]he panel recommended that proper specimen collection be supported to ensure complete necropsy in the future.

Other attempts have been made to correlate whale strandings and military operations in the Mediterranean. Simmons and Lopez-Guard (1991) reported on four mass strandings between 1985-1989 of Cuvier's beaked whale (*Ziphius cavirostris*) on the coast of Fuerteventura in the Canary Islands that may have been related to naval maneuvers. At the same time, NATO sonars have been tested in the Mediterranean Sea on many occasions without strandings. Upon reviewing the data the NRC concludes that:

Both Simmonds and Lopez-Jurado (1991) and Frantzis (1998) started with rare strandings and then looked for some other rare event that might correlate, but neither paper makes a strong case for having performed a thorough systematic survey of when naval or sonar exercises might have occurred in these areas in the absence of strandings. There is a clear need for studies designed to test this association more systematically.

E. U.S. Navy. The NATO panel reviewing the 1996 Mediterranean strandings acknowledged that the U.S. Navy has been a leader in advancing the state of knowledge of underwater acoustics, and that among the passive acoustic monitoring systems that have been developed:

... Perhaps the most impressive project was the employment of the Navy's deep water submarine monitoring system (SOSUS) to listen to the vocal activity of whales over millions of square miles of the world's oceans to reveal an unprecedented picture of the global movements of these far-ranging animals. These data, along with distribution and abundance data from a variety of sources, are being incorporated into a Global Information System (GIS) type mapping technology to enable Navy planners to avoid areas of high marine mammal density ("hotspots") and to predict possible effects of an activity at whatever spatial scale is appropriate.

During more or less the same time period as ATOC review and the Mediterranean controversy, the U.S. Navy acknowledged the existence of its own past and ongoing LFA sonar programs. For example, after protecting classified portions the Navy released after-the-fact documentation of several past Navy LFA operations offshore of California, including: (1) Magellan II, Aug. 1994, location classified; (2) LFA-14, Northern, Sept. 26, 1995, to October 9, 1995, west of S.F. Bay, extending north along the Mendocino coast; (3) LFA-14, Southern, Sept. 26, 1995, to Oct. 9, 1995, south of the Channel Islands, extending south along the Baja California coast; and (4) LFA-15, Feb. 1996-Mar. 1996, south of the Channel Islands, extending south along the Baja California coast (source – partially declassified Navy Environmental Assessments (EAs). [Note: pre-1994 LFA exercises were not documented]

Due to evolving concerns over Navy LFA, in July 1996 the Navy agreed to prepare an EIS and delay further use of LFA until its completion. To assist this effort, the Navy designed a three-phased program to study LFA effects on a variety of marine mammal behaviors, including: (1) feeding blue and fin whales off San Nicolas Island; (2) migrating gray whales off Big Sur; and (3) humpback breeding offshore of Hawaii. The first two of the phases were offshore of California, and in 1997 the Commission concurred with consistency determinations for those research efforts.

F. The Bahamas Whale Strandings. In a more recent and dramatic incident implicating mid-frequency military sound and whale strandings (as opposed to low-frequency sound used for Navy LFA sonar), on March 15-16, 2000, 16 whales of four different species beached themselves in the Bahamas off the east coast of the U.S. during the time the Navy was

conducing Littoral Warfare Advanced Development (LWAD) Sea Tests. Seven whales died, including four Cuvier's beaked whales, a Blainville's dense beaked whale, and a spotted dolphin. This time, necropsies were performed; the National Marine Fisheries Service (NMFS) reported that:

The injuries to the six beaked whale heads were all consistent with an intense acoustic or pressure event. All six whales were examined by gross dissection and two of the heads were examined by computerized topography (CT) scan. All six beaked whales had some evidence of trauma to tissue associated with hearings, sound production, and/or airways. In particular, all had some hemorrhages in or around the ears. Other issues related to sound conduction or production such as the larynx and auditory fats had minor to severe hemorrhages. One animal also had evidence of a hemorrhage in the fluid space around the brain. In humans, injuries such as these would have caused extreme discomfort but do not generally cause permanent hearing loss or death.

These animals died from being stranded. We do not know what caused the animals to strand, but we think it is possible that the animals suffered vestibular effects (disequilibrium and disorientation) from an acoustic or pressure event. We base this suspicion upon the unique physiology of beaked whales about which little is known to date within the scientific community, and the fact that two species of beaked whales predominated the stranding event.

The injuries revealed in the necropsies were not consistent with a nearby explosion (there were no bone fractures), but could have been caused by a distant explosion, or an intense acoustic event. Postcranial tissues showed minor lesions in heart muscle and minor hemorrhage in lung and kidney issue that are less indicative of cause than the cranial results.

A NOAA acoustic array located 60 miles south of the stranding site did not indicate any explosions. However, the sampling rate of that array was not sufficient for detecting explosions.

NOAA Fisheries is unable at this time to link the biological damage to a specific source of acoustic energy or pressure. However, the coincident transit of the Northeast and Northwest Providence Channels by Navy ships using tactical sonars, and the fact that the two species of beaked whales predominated the strandings, suggest a priority need to examine whether injuries of this nature could be caused by exposure, over time, to a combination of Navy tactical sonars. The Navy has agreed to investigate this issue with us on a priority basis.

The two agencies are openly cooperating in this investigation. The Navy is preparing a model of the acoustic field produced by these tactical sonars. Examination of all models will be the subject of the next joint NOAA Fisheries/Navy workshop in mid-July. However, since microscopic examination of the inner ear of whales takes at least nine months, a final report of this investigation will not be available until early in 2001.

A Washington Post reporting of the incident noted:

The findings [on the Bahamas strandings] are the first ever to link either distant noise or a faraway explosion with a whale stranding, said Darlene Ketten, an auditory specialist at the Woods Hole Oceanographic Institution who helped conduct necropsies on six of the whales for NOAA. She called the conclusions "a red flag" and "a reason for concern."

On July 19, 2000, the U.S. House of Representatives Committee on Resources sent a letter to the Secretary of Defense, stating that the Mediterranean and Bahamas events "... warrant a more precautionary approach to the use of LFA sonar and further scientific investigation to determine its effect on marine species." The Committee stated:

...we urgently request that ... [the Navy] withdraw the DEIS and reassess your assumptions that LFA sonar poses no threat to the marine environment. We also request that you postpone proceeding with NMFS to obtain a Letter of Authorization for incidental take under the Marine Mammal Protection Act to operate LFA sonar worldwide until such time that NMFS can properly establish scientifically based noise standards for marine animals.

The Navy responded to the Committee in a letter dated August 24, 2000, stating that:

We believe that the SURTASS LFA DOEIS/EIS process continues to be a fair and comprehensive evaluation of the potential for environmental impacts from deployment of this critical national security system, and that its proposed employment will produce no more than minimal risk to the marine environment.

The Navy also noted that the sonar in use in the Bahamas in March 2000 was in the mid- (not low-) frequency range, on the order of 3-5 kHz, and the Navy contends: "These sonar systems have been in use ... for more than 20 years, including narrow passages and open ocean areas, without known ill effects on marine mammals." The Committee's letter and the Navy's response are attached as Exhibits 11 & 12.

G. <u>NRC Follow-up Review</u>. In a follow-up report to its 1994 report, in 2000 the NRC published "Marine Mammals and Low-Frequency Sound: Progress Since 1994," which included an independent discussion of both ATOC and Navy LFA research programs, and which made several recommendations addressing future research needs that are particularly relevant to Navy operations and facilities, including the following:

1. NMFS, the Navy, and other agencies with responsibilities for marine mammals or that conduct or permit activities that introduce significant levels of sound to the ocean <u>should evaluate the costs and benefits of an array of acoustic receivers designed to monitor both human-generated sound in the ocean and the vocalizations of whales in acoustic hotspots</u> (NRDC, 1999). One possibility is to use existing arrays such as the IUSS (JOI, 1994; Clark, 1995; Gisiner, 1998) developed by the U.S. Navy to detect submarines. ... Whales could be located and tracked in real time and in three-dimensional space, thus identifying natural paths

and avoidance paths. This capability was demonstrated in the Whales '93 program in which the IUSS was used to routinely detect, locate, and track blue, finback, and humpback whales in the North Atlantic Ocean (JOI, 1994). Hundreds of thousands of whale vocalizations were documented, allowing the description of seasonal movements of the whales. ... [Emphasis added.]

2. The concept of Stranded Whale Auditory Test (SWAT) teams recommended in NRC (1994) and NRDC (1999) should be implemented by funding trained scientists and associating them with stranding networks. The Office of Naval Research (ONR) partially funded a small effort to support the activities of a SWAT team, but the hardware and field methods are not yet adequate for wide testing. The ONR program manager (R. Gisiner) estimates that a considerable, but not unreasonable, amount of hardware and software design and testing will be needed (about 1-2 years of effort) before a system capable of regular operation under the SWAT team approach is feasible. However, this activity should be expanded to at least two teams, one on the east coast and one on the west coast of the United States. The teams should be responsible for (1) necropsy of suspected/possible marine mammal victims of sound injury (to be able to show whether sound caused the injuries or deaths) and (2) testing of hearing on stranded or entangled live animals. There is a need to expand the pool of individuals capable of doing this kind of work .... An immediate need is for funding a specialist in evoked potential audiometry to develop improved methods applicable to large whales ... NMFS and/or ONR should include funding for such work in the next budget cycle. [Emphasis added.]

3. Lack of specialized research facilities hinders the priority studies described earlier. ... Currently, there is only one site in the United States (and perhaps the world) that has the facilities and animals that could be used in such studies. This site is operated by the U.S. Navy in San Diego, California. ... Recommendations: If the studies described ... [in the NRC report] are of sufficient priority to reduce uncertainties in the regulation of human-generated sound in the ocean, federal agencies should establish a national facility for the study of marine mammal hearing and behavior. The Committee believes that such a facility might be established at relatively little incremental cost by enhancement of the existing Navy facility. ...The Navy's Marine Mammal Program facility in San Diego keeps marine mammals and already has trained animals and expertise in maintaining them. Its role potentially could be expanded to provide a more widely accessible national facility, including unclassified research. ... [Emphasis added.]

(Exhibit 9 contains additional Findings and Recommendations from the Executive Summary of that report.)

H. Fundamentals of Under Water Sound. Decibel measurements state the ratio between measured pressure value and a reference pressure value. The scale is logarithmic, meaning that each 10 dB increase is a ten-fold increase in power (e.g., 20 dB is a 100-fold increase, 30 dB is a 1,000-fold increase). Psychologically, humans *perceive* a 10 dB increase in noise as a doubling of sound level. Comparing sound levels in air against sound levels in water must be done carefully, for two reasons. First, the reference

pressure values are different by 26 dB. Second, and more importantly, due to the difference in relative impedance of air and water (the stiffness or density of the medium), a roughly 5,000 times greater power level (35.5 dB) is necessary in air than in water to produce an equivalent pressure level. Combining these two factors, a 61.5 dB difference or correction factor, between the air and water scales is required. In other words, 61.5 dB must be subtracted from a sound level in water to produce an equivalent acoustic intensity in air.

In this report, dB references are broadband-level values, based on the water reference standard, standardized at 1 micro Pascal at 1 m (dB re 1uPa at 1 m) for source levels (SL), and dB re 1 uPa rms (root mean squared) for received levels (RL).

Sound intensity in deep water generally diminishes as the square of the distance from the source (i.e., $1/r^2$, with a 6 dB reduction for a doubling in distance), also called "spherical spreading. In this equation transmission loss is defined as 20 log R. In shallow water, cylindrical spreading can occur (1/r, or a 3 dB reduction for a doubling in distance, or 10 log R). Because LFA is not a typical single-source and would operate in many different ocean conditions, its transmission loss calculations are complex (see discussed on page 21).

Finally, the Navy's EIS states that:

*... the source level of an array is much higher than the source level of the given elements in the array. This is because the array acts as an antenna, and the source levels of the individual elements combine to produce a louder sound field. For example, given that an array with 18 elements has a source level of 230 dB re 1 μPa at 1 m, the source level of one element is 230 – 20*log (18) = 204.9 dB re 1 μPa at 1 m. Therefore, the source level of each element is over 25 dB less than the integrated source level of the entire array.*

III. Procedures

A. Applicable Legal Authorities. Section 307 of the Coastal Zone Management Act (CZMA) provides in part:

> *(c)(1)(A) Each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs.*

B. Practicability. The federal consistency regulations implementing the CZMA include the following provision:

Section 930.32 Consistent to the maximum extent practicable.

(a) The term "consistent to the maximum extent practicable" describes the requirement for Federal activities including development projects directly affecting the coastal zone of States with approved management programs to be fully consistent with such programs unless compliance is prohibited based upon the requirements of existing law applicable to the Federal agency's operations. If a Federal agency asserts that compliance with the management program is prohibited, it must clearly describe to the State agency the statutory provisions, legislative history, or other legal authority which limits the Federal agency's discretion to comply with the provisions of the management program.

The Commission recognizes that the standard for approval of Federal projects is that the activity must be "consistent to the maximum extent practicable" (Coastal Zone Management Act Section 307(c)(1)). This standard allows a federal activity that is not fully consistent with the CCMP to proceed, if compliance with the CCMP is "*prohibited [by] existing Federal law applicable to the Federal agency's operations*" (15 C.F.R. § 930.32). The Navy has not cited any "statutory provision, legislative history, or other legal authority which limits [its] ... discretion to comply with the provisions of the" CCMP (15 C.F.R. § 930.32(a)). Since the Navy has raised no issue of practicability, as so defined, the standard before the Commission is full consistency with the policies of the California Coastal Management Program (CCMP).

C. Necessary Information. Section 930.42(b) of the federal consistency regulations (15 CFR Section 930.42(b)) requires that, if the Commission's objection is based on a lack of information, the Commission must identify the information necessary for it to assess the project's consistency with the CCMP. That section states that:

If the State agency's disagreement is based upon a finding that the Federal agency has failed to supply sufficient information (see Section 930.39(a)), the State agency's response must describe the nature of the information requested and the necessity of having such information to determine the consistency of the Federal activity with the management program.

The nature of the information that the Commission has requested, but that the Navy has failed to provide, is described on pages 23-25 & 29 of these findings. As discussed in the staff note (page 1) and as described more fully in the findings below, such information is necessary to enable it to determine whether the proposed project is consistent with Sections 30230, 30213 and 30220 of the Coastal Act (part of Chapter 3, the substantive component of the CCMP).

D. Measures to Bring the Project into Conformance with the CCMP. Section 930.42(a) of the federal consistency regulations (15 CFR § 930.42(a)) requires that, if the Commission's objection is based on a finding that the proposed activity is inconsistent with the CCMP, the Commission must identify measures, if they exist, that would bring the project into conformance with the CCMP. That section states:

In the event the State agency disagrees with the Federal agency's consistency determination, the State agency shall accompany its response to the Federal agency with its reasons for the disagreement and supporting information. The State agency response must describe (1) how the proposed activity will be inconsistent with specific elements of the management program, and (2) alternative measures (if they exist) which, if adopted by the Federal agency, would allow the activity to proceed in a manner consistent to the maximum extent practicable with the management program.

As discussed above, the Commission has found that it does not have sufficient information to find the project consistent with the marine resources (Section 30230) and public recreation (diving) policies (Sections 30213 and 30220) of the Coastal Act. Therefore, at this point, it is premature to discuss feasible alternative measures that may be needed to enable the project to be conducted in a manner consistent with the CCMP.

E. Federal Agency Responsibility. Section C(a)(i) of Chapter 11 of the CCMP requires federal agencies to inform the Commission of their response to a Commission objection. This section provides that:

If the Coastal Commission finds that the Federal activity or development project ... is not consistent with the management program, and the federal agency disagrees and decides to go forward with the action, it will be expected to (a) advise the Coastal Commission in writing that the action is consistent, to the maximum extent practicable, with the coastal management program, and (b) set forth in detail the reasons for its decision. In the event the Coastal Commission seriously disagrees with the Federal agency's consistency determination, it may request that the Secretary of Commerce seek to mediate the serious disagreement as provided by Section 307(h) of the CZMA, or it may seek judicial review of the dispute.

F. Presidential Exemption. As amended on November 5, 1990, the CZMA provides for a presidential exemption where the state finds, and the federal courts agree upon judicial review, that a Federal agency activity is not consistent to the maximum extent practicable with the state's coastal management program. Section 307(c)(1)(B) provides:

After any final judgment, decree, or order of any Federal court that is appealable under Section 1291 or 1292 of title 28, United States Code, or under any other applicable provision of Federal law, that a specific Federal agency activity is not in compliance with subparagraph (A), and certification by the Secretary that mediation under subsection (h) is not likely to result in such compliance, the President may, upon written request from the Secretary, exempt from compliance those elements of the Federal agency activity that are found by the Federal court to be inconsistent with an approved State program, if the President determines that the activity is in the paramount interest of the United States. No such exemption shall be granted on the basis of a lack of appropriations unless the President has specifically requested such appropriations as

part of the budgetary process, and the Congress has failed to make available the requested appropriations.

IV. Federal Agency's Consistency Determination. The Navy has determined the project consistent to the maximum extent practicable with the California Coastal Management Program.

V. Staff Recommendation. The staff recommends that the Commission adopt the following motion:

MOTION: I move that the Commission agree with consistency determination CD-113-00 that the project described therein is fully consistent, and thus is consistent to the maximum extent practicable, with the enforceable policies of the California Coastal Management Program (CCMP).

STAFF RECOMMENDATION:

Staff recommends a **NO** vote on the motion. Failure of this motion will result in a disagreement with the determination and adoption of the following resolution and findings. An affirmative vote of a majority of the Commissioners present is required to pass the motion.

RESOLUTION TO DISAGREE WITH CONSISTENCY DETERMINATION:

The Commission hereby **disagrees** with the consistency determination by the Navy, on the grounds that the consistency determination does not contain sufficient information to determine the project's consistency to the maximum extent practicable with the enforceable policies of the California Coastal Management Program (CCMP).

VI. Findings and Declarations:

The Commission finds and declares as follows:

A. Marine Resources.

1. Coastal Act Policies. Section 30230 of the Coastal Act provides:

Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

2. Marine Resources in Project Area. In its ocean-by-ocean list of species subject to "incidental take" pursuant to the Marine Mammal Protection Act (i.e., a NMFS harassment permit), the Navy's Draft EIS lists sensitive species likely to be affected in the Pacific Ocean. Exhibit 5 lists these species. Most of these species spend portions of their life cycle within the coastal zone and are subject to protection under the Coastal Zone Management Act.[4]

3. Navy LFA Research Results. As mentioned on page 10, the Navy performed research on feeding, migrating, and breeding whales to look at behavioral responses to LFA sounds in the 120 to 155±5 dB range. The Navy states:

In order to minimize the chance of harassment to experimental animals, the LFS SRP [Low Frequency Sound, Scientific Research Program] *restricted exposures to a maximum RL of 160±5 dB.*

During the first phase of LFS SRP research, the source ship operated routinely with the full source array at power levels similar to those that would be used in normal Navy operations. The ship also approached whales while operating two of the source levels. There was no pronounced disruption of feeding behavior from whales exposed to RLs from 110 to 153 dB.

In the second phase of LFS SRP research, migrating gray whales showed responses similar to those observed in earlier research (Malme et al., 1983; 1984) when the source was moored in the migration corridor ... The study extended those results with confirmation that a louder SL elicited a larger scale avoidance response. However, when the source was placed offshore ... of the migration corridor, the avoidance response was not evident on the track plots. The inshore avoidance model – is not valid for whales in proximity to an offshore source. Rather, these data suggest that avoidance of an offshore source (≥ 4 km [2.2 nm]) would be minor, even at considerably higher RLs of sound from SURTASS LFA sonar.

The third phase of LFS SRP research examined potential effects of SURTASS LFA sonar transmissions on singing humpback whales. These whales showed some apparent avoidance responses and cessation of song occurring at RLs ranging from 120 to 150 dB. However, an equal number of singing whales exposed to the same levels showed no cessation of song. Further analysis is required to establish how often male humpbacks stop singing in the absence of the SURTASS LFA sonar transmissions and to evaluate the significance of the song

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4 In granting the Commission permission to review ATOC (see page 7), the Office of Ocean and Coastal Resource Management (OCRM) stated: (1) "OCRM has determined that the marine animals at issue that ply the waters of the coastal zone and the OCS are coastal resources. The CZMA and its legislative history indicate that the effects test is to be construed broadly"; and (2) "...an activity that affects or is reasonably likely to affect these coastal resources that migrate through or use California waters, whether they may be affected while in or outside the coastal zone, is subject to federal consistency in accordance with the CZMA and 15 CFR Part 930."

cessation observed during playbacks. Of the whales that did stop singing, there was little response to subsequent pings. Most joined with other whales or resumed singing within less than an hour of the possible response.

This kind of brief interruption, followed by resumption of normal interactions, is similar to that seen when whales interrupt one another or when small vessels approach whales. If whales are in a breeding habitat where vessel interactions are frequent, then the aggregate impact of all disruptive stimuli could become significant. However, because the SURTASS LFA sonar system would be operated well offshore of these humpback breeding areas, it is likely that the cumulative impact of numerous inshore vessels would be significantly greater on these animals than that caused by an occasional offshore series of SURTASS LFA sonar transmissions.

The Navy concludes:

Taken together, the three phases of the LFS SRP do not support the predictions that most animals exposed to RLs near 140 dB would exhibit disruption of behavior and avoid the area. These experiments, which exposed animals to RLs ranging from 120 to 150 dB, elicited only minor, short-term behavioral responses, but not prolonged disruption of biologically important behavior.

4. Navy Analysis. Given these research results, and "based on independent research by prominent experts and the consensus from several scientific and technical workshops," Navy considers a 180-dB received level to be "... a scientifically reasonable estimate for the onset of potential injury to marine animals." To support this conclusion, in the Draft EIS the Navy developed a "risk continuum" (Exhibit 6) for the determination of the potential for prolonged disturbance of a biologically important behavior. The risk continuum ranges from a risk approaching zero at 119 dB, to a 95 percent probability of a prolonged disturbance of a biologically important behavior at 180 dB, with a graduated function in between. The Navy's EIS estimates that that below 120 dB the risk of harassment to marine mammals is zero, and at 180 dB, that 95% of marine mammals "could incur non-injurious harassment." The EIS further states that:

In all three phases of the LFS SRP, animals that were exposed to SURTASS LFA sonar signals at RLs up to 155 dB showed no behavioral response that was judged harmful or biologically significant. Those animals that did respond were found to resume normal behavior patterns within tens of minutes.

The EIS articulates a standard for safe deployment of the system to be "... that there be negligible population consequences from any non-injurious harassment caused by SURTASS LFA sonar operations." Based on this standard the EIS states:

The results of the OEIS/EIS analysis are consistent with this standard, given that proposed mitigation and monitoring are implemented ... and: 1) a low number of systems are deployed; 2) the host ship is moving during operations; 3) the duty cycle is low; and 4) aggregate mission activity in any one region and season is modest.

Exhibit 6 taken from the EIS elaborates further on the Navy's justification for a non-injurious response at RLs below 180 dB, and the following summary in the Navy's consistency determination elaborates on its "negligible population consequences" conclusion:

The potential impact on any stock of marine mammals from injury (within the LFA mitigation zone) due to the proposed action is negligible, and the effect on the stock of any marine mammal from prolonged disturbance of a biologically important behavior is minimal. Biologically important behaviors are those activities essential to the continued existence of a species, such as feeding, migrating, breeding and calving. The DOEIS/EIS calculates the percentage of each stock of marine mammals at risk of injury or prolonged disturbance of a biologically important behavior. These percentages took into consideration geographic restrictions and monitoring mitigation (Alternative 1, Restricted Operation, the Navy's Preferred Alternative) that would reduce the potential for effects on any stocks from injury to negligible levels. The numbers of animals potentially affected through prolonged disturbance of a biologically important behavior would be so small as to have negligible impacts on the affected species' stocks and upon the availability of the species for subsistence needs. The analytical methodology and results are presented in Chapter 4 of the DOEIS/EIS, and incorporated herein by reference.

To protect marine resources, the Navy has incorporated into the program: (1) operational and geographic restrictions; (2) short term, or project-related monitoring to assure the restrictions are complied with; and (3) long term monitoring to continue to study the effects of anthropogenic sounds on the marine environment. These measures are described further below.

a. <u>Operational and Geographic Restrictions</u>. The operational restrictions consist of monitoring during sonar operations to prevent injury to marine mammals (and possibly sea turtles) by ensuring, to the maximum extent possible, that they are not within the LFA mitigation zone (i.e., the 180-dB sonar sound field) during LFA transmissions. The Navy states this generally means avoiding exposing marine animals within a radius of 1 km from the source (at full power). The Navy will also employ geographic restrictions, (regardless of the presence of sensitive species), which consist of assuring that the sound field does not exceed: (1) 180 dB within 22 km (12 nm) of any coastline (including islands); and (2) 145 dB in the vicinity of known recreational and commercial dive sites. (The Navy has also agreed to avoid geographically-defined offshore "biologically important areas" (Exhibit 3); however none of these are offshore of California.)

The Navy further defines the 180 dB "Mitigation Zone" as follows:

The LFA mitigation zone covers an area ensonified to a level > 180 dB by the SURTASS LFA sonar transmit array. Under normal operating conditions, the range of this 180-dB sound field will vary between the nominal ranges of 0.75 to 1.0 km (0.40 to 0.54 nm) from the source array over a depth of approximately 122 ± 35 m (400 ± 115 ft). (The center of the array is at a nominal depth of 122 m [400 ft]). Under rare conditions (e.g., strong acoustic duct) this range could be somewhat greater than 1 km (0.54 nm). Knowledge of local environmental conditions (such as sound speed profiles [depth vs. temperature] and sea state) that affect sound propagation is critical to the successful operation of the SURTASS LFA sonar and is monitored on a near-real-time basis. Therefore, the SURTASS LFA sonar operators would have foreknowledge of such anomalous acoustic conditions and would mitigate to the 180-dB range even when this was beyond 1 km (0.54 nm).

b. Short-term Monitoring. The marine mammal restrictions will be accomplished through a relatively sophisticated three-part monitoring program, using visual, passive acoustic, and active acoustic monitoring, as follows:

- Visual monitoring for marine mammals and sea turtles from the SURTASS LFA sonar vessel during daylight hours;
- Use of the passive (low frequency) SURTASS array to listen for sounds generated by marine mammals as an indicator of their presence; and
- Use of high frequency (HF) active sonar to detect/locate/track potentially affected marine mammals (and possibly sea turtles) near the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array.

c. Long-term Monitoring. The Navy states "...it would be prudent to continue monitoring of potential effects of SURTASS LFA sonar on marine mammals." Consequently, the Navy intends to conduct Long Term Monitoring (LTM) concurrently with the operation of LFA sonar, as follows:

The principal objectives of the LTM Program for the proposed SURTASS LFA sonar employment are:

- *Conduct Navy and independent scientific analyses of the effectiveness of proposed mitigation measures, and make recommendations for improvements where applicable, to incorporate them as early as possible, with National Marine Fisheries Service (NMFS) concurrence;*
- *Provide the necessary input data for reports to NMFS (under the Marine Mammal Protection Act as discussed below) on assessment of whether any taking of marine*

mammal(s) occurred within the LFA mitigation zone (180-dB sound field) during SURTASS LFA sonar operations;

- *Study the potential effects of Navy SURTASS LFA sonar-generated underwater sound on long-term ecological processes relative to LF sound-sensitive marine mammals and sea turtles, focusing on the application of Navy technology for the detection, classification, localization, and tracking of these animals;*

- *Collaborate, as feasible, with pertinent Navy, academic, and industry laboratories and research organizations, and where applicable, with Allied navy and academic laboratories; and*

- *Provide for incident monitoring to include: (1) recreational or commercial diver incident monitoring, and (2) marine mammal stranding incident monitoring. The Navy would maintain close coordination with the principal clearinghouses for information on diver-related incidents, namely the National Association of Underwater Instructors (NAUI), Professional Association of Diving Instructors (PADI) and Divers Alert Network (DAN). For recreational dive sites, the Navy will notify DAN and other diving organizations concerning SURTASS LFA sonar operations on a case-by-case basis. In addition, when the Navy files a Notice to Mariners for major naval exercises, it would include the notification of any SURTASS LFA sonar participation. The Navy would also coordinate with the principal worldwide marine mammal stranding networks, including federal and state, and international organizations.*

The Navy concludes:

The Navy has determined that with geographic restrictions and monitoring mitigation the proposed SURTASS LFA sonar employment would be carried out in a manner that would sustain and protect the biological productivity of coastal waters. As such, the Navy has determined that the proposed action is consistent with Sections 30230 and 30231 of the California Coastal Act.

5. <u>NRDC Concerns</u>. Just as the Navy has been a leader in pursuing research on the effects of sounds in the marine environment, the Natural Resources Defense Council (NRDC) has been instrumental in bringing the issues raised to the attention of the general public and raising concerns about the increasing degree of ambient noise in the ocean caused by human activity[5]. The NRDC's comments on the DEIS describe a number of deficiencies in the Navy's analysis and conclusions. The most relevant of these are attached as Exhibit 10 (NRDC letter to Navy, pp. 8-13). NRDC believes the Navy: (1) makes unwarranted

[5] *Sounding the Depths: Supertankers, Sonar, and the Rise of Undersea Noise,* Natural Resources Defense Council, 1999.

extrapolations from extremely limited data; (2) ignores relevant data not supporting the Navy's conclusions; (3) disregards biological concerns, (4) ignores the Navy's own cautions about extrapolating 120-150 dB data to higher received levels; and (5) ignores a recent (Aug. 1999) study by Kastak and Schusterman et al.,[6] which found temporary threshold shifts at 60-75 dB above lowest haring threshold in 3 pinniped species, and which NRDC maintains contradicts studies on bottlenose dolphins relied on by the Navy as the primary basis for its 180 dB criterion. The Navy has not yet responded to NRDC's comments, as of the date of this writing.

6. Commission Conclusion: Marine Resources. In commenting on the Navy's DEIS, the Commission staff stated (Exhibit 7):

Whereas the Navy's preliminary research better clarified marine mammal response to LFA signals in the range of 120-160 dB RL (Received Level) range, the EIS extrapolated from this range to a conclusion that any RL of <180 dB is acceptable. This is simply not justified by the available evidence.

We recommend a return to the Navy's previous approach adopted prior to publication of the EIS and one we supported in our review and concurrence with the Navy's Phase I and II LFA research. That approach is to perform additional scientific studies that establish (rather than extrapolate and speculate) safe levels of use, and only then to proceed to operate at the higher noise levels. We believe the Navy should conduct further studies of effects on marine resources, or at least perform additional studies concurrently with LFA operation, attempting to document impacts at these higher noise levels. The Navy also needs to collect, maintain and publish monitoring results for the life of the program. Given the steady increases in anthropogenic sound in the marine environment, and the difficulty in truly understanding the effects of underwater sound on marine mammals, there will continue to be unresolved questions about the wisdom and safety of the use of active sonar technology. The use of loud low frequency active sonar equipment, whether it is being used for commercial, scientific or military purposes, needs to be accompanied by significant studies of the effects of these types of anthropogenic noises in order for policymakers to approve and the public to accept their use.

The Commission staff also: (1) questioned the Navy's conclusions concerning the effectiveness of its active monitoring technology; (2) questioned the Navy's assumptions and extrapolations of LFA research to the 180 dB level; (3) questioned assumptions from the Navy's diver studies; (4) raised cumulative impact concerns; and (5) asked several questions about the Navy's monitoring. The Commission staff concluded:

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[6] Kastak and Schusterman et al., "Underwater temporary threshold shift induced by octave-band noise in three species of pinniped," 106 *J. Acoust. Soc. Am.* 1142-48.

In light of the above discussion and information needs, we finally question the confidence with which the Navy asserts on Page 4.4-3 that: "... any potential for cumulative impacts from SURTASS LFA sonar operations is extremely small and has been addressed by limitations proposed for employment of the system." To reiterate briefly, among the reasons for our questioning this conclusion are: (1) the lack of reliable cumulative impact information concerning both Navy and other nations' or organizations' use of LFA; (2) the paucity of reliable information on the overall effects of noise on the marine environment; (3) the extreme difficulty of accurately monitoring and measuring the effects of LFA and other low-frequency underwater noise impacts; and (4) an unsubstantiated reliance on 180 dB as a safety threshold for impacts, based on limited Navy LFA studies primarily exposing animals to <180 dB levels.

We understand that in the context of all the world's noise sources, LFA is not a dominant factor. But the same can be said of any individual source: each one by itself is relatively insignificant, but the cumulative impact may be significant. The EIS should acknowledge how little we really know about cumulative noise impacts and should propose studies to fill the data gaps and monitor the effects of human-induced noise on the marine environment.

In reviewing the LFA research phases, ATOC, and other acoustic projects, the Commission noted growing evidence from the past decade that man-made sounds can disturb marine mammals. Despite the additional Navy research, and considering the recent events in the Mediterranean and the Bahamas, the Commission remains concerned over these issues. Definitive conclusions regarding the implications of recent stranding events for LFA technology are elusive. On the one hand, low-frequency sound was not implicated in the Bahamas whale strandings, and it may well have been the mid- rather than low-frequency sound leading to the 1996 Mediterranean strandings. On the other hand, the events underscore how little is known about marine mammals and noise. Based on current commonly-held assumptions, the sounds that may have caused the Bahamas strandings were not expected to lead to severe adverse marine mammal reactions. Also, it may have been a complex synergistic effect of a combination of different sounds that caused the reaction. In any event, serious re-evaluation of current assumptions on the effects of military sonar technology may be warranted.

Marine mammals rely on sound for communication, orientation, and detection of predators and prey. LFA (and ATOC) research efforts documented behavioral responses including silencing, disruption of activity, and movement away from the source. Sound carries so well underwater that animals can be affected at great distances from a loud acoustic source (and with low-frequency sources carrying the greatest distances). Because so little is known about the effects of low-frequency sound on marine mammals, NMFS, the Commission, and other regulatory agencies have been extremely challenged in their efforts to establish regulatory thresholds and policy in the absence of reliable data. To date, and clearly with difficulty, the Commission has, for want of a more reliable standard, accepted 180 dB (RL) as "a reasonable estimate for the level at which potential physiological injury could occur for marine animals." (See, for example, USGS Seismic Surveys (CD-32-99 and CD-16-00), NMFS Pulsed Power Experiment (CD-102-99), and the Minerals Management Service's High Energy Seismic Survey (HESS)

efforts). Even *more* challenging, given the long-term scope of the proposed LFA project, and given the fact that behavioral changes can be documented at RLs well below 180 dB, is determining which types of behavioral responses should be considered acceptable and benign, as opposed to those which pose adverse population or biological consequences. Clearly, both the geographic and temporal scope of LFA use far exceed any of the more limited acoustic activities previously authorized by the Commission. On the other side of the equation, the Navy articulates legitimate defense mission needs and has sincerely and objectively attempted to answer some of the thorny issues raised and incorporate measures to protect marine resources. Despite the challenges and limited research available, the Commission needs to weigh the competing military and resource protection needs and arrive at a scientifically justifiable conclusion.

The Commission did not receive the Navy's responses to the Commission staff's Oct. 26, 1999, comments and questions on the Draft EIS by the time of publication of this report for the December Commission meeting. Analysis of these questions is necessary to enable the Commission to determine whether marine resources would be adversely affected by the proposed LFA use. Therefore, at this point in the process, the Commission concludes that it does not have sufficient information to determine the project's consistency to the maximum extent practicable with the marine resource protection policy (Section 30230) of the Coastal Act.

B. Commercial and Recreational Fishing and Diving.

1. Coastal Act Policies. Section 30230 of the Coastal Act, quoted on page 17 above, provides for the protection of economically (as well as biologically) significant marine species (including fish). Section 30234 provides: "Facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded." Section 30234.5 provides that: "The economic, commercial, and recreational importance of fishing activities shall be recognized and protected." Section 30213 provides that "Lower cost visitor and recreational facilities shall be protected, encouraged, and, where feasible, provided." Section 30220 of the Coastal Act provides that: "Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses."

2. Fishing. The Navy believes that impacts on commercial and recreational fishing will be minimal. The Navy's consistency determination states:

The criterion applied to fish, sharks and sea turtles for the proposed action to cause significant direct effects is that the animal would have to be located within the LFA mitigation zone (180-dB sound field) during the time that the sonar was operating. A negligible portion of stocks of any fish, shark or sea turtle would be exposed to these levels, even in the absence of monitoring mitigation.

Section 30234.5 provides: "The economic, commercial and recreational importance of fishing activities shall be recognized and protected." The proposed SURTASS LFA sonar employment would restrict the operation of SURTASS LFA sonar in coastal areas of commercial and recreational fishing activities. Scientific data and evidence indicate that if SURTASS LFA sonar operations occur in proximity to pelagic fish stocks, members of some fish species could potentially be affected by LF sounds. However, it is reasonable to consider any possible hearing loss or injury to fishes from SURTASS LFA sonar transmissions to be limited to the LFA mitigation zone (180-dB sound field), and a negligible portion of any fish stock would be present within this zone at any one time during actual sound transmission. Even assuming that all fish exposed within the LFA mitigation zone were to be affected, the percent of fish catch within the NMFS Fisheries Resource Region—Pacific Coast potentially affected would be negligible compared to the tonnage of fish harvested commercially and recreationally in the same oceanic region. The Navy has therefore determined that the proposed SURTASS LFA sonar employment is consistent with Section 30234.5 of the California Coastal Act.

Concerning recreational fishing, the Navy states:

The proposed action would have no significant impacts on recreational fish stocks and/or fish captures in marine waters due to the geographic restriction on operations and the temporary nature of SURTASS LFA sonar employment (i.e., limited duty cycle [on no more than 20 percent of the time], relatively short signal duration [maximum of 100 seconds] and moving source).

NRDC has raised concerns about the "lack of meaningful analysis of LFA's effects on Salmon and other endangered and threatened fish" in its DEIS comments; however this discussion focused on potential effects in the Gulf of Alaska. The Commission does not believe the available evidence supports a finding that operations offshore of California waters would adversely affect commercial and recreational fishing; nor does the Commission anticipate additional information on this subject. The Commission finds that project will not cause significant adverse effects on commercial and recreational fishing in California coastal waters, and is therefore consistent with the portion of Section 30230 relating to fisheries, and with Sections 30234, and 30234.5 of the Coastal Act.

3. <u>Diving/Other Recreation.</u> The Navy also believes that impacts on commercial and recreational diving will be minimal with proposed mitigation; the Navy's consistency determination states:

Adequacy of Scientific Information On Human Divers

The Navy sponsored research to study the potential effects of LF sound on humans in the water. This research was conducted by teams of independent scientists from universities and from military research laboratories. The research is described below. Based on results from this research and in conjunction with guidelines developed from

psychological aversion testing, the Navy concluded that LF sound levels below 145 dB would not have an adverse effect on recreational or commercial divers. This led the Navy Submarine Medical Research Laboratory (NSMRL) to establish a 145-dB received level (RL) criterion for recreational and commercial divers. The Navy-sponsored studies on human divers included:

- *Tests on Navy divers. This research was conducted by the Applied Research Laboratory, University of Texas, from 1993 to 1995 under the direction of NSMRL. In this study, 87 subjects (Navy divers) participated in 437 tests designed to determine the received sound level threshold below which there was no risk of auditory damage. This research resulted in the establishment of a damage risk threshold of 160 dB received level for less than 2 minutes at one time and for less than 15 minutes a day. The 160-dB RL threshold was the maximum level recommended as standard guidance for divers who were equivalent in medical health and fitness to Navy divers.*

- *A study to develop guidance for safe exposure limits for recreational and commercial divers who might be exposed to LF sound. This research was conducted by scientists from the Office of Naval Research (ONR) and NSMRL between June 1997 and November 1998 in conjunction with scientists from University of Rochester, Georgia Institute of Technology, Boston University, University of Pennsylvania, Naval Medical Center San Diego, Duke University, Divers Alert Network, and Applied Research Laboratory, University of Texas. This study, which is incorporated as Technical Report 3 to the DOEIS/EIS, developed guidance criteria for human exposure to LF sounds such as those transmitted by the SURTASS LFA sonar system. Results were based on computer modeling and animal and human studies during which subjects were exposed to known levels of LF sound for known periods of time.*

  Human guidelines were established based on psychological aversion testing. There was only a two percent aversion reaction subjectively judged as "very severe" by divers at a level of 148 dB. NSMRL therefore determined that scaling back the intensity by 3 dB (a 3 dB reduction equals a 50 percent reduction in signal strength) would provide a suitable margin of safety against psychological aversion for divers. Hence, NSMRL set the RL criterion for recreational and commercial divers at 145 dB. This criterion was endorsed by the Department of the Navy, Bureau of Medicine and Surgery (BUMED) on 18 October 1999.

The Navy's adoption of the 145-dB guidance for operation of low frequency underwater sound sources in the presence of divers is considered a conservative, protective decision. During operation of the SURTASS LFA sonar, the distance from the source to where the RL is 145 dB (the 145-dB sound field) varies from site to site due to the high variability in underwater sound propagation characteristics and deployment protocols. The most reliable method for ensuring that the criterion of 145-dB maximum RL is maintained at

known recreational and commercial dive sites involves the application of validated underwater acoustic models of sound propagation using site-specific environmental parameters. Results provide an estimation of sound pressure level (SPL) as a function of range and depth for each specific site.

The Navy's consistency determination further states:

The proposed SURTASS LFA sonar employment (Alternative 1, Restricted Operation) would be employed with geographic operational restrictions. Sound levels generated by the operation of the sonar would not be allowed to exceed 180 dB within 22 km (12 nm) of the coast. In addition, sound fields generated by the SURTASS LFA sonar under the Restricted Operation Alternative would not be allowed to exceed 145 dB in the vicinity of known dive sites. This is generally defined as from the shoreline out to the 40-m (130-ft) depth contour, but it is recognized that there are other sites that may be outside of this boundary. The latter would be identified using information obtained from the worldwide Divers Alert Network (DAN) and other available literature.

As discussed below, the geographic restrictions imposed on the proposed SURTASS LFA sonar employment ensure that California coastal areas suited for water-oriented activities would be protected for such uses.

Swimming, Surfing, Snorkeling and Diving: Participants in activities that may involve submersion below the ocean's surface, such as swimming, surfing, snorkeling and diving, would not be significantly impacted by the proposed SURTASS LFA sonar employment. This determination is based on the following findings.

- *Beach Location - Exposure to LF sound energy would be eliminated or greatly reduced at beaches that are separated from the open ocean by a land mass (such as beaches that exist inside islands or in bays), or beaches along portions of the continental shelf.*

- *Water Depths - Swimming, surfing and snorkeling occur generally in areas that extend from the surface to approximately 2 m (6.5 ft). Applying underwater acoustic propagation theory and detailed measurements to these depths, there would be substantial sound transmission losses occurring in the top layer of water where swimmers, surfers and snorkelers would most likely be found. Sound fields in this layer of water would be about 20 dB less than the sound fields in adjacent deeper water.*

- *Divers – Under the proposed SURTASS LFA sonar employment, employment of the SURTASS LFA sonar would be restricted to sound pressure levels not to exceed 145 dB in known recreational and commercial diving sites. As described*

- *above and in Attachment A, research conducted by the Navy indicates that LF sound levels below 145 dB do not have an adverse effect on humans (recreational or commercial divers) in water.*

These findings provide the basis for the Navy's determination that there would be no significant impacts to persons engaged in swimming, surfing, snorkeling, and diving resulting from the proposed SURTASS LFA sonar employment.

Whale Watching: The geographic and sound level restrictions of the proposed SURTASS LFA sonar employment were included to restrict the operation of SURTASS LFA sonar in areas where there are known concentrations of marine mammals, such as whales. Whale watching sites are located in areas where there are known concentrations of marine mammals. In California, this activity is concentrated on the coastal migratory routes of whales. Consequently, these geographic and sound pressure level restrictions would ensure that there were no significant impacts on whale watching activities as a result of the proposed employment of SURTASS LFA sonar.

4. Commission Conclusion: Fishing/Recreation/Diving. As stated above, the Commission has found the project consistent with the fishing policies. However, concerning diving activities, the Navy has not yet responded to the Commission staff's questions regarding the reliability of its assumptions and conclusions from its diving studies. The Commission also questions the Navy's assumptions that whale watching impacts would be confined to coastal areas, and therefore, with its conclusion that whale watching would not be affected. Monterey Bay whale watching tour guides report that whale watching activities in California waters are not limited to coastal migratory paths, and even gray whale migratory paths are far from shore in the area between south of Point Conception and Mexico area. Therefore, while the project consistent is with the commercial and recreational fishing policies, the Commission concludes that it lacks sufficient information at this time to determine the project's consistency to the maximum extent practicable with the diving and recreation policies (Sections 30213 and 30220) of the Coastal Act.

VII. SUBSTANTIVE FILE DOCUMENTS:

1. Navy Consistency Determination CD-113-00, Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") Sonar Program.

2. Draft Overseas Environmental Impact Statement/Environmental Impact Statement (OEIS/EIS) Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") Sonar Program, U.S. Navy, July 1999.

3. Consistency Determination No. CD-95-97 (Navy, LFA, Phase I, off San Nicolas Island). and CD-153-97 (Navy, LFA, Phase II, off Big Sur).

4. Consistency Certification CC-110-94/Coastal Development Permit Application 3-95-40, Scripps Institution of Oceanography, Acoustic Thermometry of Ocean Climate (ATOC) Project and Marine Mammal Research Program (MMRP).

5. Consistency Determinations CD-109-98 (Navy Advanced Deployable System (ADS) acoustic undersea surveillance system tests), CD-32-99 and CD-16-00 (USGS, seismic surveys, southern California), and CD-102-99 (National Marine Fisheries Service, pulsed power tests).

6. *Low-frequency Sound and Marine Mammals: Current Knowledge and Research Needs, Committee on Low-frequency Sound and Marine Mammals*, Ocean Studies Board, Commission on Geosciences, Environment, and Resources, National Research Council, March 21, 1994.

7. *Marine Mammals and Low-Frequency Sound: Progress Since 1994*, Ocean Studies Board, Commission on Geosciences, Environment, and Resources, National Research Council, 2000.

8. *Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior. Phase II: January 1984 migration,* Malme CI, PR Miles, CW Clark, P Tyack and JE Bird (1984), Bolt Beranek and Newman Report No. 5586 submitted to Minerals Management Service, U. S. Dept. of the Interior.

9. *Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior,* Malme CI, PR Miles, CW Clark, P Tyack and JE Bird (1983. Bolt Beranek and Newman Report No. 5366 submitted to Minerals Management Service, U. S. Dept. of the Interior.

10. *Behavioral Responses and Temporary Shift in masked Hearing Threshold of Bottlenose Dolphins,* Tursiops truncatus, to 1-second Tones of 141 to 201 dB re 1 μPa, Sam H Ridgeway, et al., July 1997.

11. Quick Look – Playback of low frequency sound to gray whales migrating past the central California coast – January, 1998, Peter Tyack, Christopher Clark, 23 June 1998.

12. *Summary Record and Report SACLANTCEN Bioacoustics Panel, NATO* (A. D'Amico, Editor), El Spezia, Italy, 15-17 June 1998.

13. *Marine Mammals and Noise*, W. John Richardson, Charles R. Greene, Jr., Charles I. Malme, Denis H. Thomson, 1995.

14. High Energy Seismic Survey Review Process and Interim Operational Guidelines for Marine Surveys Offshore Southern California, the High Energy Seismic Survey Team, for

the California State Lands Commission and the U.S. Minerals Management Service Pacific OCS Region, September 1996 – February 1999.

15. *The Heard Island Feasibility Test*, Baggeroer and Munk, Physics Today, Sept. 1992, 45:22-30.

18. *Sounding the Depths: Supertankers, Sonar, and the Rise of Undersea Noise,* Natural Resources Defense Council, 1999.

19. *Underwater temporary threshold shift induced by octave-band noise in three species of pinniped*, Kastak and Schusterman et al., 106 J. Acoust. Soc. Am. 1142-48.

G: Land Use/Federal Consistency/Staff Reports/2000/113-00 Navy LFA

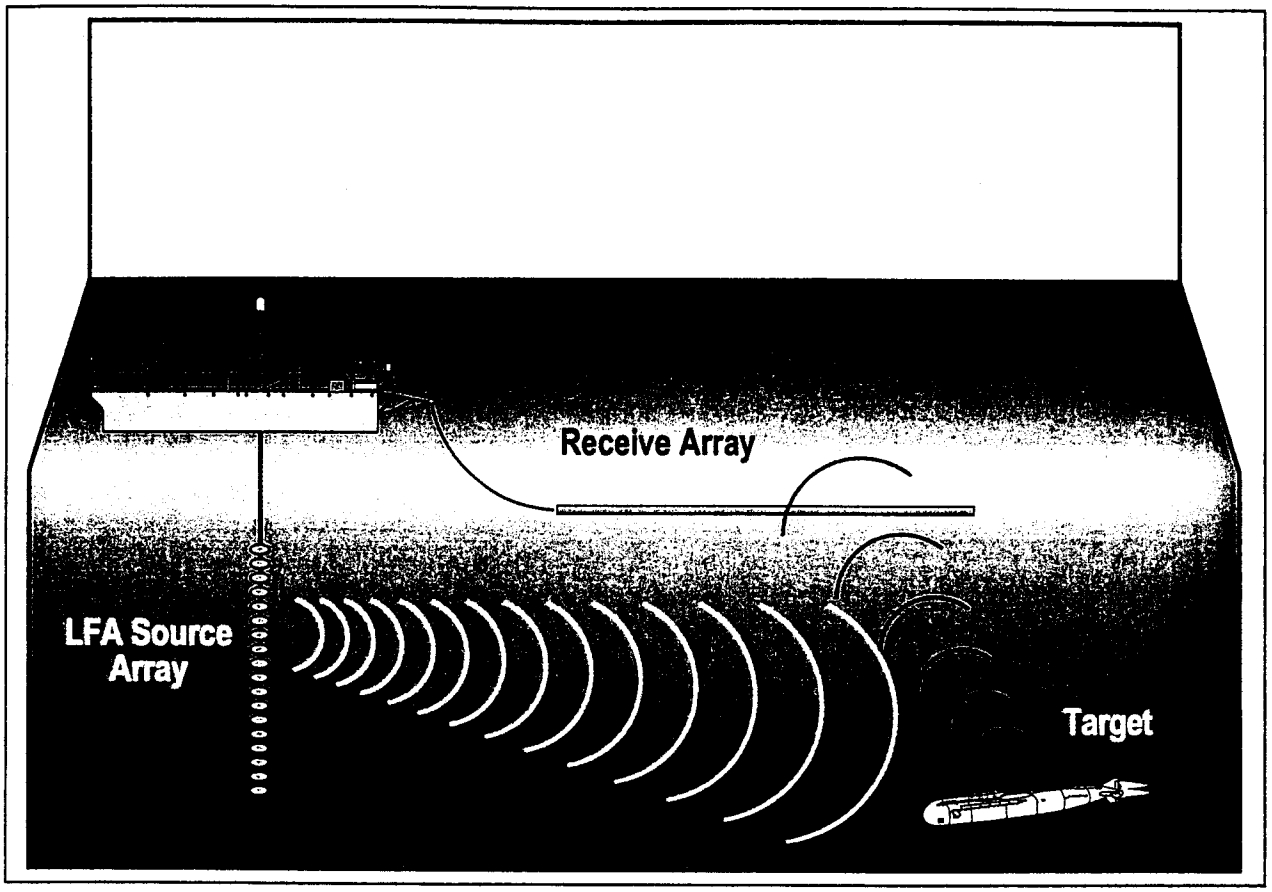

Figure S-2. SURTASS LFA Sonar System.

and constant tones, or frequencies. The signals are loud at the source, but levels diminish rapidly over the first kilometer.

The passive or listening component of the system is SURTASS, which detects returning echoes from submerged objects through the use of hydrophones on a receiving array that is towed behind the ship. The SURTASS LFA ship maintains a minimum speed of 5.6 kilometers (km) per hour (kph) (3 knots [kt]) through the water to tow the horizontal line hydrophone array.

Executive Order 12114 and NEPA require the Navy to evaluate a reasonable range of alternatives to the proposed action. The alternatives evaluated in this OEIS/EIS are the:

- **No Action Alternative** - operational deployment of SURTASS LFA sonar would not occur;

- **Alternative 1** - (the Navy's preferred alternative) use of the sy geographic restrictions and monitoring to prevent injury to species (see S.4.8 below); and

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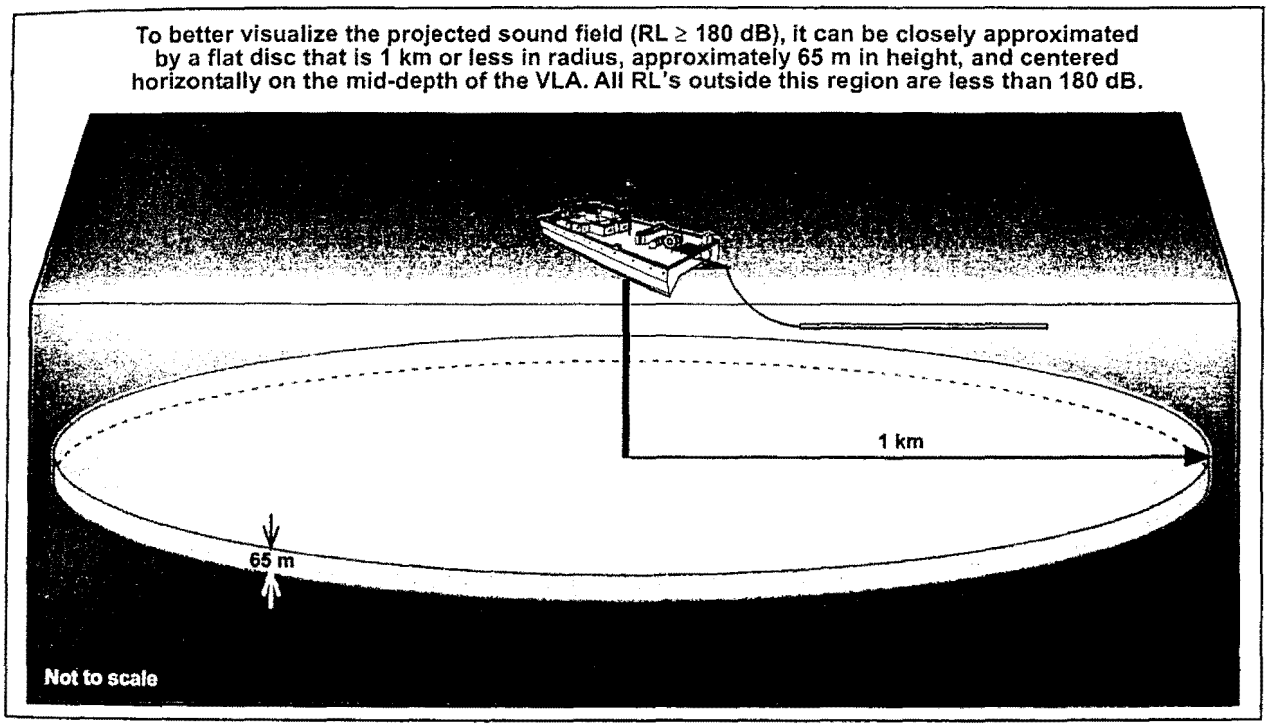
the exposure of a marine mammal to a sound that was loud enough to cause permanent loss of hearing, or permanent threshold shift (PTS). Non-serious injury is usually considered to be an injury from which a marine mammal would recover, such as TTS in hearing due to exposure to loud sounds. In the case of SURTASS LFA sonar, a marine mammal would have to receive one ping at a RL greater than or equal to 180 dB or many pings at a slightly lower RL (i.e., SPE ≥180 dB) to possibly incur non-serious injury. For serious injury, the animal would have to be well within the 180-dB sound field at the onset of a transmission (i.e., it would have to be nearly co-located with the vessel to be exposed to this level). The probability of this co-location occurring is nearly zero because of the visual and acoustic monitoring that would be utilized whenever the SURTASS LFA sonar is transmitting (see S.4.8 below). Therefore, for a single ping, the sound field ≥180 dB is considered to be only for non-serious injury (as shown in Figure S-3 [SURTASS LFA Sonar Projected 180 dB Sound Field])

Figure S-3. SURTASS LFA Sonar Projected 180 dB Sound Field.



The SURTASS LFA standard used for determining whether SURTASS LFA sonar could be safely employed was that any potential for non-serious injury or injury to marine mammals had to be negligible. The results of the OEIS/EIS analysis are consistent with the SURTASS LFA standard, predicated upon application of the proposed mitigation and monitoring (see S.4.8 below) in addition to the following factors: 1) a small number of SURTASS LFA sonar systems would be deployed worldwide; 2) the host ship would always be moving during operations; 3) the duty cycle would be low and mission time periods short; and 4) the possibil mammal being within the 180-dB sound field during a sonar transmission would b

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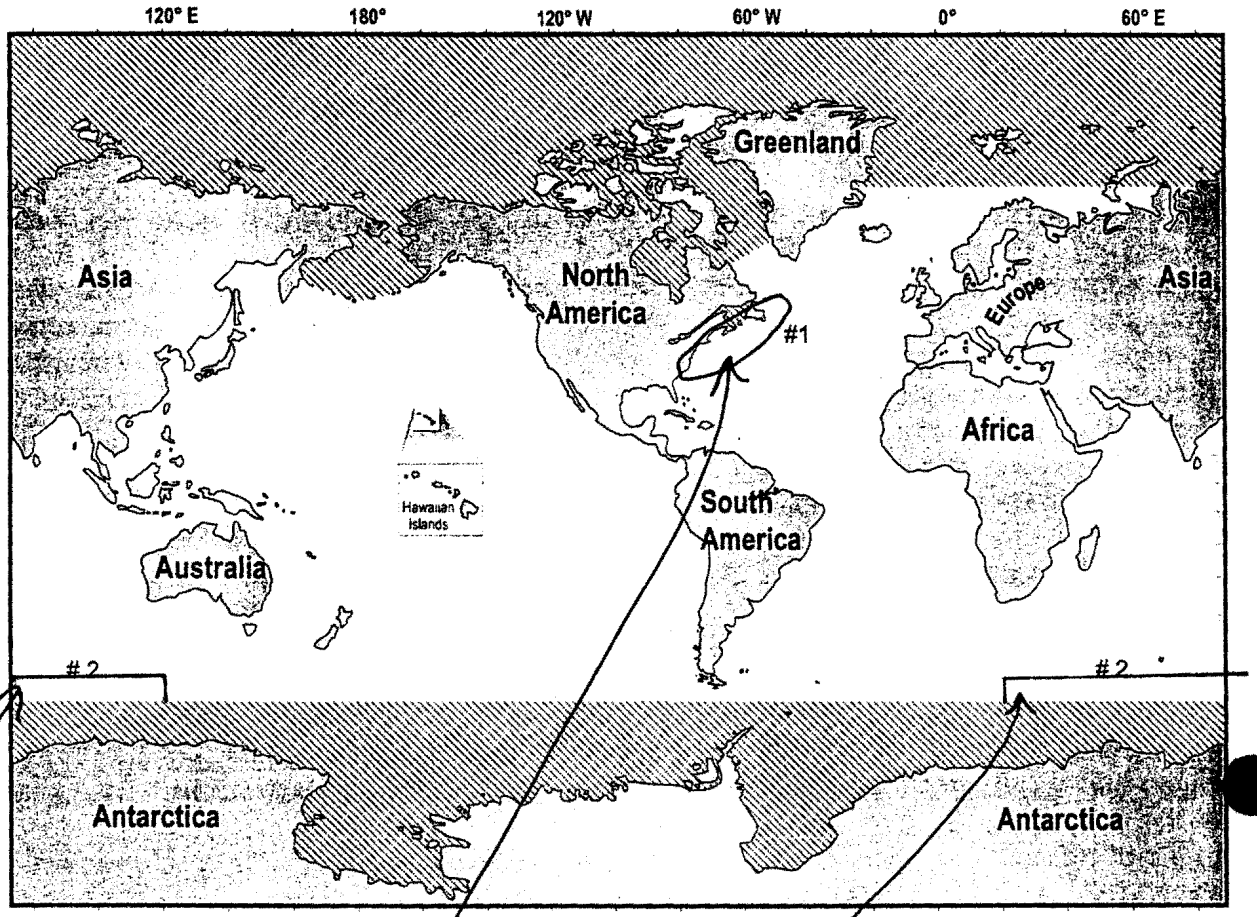

Non Operating Areas

Offshore Biologically Important Areas (outside of 12 nm or 22 km) (for details, see Tabe 2-3.)

Figure 2-2. Examples of Offshore Biologically Important Areas.

Table 2-3

Examples of Offshore Biologically Important Areas

Area Number*	Name of Area	Location of Area	Months of Importance	Species
1	200 m isobath of North American East Coast	From 30°N to 50°N west of 40°W	Year Round	northern right whale sei whale humpback whale northern bottlenose whale
2	Antarctic Convergence Zone	From 20°E to 120°E, south of 55°S	October through March	blue whale fin whale sei whale minke whale hu

Note: See Figure 2-2

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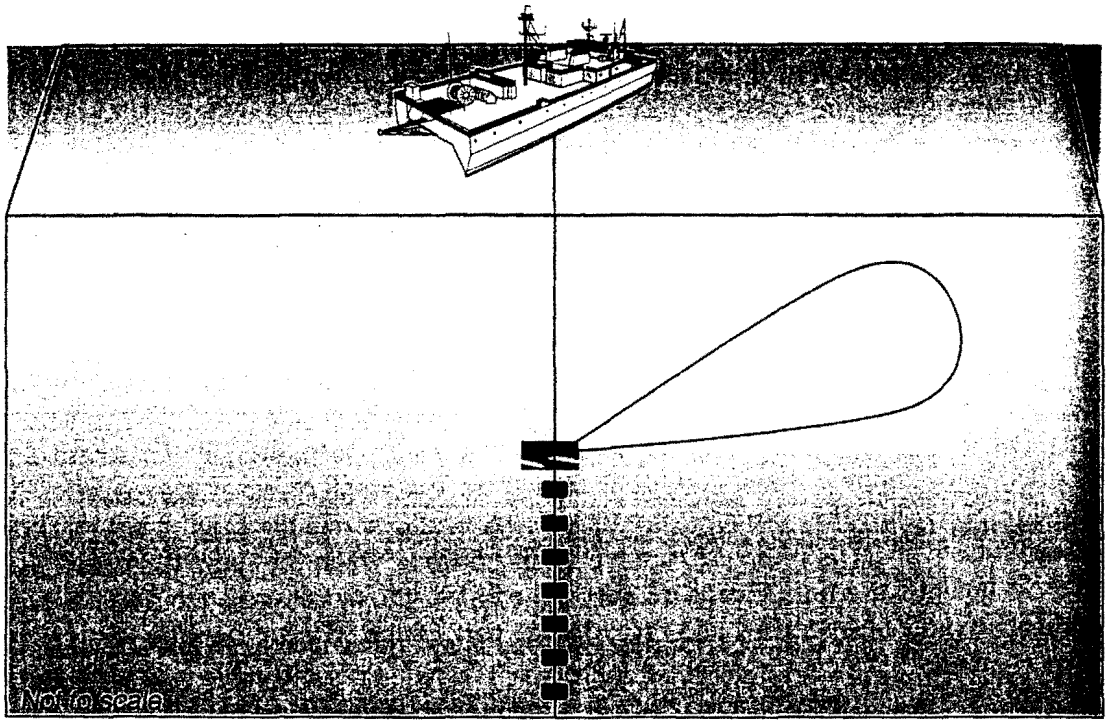

Figure 2-3. High Frequency Marine Mammal Monitoring Sonar.

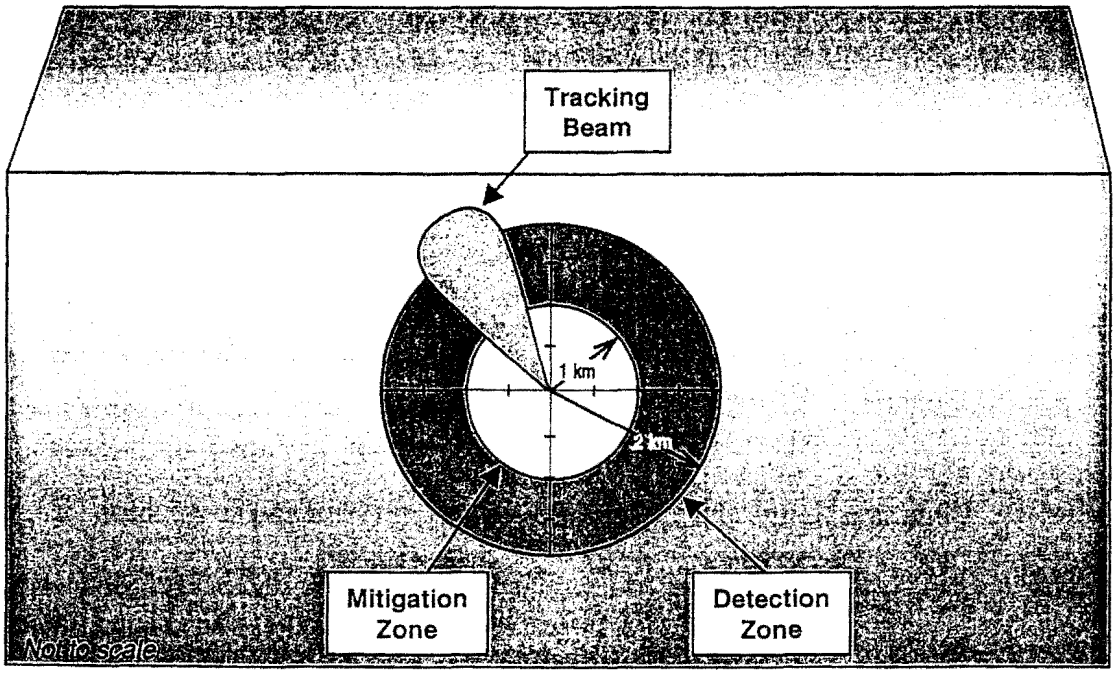

Figure 2-4. High Frequency Marine Mammal Monitoring Sonar Detection and Mitigation Zones.

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Table S-1

Annual Estimates of Percentages of Marine Mammal Stock Populations Potentially Affected by Harassment
(Alternative 1 - With Geographic and Monitoring Mitigation, Pacific/Indian Oceans)

Stock Areas	Eastern North Pacific	Western North Pacific	South Pacific	Indian
Species				
blue whale	8.33	6.22	0.31	N/M[1]
fin whale	1.01	1.08 (0.01)[2]	0.28	N/M[1]
sei whale	N/M[1]	N/M[1]	0.15	N/M[1]
Bryde's whale	N/M[1]	0.32	0.08	0.02
Minke whale	0.71	1.14	N/M[1]	N/M[1]
Humpback whale	2.55	3.42 (0.21)[2]	4.28	0.19
gray whale	3.43	5.29	N/M[1]	N/M[1]
n. right whale	4.03	N/M[1]	N/M[1]	N/M[1]
s. right whale	N/M[1]	N/M[1]	1.32	N/M[1]
Sperm whale	0.15	N/M[1]	0.30	0.02
Beaked whale	0.15	1.64	0.54	0.01
pilot whales	0.09	0.16	N/M[1]	0.01
Pelagic dolphins	0.15	0.90 (0.02)[2]	0.11	0.01
N. elephant seal	10.72	N/M[1]	N/M[1]	N/M[1]
S. elephant seal	N/M[1]	N/M[1]	0.07	N/M[1]
N. sea lion	9.88	0.18	N/M[1]	N/M[1]
N. fur seal	0.09	5.07	N/M[1]	N/M[1]
Australian fur seal	N/M[1]	N/M[1]	1.09	N/M[1]
S. American fur seal	N/M[1]	N/M[1]	0.72	N/M[1]

1. N/M = Not Modeled. This species was not modeled in this stock area.
2. ( ) = Annual estimate of percentages of marine mammal stock populations affected by non-serious injury.

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- Two other studies concern Arctic animals. Beluga whales and narwhals showed profound behavioral responses to noise from an icebreaker at 50 km (27 nm). At this range, the RL of the noise is near the detection threshold. These reactions appeared similar to the responses of each species to their most significant predator, the killer whale (Finley et al., 1990). It is not known why these animals were so sensitive to icebreaker noise and responded as if it were a predator. But, if these animals are responding to ice breakers as if to predators, it was understandable why these animals would show strong responses at detection threshold. This response has not been noted for other sound stimuli, only playback of killer whale calls. The sensitive responses of the Arctic species may relate to the fact that these animals are hunted by Eskimos, often using motorized boats. Other factors specific to the Arctic that may contribute to this sensitivity are: confinement of whales by ice, scarcity of ships in the high Arctic, and low background noise and good sound propagation in Arctic waters.

- Controlled playback experiments and observations around actual industrial sources show bowhead whales avoid drill ship noise at estimated RLs of 110 to 115 dB and seismic sources at estimated RLs of 110 to 132 dB (Richardson et al., 1995a). It must be emphasized that drill ship noise (continuous), icebreaker noise (variable, but high duty cycle), and seismic noise (brief impulses, but high duty cycle) have very different acoustic properties than the SURTASS LFA sonar signals. Nothing learned from the LFS SRP affects the interpretation of these studies. Richardson et al. (1995a) point out that the strong reactions to icebreaker noise are unique in the marine mammal disturbance literature.

It should be noted that in contrast to some of the noise sources used in the above experiments, signals from SURTASS LFA sonar are not continuous, but intermittent. Additionally, the signal is broadcast about 10 to 20 percent of the time (10 to 20 percent duty cycle) and the tonal quality and duration of the signals are quite different from the sounds present in other studies.

4.2.5 Risk Continuum Analysis

To repeat, the values of the B, A, and K need to be established in order to utilize the risk function specified in Subchapter 4.2.3.

4.2.5.1 Basement Value for Risk - The B Parameter

The LFS SRP results were interpreted to justify use of 120 dB as the basement value for risk. To reiterate, this 120-dB level is taken as the RL below which there is no risk of non-injurious harassment. This level is close to the values at which transient responses have been detected in baleen whales (Richardson et al., 1995b). It also corresponds to the level of uninterrupted sound that Richardson et al. (1995b) conjectured might lead to permanent threshold shift (PTS) in the

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most sensitive odontocete species at their most sensitive frequency, if exposure were sustained for a very long time. The frequencies at which these maximal sensitivities occur (10 to 100 kHz) in odontocete species are well above the SURTASS LFA sonar's operating band. Consequently, it is unlikely that exposure to SURTASS LFA sonar signals at 120 dB could cause threshold shifts in whales.

4.2.5.2 Risk Transition - The A Parameter

The A parameter controls how rapidly risk transitions from low to high values as RL increases. A value was chosen that is more gradual than the slopes that emerged from avoidance reactions in migrating gray whales with the source in the migratory path (Malme et al., 1984), a scenario that would not occur with SURTASS LFA operations. The choice of a more gradual slope than the empirical data was consistent with all other decisions to make conservative assumptions when extrapolating from other data sets. Lower values of the A parameter, which cause more gradual slopes, cause an increase in the estimates of risk in the AIM analyses. The value of A used (10) was consistent with the LFS SRP results, which failed to document any extended, biologically significant response at maximum RLs up to 150 dB. Thus, the value of A was chosen such that a 2.5 percent value of risk corresponded to 150 dB.

4.2.5.3 The K Parameter

Given the lack of consistent and sustained response in all three LFS SRP phases, it seems that the RL at which 50 percent risk may occur is above 150 dB. Thus, it would be difficult to justify aligning the risk function based on a 50 percent criterion. As an alternate approach, this analysis postulates that there is a 95 percent risk to animals exposed to a single ping at a RL of 180 dB. This 180-dB value is a conservative assessment of the RL that could cause non-serious injury, and in this context represents the RL at which prolonged disruption of biologically important behavior is probable. If the risk of non-serious injury starts at 180 dB, it seems conservative to assert that 95 percent of the animals exposed to a single transmission at this level would sustain non-injurious harassment. The K parameter was chosen, in conjunction with a specified value for the A parameter, such that the risk function for a single exposure equaled 95 percent at 180 dB.

4.2.5.4 The 180-dB Criterion

The Navy proposes to accept for purposes of this statement, and for mitigation, that 180 dB is the estimated RL that may cause non-serious injury to marine mammals. Several studies demonstrated that 180 dB is a conservative and protective estimate. Direct measurements of hearing loss in marine mammals due to LF sound exposure are not available. However, studies of human hearing indicate that the normal process of hearing loss with age can be accelerated by chronic exposure to sounds 80 dB above the absolute threshold of hearing (Richardson et al., 1995b). Here, chronic is interpreted as about 8 hours per day for about 10 years. For odontocetes, Richardson et al. (1995b) present data indicating that hearing thresholds are about 100 dB at 500 Hz. Some more recent data on LF hearing sensitivity for two species of odontocetes indicate hearing thresholds of about 140 dB at 75 Hz (Au et al., 1997).

Sample Single Ping Equivalent (SPE) Calculation

A generic example of how calculations were carried out for translating the number of pings that a marine mammal was exposed to into an SPE can be seen in Figure 4.2-2a (Sample Single Ping Equivalent (SPE) Calculation). his illustration assumes a marine mammal is exposed to a total of ten SURTASS LFA sonar transmissions, or pings, within the received level (RL) band of 150-159 dB. The pings are delineated by individual bins of one dB each. The illustration shows that, for this example, the animal was exposed to two pings at 150 dB RL, none at 151 dB RL, three pings at 152 dB RL, etc. Carrying out the appropriate calculation (see subchap. 4.2.3.1), these ten pings equate to an SPE of 160.47 dB.

An example of the effect of increased RL can be seen in Figure 4.2-2b (Single Ping Equivalent Probability Function), which displays the probability function for a single ping. At an RL of 150 dB, the probability of non-injurious harassment is 2.5 percent. The RL corresponding to 50 percent probability on this curve is 165 dB. At 180 dB, the probability is 95 percent. For the above Sample Single Ping Equivalent (SPE) Calculation, an SPE of 160.47 dB equates to a 24.48% probability of non-injurious harassment. Note that as explained in subchap. 4.2.6.3, the risk probabilities for all modeled individuals are summed to obtain an aggregate risk for the modeled population.

If the "80 dB above threshold" rule is valid for odontocetes, then 180-220 dB would be the threshold at which accelerated hearing loss could occur with chronic exposure in the 75-500 Hz frequency band. Richardson et al. (1995b) cite Kryter (1985) to indicate that for human exposure to 90 seconds of sound per day (over ten years), the risk criterion is 115 dB above threshold. Assuming this observation can be extrapolated to marine mammals, then an odontocete would be predicted to experience hearing loss (e.g., PTS) if subjected to daily exposure of a single 500 Hz SURTASS LFA sonar ping of 215 dB RL for ten years. Therefore, a single ping RL of 180 dB can be considered a conservative estimate for non-serious injury, such as TTS, in odontocetes based upon damage risk assessment criteria designed to protect human beings.

Audiometric and anatomical data led Ketten (1998) to conclude that baleen whales and the elephant seal are the species that are most likely to experience effects from LF sound. Fin, blue, and humpback whales were selected as subjects for the LFS SRP, because groups of experts agreed they were likely to be the species most sensitive to SURTASS LFA sonar signals. Hearing thresholds are not known in mysticetes, but the lowest value is speculated to be 80 dB (Ketten, 1998). Following the logic of the previous paragraph, this suggests that ten years of exposure to 160 dB RL for 8 hours per day, or to 195 dB RL for 90 seconds per day, would cause injury such as PTS.

Ridgway et al. (1997) documented TTS in bottlenose dolphins after exposure to a sound at 192 dB for one second. Ridgway's experiment used sounds in the frequency band of best hearing (20-70 kHz) for these dolphins, which are among the odontocete species with the most sensitive measured hearing thresholds. The results of this study can be extended to baleen whales whose frequency bands of best hearing are at low frequencies. Ridgway's measurements were made with 1-second signals, but SURTASS LFA sonar signals range in duration from 6 to 100 seconds. Most extrapolations of RL expected to yield TTS for signals of different duration range

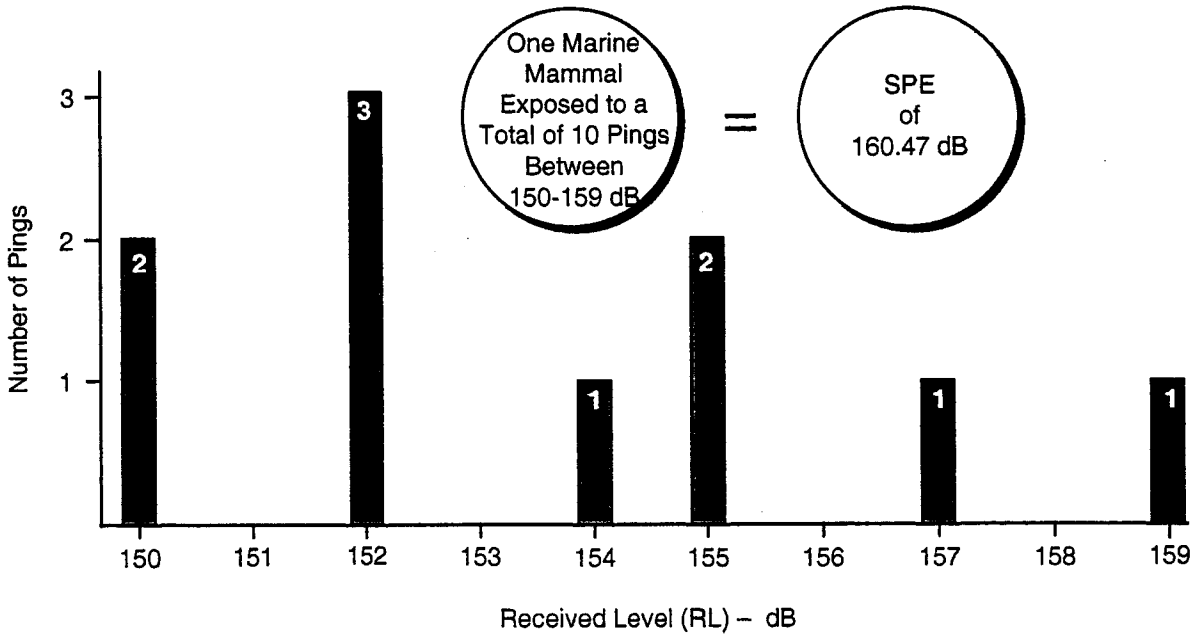

Figure 4.2-2a. Sample Single Ping Equivalent (SPE) Calculation.

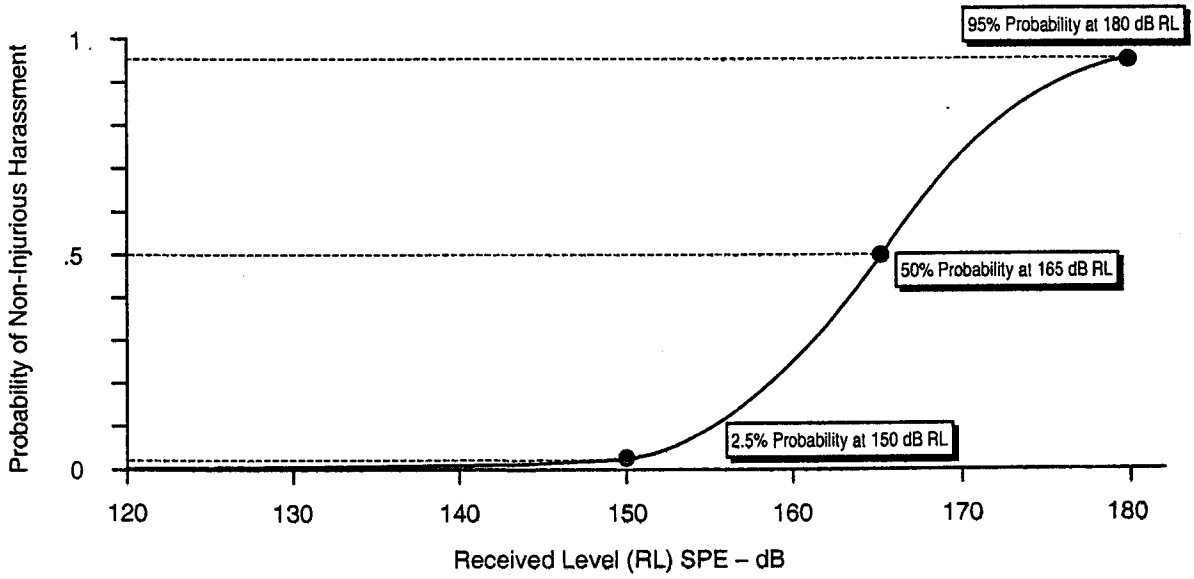

Figure 4.2-2b. Single Ping Equivalent Probability Function.

from an equal energy assumption 10 log (t) (the best that can occur under our present laws of physics), to 5 log (t), which has been demonstrated to occur in human beings.

Ridgway's TTS measurement at one-second duration implies that the TTS threshold for a 100-second signal lies between 182 and 172 dB, depending on the formula used. For example, assuming a 40-second SURTASS LFA sonar signal and using the conservative TTS value of 172 dB (using the 10 log(t) time function), the 180-dB single ping injury criterion still can be considered conservative. This is because the estimate uses the only available TTS data for a cetacean, estimates threshold at best frequency, and uses a conservative correction for duration of signal, estimating a signal duration greater than SURTASS LFA sonar pings. Even if a whale were exposed to several pings between 172 and 180 dB, this short exposure is extremely unlikely to cause more than a brief and minor threshold shift.

Lastly, Richardson et al. (1995b) note that PTS occurs at the frequency of best hearing in humans at RLs that are 155 dB above hearing threshold. This suggests that an RL of 195 to 225 dB could cause hearing loss in the most sensitive marine mammals with hearing thresholds near 40 dB, but whose best hearing frequencies are 16 to 120 kHz. It should be noted that ambient noise levels are lower in this high frequency range than in the LF range of SURTASS LFA sonar. Given the scientific hypothesis that marine mammal hearing thresholds have evolved from levels on the order of ambient noise, then using the thresholds calculated from the HF ambient noise values for the LF range of SURTASS LFA sonar should be conservative.

Additionally in mammals (e.g., humans, cats, bats) there is a mechanism (the "acoustic reflex") that protects the ears from high intensity sound exposure from either an external source or from the animal's own vocalization (Suga and Simmons, 1975). This mechanism results in a dramatic decrease in auditory sensitivity during the occurrence of the sound. Such a mechanism may exist in marine mammals and act to protect them from high intensity signals. However, the protective benefit from this reflex has not been specifically factored into this evaluation of risk so that this assessment of risk from a 180-dB exposure is conservative.

Some of the highest RLs would come from the animals themselves. If the acoustic reflex in marine mammals has the same effect for loud sounds coming from an external source as from the animal's own vocalizations, then we can also use the source levels and durations of the animals' own sounds to estimate safe exposure levels. Recent measurements of the SLs of fin and blue whale calls fall in the range of 180-190 dB (Charif, in preparation; Patterson and Hamilton, 1964; Watkins et al., 1987). It is very unlikely that an auditory system would evolve such that the loud calls produced by an individual would immediately cause a permanent loss of hearing sensitivity.

Fin whale calls are much shorter than SURTASS LFA sonar signals, but blue whale calls are of comparable duration. Humpback whale calls are of similar level, and intermediate duration. During presumed reproductive displays, male baleen whales may call without a significant break for many days (Winn and Winn, 1978; Watkins et al., 1987). "Duty cycles" for acoustic

broadcasts in these whales range from about 7 percent in fin whales through 20 percent in blue whales to perhaps 40 percent in singing humpbacks. It is illogical that a whale would sustain permanent hearing loss from exposure to its own calls or the calls from those of the same species.

It is important to recall that risk varies with both level and duration. In terms of biological risk, it is important to note that individuals will vary in their pre-exposure hearing sensitivity, in their actual PTS responses, and in the severity of the consequent biological effects (survivorship and reproduction). No two individuals will react to SURTASS LFA sonar exposure in the same way. The risk continuum estimates that 95 percent of the marine mammals exposed to a single ping at 180 dB could suffer a risk of non-injurious harassment. Based on the above discussion, this is a conservative estimate.

4.2.5.5 Other Conservative Assumptions

The 180-dB injury threshold is one of a series of conservative assumptions underlying the AIM risk assessment. Another was the assumption that risk could begin at 120 dB, and that non-injurious harassment might occur for 2.5 percent of a population exposed to RLs of 150 dB. In all three phases of the LFS SRP, most animals showed no detectable response to SURTASS LFA sonar signals at RLs up to 145-155 dB, and those animals that did respond were found to resume normal behavior patterns within tens of minutes. The sound level used in this analysis for minimum impact threshold (120 dB) equates to 1,000 times less acoustic power than the level at which the LFS SRP noted any awareness by blue, fin and humpback whales (150 dB).

Another conservative assumption involved the effect of cumulative exposure. The analysis assumed that the SPE level scaled in accordance with previous studies of TTS shifts that dealt with continuous sound, even though SURTASS LFA sonar pings would be separated by 6 to 15 minutes of silence. The 20 percent (maximum) duty cycle of SURTASS LFA sonar transmissions implies that the cumulative effect will be less than for continuous sounds, but determining how conservative this assumption may be is not possible.

The AIM simulations incorporated conservative assumptions regarding the fraction of the regional stock in the area affected by the hypothetical SURTASS LFA sonar operation, the diving behavior of the animals, and their movement patterns. For the first two factors, scientific data are typically reported with 95 percent confidence intervals. However, in order to run AIM, an exact number must be specified. Therefore, the conservative end of the 95 percent confidence interval was used. For the last factor, it must be emphasized that the animals were constrained to remain in the area affected by the hypothetical SURTASS LFA sonar operation, and no new animals were allowed to migrate in. On balance, the increased exposure to the "restrained" animals outweighed the partial exposure to animals that would have moved into the area, and thus increased the overall risk estimate.

TE OF CALIFORNIA – THE RESOURCES AGENCY

GRAY DAVIS, *Governor*

ALIFORNIA COASTAL COMMISSION
5 FREMONT STREET, SUITE 2000
AN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

October 26, 1999

J.S. Johnson
Attn: Surtass LFA Sonar OEIS/EIS Program Manager
901 North Stuart St., Suite 708
Arlington, VA 22203

Re: Draft Overseas Environmental Impact Statement/Environmental Impact Statement (OEIS/EIS) Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") Sonar Program

Dear Mr. Johnson:

Thank you for the opportunity to comment on the above-referenced OEIS/EIS (hereinafter referred to as "EIS"). The Coastal Commission is very interested in and concerned about this program and its potential acute and cumulative effects on marine resources. This interest has been previously communicated to the Navy in the context of the Commission's federal consistency review of Phases I and II of the Navy's LFA research, which the Navy conducted as part of the formulation of this EIS.

Procedural Comments

First, we wish to clarify and memorialize our telephone conversations with you concerning the status of Coastal Commission federal consistency review of any future LFA transmissions off California waters. Page 1-1 of the EIS indicates that the EIS is intended to augment other environmental reviews for SURTASS LFA, including "Consistency determinations under provisions of the Coastal Zone Management Act." Pages 6-2 and 6-3 contain a generic, one-half page summary of why the Navy believes that "...employment of the SURTASS LFA sonar would be consistent to the maximum extent practicable with the following relevant coastal zone management policies...[etc]." Shortly after receiving a copy of the EIS you and I discussed (by telephone) whether the Navy intended this brief summary to constitute a formal consistency determination, and you indicated that it did not. You followed this up with an email (dated August 17, 1999) which requested, on behalf of the Navy, that the Coastal Commission not consider this Draft EIS language to constitute a formal consistency determination. You further stated that the Navy would forward a separate letter, requesting Coastal Commission review of the consistency determination "later this calendar year." As the Navy is aware, such a submittal is required pursuant to Section 307 of the federal Coastal Zone Management Act[1], for activities affecting California's coastal zone. Permission for the Coastal Commission to review Scripps Institution of Oceanography's (Scripps') ATOC project, granted by NOAA's Office of Ocean

[1] 16 U.S.C. Section 1456, with implementing regulations at 15 CFR Part 930.

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and Coastal Resource Management (OCRM)[2] in a letter dated March 10, 1995, lends further support to our jurisdictional assertions. Scripps' sound source for ATOC was located 50 miles offshore of San Mateo County, at Pioneer Seamount. That OCRM letter stated:

> *OCRM has determined that the marine mammals at issue that ply the waters of the coastal zone and the OCS are coastal resources. The CZMA and its legislative history indicate that the effects test is to be construed broadly. In addition, Secretary of Commerce consistency appeal decisions have held that coastal resources are not bound by jurisdictional limits, and they may be affected when outside of the coastal zone.*

We look forward to reviewing your consistency determination for Navy operation of LFA off California's coast. The consistency determination should include a finding as to whether the project is consistent to the maximum extent practicable with the California Coastal Management Program. It should also include the necessary information to support that conclusion, including an analysis of the project's consistency with Chapter 3 of the Coastal Act. (See 15 CFR Section 930.39 for a full listing of the information required for a complete consistency determination). The consistency determination should also address the questions contained below (except where the questions relate to geographic areas other than California waters).

Substantive Comments

Overall Comments:

We have several serious concerns about the overall adequacy of the EIS. Fundamentally, the EIS: (1) ignores important information; (2) is deficient in its description of cumulative impacts; (3) relies on unjustified and/or overly simplistic assumptions; and (4) arrives at conclusions that are not warranted based on the research and science that have been performed to date. The clearest example of these deficiencies is the discussion of marine mammal response to LFA signals. Whereas the Navy's preliminary research better clarified marine mammal response to LFA signals in the range of 120-160 dB RL (Received Level) range, the EIS extrapolated from this range to a conclusion that any RL of <180 dB is acceptable. This is simply not justified by the available evidence.

We recommend a return to the Navy's previous approach adopted prior to publication of the EIS and one we supported in our review and concurrence with the Navy's Phase I and II LFA research. That approach is to perform additional scientific studies that establish (rather than extrapolate and speculate) safe levels of use, and only then to proceed to operate at the higher noise levels. We believe the Navy should conduct further studies of effects on marine resources, or at *least* perform additional studies concurrently with LFA operation, attempting to document impacts at these higher noise levels. The Navy also needs to collect, maintain and publish monitoring results for the life of the program. Given the steady increases in anthropogenic

[2] OCRM permission is needed where non-federal agencies seek federal permits that are not "listed" under California's Coastal Management Program.

sound in the marine environment, and the difficulty in truly understanding the effects of underwater sound on marine mammals, there will continue to be unresolved questions about the wisdom and safety of the use of active sonar technology. The use of loud low frequency active sonar equipment, whether it is being used for commercial, scientific or military purposes, needs to be accompanied by significant studies of the effects of these types of anthropogenic noises in order for policymakers to approve and the public to accept their use.

Specific Comments:

Figure 2-2 on Page 2-10 represents a relatively simplistic approach to categorizing biologically sensitive regions of the world's oceans. The EIS portrays the vast majority of the world's oceans as non-sensitive; nevertheless within those areas there are regions of greater and lesser biological productivity, sensitivity, and at least seasonally high concentrations of marine mammals. This type of information should be provided, and areas of lesser sensitivity considered higher priority for LFA use. Also, although it is outside our agency's scope of concern, given the unexplained and, therefore, potentially extreme sensitivity of Cuvier's beaked whales in the Mediterranean sea to LFA noise (see comments on EIS p. 4.2-57 below), that area should be given special consideration and protection, at least until more is known about this species' hearing sensitivity.

Page 2-11 indicates the 180 dB noise contour is based on spherical spreading modeling (presumably a 20 log R calculation). When LFA is used in areas of high sound conductivity (e.g., the "SOFAR" [sound frequency and ranging] channel), spherical spreading ceases to be an appropriate model. What is the maximum distance to the 180 dB noise contour if the sound were to be projected into or within this channel?

Page 4.2-48 optimistically assumes the Navy can achieve a 70-99% probability of detecting a marine mammal within the 180-dB, 1-km contour, using a combination of visual monitoring and passive and active acoustic monitoring. This is based on a 70% effectiveness attributed to the active acoustic monitor (using HF/M3 (High Frequency Marine Mammal Monitoring) sonar). No justification for this assertion is provided, and we are not aware of any information that would support this claim. Further studies and/or field verification (which could be accomplished with studies using tagged animals) is needed to substantiate these claims. In addition, concerning visual monitoring, no limitations are proposed during periods of low visibility (e.g., night and foggy conditions); therefore the effectiveness of visual monitoring may be compromised. Passive acoustic monitoring only works if animals are vocalizing, and, therefore, while we support a multi-modal monitoring effort such as is proposed, we question the Navy's assumptions as to how effective it will be.

Table 4.2-11 on page 4.2-49 shows the HF/M3 sonar as being at 220 dB at 1 m, and page 4.2-53 states it would attenuate to 193 dB in a 7 m radius. Please explain how this calculation is made.

Pages 4.2-26 to 4.2-30 discuss the proposed "180 dB criterion" and new categories of effects which the Navy calls "non-serious injury" and "non-injurious harassment." These terms are not well defined. The further discussion on Pages 4.2-56 and 57, which analyzes "non-injurious harassment" and/or "disruption of a biologically important behavior," appears to dismiss the significance of such harassment "unless reproductive successes are affected." This discussion assumes that serious injury could occur only at levels >195 dB. These categorizations and conclusions are based in part on extrapolation from human hearing studies and in part on very limited marine mammal hearing studies. As such these categorizations are speculative, and we are not aware of any reliable data available to support them. We would like to see a peer review and analysis by independent scientific experts for these categorizations and conclusions.

Page 4.2-53 states the HF/M3 would be lowered in power if an animal approached this source. Is the HF/M3 omnidirectional? The schematic on Page 2-14 makes it appear to be more effective at detecting above the vertical line array (VLA) than below. Can it detect an animal directly below the VLA? Wouldn't the LFA loudspeakers themselves interfere with the signal and detection directly below the VLA?

Page 4.2-57 states that "The reference points of 120 dB and 180 dB were chosen for the risk function on the basis of consensus views ... by scientists who play leading roles in identifying ocean noise pollution as a potential problem for marine mammals." Please provide detailed elaboration to support this statement.

Also, for purposes of illustration and understanding the sound attenuation and maximum potential impact, we would appreciate it if the Navy would provide an estimate of the maximum distance from the source to a 145 dB contour (the level proposed for diver protection), as well as to a 120 dB contour, since 120 dB is likely to represent the lower limit of impact potential.

Page 4.2-57 states that "The next level of risk is tissue damage then mortality, which would require even higher RLs. Since the potential for SURTASS LFA sonar to cause these risk levels is negligible, they are not addressed in the risk assessment." It is disappointing that the Navy's EIS does not directly address the serious and alarming May 1996 mortality of Cuvier's beaked whales in the Mediterranean Sea, which, according to "Nature (March 5, 1998)" was most likely to have been the result of NATO LFA sonar operations. The lack of discussion of this incident and its implications in the EIS is a glaring omission. A credible EIS needs to analyze all relevant information and provide full disclosure of impact potential to reviewers and decisionmakers.

Pages 4.3-2 and 3 propose using a maximum 145 dB exposure to divers, based on the study contained in Technical Report #3 which exposed divers to various sounds between 145 dB and 160 dB. During previous submittals to the Commission (Phase I and II LFA research), the Navy indicated that it was relying on guidance from the Navy Bureau of Medicine and Surgery, which had issued interim guidance for operation of low frequency sound sources.

That guidance used a 160 dB maximum for trained Navy divers, and, for non-Navy-trained divers, a 130 dB maximum, which is significantly lower than the current proposal for a 145 dB maximum. The studies described in Technical Report #3 indicate that although its studies did not use Navy-trained divers, the divers represented "volunteers drawn from the military population in the San Diego area." Given that these divers were aware they would be subjected to noise, and were associated with the military, we question whether their experience was analogous to divers in the ocean experiencing sounds of unknown (to them) origin. We would also like to know whether the Navy Bureau of Medicine and Surgery has reviewed Technical Report #3 and, if so, whether it agrees with the Navy's conclusions.

Technical Report #3 also divulges frequencies at which divers would experience lung vibration, which the document states would happen at 40 Hz (at the surface) to 80 Hz (at a depth of 120 ft.). The Navy purports to operate LFA between 100 and 500 Hz. Given the Navy's ability to operate at multiple and complex frequencies, what measures will be taken to provide assurances that frequencies less than 100 Hz will not be used? Finally, we are perplexed by the Navy's omission in not discussing or analyzing the incident that occurred during the Navy's Phase III LFA testing in Hawaii, when swimmer Chris Reid was alleged to have become disoriented after being exposed to sound levels around 125 dB.

Possible Additional Information:

Technical Report #1, which primarily summarizes past Navy LFA studies (Phases I-III), also (as shown in the following quotes) discusses future studies and/or analyses:

Page 44: "A more objective evaluation of changes of vocal activity as a function of LFA playback condition is now underway."

Page 68: "Our final, more quantitative analysis will test for any systematic decrement in the number of whale tracks ...."

Page 73: "Results from these analyses should be available this summer, with manuscripts for peer reviewed journals submitted by the fall."

Page 103: "A broader community of biologists, acousticians, and regulators will be needed to evaluate the potential for biological significance of any reactions."

Page 107: "We will carefully evaluate these sighting data in terms of these two potential avoidance responses."

These excerpts were taken from LFA research reports written in 1997 (Phase I) and 1998 (Phases II & III). Is the information these reports states will be provided at some future date now available? In what form? If they are discussing ongoing or future analyses, can you estimate when will they be made available?

Cumulative Impacts/Monitoring:

Page 4.4-1 assumes that LFA would not "cumulate" with other noise sources, because the other sources would interfere with LFA missions. This statement may be unsupportable for several reasons, among them: (1) the Navy already has the capability to distinguish between different sound sources by analyzing the noise footprint from each source; and (2) to our knowledge, the Navy is not making any commitment to avoid operating within specified distances from other loud sound sources. More importantly, the Navy's cumulative impacts discussion is flawed because it ignores use by other nations (or even other branches of the U.S. military) of the same or similar technology. Once the Navy begins widespread use of this technology, the following may occur: (1) other nations will want to develop and use the same or similar technology, if they have not already done so (clearly NATO is already using the technology); and (2) defense contractors will want to market the technology to other nations. Regardless of how they receive or develop the technology, use of LFA technology by other nations may not occur in conjunction with any restrictions on maximum levels or sensitive areas, such as those agreed to by the Navy. We are very concerned about widespread use of the technology. We are also concerned over the possibility that other nations might attempt to thwart LFA detection be sending out "jamming" or confounding signals of its own, which would only lead to increased noise effects on the marine environment. What are likely defensive countermeasures that might be developed to protect a submarine from being detected by LFA? Is the U.S. Navy in the process of developing countermeasures of its own to protect against submarine detection by other nations' LFAs? While we understand any such measures may be classified, we would like to know whether any such countermeasures would involve adding noise to the marine environment.

Page 4.4-3 states the Navy intends to conduct annual assessments of potential cumulative impact of LFA operations, including tabulating non-serious injuries and non-injurious harassment over an initial five year period. Pages 5-2 and 3 further describe on-going operational monitoring. We have a number of questions about these monitoring efforts:

1. How will the Navy collect these data?

2. Will the Navy be analyzing marine mammal reactions to noise sources other than the Navy's LFA? Isn't this information necessary for a valid cumulative impact analysis?

3. Will the Navy's monitoring results be made available to the Coastal Commission and the public? If so, how will this information be provided?

4. Will the monitoring end after the initial 5 year period?

5. When will the monitoring providing field verification of the 1-km radius for the 180-dB noise contour be made available?

6. Will the operations be conducted during low-visibility conditions, such as night and foggy weather, when visual monitoring will be less effective?

7. How does passive acoustic monitoring determine the distance to the animal?

8. Will the monitoring information be accompanied by an assessment of the extent to which ambient anthropogenic noise levels in the ocean are continually increasing? What efforts will be made to determine and factor into future analyses these increases in ambient noise levels?

In light of the above discussion and information needs, we finally question the confidence with which the Navy asserts on Page 4.4-3 that: "... any potential for cumulative impacts from SURTASS LFA sonar operations is extremely small and has been addressed by limitations proposed for employment of the system." To reiterate briefly, among the reasons for our questioning this conclusion are: (1) the lack of reliable cumulative impact information concerning both Navy and other nations' or organizations' use of LFA; (2) the paucity of reliable information on the overall effects of noise on the marine environment; (3) the extreme difficulty of accurately monitoring and measuring the effects of LFA and other low-frequency underwater noise impacts; and (4) an unsubstantiated reliance on 180 dB as a safety threshold for impacts, based on limited Navy LFA studies primarily exposing animals to <180 dB levels.

We understand that in the context of all the world's noise sources, LFA is not a dominant factor. But the same can be said of any individual source: each one by itself is relatively insignificant, but the cumulative impact may be significant. The EIS should acknowledge how little we really know about cumulative noise impacts and should propose studies to fill the data gaps and monitor the effects of human-induced noise on the marine environment.

In conclusion, thank you for your continued cooperation in working with our agency and providing us with the opportunity to comment on this important matter. If you have any questions about preparation of a consistency determination, please contact James Raives, federal consistency coordinator, at (415) 904-5292. If you have any questions about these comments, please contact me at (415) 904-5289.

Sincerely,

Mark Delaplaine

MARK DELAPLAINE
Federal Consistency Supervisor

cc: NOAA/Sanctuaries and Reserves
NOAA/OCRM
NMFS
EPA

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Table 2-1

Nominal SURTASS LFA Sonar Annual and 30-Day Deployment Schedule

I. Nominal Annual Deployment

30 Days			5 Days	30 Days			5 Days	30 Days			5 Days	30 Days			5 Days	30 Days		
T	Mission Active Operations	T	In-Port Upkeep*	T	Mission Active Operations	T	In-Port Upkeep*	T	Mission Passive Operations*	T	In-Port Upkeep*	T	Mission Active Operations	T	In-Port Upkeep*	T	Mission Active Operations	T

45 Days	30 Days			5 Days	30 Days			5 Days	30 Days			5 Days	30 Days			15 Days
Regular Overhaul*	T	Mission Active Operations	T	In-Port Upkeep*	T	Mission Passive Operations*	T	In-Port Upkeep*	T	Mission Active Operations	T	In-Port Upkeep*	T	Mission Passive Operations*	T	Leave and Upkeep*

Notes: "T" denotes transit periods when there would be no active transmissions; and * denotes that there would be no active transmissions (for operations in SURTASS LFA geographically-restricted areas).

II. Nominal 30-Day Mission

5 Days	9 Days	2 Days		5 Days
Transit	Exercise (36 hours active sonar transmissions)	Reposition	Exercise (36 hours active sonar transmissions)	Transit

III. Nominal Annual Summary

Underway on Mission	Days	Not Underway	Days
Transit	90	In-Port Upkeep	50
Active Operations (432 hours transmissions based on a 20% duty cycle)	108	Regular Overhaul	45
Passive Operations	54	Total Not-Underway	95
Reposition	18		
Total Underway	270		
Total Underway/Not Underway			365

EXHIBIT 8

FINDINGS AND RECOMMENDATIONS

Some of the MMRP observations, such as movements of humpback whales in near-coastal areas off Kauai and the abundance of some whale species near the Pioneer Seamount source off California, showed no statistically significant effects of ATOC transmissions. For these observations, the Committee could not distinguish among true lack of effect and insufficient observations, small sample sizes, and incorrect statistical treatment of data. A somewhat clearer lack of significant effects of the ATOC transmissions was demonstrated in observations of elephant seals' diving behavior near the Pioneer Seamount source. Some statistically significant differences between control and exposure conditions were found for other species, including (1) an increase in average distance of humpback whales from the California source and (2) increased dive duration for humpback whales off Hawaii. The MMRP found no obvious catastrophic short-term effects as a result of transmissions from either source, such as mass strandings or mass desertions of source areas.

Statements about whether ATOC should be allowed to continue, based on MMRP and other results, are clearly outside the Committee's statement of task. However, the Committee does offer suggestions about how future large-scale acoustic tomography experiments could be designed to accomplish appropriate monitoring for scientific purposes and mitigation measures to decrease the possibility of harm to marine mammals.

Progress has been made since 1994 in answering several of the research questions described in the 1994 NRC report. Research funded by ONR and other agencies and the results of the MMRP and LFA tests have contributed new knowledge regarding the effects of low-frequency sound on marine mammals. Research and observations published since 1994 have extended our knowledge of the hearing abilities of marine mammals at lower frequencies, at depth, in the presence of human-generated noise, and among different individuals of the same species. More observations of baleen whale vocalizations and responses to sound have been collected and a greater appreciation has been gained about how the respective locations of a baleen whale and a sound source can affect vocalizations and other behavior. Extensive testing with conventional and new methods, such as computational modeling of ear anatomy, auditory evoked potential techniques, and stimulus-response experiments with trained animals have provided new insights into normal hearing and the levels of sound required to produce shifts in the hearing abilities of individual animals.

Most of the research directions recommended by the 1994 report are still relevant. This continued need to answer the questions raised therein is not due to

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lack of effort but is a result of the complexities of the questions and the difficulties of conducting studies on marine mammals because of the lack of adequate research support, equipment, techniques, and facilities.

The 1994 amendments to the MMPA (16 U.S.C. 1361 et seq.) changed the legal definitions of marine mammal "harassment" as applied to scientific use of sound in the ocean. If the MMPA is to be implemented responsibly, however, additional changes should be made to the act and to the regulations promulgated pursuant to the act by the Office of Protected Resources of the National Marine Fisheries Service (NMFS) in the National Oceanic and Atmospheric Administration (NOAA).

There is little disagreement that scientific use of sound in the ocean is a minor component of human-generated sound pollution. Industry (e.g., shipping and hydrocarbon exploration and production) are thought to be the largest sources. Yet, uses of sound by scientists and the Navy are the most stringently regulated. Unfortunately, few data are available to regulators regarding ambient noise levels in the ocean and the relative importance of different sources in contributing to the cumulative human-generated noise. Cooperative funding of research by government and industries responsible for the noise could result in more rapid advance of knowledge about the effects of sound on marine mammals and cooperative solutions to noise problems.

This report includes a number of recommendations to Congress, to NOAA in its regulatory role, and to research sponsors, as well as to the scientific community. The recommendations directed to Congress should be implemented in the upcoming reauthorization of the MMPA. The recommendations directed to NOAA in its regulatory role should be implemented as it promulgates new regulations based on the reauthorized MMPA. Finally, agencies that fund marine mammal and acoustic research should begin weighing recommendations about research, monitoring, and facilities against other budget priorities for the fiscal year 2002 budget cycle and beyond. Some of the recommendations to research sponsors should not require reprogramming or new money and could be implemented immediately.

Recommendations for Congress

As part of the upcoming reauthorization, Congress should consider changes to the MMPA that would allow studies of the ocean while protecting marine mammals. In particular, Congress should consider the following actions:

- define "type B harassment" of marine mammals in terms of significant disruption of behaviors critical to survival and reproduction.
- acknowledge the relative significance of different sources of sound in the ocean, insofar as this is known, and provide new means to bring all commercial sources of sound into the MMPA's legal and regulatory framework.

The committee believes that regulation of sound in the ocean is based on inadequate information and that more information needs to be collected. Congress should decide what kinds of regulations are appropriate and how much funding should be available for marine mammal research, given the existing inadequacy of knowledge.

Recommendations for NOAA

NOAA's responsibilities with respect to whales and seals are set forth in the MMPA, the Endangered Species Act, and other relevant legislation. NOAA's responsibility has been delegated to NMFS. Although NMFS conducts and supports some marine mammal research, it has conducted or supported very little research aimed at determining the potential effects of anthropogenic sound on the distributions, sizes, or productivity of marine mammal species or stocks. In September 1998, NMFS held a workshop to seek input from the scientific community regarding guidelines or regulations that might be promulgated to guide or govern authorization of the taking of marine mammals incidental to activities that use or produce sound in the ocean (no publication resulted from the meeting). The workshop participants noted a variety of uncertainties concerning the possible effects of anthropogenic sound on marine mammals. Pending resolution of the uncertainties, NMFS should focus on developing and evaluating the effectiveness of guidelines for preventing injuries and disruption of behavior that could affect survival or reproduction. NMFS should consult further with experts in oceanography, bioacoustics, underwater sound propagation, and animal behavior to (1) identify sound-producing activities that, because of their nature, location, intensity, or duration, are likely to have biologically significant effects on marine mammals and thus should be higher priority for enforcement of the "taking" authorization under the MMPA or the Endangered Species Act; and (2) for cases in which there is uncertainty or disagreement as to possible adverse effects of underwater sound on survival or productivity, describe (a) the research required to resolve the uncertainty, and/or (b) the monitoring that should be required as a condition of any incidental take authorization provided by NMFS. Further, NMFS should work cooperatively with ONR to develop technology and programs for monitoring ambient sound levels and noise pollution in critical marine mammal habitats and to develop and implement methods for obtaining data on the hearing capabilities of marine mammals, including data on auditory sensitivity, damage thresholds, and potential for behavioral disruptions of representatives of all types of marine mammals (see Box 5.1).

Recommendations for Research Sponsors

Developing an understanding of the effects of low-frequency sound on marine mammals will require a more sustained and integrated approach than has

been the case in previous research. Much research in the past was conducted by single investigators responding to the need for specific information about the effects of a single sound source. Multi-investigator teams of biologists, acousticians, psychoacousticians, engineers, and statisticians should be funded to conduct a set of systematic studies of marine mammal species that represent different potential hearing abilities, based on the need to know how sound of different types affects characteristic species. The committee also identifies the need for research to determine:

- how marine mammals utilize natural sound for communication and for maintaining their normal behavioral repertoires;
- the responses of free-ranging marine mammals to human-generated acoustic stimuli, including repeated exposure of the same individuals to the same stimulus;
- the response of deep-diving marine mammals to low-frequency sounds whose characteristics duplicate or approximate those produced by acoustic oceanographers and other sources of human-generated sound, such as low-frequency military sonars and sounds used for seismic exploration;
- basic hearing capabilities of various species of marine mammals;
- hearing capabilities of larger marine mammals that are not amenable to laboratory study;
- audiometric data on multiple animals of different sexes and ages in order to understand variance in hearing capabilities within a given species;
- sound pressure levels that produce temporary and permanent hearing loss in marine mammals;
- condition of a representative sample of important cochlear structures in different species of wild marine mammals using post-mortem examinations;
- morphology and sound conduction paths of the auditory system in various marine mammals;
- temporal-resolving power for various marine mammals;
- whether low-frequency sounds affect the behavior and physiology of organisms that serve as part of the food chain for marine mammals; and
- whether low-frequency sounds affect the nonauditory physiology or structures of marine mammals.

Such research should be sponsored by the agencies that fund basic and applied biological research and that fund ocean research using sound, including ONR, NOAA, the National Science Foundation (NSF), the Minerals Management Service, the Biological Resources Division of the U.S. Geological Survey, and the National Institutes of Health (NIH). Mission-oriented agencies should ensure that the research they sponsor will not only contribute to their immediate missions but also answer basic questions about marine mammal bioacoustics. Agencies that fund more fundamental science, such as NSF and NIH, should

consider funding marine mammal research when it has implications for understanding basic biology or health-related issues. Most importantly, all of these projects should receive strict peer review and be evaluated on the quality of the science proposed.

Other generators of sound in the ocean, such as shipping and hydrocarbon exploration and production companies, also should participate in funding research on the effects of sound on marine mammals. Given our ignorance about safe exposure levels of sound, great benefit could accrue if ocean noise generators, government agencies, and environmental groups formed a consortium to fund the kinds of research recommended in this report. Opportunities may also exist for cooperation between U.S. scientists and agencies and their counterparts in other nations. Cooperation with Canada and Mexico could be particularly productive because several species cross the exclusive economic zones of the three nations. For example, another NRC (1999) report described research on marine mammals that could benefit from binational research by the United States and Mexico. Europe is also a likely source of partners for cooperative research and management, given the shared marine mammal stocks and the existing cooperation in the North Atlantic Treaty Organization, which shares both active and passive sonar sources with the United States. A variety of organizations, including the Ocean Drilling Program, provide models for the possible structure and functioning of a multinational consortium for research on the effects of sound on marine mammals.

Research on captive marine mammals is expensive because of the need for extended training and maintenance of animals and the added requirement of highly specialized care (e.g., aquatic veterinarians). Funds to support marine mammals must be provided for the long term because once an animal is in captivity it generally must be maintained there for its lifetime. Facilities to conduct research with marine mammals are difficult to set up, and most existing commercial facilities are not able to provide access to animals for research. However, without such facilities, many basic science studies on marine mammal bioacoustics (and other aspects of marine mammal biology) such as those described in this report cannot be conducted, and it will be difficult to develop regulations that protect marine mammals appropriately. The lack of a specialized marine mammal research facility available to U.S. scientists has hindered the progress of research on marine mammal hearing. If the studies described in this report are of sufficient priority to reduce uncertainties in the regulation of human-generated sound in the ocean, federal agencies should consider establishing a national facility for the study of marine mammal hearing and behavior. If established, the proposed facility should be made available to the entire scientific community, and the allocation of animal experimental and observation time should be based on the scientific merit of proposals as determined by peer-reviewed evaluation of research. Funding for research at this facility should be coordinated with the availability of animals to ensure that once an investigator receives funding he or she will have access to appropriate animals. The committee

believes that such a facility could be established at relatively little incremental cost by enhancement of an existing facility.

Our understanding of how marine mammals react to natural and human-made sound is rudimentary. The actions recommended in this report could result in significant advances in knowledge and better regulation of human activities that might be harmful to marine mammals.

that duty cycles may lengthen beyond 20%, that operations may last beyond a month, that the sonar vessel may hold to a fixed geographic area, and that multiple sources may operate in the same area for an extended period. None of these circumstances is considered.

Because the goals and purposes of LFA contemplate additional deployments beyond routine training—and without the basic mitigation that has been proposed—the Navy must evaluate their impacts now. To do so later, when still more resources have been committed and the program has been fully integrated into the Navy's operations, would frustrate the purposes of NEPA.

(3) Failure to Acknowledge Data Gaps, and Unwarranted Extrapolations from Limited Data—Agencies have a duty under NEPA to 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 are required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about a program's impacts remain unknown to science.

The Navy's DEIS satisfies none of these requirements. There is a virtually unanimous consensus among marine scientists and bioacousticians that too little is known about the impacts of anthropogenic noise on the marine environment and marine species. Although these experts may disagree about the meaning of a set of data points, there is no disputing the fact that definitive conclusions cannot be drawn from the information currently available regarding the potential impacts of the LFA system. Remarkably, this critical fact is never acknowledged in the DEIS. No effort is made to identify data gaps, to describe areas of scientific

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disagreement or controversy, or to qualify conclusions regarding biological significance in light of either. And this flaw permeates the DEIS -- a flaw that, unless clearly and unambiguously corrected, will undermine the integrity of the entire analysis and, indeed, the LFA program as a whole.

Ultimately, the Navy's findings of biological insignificance rest in essential part on two sources of evidence: (a) data on gray, fin, blue, and humpback whales collected through the Navy's Scientific Research Program ("SRP"), and (b) data on temporary threshold shift in bottlenose dolphins obtained from a study by Navy researchers. Both sets of data are extremely limited in scope and difficult to interpret. Rather than pursue the objective analysis prescribed by regulation, however, the Navy has attempted to fill gaps in information by extrapolating from these data and others in unjustifiable ways. To take just a few examples:

(A) The Navy finds, entirely without support, that none of the behaviors exhibited by exposed animals during the SRP rises to the level of "biological significance." In concluding, for instance, that humpback whales did not permanently abandon their breeding grounds when exposed to 140 dB (DEIS at 4.2-24), the Navy disregards the long-standing belief of the scientific community that animals might remain in biologically productive areas or continue biologically important activities despite the presence of harmful noise. That they remain nearby does not suggest the animals do not suffer harm; on the contrary, it means the risk of harm is increased. As W.J. Richardson noted in 1995: "[If marine mammals] are subject to ongoing stress within that area, there could be long-term effects on individuals and the population." W.J. Richardson et al., Marine Mammals and Noise 396 (1995). The Navy must consider this hypothesis in its assessment of risk.

(B) The Navy assumes, on the basis of the Scientific Research Program, that animals exposed to received levels above 150 dB will experience, at most, the same, supposedly "biologically insignificant" behavioral effects that small

numbers of their cohort are said to experience at 150 dB, ignoring the fact that no animals were actually exposed to these levels in the course of research. (It is on this assumption that the Navy bases the A and K parameters of its unprecedented "risk continuum analysis," which it rightly describes as novel.) See DEIS at ES-10, 4.2-26. The SRP investigators decline to make such claims in their technical report; on the contrary, they note the dangers of doing so, as in this summary of the SRP's third phase: "Responses did not scale consistently to received level, and it will be difficult to extrapolate from these results to predict responses at higher exposure levels." C. Clark, P. Tyack, & W. Ellison, Low Frequency Sound Scientific Research Program Technical Report 1: Responses for Four Species of Whales to Sounds of SURTASS LFA Sonar Transmissions at 10 (Feb. 1999). The significance of this flaw is particularly important in light of the intended deployment of the system at source levels at or exceeding 230 dB.

(C) The Navy relies heavily on its own bottlenose dolphin study to support its "180 dB criterion" for non-serious injury (see DEIS at 4.2-27 to 29) and in so doing improperly extrapolates from a single species to all other odontocetes including the sperm whale (which has been shown in several instances to modify behavior at relatively low levels of marine noise), to mysticetes, to pinnipeds, and apparently to sea turtles as well, despite known anatomical differences in the ears of these species. See, e.g., D.R. Ketten, Marine mammal auditory systems: A summary of audiometric and anatomical data and its implications for underwater acoustic impacts, NOAA Tech. Memo. NMFS: NOAA-TM-NMFS-SWFSC-256 (1998).

(D) The Navy's "single ping equivalent" has its source in an idea, first postulated in 1995, that correlates acoustic injury with repeated exposures. According to the Navy, "[a]s postulated, the risk threshold is lowered by 5 dB per ten-fold increase in the number of sounds in the exposure" (DEIS at 4.2-19)—but that is a gross misstatement of the original. Drs. W.J. Richardson and C.I. Malme, the authors of the study, having noted the lack of any directly relevant data,

proceeded to extrapolate from human in-air data analyzed in 1968. Richardson et al. at 372-76. They did so, however, with extreme caution, and in a tone exceptional even for a book-length work as careful and cautious as theirs. "We emphasize," they wrote "that these values are all extremely speculative, given the unknown relevance of human in-air data to marine mammals underwater" (emphasis in original). Id. at 373. "Again, this 'evidence' is indirect and the conclusion is speculative." Id. at 375. It should be noted, too, that these statements—none of which found its way into the DEIS—were made about impulsive noise (as from air guns), not continuous noise (as from LFA), a distinction made in the 1995 book and supported by consensus of the scientific community, making the Navy's use of this material even more strained. It is astonishing that the Navy would base so consequential a finding as its single ping equivalent, a finding that underlies its virtual dismissal of acoustic impacts on marine mammals beyond the 180 dB zone, on so speculative an idea.

Each one of these lapses implicates a critical aspect of the Navy's analysis, and each one must be addressed and corrected before the EIS is complete.

(4) Exclusion of Relevant Data—Despite the lack of empirical data for many of the Navy's claims and the persistence of evidentiary gaps throughout the DEIS, relevant evidence that runs contrary to the Navy's conclusions was omitted. For example:

(A) Not once in the DEIS does the Navy refer to the mass stranding of Cuvier's beaked whales in the Kyparissiakos Gulf or even to NATO's study of it. This extraordinary event–an event in which a mass stranding was highly correlated with the operation of a low frequency active sonar system by NATO–has been widely recognized for its importance, not only in the scientific community but within the military as well. Indeed, NATO convened meetings at La Spezia, Italy to discuss the circumstances, with many of the represented nations ultimately concluding that measures to prevent similar occurrences in the

future were essential. Although NATO's study was itself inconclusive, owing to the lack of necropsy and tissue analyses, even this assessment conceded that the active sonar vessel operated by NATO could well have caused the stranding. SACLANTCEN Bioacoustics Panel at 1-3. This information should surely have figured in the Navy's analysis of "reasonably foreseeable" impacts, which under NEPA include impacts with "catastrophic consequences, even if their probability of occurrence is low." 40 C.F.R. § 1502.22(b)(4). Furthermore, given the potential for mass strandings indicated in the SACLANTCEN report, the Navy should have attempted to review available stranding data in light of prior active-sonar deployments.

(B) Even as it claims support for its risk-continuum analysis in the SRP, the Navy fails to consider the results of the SRP's second phase, a study of LFA's impacts on the migration of Pacific gray whales. That study showed that, at received levels approaching 120 dB, a large number of gray whales (perhaps as many as 50%) begin to swerve from their migration paths when the LFA source is placed directly ahead or in-shore[6]—a result manifestly at odds with a function that finds virtually no effect whatever at 120 dB. Compare C. Clark et al., Technical Report 1 at 50, 66-68, figs. C-7, C-8, C-10, C-11 and DEIS at 4.2-26, 28. In fact, for some significant percentage of gray whales (but less than 50%), exposure to levels lower than 120 dB may also cause disturbance. Similarly, the DEIS fails to at least consider prior research in other areas of ocean noise pollution, ignoring published studies and unpublished studies from leading researchers on the ecological impacts of airgun surveys, acoustic thermometry, etc.

(C) While freely extrapolating from data produced in its bottlenose dolphin study, the DEIS fails to mention the most recent study of underwater threshold shift in a marine species, conducted by researchers at the University of California, Santa Cruz–a study directly at odds with the extrapolations made by

[6] According to the investigators, the avoidance response under these conditions was similar to those observed by an earlier study, which found 50% avoidance in gray whales at 120 dB. See C. Clark et al., Technical Report 1 at 50.

the Navy to support its reliance on a 180 dB impact threshold. This study found that "noise of moderate intensity and duration"—just 60-75 dB above sensation level after non-continuous exposures of 20-22 minutes—was sufficient to induce temporary threshold shift in three pinniped species (the harbor seal, California sea lion, and elephant seal). Not only do these findings conflict with the Navy's optimistic extrapolations from the earlier study, they also challenge some of the methodologies of the earlier study, suggesting that the numbers produced for bottlenose dolphins may have been overestimated. See D. Kastak, R.J. Schusterman, et al., Underwater temporary threshold shift induced by octave-band noise in three species of pinniped, 106 J. Acoust. Soc. Am. 1142. That the new study appeared in August 1999, shortly after the DEIS release, hardly absolves the Navy for disregarding important contrary evidence: the research was funded by the Office of Naval Research. In any case, the Navy must revise its analysis to take this second data set (and its critique of the first data set) into account.

(5) Limitations in Range of Species and Impacts—The analysis of LFA's potential impacts presented in the DEIS is improperly narrow. It improperly omits consideration of a broad range of potentially affected species, and it provides no discussion of long-term effects such as physiological stress and acute short-term effects (e.g., agonistic response), dismisses effects entirely beyond the 180 dB isopleth, and assimilates the diversity of species to the same Procrustean standard: a reductive approach to time, space, and species that is unjustified by any empirical evidence. The Environmental Protection Agency called for a different approach in its scoping comments three years ago, insisting the Navy assess its program comprehensively as it unfolds "in space and time, in numerous oceanographic conditions [and] under various scenarios of system operations." Letter from R.E. Sanderson, Director, EPA Office of Federal Activities, to Office of the Chief of Naval Operations (Sept. 9, 1996). Until the Navy does so, its analysis of LFA's environmental consequences is incomplete.

DON YOUNG, CHAIRMAN

U.S. House of Representatives
Committee on Resources
Washington, DC 20515

July 19, 2000

The Honorable William Cohen
Secretary of Defense
1000 Defense Pentagon
Washington, DC 20301-1000

Dear Secretary Cohen,

Recent media reports have identified serious scientific and environmental concerns with the U.S. Navy's development and planned deployment of the Surveillance Towed Array Sonar System Low Frequency Active (LFA) sonar system. LFA, as you know, is designed to take advantage of the special acoustic properties of high-decibel, low-frequency sound in sea water to detect hostile submarines.

We believe that the research program on LFA sonar conducted by the Navy has been inadequate as evidenced by the criticism directed at the Navy's Draft Environmental Impact Statement (DEIS), and also by the marine mammal strandings which could be attributed to acoustic events.

We are particularly concerned by the Navy's application to the National Marine Fisheries Service (NMFS) for a permit to harass marine mammals while operating LFA sonar worldwide even though there is significant scientific uncertainty surrounding the technology.

Whales and many other marine species use sound to communicate and sense their environment. Because sound produced by the LFA sonar system is designed to travel over vast distances, and because the sound produced by the system is so powerful, there is a growing scientific concern that the use of LFA sonar will interfere with the natural behavior of many marine species, especially marine mammals. In fact, many scientists believe that "active" sonar, such as that employed by the LFA sonar system, may lead to large numbers of marine mammal mortalities, and may even pose a human health risk to divers and swimmers.

Recent events suggest these concerns are well-founded. On March 15 and 16, 2000, there were a number of marine mammal strandings in the northern Bahamas. The National Oceanic and Atmospheric Administration (NOAA) released a preliminary report on the event, stating that, "the injuries to the six beaked whale heads [from animals which stranded in the Bahamas on March 15 and 16, 2000] were all consistent with an intense acoustic or pressure event," and occurred in conjunction with Naval activity in the area that employed tactical sonars. This report was also publicized in an

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article that appeared in the Washington Post on June 15, 2000. A stranding event of this magnitude in the Bahamas is unprecedented. In fact, the Bahama islands as a whole average just under one stranding per year. Although LFA sonar was not being used in the Bahamas at that time, LFA sonar does produce underwater sound thousands of times more powerful than the active sonar that was being used in the area. In addition, a similar stranding event occurred in 1996 in the Mediterranean Sea, when twelve beaked whales became stranded in Greece during NATO exercises that employed LFA sonar.

These events warrant a more precautionary approach to the use of LFA sonar and further scientific investigation to determine its effect on marine species. Defining what types and intensities of sound might harm, harass, or endanger marine mammals and other marine species is the single most pressing need in the evaluation of the environmental impacts potentially caused by LFA sonar. Without such information it is difficult, if not impossible, to write appropriate acoustic criteria and determine if technological applications like LFA sonar are safe.

Given the credible scientific uncertainty surrounding LFA sonar's effect on the marine environment and given the criticism directed at the program, we urgently request that you withdraw the DEIS and reassess your assumptions that LFA sonar poses no threat to the marine environment. We also request that you postpone proceeding with NMFS to obtain a Letter of Authorization for incidental take under the Marine Mammal Protection Act to operate LFA sonar worldwide until such time that NMFS can properly establish scientifically-based noise standards for marine animals.

Sincerely,

GEORGE MILLER, M.C.

RUSH HOLT, M.C.

DENNIS KUCINICH, M.C.

JACK METCALF, M.C.

THOMAS ALLEN, M.C.

WILLIAM D. DELAHUNT, M.C.

SAM FARR, M.C.

MICHAEL E. CAPUANO, M.C.

JIM MCDERMOTT, M.C.

HENRY WAXMAN, M.C.

TAMMY BALDWIN, M.C.

BARNEY FRANK, M.C.

PETER DEFAZIO, M.C.

LANE EVANS, M.C.

ENI FALEOMAVAEGA, M.C.

JOHN CONYERS, M.C.

MAURICE HINCHEY, M.C.

MARTIN MEEHAN, M.C.

ANNA ESHOO, M.C.

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ROBERT WEXLER, M.C.

LLOYD DOGGETT, M.C.

FRANK PALLONE, JR., M.C.

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PATSY T. MINK, M.C.

→ MATT

DEPARTMENT OF THE NAVY
OFFICE OF THE SECRETARY
1000 NAVY PENTAGON
WASHINGTON, D.C. 20350-1000

24 August 2000

The Honorable Don Young
Chairman, Committee on
Resources
Washington, DC 20515-1901

Dear Mr. Chairman:

Thank you for your letter of July 19, 2000, to Secretary Cohen concerning the Navy's Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) program and Draft Overseas Environmental Impact Statement/Environmental Impact Statement (DOEIS/EIS). I am responding on behalf of Secretary Cohen.

We appreciate and share your concern for the marine life in our oceans. The Department of the Navy takes very seriously its stewardship of the seas. To emphasize that fact and put our views in context, I am enclosing a paper describing our assessment of SURTASS LFA and its potential impacts on the environment.

We cannot - and should not - assure you that there is zero risk to marine life from any of our national security military operations. However, in conducting its analysis into potential effects of SURTASS LFA on the environment, the Navy has used the best available scientific data, consistently combining rigorous scientific methodology with an objective, prudent and conservative approach. We have opted for caution in those areas where scientific knowledge is incomplete.

Our environmental analysis of SURTASS LFA has been based on research and results by independent and distinguished marine biologists and bio-acousticians. SURTASS LFA scientific research efforts represent a significant advance in the current knowledge of anthropogenic sound in the marine environment. This research in conjunction with the proposed geographic restrictions, long-term monitoring program, and mitigation outlined in the DOEIS/EIS, will minimize the potential for adverse effects on marine life. We are currently responding to the public's comments and concerns and expect to finalize the DOEIS/EIS within the next few months. To date, there is no public comment that presents information that would change the analysis or conclusions in the EIS. We believe that the SURTASS LFA DOEIS/EIS process continues to be a fair and comprehensive

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evaluation of the potential for environmental impacts from deployment of this critical national security system, and that its proposed employment will produce no more than minimal risk to the marine environment.

As always, if I can be of further assistance, please let me know.

Sincerely,

Richard Danzig
Secretary of the Navy

Enclosure:
SURTASS LFA DOEIS/EIS Review

Copy to:
The Honorable George Miller
Ranking Minority Member
The Honorable Rush Holt
The Honorable Dennis Kucinich
The Honorable Thomas Allen
The Honorable Sam Farr
The Honorable Jack Metcalf
The Honorable William D. Delahunt
The Honorable Michael E. Capuano
The Honorable Jim McDermott
The Honorable Tammy Baldwin
The Honorable Peter DeFazio
The Honorable Eni Faleomavaega
The Honorable Maurice Hinchey
The Honorable Anna Eshoo
The Honorable Robert Wexler
The Honorable Frank Pallone, Jr.
The Honorable Carlos Romero-Barcelo
The Honorable Henry Waxman
The Honorable Barney Frank
The Honorable Lane Evans
The Honorable John Conyers
The Honorable Martin Meehan
The Honorable Nancy Pelosi
The Honorable Lloyd Doggett
The Honorable Luis V. Gutierrez
The Honorable Patsy T. Mink

SURTASS LFA DOEIS/EIS Review

Purpose and Need

By way of introduction, the proposed action is employment of the SURTASS LFA sonar, which is a long-range, low frequency (between 100 and 500 Hz), sonar system composed of both active and passive components. The purpose of the proposed action is to meet the U.S. need for improved capability to detect quieter and harder-to-find foreign submarines at long range. This capability would provide U.S. forces with adequate time to react to, and defend against, potential submarine threats while remaining a safe distance beyond the submarine's effective weapons range. To meet its long-range detection need, the Navy investigated the use of acoustic and non-acoustic technologies. Of those technologies studied, LFA sonar is the only system considered physically capable of providing long-range detection, as LF sound (below 1,000 Hz) propagates in seawater more effectively and for longer distances than active sonars employing mid (1,000 to 10,000 Hz) and high frequencies (greater than 10,000 Hz).

Why is the U.S. Navy so concerned with foreign submarines since the Cold War (with the USSR's massive submarine fleet) is long past? Submarines are, in fact, proliferating at a high rate throughout the world, and they possess a number of tactical characteristics that are both dangerous and difficult to counter, including:

- Stealth - a submarine is inherently stealthy. This provides a submarine with the dual tactical advantages of opportunity and time for planning an attack with a high probability of success;

- Lethality - a submarine can carry highly potent armament (highly destructive torpedoes and cruise missiles) capable of inflicting serious damage to or sinking even the largest ships; and

- Economy of Force - a submarine requires fewer operational resources than the resources required to defend against it, as illustrated by the difficulties that the Allied fleet experienced during World War II

Encl (1)

in defending against a small number of German U-boats in the Atlantic.

An unfriendly nation's aggressive use of even a single submarine has the potential to disrupt operations of U.S. Naval forces and constitutes a threat to U.S. security. The Russian Federation and the People's Republic of China have publicly declared that the submarine is the capital ship of their navies. Many potentially adversarial countries have essentially done the same, including Iran and North Korea. A former Indian Navy submarine admiral has commented that developing nations desire submarine forces because they are a most cost-effective platform for the delivery of several types of weapons; they counter surface forces effectively; they are flexible, multi-mission ships; they are covert, and thus can operate with minimal political ramifications; and they can operate without the burden of supporting escorts (JCS, 1995).

Submarines are ideal weapons for states that lack, or cannot afford, the capability to assert sea control in their own (or others') waterspace (Hervey, 1994). As such, they can operate in an opponent's backyard. Even in the face of determined sea control efforts, they can conduct stealthy and intrusive operations in sensitive areas, and can be inserted early for a wide range of tasks with a high degree of assured survivability (Chapman, 1993). When equipped with mines, advanced torpedoes, and/or anti-ship, and/or land-attack missiles, a submarine is a potent political weapon. A diesel electric submarine able to penetrate a multinational task force's defenses could undermine efforts to manage coalition politics in a single strike (Canadian Maritime Command, 1997).

The quieting of advanced non-U.S. nuclear submarines and advanced conventional (diesel-electric) submarines operating on battery power is now at parity with U.S. submarines. The U.S. no longer enjoys a comfortable acoustic advantage against the front-line submarines of some other nations. The Russian Federation continues to build new classes of highly capable submarines and to operate its newest vessels outside of home waters, including waters contiguous to the U.S. China is investing heavily in submarine technology, including designs for nuclear attack submarines, strategic ballistic missile submarines, and advanced conventional submarines; the latter through the purchase of KILO-class boats from Russia. China hopes to leap generations of submarine technology in its ambitious buying and building program (NRC, 1997).

The President's National Research Council (NRC) (1997) has projected that by 2035, the U.S. may be seriously and competently challenged by submarines from major powers (Russia and China) or from a number of potentially unfriendly nations. There are currently more than 150 submarines in the navies of potentially unfriendly countries other than Russia. Approximately 45 of these are modern, non-nuclear boats. About 45 more are on order worldwide, principally from German and Russian shipyards. By 2030, it is projected that 75 percent of the submarines in the rest of the world will have advanced capabilities, most likely including air-independent propulsion (AIP) that allows 30 to 50 days of submerged operations without surfacing or snorkeling. When these units are in a defensive mode, that is, not having to travel great distances or at high speed, they have a capability nearly equal to that of the modern nuclear submarine. Quieting technology is expected to proliferate, which will render these submarines difficult to detect, even with the latest ASW passive sonar equipment; and they may be armed with highly capable weapons.

The readiness and proficiency of submarine crews in the rest of the world are improving, and their performance is generally underestimated. Today, the countries that export these submarines offer high-quality crew training. Operated competently, these submarines are particularly difficult to find, much less neutralize.

Effects of Sonar on Marine Mammals

Now we will address the principal criticism of the SURTASS LFA DOEIS/EIS, and the March 2000 and other marine mammal strandings that have, in some instances, erroneously been attributed to SURTASS LFA. Despite the media reports, the Navy was not using low frequency sonar of any type in the Bahamas during the time preceding or during the strandings, including the SURTASS LFA sonar system. Moreover, the SURTASS LFA sonar program has been focusing on the issue of the potential for LF sound impacts on all marine animals, including beaked whales, long before the recent Bahamas (2000) and the Mediterranean (Greece, 1996) strandings. The following provides our understanding of the strandings:

Frantzis (1998) reports that on 12-13 May 1996, 12 or more *Ziphius cavirostris* (beaked whales) stranded along 38 km (20.5 NM) of coastline in the Kyparissiakos Gulf in Greece. There was no external sign of injury or disease in any of these juvenile whales, and many had recently been feeding. In searching for a

potential cause of these strandings, Frantzis noted a warning had been issued to mariners indicating that a test of a NATO low frequency sonar called LFAS was being conducted in the gulf at the same time as the strandings. Frantzis presents data on the number of strandings analyzed by half-year from 1992-1996, and states that no mass strandings or LFAS tests had occurred in the Ionian Sea since 1981, except during the four-day period 11-15 May 1996. He concludes that the probability of the mass stranding and the sonar exercise occurring simultaneously was less than 0.07. The statistical analysis was not described in the paper, but it appears to treat each four-day period during the 16.5 years from 1981 to 1997 as an independent event during which strandings and sonar tests could be counted. The probability of the mass stranding occurring during the four known days of sonar testing was then simply calculated by dividing the four days by the number of days in 16.5 years to come up with 0.066%.

The Frantzis (1998) letter stimulated the NATO SACLANT Undersea Research Center (SACLANTCEN) that conducted the sonar tests to convene panels to review the data and to develop an environmental policy. They determined that the NATO sonar transmitted two simultaneous signals lasting four seconds and repeating once every minute. The simultaneous signals each were broadcast at source levels of just under 230 dB re 1 μPa at 1 m. One of the signals covered a frequency range from 450-700 Hz and the other one covered 2.8-3.3 kHz. The *Ziphius* strandings in the Kypriassakos Gulf occurred during the first two sonar runs on each day of 12 and 13 May 1996. The close timing between the onset of sonar transmissions and the first strandings suggests closer synchrony between the onset of sonar transmissions and the strandings than was presented in Frantzis (1998). However, the Bioacoustics Panel convened by NATO was unable to reach a definitive conclusion: "An acoustic link can neither be clearly established nor eliminated as a direct or indirect cause for the May 1996 strandings; there is no evidence of direct physical injury because no viable tissue samples suitable for analysis were available."

The Frantzis (1998) paper served an important function to alert marine mammalogists of a coincidence of a rare stranding with military operations. However, two problems prevent stronger inference. The papers do not have the appropriate design for statistical analysis of conditional probability, and no such correlative study can provide evidence for causation. The paper started with stranding events and then looked for some other rare event that might coincide. This strategy is useful to

identify coincidences, but is not appropriate for a statistical analysis of conditional probability unless independent tallies are made of the two kinds of events. The paper suggests that naval sonar may have caused the stranding, but did not perform a systematic survey of naval or sonar exercises. SACLANTCEN (1998) attempted a correlative study relating all tests of the NATO sonar with Italian and Spanish stranding records. SACLANTCEN (1998) reported that the same NATO sonar described in Frantzis (1998) was used in six sonar tests in the Mediterranean near the Spanish and Italian coasts; five additional low frequency sonar tests were conducted by NATO in the Mediterranean from 1981 to 1992 using source levels below 215 dB re 1 μPa at 1 m. SACLANTCEN's (1998) review of Italian and Spanish stranding records revealed no other coincidence of beaked whale strandings near the time and place of the sonar tests (SACLANTCEN, 1998).

On March 15, 2000, a number of marine mammals, including primarily beaked whales, stranded in the Bahamas. The U.S. Navy continues to investigate this phenomenon with scientists from NOAA's National Marine Fisheries Service and other agencies to determine the possible cause of the strandings. Under review is the transit of seven ships and three submarines through the area of the Northwest New Providence Channel during the morning and afternoon of March 15th in an effort to determine if any action by these vessels could have created an environment hazardous to marine mammals, and particularly beaked whales. The Navy is reviewing acoustic, oceanographic, biological and environmental data to determine whether these transit activities may have had a role in the strandings. Preliminary analysis indicates that one submarine sonar and five of the seven ship sonars were in use during the transit, and their operating frequencies and power settings are part of the investigation. Eachsonar was a standard, mainframe mid-frequency (3 to 5 kHz) sonar of the type commonly found on surface combatants and submarines. They operated with standard power outputs and modes. These sonar systems have been in use on U.S. and allied Navy ships for more than 20 years, including narrow passages and open ocean areas, without known ill effects on marine mammals. Please note, however, that neither SURTASS LFA nor any low frequency sonar was used during the transit.

In summary, while we agree there is need for continued investigation, the SURTASS LFA sonar is not comparable to those associated with any of the reported strandings. Additionally, SURTASS LFA will not be used in restricted waterways, such as the Bahamas and the Kypriassakos Gulf. It will also use the very latest monitoring mitigation technology, which includes visual,

passive sonar and the High Frequency Marine Mammal Monitoring active sonar. With the operational restrictions proposed for SURTASS LFA and the believed relatively poor hearing sensitivity of beaked whales in the LFA sonar transmit frequency band of 100 to 500 Hz, it is extremely unlikely that any future strandings could be induced by SURTASS LFA sonar operations.

SURTASS LFA Scientific Research Program

I would now like to address your concern about the alleged inadequacy of the SURTASS LFA research program, due, in part, to the criticism of the DOEIS/EIS. It should be stressed that the vast majority of the scientists who have published peer reviewed papers in this field will agree that the LFA research program has been, by far, the most extensive study of underwater noise on wild marine mammals ever conducted. Scientific analyses, utilizing the results of the LFA research as well as all available scientific data, underpin the LFA DOEIS/EIS methodology in that they are the basis for determining reference points, assessing stock abundance, quantifying uncertainty, and assessing the risk associated with different management options. The SURTASS LFA DOEIS/EIS utilizes a conservative methodology analogous to that used by NMFS. This prudent and conservative approach has been utilized in determining the potential effects of the employment of SURTASS LFA sonar on the marine environment by:

- Determination of impacts on overall stock populations;
- Determination of conservative impact reference points;
- Quantifying uncertainties;
- Development of a risk continuum to apply the impact (reference points) realistically to each stock population; and
- Development of mitigation measures to minimize potential effects to marine animal stocks.

In 1997, there was a widespread consensus that cetacean response to LF sound signals needed to be better defined using controlled experiments. In response, the Navy worked with scientists from Cornell University and Woods Hole Oceanographic Institute to develop the Low Frequency Sound Scientific Research Program (LFS SRP). The LFS SRP was designed to supplement the data from previous studies. Also, the Navy made the SURTASS LFA sonar vessel (R/V *Cory Chouest*) available to the LFS SRP, which enabled greater control over received levels (RL) due to the

dynamic range of the ship's transmission system and the quality of its environmental acoustic modeling capabilities.

The selection of species and study sites emerged from an extensive review in several workshops by a broad group of interested parties, including academic scientists, federal regulators, and representatives of environmental and animal welfare groups. The outcome of this group's decisions was that baleen whales should be the focus of the research since they were believed most likely among all marine mammals to have the best hearing in the SURTASS LFA sonar frequency band (Figure 1), and because of their endangered status and/or prior evidence of avoidance responses to LF sounds. Study sites were selected that offered the best opportunities for detailed observations combined with previous research that documented undisturbed patterns of behavior and distribution, or avoidance reactions to manmade sound at low RLs.

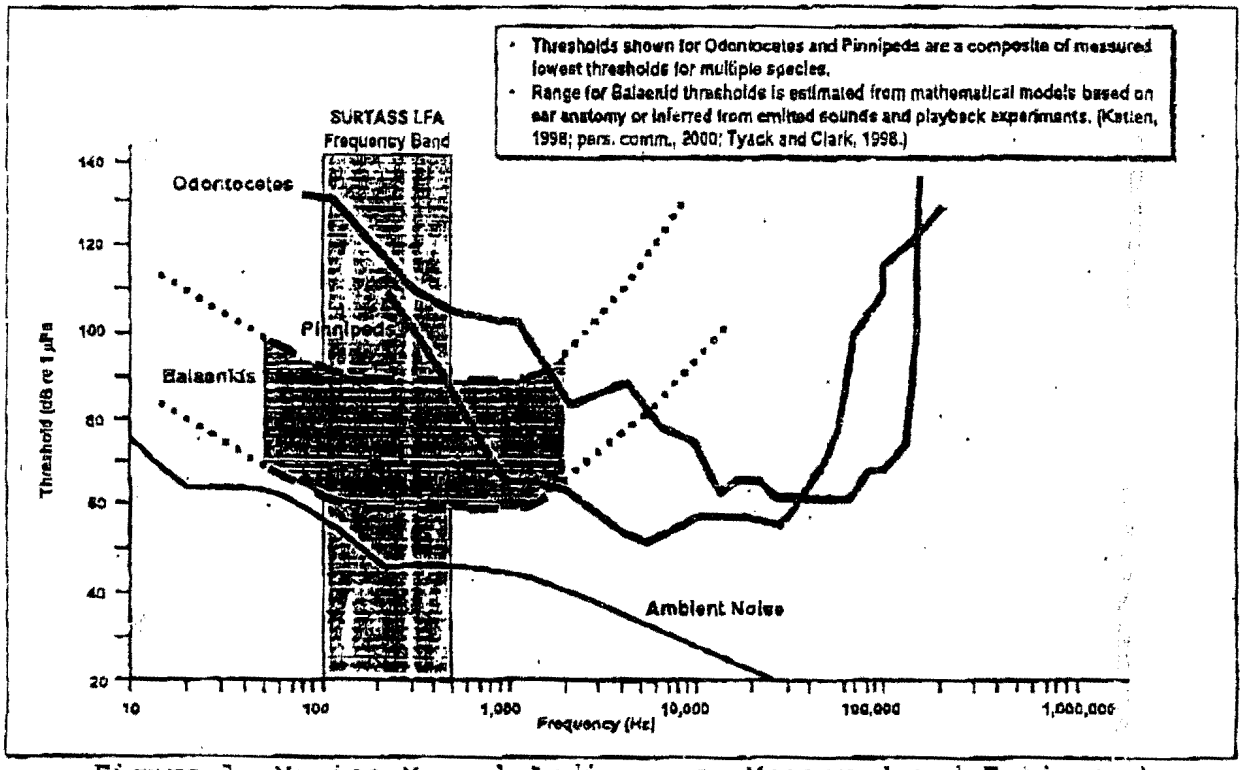

Figure 1: Marine Mammal Audiograms; Measured and Estimated

This focus on the most sensitive species and the best sites for detecting a response was intended to produce a model of response that could be applied to other species which were known to be

less sensitive to LF sound such as odontocetes, phocids and otariids. This was a critical element of the logic of the LFS SRP. Extrapolation was unavoidable, so conservative assumptions were adopted. This reduced the chances that species or contexts that are more difficult to study turned out to be more sensitive than the LFS SRP model systems.

For the purposes of the SURTASS DOEIS/EIS, the LFS SRP was the best option available to obtain critical scientific data under time and funding constraints. It should be noted that the Navy has committed to a program of continued long term monitoring, focusing on any indications of heightened sensitivity or stronger responses to SURTASS LFA sonar operations than was predicted in this scientifically based assessment.

The species and settings chosen for the three phases of the LF sound "playback" experiments were:

- Blue and fin whales feeding in the Southern California Bight (Phase I) (September-October 1997);
- Gray whales migrating past the central California coast (Phase II) (January 1998); and
- Humpback whales off Hawaii (February-March 1998) (Phase III).

These studies included three important behavioral contexts for baleen whales: feeding, migrating, and breeding. The first phase also involved some studies of northern elephant seals tagged with acoustic data loggers. Elephant seals are considered among the most sensitive pinnipeds to LF sound and are deep divers. The third phase also attempted to conduct playbacks with sperm whales, but no animals were encountered during the offshore portions of the cruise schedule. Sperm whales are listed by the U.S. as endangered, and they were suspected to be the toothed whale most sensitive to LF sound. There have also been reports of sperm whales being sensitive to manmade transient noise (Watkins and Schevill, 1975; Watkins et al., 1985; Bowles et al., 1994; Mate et al., 1994b).

The LFS SRP produced new information about responses to the SURTASS LFA sonar sounds at RLs from 120 to 155 dB. The LFS SRP team explicitly focused on situations that promoted high RLs, but were seldom able to achieve RLs above 155 dB due to the motion of the whales and maneuvering constraints of the LF source vessel.

During the first phase of LFS SRP research, the source ship operated routinely with the full source array (18 transducers) at source levels similar to those that would be used in normal Navy operations. The ship also approached whales while operating two of the transducers at full power levels. Over the 19-day period, there were no immediately obvious responses from either blue or fin whales as noted during observations made from any of the research vessels during playback of LFA sounds (Clark et al., 1999).

In the second phase of LFS SRP research, migrating gray whales showed responses similar to those observed in earlier research (Malme et al., 1983, 1984) when the source was moored in the migration corridor (2 km [1.1 nm] from shore). The study extended those results with confirmation that a louder SL elicited a larger scale avoidance response. However, when the source was placed offshore (4 km [2.2 nm] from shore) of the migration corridor, the avoidance response was not evident, even though the whales were exposed to the same level of sound. This implies that the inshore avoidance model -- in which 50 percent of the whales avoid exposure to levels of 141 $\pm$3 dB -- may not be valid for whales in proximity to an offshore source (Buck et al, 2000). Rather, these new data suggest that avoidance of an offshore source ($\geq$ 4 km [2.2 nm]) was minor.

The third phase of LFS SRP research examined potential effects of SURTASS LFA sonar transmissions on singing humpback whales. These whales showed some apparent avoidance responses and cessation of song occurring at RLs ranging from 120 to 150 dB. However, a greater number of singing whales exposed to the same levels showed no cessation of song. The June, 2000 issue of the journal *Nature* included the first peer-reviewed published article on this topic, addressing a lengthened whale song in response to LFA exposure. This showed that it is possible to observe and measure the behavioral repose of individual whales, using the LFS SRP methodology; it should also be noted that the studied whales resumed their normal behavior within approximately one hour (Miller, 2000). This kind of brief interruption, followed by resumption of normal interactions, is similar to that seen when whales interrupt one another or when small vessels approach whales.

In summary, the scientific objective of the LFS SRP was to conduct independent field research in the form of controlled experimental tests of how baleen whales responded to SURTASS LFA sonar signals. Taken together, the three phases of the LFS SRP do not support the hypothesis that most animals exposed to RLs

near 140 dB would exhibit disturbance of behavior and avoid the area. These experiments, which exposed animals to RLs ranging from 120 to about 155 dB, detected only minor, short-term behavioral responses, which do not necessarily constitute harassment in the sense of a prolonged disturbance of a biologically important activity.

In response to the comment that "There may also be human health implications for divers and swimmers," the following specifics are provided. Participants in activities that may involve submersion below the ocean's surface, such as swimming, surfing, and snorkeling, would not be significantly impacted by exposure to LF sounds transmitted from the SURTASS LFA sonar. In making this determination, several factors were considered:

- Beach Location - Exposure to LF sound energy would be eliminated or greatly reduced at beaches that are separated from the open ocean by a land mass (such as beaches that exist inside barrier islands), or beaches along the broad, shallow portion of the continental shelf; and

- Water Depths Used by Swimmers - Other than for very short periods of time, swimming and snorkeling occur in areas that extend from the surface to depths not greater than 2 m (6.5 ft). Applying acoustic theory and detailed measurements to these depths, there would be substantial sound transmission losses occurring in the top layer of water (about 1.8 m [6 ft]) where swimmers would most likely be found. Sound fields in this layer of water would be about 20 dB less than the sound fields in adjacent deeper water.

In addition to these factors, employment of the SURTASS LFA sonar would be restricted to RLs not to exceed 145 dB in known recreational and commercial diving sites (and within the 40-meter [130-foot] depth contour). As described below, research conducted by the Navy indicates that LF sound levels below 145 dB do not have an adverse effect on humans (recreational or commercial divers) in water. Therefore, there would be no significant impacts to persons engaged in swimming, surfing, and snorkeling from SURTASS LFA sonar operations under the proposed Alternative 1 (preferred alternative), which includes geographic restrictions and monitoring to prevent injury.

Two controlled studies with humans have been conducted on SURTASS LFA sonar sound exposures. The Applied Research

Laboratory, University of Texas conducted the first study by the Navy from 1993 to 1995. Eighty-seven subjects participated in 437 tests under the control of the Naval Submarine Medical Research Laboratory (NSMRL). Tests only went to 160-dB received level, which was the maximum level (for no more than 2 min at a time and no more than 15 min a day) recommended as interim guidance for human diver populations equivalent in medical health and fitness to Navy divers.

The second study was conducted by ONR and NSMRL between June 1997 and November 1998 in conjunction with a consortium of university and military laboratories. Its purpose was to develop guidance for safe exposure limits for recreational and commercial divers exposed to LF sound such as that created during the operation of the SURTASS LFA sonar system. Computer modeling and animal and human studies were performed.

The study concluded that the maximum intensity tested (received level of 157 dB) did not produce physiological evidence of damage in human subjects. Furthermore, there was only a two percent very severe aversion reaction by divers at a level of 148 dB. NSMRL, therefore, determined that scaling back the intensity by 3 dB (3 dB reduction equals a 50 percent reduction in signal strength) would provide a suitable margin of safety for divers. Hence, it set the intensity criteria for recreational and commercial divers at 145 dB. Because operation of the SURTASS LFA sonar systems would be restricted to 145 dB in known areas of recreational and commercial diving, Alternative 1 would have no potential effects on diving or related human activities in water. Thus, a prudent approach was applied in the selection of this 145-dB criterion.

The distance of the 145-dB sound field from the SURTASS LFA sonar vessel is unique to each operational site and/or scenario due to the high variability in underwater sound propagation characteristics. The technique of sound field determination through the estimation of sound pressure levels (SPL) is the most reliable method of ensuring that the criterion of 145 dB maximum RL at known recreational and commercial dive sites is maintained.

Summary

Although it is true that, due to low frequency underwater sound propagation, the SURTASS LFA sound can be detected at long ranges, it is not true as has been alleged that it will "impact the oceans on a global scale," nor will it "flood the oceans

with sound." Rarely will there be more than two ships at sea at any one time, and even more rarely would they be operating in the same ocean at the same time. When operating, the ship covers a limited area, traveling at only 3 knots. At a maximum 20% duty cycle, active transmission time for each ship would not exceed 432 hours distributed over the course of an entire year (less than 5% of the total hours in a year). Additionally, it is important to note that the intensity of low frequency sound decreases rapidly as the distance from the transmitter increases. The most significant decrease in sound intensity, a loss of 60 decibels, occurs within the first kilometer from the ship. Assuming that the ship is operating at its maximum source level, the intensity level will decrease to 215 decibels at 10 meters, 195 decibels at 100 meters, 175 decibels at 1000 meters, and so on. Although it is too technical to discuss here, to avoid confusion it should be noted in this context that decibel levels in water cannot be compared with air.

Under the Navy's preferred alternative as outlined in the SURTASS LFA DOEIS/EIS, i.e., deployment of SURTASS LFA with geographic restrictions and mitigation measures that greatly reduce the chance of exposure to harmful levels of sound, the potential for adverse effects on humans in the water is virtually non-existent, and for marine animals is negligible. However, because there is some potential for incidental takes of marine mammals from behavioral harassment, the Navy is requesting a Letter of Authorization for incidental harassment from the National Marine Fisheries Service in compliance with the Marine Mammal Protection Act, and is consulting pursuant to the Endangered Species Act. While the DOEIS/EIS supports a position that SURTASS LFA sonar can be operated safely relative to both human and marine life, this position is subject to final review that will be published in the Final EIS. The Navy has made every effort to maximize public opportunity to review and comment on the program and will continue to do so.

NOISE SOURCE	MAXIMUM SOURCE LEVEL	REMARKS	REFERENCE
UNDERSEA EARTHQUAKE	272 dB	Magnitude 4.0 on Richter scale (energy integrated over 50 Hz bandwidth)	Wenz, 1962.
SEAFLOOR VOLCANO ERUPTION	255+ dB	Massive steam explosions	Dietz and Sheehy, 1954; Kibblewhite, 1965; Northrop, 1974; Shepard and Robson, 1967; Nishimura, NRL-DC, pers. comm., 1995.
AIRGUN ARRAY (SEISMIC)	255 dB	Compressed air discharged into piston assembly	Johnston and Cain, 1981; Barger and Hamblen, 1980; Kramer et al., 1968.
LIGHTNING STRIKE ON WATER SURFACE	250 dB	Random events during storms at sea	Hill, 1985; Nishimura, NRL-DC, pers. com., 1995.
SEISMIC EXPLORATION DEVICES	212-230 dB	Includes vibroseis, sparker, gas sleeve, exploder, water gun and boomer seismic profiling methods.	Johnston and Cain, 1981; Holiday et al., 1984.
FIN WHALE	200 dB (avg. 155-186)	Vocalizations: Pulses, Moans	Watkins, 1981b; Cummings et al., 1986; Edds, 1988.
CONTAINER SHIP	198 dB	Length 274 meters; Speed 23 knots	Buck and Chalfant, 1972; Ross, 1976; Brown, 1982b; Thiele and Ødegaard, 1983.
ATOC SOURCE	**195 dB**	**Depth 980 m; Average duty cycle 2-8%**	**DEIS/EIR for the California ATOC Project and MMRP, 1994.**
HUMPBACK WHALE	192 dB (avg. 175-190)	Fluke and flipper slaps	Thompson et al., 1986.
SUPERTANKER	190 dB	Length 340 meters; Speed 20 knots	Buck and Chalfant, 1972; Ross, 1976; Brown, 1982b; Thiele and Ødegaard, 1983.
BOWHEAD WHALE	189 dB (avg. 152-185)	Vocalizations: Songs	Cummings and Holiday, 1987.
BLUE WHALE	188 dB (avg. 145-172)	Vocalizations: Low frequency moans	Cummings and Thompson, 1971a; Edds, 1982.
RIGHT WHALE	187 dB (avg. 172-185)	Vocalizations: Pulsive signal	Cummings et al., 1972; Clark 1983.
GRAY WHALE	185 dB (avg. 185)	Vocalizations: Moans	Cummings et al., 1968; Fish et al., 1974; Swartz and Cummings, 1978.
OFFSHORE DRILL RIG	185 dB	Motor Vessel KULLUK; oil/gas exploration	Greene, 1987b.
OFFSHORE DREDGE	185 dB	Motor Vessel AQUARIUS	Greene, 1987b.
OPEN OCEAN AMBIENT NOISE	74-100 dB (71-97dB in deep sound channel)	Estimate for offshore central Calif. sea state 3-5; expected to be higher (≥ 120 dB) when vessels present.	Urick, 1983, 1986.

Note: Except where noted, all the above are nominal total broadband power levels in 20-1000 Hz band. These are the levels that would be measured by a single hydrophone (reference 1 μPa @ 1 m) in the water.

Table 1.1.3-1 Natural and human-made source noise comparisons.

EXHIBIT NO. 13
APPLICATION NO.
CD-113-00

STATE OF CALIFORNIA – THE RESOURCES AGENCY GRAY DAVIS, *Governor*

CALIFORNIA COASTAL COMMISSION
45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

RECORD PACKET COPY

Tu 5 a

Memo

Date: **November 16, 2000**

To: **Commissioners and Interested Persons**

From: **Peter Douglas, Executive Director**
Mark Delaplaine, Federal Consistency Staff

Subject: **Consistency Determination CD-113-00**
U.S. Navy, Low Frequency Active (LFA) Sonar

On November 8, 2000, the Commission staff received the Navy's consistency determination for the employment of its Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA," or LFA, for short) sonar system. The staff informed the Navy it was not able to complete its recommendation without the Navy's responses to the staff's October 26, 1999, comments on the Navy's Draft Overseas Environmental Impact Statement/Environmental Impact Statement (OEIS/EIS) for the system. The Navy indicates it will provide a response to the Commission staff's comments, but not before the first mailing for the December Commission meeting. Therefore the staff recommendation will not be available until the second mailing; in the meantime attached is the Navy's consistency determination for the Commission to review.

Attachment: Navy Consistency Determination CD-113-00.

DEPARTMENT OF THE NAVY
NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY
NAVAL SUBMARINE BASE NEW LONDON
GROTON, CONNECTICUT 06349-5900

IN REPLY REFER TO:
3950
Ser 01C/025
November 6, 2000

Mr. Mark Delaplaine
Federal Consistency Supervisor
California Coastal Commission
45 Fremont, Suite 2000
San Francisco, CA 94105-2219

RECEIVED
NOV 08 2000
CALIFORNIA
COASTAL COMMISSION

Dear Mr. Delaplaine:

I am pleased to forward the enclosed consistency determination pursuant to Section 930.34 et seq. of the National Oceanic and Atmospheric Administration (NOAA) Federal Consistency Regulations (15 CFR Section 930.30 et seq.) and Section 307(c)(1) of the federal Coastal Zone Management Act of 1972 (CZMA) (16 U.S.C. 1456(c)).

The determination covers the proposed employment of the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar in ocean areas off California. A Draft Overseas Environmental Impact Statement/Environmental Impact Statement (DOEIS/EIS) was prepared and issued in July 1999 with copies being sent to the Commission.

If you have any questions or require any additional information, please do not hesitate to contact the undersigned at (703) 604-7882.

Sincerely,

Joseph S. Johnson

JOSEPH S. JOHNSON
Deputy, Special Programs
By Direction of the Commanding Officer

Enclosure: 1. Proposed Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar Employment: Determination Of Consistency With the California Coastal Act

PROPOSED SURVEILLANCE TOWED ARRAY SENSOR SYSTEM LOW FREQUENCY ACTIVE (SURTASS LFA) SONAR EMPLOYMENT: DETERMINATION OF CONSISTENCY WITH THE CALIFORNIA COASTAL ACT

1. AUTHORITY

This consistency determination is being submitted in compliance with Section 930.34 et seq. of the National Oceanic and Atmospheric Administration (NOAA) Federal Consistency Regulations (15 CFR Section 930.30 et seq.) and Section 307(c)(1) of the federal Coastal Zone Management Act of 1972 (CZMA) (16 U.S.C. 1456(c)).

This determination is being submitted in connection with the Department of the Navy's proposed Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar employment. The proposed SURTASS LFA sonar employment is described below in Section 3.

2. DETERMINATION

In accordance with Section 307(c)(1)(A) of the CZMA, the U.S. Navy has determined that:

> The proposed SURTASS LFA sonar employment, if undertaken by the U.S. Navy, would be consistent with and will be conducted in a manner consistent to the maximum extent practicable with the federally approved enforceable policies of the California Coastal Act of 1976 (as amended).

This determination is based on the information contained in this consistency determination and Attachment A, as well as in the Draft Overseas Environmental Impact Statement/Environmental Impact Statement (DOEIS/EIS) for the Navy's proposed SURTASS LFA sonar employment.[1]

3. PROGRAM DESCRIPTION

In accordance with the requirements of Presidential Executive Order (EO) 12114 (Environmental Effects Abroad of Major Federal Actions) and the National Environmental Policy Act of 1969 (NEPA), the Navy prepared a DOEIS/EIS in July 1999 to evaluate the potential environmental effects of the proposed SURTASS LFA sonar employment on the marine environment. The word "employment" as used in this document means the use of the SURTASS LFA sonar during routine training and testing as well as the use of the system during military operations. It does not apply to the use of the system in armed conflict or direct combat support operations, nor during periods of heightened threat conditions, as determined by the National Command Authorities. The Navy will decide whether to proceed with the proposed SURTASS LFA sonar employment after the DOEIS/EIS is finalized.

[1] The DOEIS/EIS has been prepared pursuant to the National Environmental Policy Act (NEPA) and Executive Order (EO) 12114. In response to comments received from the public and other agencies on the DOEIS/EIS, the Navy may revise the document prior to issuing a final OEIS/EIS.

Under the SURTASS LFA sonar program described in the DOEIS/EIS, the Navy proposes to equip up to four ocean surveillance vessels with SURTASS LFA sonar systems. The SURTASS LFA sonar employment preferred alternative calls for geographic restrictions and monitoring to mitigate effects on the marine environment, particularly in the coastal zone. In accordance with the requirements of EO 12114 and NEPA, the DOEIS/EIS also considered alternatives to the proposed SURTASS LFA employment, including the No Action Alternative and an Alternative which called for the operation of the SURTASS LFA sonar without geographic restrictions and monitoring mitigation (Unrestricted Operation, or Alternative 2). However, this consistency determination is based on the Navy's preferred alternative for the SURTASS LFA sonar employment; i.e. Restricted Operation Alternative (Alternative 1) as described in the DOEIS/EIS.

Purpose and Need

The purpose of the proposed action is to meet U.S. need for improved capability to detect quieter and harder-to-find foreign submarines at long range. This capability would provide U.S. forces with adequate time to react to, and defend against, potential submarine threats while remaining a safe distance beyond a submarine's effective weapons range.

SURTASS LFA Sonar Technology

SURTASS LFA sonar is a long-range, low frequency (between 100 and 500 Hz), all-weather sonar system composed of both active and passive components.

The active component of the SURTASS LFA system, LFA, is an augmentation to the passive detection system, to be used when passive system performance is inadequate. LFA is a set of acoustic transmitting source elements suspended by cable from underneath a ship. These elements, called projectors, are devices that produce the active sound pulse, or "ping." The projectors transform electrical energy to mechanical energy that set up vibrations or pressure disturbances within the water to produce a "ping." The characteristics and operating features of the active components (LFA) are:

- The source is a vertical line array (VLA) of up to 18 sound projectors suspended below the vessel. LFA's transmitted beam is omnidirectional (360 degrees) in the horizontal (nominal depth of the center of the array is 122 m [400 ft]), with a narrow vertical beamwidth that can be steered above or below the horizontal.

- The source frequency is between 100 and 500 Hz (the LFA system's physical design does not allow for transmissions below 100 Hz). A variety of signal types can be used, including continuous wave (CW) and frequency-modulated (FM) signals. Signal bandwidth is approximately 30 Hz.

- The source level (SL) of an individual element of the SURTASS LFA sonar array is approximately 215 decibels (dB) (referenced to 1 micro Pascal [μPa] at 1 meter). The sound field of the array can never be higher than the SL of an individual source projector.

- The typical LFA signal is not a constant tone, but rather a transmission of various waveforms that vary in frequency and duration. A complete sequence of sound transmissions is referred to as a "ping" and lasts between 6 and 100 seconds, although the duration of each continuous frequency sound transmission is never longer than 10 seconds.

- Average duty cycle (ratio of sound "on" time to total time) is less than 20 percent (20 percent is the maximum physical limit of the LFA system). The typical duty cycle is between 10 and 20 percent.

- The time between transmissions is typically from 6 to 15 minutes.

The passive, or listening, component of the system is SURTASS. SURTASS detects returning echoes from submerged objects, such as threat submarines, through the use of hydrophones. These devices transform mechanical energy (received acoustic sound wave) to an electrical signal that can be analyzed by the processing system of the sonar. The SURTASS hydrophones are mounted on a receive array that is towed behind the ship. The SURTASS LFA sonar ship must maintain a minimum speed of 5.6 kilometers per hour (3 knots) through the water in order to tow the hydrophone array. The return signals, which are usually below background or ambient noise level, are then processed and evaluated to identify and classify potential underwater threats.

Alternatives Considered by the Navy

In the DOEIS/EIS, the Navy discussed the environmental effects of a reasonable range of alternatives, including the No Action Alternative, the Restricted Operation Alternative, and the Unrestricted Operation Alternative. Under NEPA, reasonable alternatives are those that will accomplish the purpose and meet the need of the proposed action (in this case the U.S. need for improved capability to detect quieter and harder-to-find foreign submarines at long range) and those that are practical and feasible from a technical and economic standpoint. For the reasons explained below, the Navy determined that the Restricted Operation Alternative (Alternative 1) was the preferred alternative.

Alternative 1 (Restricted Operation, the Navy's Preferred Alternative)

Alternative 1, the Navy's preferred alternative, best meets the program's purpose and need, while minimizing potential environmental effects as compared with unrestricted operations. This alternative would include geographic restrictions and monitoring to prevent injury to potentially affected species while satisfying the stated purpose of the proposed action to meet U.S. need for improved capability to detect quieter and harder-to-find foreign submarines at long range.

Geographic Restrictions

The following geographic restrictions would limit the California coastal areas in which the Navy would deploy the SURTASS LFA sonar under Alternative 1 such that the sound field does not exceed:

- 180 dB within 22 km (12 nm) of any coastline (including islands); and

- 145 dB in the vicinity of known recreational and commercial dive sites, including "blue water" sites. Sites frequented by recreational divers are generally defined as from the shoreline out to the 40-meter (m) (130-feet [ft]) depth contour. The Navy would contact commercial dive organizations to determine the locations of "blue water" diving sites. For recreational "blue water" dive sites the Navy would notify DAN and other diving organizations concerning SURTASS LFA sonar operations on a case-by-case basis.

LFA Mitigation Zone

Implementation of Alternative 1 would provide for monitoring mitigation during operations of the SURTASS LFA sonar to prevent injury to marine mammals (and possibly sea turtles) by ensuring to the maximum extent possible that they are not within the LFA mitigation zone (180-dB SURTASS LFA sonar sound field) during low frequency (LF) transmissions.

LFA Mitigation Zone

The LFA mitigation zone covers an area ensonified to a level $\geq$ 180 dB by the SURTASS LFA sonar transmit array. Under normal operating conditions, the range of this 180-dB sound field will vary between the nominal ranges of 0.75 to 1.0 km (0.40 to 0.54 nm) from the source array over a depth of approximately 122 ± 35 m (400 ± 115 ft). (The center of the array is at a nominal depth of 122 m [400 ft]). Under rare conditions (e.g., strong acoustic duct) this range could be somewhat greater than 1 km (0.54 nm). Knowledge of local environmental conditions (such as sound speed profiles [depth vs. temperature] and sea state) that affect sound propagation is critical to the successful operation of the SURTASS LFA sonar and is monitored on a near-real-time basis. Therefore, the SURTASS LFA sonar operators would have foreknowledge of such anomalous acoustic conditions and would mitigate to the 180-dB range even when this was beyond 1 km (0.54 nm).

The use of the following three monitoring techniques are proposed:

- Visual monitoring for marine mammals and sea turtles from the SURTASS LFA sonar vessel during daylight hours;

- Use of the passive (low frequency) SURTASS array to listen for sounds generated by marine mammals as an indicator of their presence; and

- Use of high frequency (HF) active sonar to detect/locate/track potentially affected marine mammals (and possibly sea turtles) near the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array.

Sound Field Pressure Level Determination

Under Alternative 1, operators of SURTASS LFA sonar would estimate sound pressure levels (SPLs) versus distances from the transmit array prior to and during active operations. This SPL monitoring would account for the factors affecting the transmission of sound in the ocean. It would be performed by measuring and entering near-real-time environmental inputs (such as sound speed profile [SSP], sea state, water depth, etc.) along with SURTASS LFA sonar operational characteristics into Navy standard acoustic performance prediction models that would then calculate the received levels (RLs) at various ranges and depths.

Alternative 2 (Unrestricted Operation)

Under Alternative 2, the Navy could conduct SURTASS LFA sonar operations with no mitigation measures (e.g., no geographic restrictions and no monitoring to mitigate injury) within the system's physical limitations (e.g., not in very shallow water). Even though Alternative 2 is more operationally flexible and cost-effective for the Navy to implement and operate, it is not the Navy's preferred alternative due to its potential adverse effects to marine animals and human divers. This alternative would also be inconsistent with other regulations, such as the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). Its implementation would not be consistent with the Chief of Naval Operations' commitment to the protection of the environment and good stewardship of the sea.

No Action Alternative

Under the No Action Alternative, the SURTASS LFA sonar system would not be deployed. The effects of the No Action Alternative are those effects, going forward, that can be expected if the proposed project is not implemented. These would include the potential for increased underwater noise from additional ships and sonars, or additional time at sea (fewer ships/sonars) and more sonar transmissions, to compensate for the loss of long-range detection capability afforded by SURTASS LFA sonar. In addition, there would be an increase in fuel consumption and expenditure of energy resources associated with additional ships or increased time at sea. Thus, there would be environmental impacts resulting from implementation of this alternative. Most importantly, however, the No Action Alternative would deprive the U.S. Navy of the capability to detect quieter and harder-to-find foreign submarines at long range. Thus, U.S. forces would not have adequate time to react to, and defend against, potential submarine threats while maintaining a safe distance from a submarine's effective weapon range. As such, the No Action Alternative would potentially produce increased environmental impacts and would not accomplish the purpose and need of the proposed action.

Alternatives That Do Not Fulfill the Purpose and Need

Several alternatives that did not fulfill the purpose and need of the proposed action were eliminated from detailed study in the DOEIS/EIS. These are briefly discussed below. Non-acoustic alternative underwater detection technologies were evaluated to determine which of them were capable of meeting the U.S. need to improve detection of quieter and harder-to-find foreign submarines at long range. Those evaluated and tested by the Navy included radar, laser, magnetic, infrared, electronic, electric, hydrodynamic, and biologic technologies. None of these non-acoustic technologies were capable of fulfilling the purpose of the proposed action, and they were eliminated from further study in the DOEIS/EIS. While these alternative technologies demonstrated some utility in detecting submarines, they could not reliably provide U.S. forces with long-range detection (tens to hundreds of nautical miles) and longer reaction times due to a number of critical factors:

- Limited range of detection;
- Meteorological and oceanographic limitations;
- Unique operating requirements; and/or
- Requirement for the submarine to be at or near the surface for detection.

Analytical Context

In developing the framework for the DOEIS/EIS, the Navy recognized that it needed to address the following issues:

- Adequacy of scientific information on human divers - Data regarding the effects of underwater LF sound on humans are limited. As a result of this, the Navy sponsored independent scientific research to study the potential effects of LF sound on human divers.
- Adequacy of scientific information on marine animals - Data regarding the effects of underwater LF sound on marine animals, and in particular marine mammals, are limited. As a result of this limitation, the Navy conducted a series of original scientific field research projects to fill the most critical of the data gaps regarding the potential effects of LF sound on the behavioral responses of free-ranging marine mammals. This research effort is referred to as the Low Frequency Sound Scientific Research Program (LFS SRP).
- Analytical approach - Given the data limitations, it was necessary to develop a prudent and conservative approach to the evaluation of potential environmental impacts from SURTASS LFA sonar. A prudent approach was utilized throughout the DOEIS/EIS and its supporting studies.

These topics are addressed below and in more detail in Attachment A.

Scientific Research Programs

As studies for the proposed SURTASS LFA sonar system progressed, the Navy recognized that additional research was required in several areas to fill gaps in the scientific data. These included the potential effects of LF sound on human divers, development of scientifical data concerning what exposure (combination of received level and duration) could potentially result in injury to marine mammals, and the potential effects of LF sound on marine mammal behavior. The Navy's research activities in these areas are described below.

Potential Effects on Human Divers

The Navy sponsored independent research by a consortium of university and military laboratories to study the potential effects of LF sound on humans in the water. This research indicated that LF sound levels below 145 dB do not have physical and psychological adverse effects on humans (recreational or commercial divers) in water. The Navy-sponsored studies are discussed in Attachment A.

The Navy's adoption of the 145-dB criterion with respect to human divers is a conservative, protective decision. The distance of the 145-dB sound field from the SURTASS LFA sonar vessel is unique to each operational site due to the high variability in underwater sound propagation characteristics. The technique of sound field determination through the estimation of sound pressure level (SPL) is the most reliable method of ensuring that the criterion of 145 dB maximum RL at known recreational and commercial dive sites is maintained. As explained above, the RLs will be determined in near-real-time by acoustic performance prediction models.

Potential Effects on Marine Mammals

The Navy has been instrumental in advancing scientific understanding of the potential effects of LF sound on the marine environment through its three-year Low Frequency Sound Scientific Research Program (LFS SRP), and the Marine Mammal Biology Program, a major Office of Naval Research (ONR) initiative since 1993 under ONR Code 335. The LFS SRP is discussed in more detail in Technical Report 1 of the DOEIS/EIS.

Impact Criteria

Based on independent research by prominent experts and the consensus from several scientific and technical workshops, the 180-dB received level was considered to be a scientifically reasonable estimate for the onset of potential injury to marine animals. Based on the results of the LFS SRP and independent research by prominent scientific experts, a risk continuum was developed for the determination of the potential for prolonged disturbance of a biologically important behavior, which ranged from risk approaching zero at 119 dB to a 95 percent probability of a prolonged disturbance of a biologically important behavior at 180 dB with a graduated function in between.

Summary of Potential Impacts

Sound is a pervasive stimulus in marine environments, but the majority of marine animal species would be unaffected by the proposed SURTASS LFA sonar employment. Many areas would not be exposed to significant LF sonar sound. For example, LF sounds do not propagate effectively, or spread, into shallow water environments. In addition, for SURTASS LFA sonar to have an effect on an animal, some organ or tissue must be capable of changing LF sound energy into mechanical effects.

The DOEIS/EIS for the proposed SURTASS LFA sonar employment evaluated the potential impacts on all marine species that could occur within the same ocean region and during the same time of year as the SURTASS LFA sonar operation, and which possess some sensory mechanism that allows them to perceive the LF sounds or possess tissue with sufficient acoustic impedance different from water to be affected by LF sounds. Species that did not meet these criteria were excluded from consideration. Those not evaluated because they did not meet the above criteria included phytoplankton, zooplankton, invertebrates, seabirds, and sea snakes.

The criterion applied to fish, sharks and sea turtles for the proposed action to cause significant direct effects is that the animal would have to be located within the LFA mitigation zone (180-dB sound field) during the time that the sonar was operating. A negligible portion of stocks of any fish, shark or sea turtle would be exposed to these levels, even in the absence of monitoring mitigation.

The potential impact on any stock of marine mammals from injury (within the LFA mitigation zone) due to the proposed action is negligible, and the effect on the stock of any marine mammal from prolonged disturbance of a biologically important behavior is minimal. Biologically important behaviors are those activities essential to the continued existence of a species, such as feeding, migrating, breeding and calving. The DOEIS/EIS calculates the percentage of each stock of marine mammals at risk of injury or prolonged disturbance of a biologically important behavior. These percentages took into consideration geographic restrictions and monitoring mitigation (Alternative 1, Restricted Operation, the Navy's Preferred Alternative) that would reduce the potential for effects on any stocks from injury to negligible levels. The numbers of animals potentially affected through prolonged disturbance of a biologically important behavior would be so small as to have negligible impacts on the affected species' stocks and upon the availability of the species for subsistence needs. The analytical methodology and results are presented in Chapter 4 of the DOEIS/EIS, and incorporated herein by reference.

Findings from the LFS SRP did not reveal any prolonged disturbance of behavior in marine mammals, and the risk analysis showed a low risk to marine mammal stocks from the proposed SURTASS LFA sonar employment. However, should the Navy decide to proceed with the proposed SURTASS LFA sonar employment, the Navy believes that it would be prudent to continue monitoring of potential effects of SURTASS LFA sonar on marine mammals. The Navy's efforts in this regard and its stated intention to conduct Long Term Monitoring (LTM) concurrently with the operation of SURTASS LFA sonar would contribute to the body of scientific knowledge on the potential effects of human-made underwater LF sound on marine life.

Long Term Monitoring (LTM) Program

The principal objectives of the LTM Program for the proposed SURTASS LFA sonar employment are:

- Conduct Navy and independent scientific analyses of the effectiveness of proposed mitigation measures, and make recommendations for improvements where applicable, to incorporate them as early as possible, with National Marine Fisheries Service (NMFS) concurrence;

- Provide the necessary input data for reports to NMFS (under the Marine Mammal Protection Act as discussed below) on assessment of whether any taking of marine mammal(s) occurred within the LFA mitigation zone (180-dB sound field) during SURTASS LFA sonar operations;

- Study the potential effects of Navy SURTASS LFA sonar-generated underwater sound on long-term ecological processes relative to LF sound-sensitive marine mammals and sea turtles, focusing on the application of Navy technology for the detection, classification, localization, and tracking of these animals;

- Collaborate, as feasible, with pertinent Navy, academic, and industry laboratories and research organizations, and where applicable, with Allied navy and academic laboratories; and

- Provide for incident monitoring to include: (1) recreational or commercial diver incident monitoring, and (2) marine mammal stranding incident monitoring. The Navy would maintain close coordination with the principal clearinghouses for information on diver-related incidents, namely the National Association of Underwater Instructors (NAUI), Professional Association of Diving Instructors (PADI) and Divers Alert Network (DAN). For recreational dive sites, the Navy will notify DAN and other diving organizations concerning SURTASS LFA sonar operations on a case-by-case basis. In addition, when the Navy files a Notice to Mariners for major naval exercises, it would include the notification of any SURTASS LFA sonar participation. The Navy would also coordinate with the principal worldwide marine mammal stranding networks, including federal and state, and international organizations.

Permitting Requirements

Upon completion of the DOEIS/EIS and its filing with the U.S. Environmental Protection Agency, the Navy initiated formal consultation with NMFS on 4 October 1999 under the Endangered Species Act of 1972, as amended.

Additionally, on 12 August 1999, the Navy submitted an application to NMFS for a letter of authorization under Section 101(a)(5)(A) of the Marine Mammal Protection Act to take marine mammals incidentally through the operation of the proposed SURTASS LFA sonar.

4. DETERMINATION OF CONSISTENCY WITH THE ENFORCEABLE POLICIES OF THE CALIFORNIA COASTAL ACT

Pursuant to the CZMA, the Navy has determined that the proposed SURTASS LFA employment is consistent to the maximum extent practicable with the enforceable policies of California Coastal Act (Division 20, California Public Resource Code). As the principal legislative/ regulatory component of the California Coastal Management Program, the California Coastal Act provides the basis for CZMA federal consistency review. The policies set forth in Chapter 3 of the California Coastal Act provide the standard of review for permit and federal consistency matters. These policies are interpreted in light of legislative findings, state goals, and interpretive directions contained elsewhere in the Act.

Table 1 provides a summary (by article and section) of the Navy's determinations regarding the consistency of the proposed SURTASS LFA sonar employment with the policies set forth in Chapter 3 of the California Coastal Act.

Table 1.
Consistency Determinations for Policies Set Forth in
Chapter 3 of the California Coastal Act

Article/Section	Title	Consistency Determination
	Article 1 General	
30200	Policies as standards; resolution of policy conflicts	Consistent
	Article 2 Public Access	
30210	Access; recreational opportunities; posting	NA
30211	Development not to interfere with access	NA
30212	New development projects; provisions for access; exceptions	NA
30212.5	Public facilities; distribution	NA
30213	Lower cost visitor and recreational facilities; encouragement and provision, overnight room rentals	NA
30214	Implementation of public access policies; legislative intent	NA
	Article 3 Recreation	
30220	Protection of certain water-oriented activities	Consistent
30221	Oceanfront land; protection for recreational use and development	NA
30222	Private lands; priority of development purposes	NA
30222.5	Oceanfront land; protection for aquaculture use and development	NA
30223	Upland areas	NA
30224	Recreational boating use; encouragement; facilities	NA

Article/Section	Title	Consistency Determination
Article 4 Marine Environment		
30230	Marine resources; maintenance	Consistent
30231	Biological productivity; waste water	Consistent
30232	Oil and hazardous substance spills	NA
30233	Diking, filling or dredging	NA
30234	Commercial fishing and recreational boating facilities	NA
30234.5	Fishing; economic, commercial, and recreational importance	Consistent
30235	Revetment, breakwaters, etc.	NA
30236	Water supply and flood control	NA
30237	Habitat conservation plan; Bolsa Chica	NA
Article 5 Land Resources		
30240	Environmentally sensitive habitat areas; adjacent developments	NA
30241	Prime agricultural land; maintenance in agricultural production	NA
30241.5	Agricultural lands; viability of uses	NA
30242	Land suitable for agricultural use; conversion	NA
30243	Productivity of soils and timberlands; conversion	NA
30244	Archaeological or paleontological resources	NA
Article 6 Development		
30250	Location, generally	NA
30251	Scenic and visual qualities	NA
30252	Maintenance and enhancement of public areas	NA
30253	Safety, stability, pollution, energy conservation, visitors	NA
30254	Public works facilities	NA
30254.5	Sewage treatment plants and conditions	NA
30255	Priority of coastal-dependent developments	NA
Article 7 Industrial Development		
30260	Location or expansion	NA
30261	Use of tanker facilities; liquefied natural gas terminals	NA
30262	Oil and gas development	NA
30263	Refineries or petrochemical facilities	NA
30264	Thermal electric generating plants	NA
30265	Offshore oil transportation and refining	NA
30265.5	Coordination of offshore oil transport and refining activities	NA

Consistent - Consistent to the maximum extent practicable with the enforceable policies of the California Coastal Act of 1976 (as amended).
NA - The Navy has determined that the proposed action is not applicable to the referenced section of Chapter 3 of the Act.

Basis for Navy's Consistency Determination

Article 1 - General

Section 30200 of Article 1 of the California Coastal Act provides in pertinent part: " [T]he policies of this chapter shall constitute the standards by which [ ] the permissibility of proposed developments subject to the provisions of this division are permitted. All public agencies carrying out or supporting activities outside the coastal zone that could have a direct impact on resources within the coastal zone shall consider the effect of such actions on coastal zone resources in order to assure that these policies are achieved."

The proposed action would be carried out outside of the California coastal zone, but could potentially affect resources within the coastal zone. Therefore, consistent with Section 30200 of the California Coastal Act, the Navy has reviewed the action for consistency with the California Coastal Management Program.

Article 2 - Public Access

Public access to the sea and along the shoreline are fostered and protected by Sections 30210-30214 of the Act. The employment of SURTASS LFA sonar would have no effect upon these, as all activities would occur in the offshore regions of the California coast and at least 22 km (12 nm) from any coast (including islands).

Article 3 - Recreation

Section 30220 of Article 3 of the California Coastal Act provides: "Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland waters shall be protected for such uses." Although the term "water-oriented recreational activities" is not defined in the California Coastal Act or its implementing regulations, presumably these activities would include recreational fishing, swimming and snorkeling, surfing, diving, and whale watching.

The proposed SURTASS LFA sonar employment (Alternative 1, Restricted Operation) would be employed with geographic operational restrictions. Sound levels generated by the operation of the sonar would not be allowed to exceed 180 dB within 22 km (12 nm) of the coast. In addition, sound fields generated by the SURTASS LFA sonar under the Restricted Operation Alternative would not be allowed to exceed 145 dB in the vicinity of known dive sites. This is generally defined as from the shoreline out to the 40-m (130-ft) depth contour, but it is recognized that there are other sites that may be outside of this boundary. The latter would be identified using information obtained from the worldwide Divers Alert Network (DAN) and other available literature.

As discussed below, the geographic restrictions imposed on the proposed SURTASS LFA sonar employment ensure that California coastal areas suited for water-oriented activities would be protected for such uses.

Recreational Fishing: The proposed action would have no significant impacts on recreational fish stocks and/or fish captures in marine waters due to the geographic restriction on operations and the temporary nature of SURTASS LFA sonar employment (i.e., limited duty cycle [on no more than 20 percent of the time], relatively short signal duration [maximum of 100 seconds] and moving source).

Swimming, Surfing, Snorkeling and Diving: Participants in activities that may involve submersion below the ocean's surface, such as swimming, surfing, snorkeling and diving, would not be significantly impacted by the proposed SURTASS LFA sonar employment. This determination is based on the following findings.

- Beach Location - Exposure to LF sound energy would be eliminated or greatly reduced at beaches that are separated from the open ocean by a land mass (such as beaches that exist inside islands or in bays), or beaches along portions of the continental shelf.

- Water Depths - Swimming, surfing and snorkeling occur generally in areas that extend from the surface to approximately 2 m (6.5 ft). Applying underwater acoustic propagation theory and detailed measurements to these depths, there would be substantial sound transmission losses occurring in the top layer of water where swimmers, surfers and snorkelers would most likely be found. Sound fields in this layer of water would be about 20 dB less than the sound fields in adjacent deeper water.

- Divers – Under the proposed SURTASS LFA sonar employment, employment of the SURTASS LFA sonar would be restricted to sound pressure levels not to exceed 145 dB in known recreational and commercial diving sites. As described above and in Attachment A, research conducted by the Navy indicates that LF sound levels below 145 dB do not have an adverse effect on humans (recreational or commercial divers) in water.

These findings provide the basis for the Navy's determination that there would be no significant impacts to persons engaged in swimming, surfing, snorkeling, and diving resulting from the proposed SURTASS LFA sonar employment.

Whale Watching: The geographic and sound level restrictions of the proposed SURTASS LFA sonar employment were included to restrict the operation of SURTASS LFA sonar in areas where there are known concentrations of marine mammals, such as whales. Whale watching sites are located in areas where there are known concentrations of marine mammals. In California, this activity is concentrated on the coastal migratory routes of whales. Consequently, these geographic and sound pressure level restrictions would ensure that there were no significant impacts on whale watching activities as a result of the proposed employment of SURTASS LFA sonar.

The proposed employment of SURTASS LFA sonar would have no effect upon ocean front lands, as all activities would occur in the offshore regions of the coastline and at least 22 km (12 nm) from any coast (including islands).

Sections 30221-30224 of the Act are not applicable to the proposed action because they are related to shore facilities.

Article 4 - Marine Environment

Section 30230 of Article 4 of the California Coastal Act provides: "Marine resources shall be maintained, enhanced, and, where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Use of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will adequately maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific and educational purposes."

Section 30231 of Article 4 of the California Coastal Act provides in pertinent part: "The biological productivity and the quality of coastal waters [ ] appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored."

The Navy has determined that with geographic restrictions and monitoring mitigation the proposed SURTASS LFA sonar employment would be carried out in a manner that would sustain and protect the biological productivity of coastal waters. As such, the Navy has determined that the proposed action is consistent with Sections 30230 and 30231 of the California Coastal Act.

Sections 30232-30234 of the California Coastal Act are not applicable because the proposed action does not involve wastewater; oil and hazardous substance spills; diking, filling, or dredging; or boating facilities.

Section 30234.5 provides: "The economic, commercial and recreational importance of fishing activities shall be recognized and protected." The proposed SURTASS LFA sonar employment would restrict the operation of SURTASS LFA sonar in coastal areas of commercial and recreational fishing activities. Scientific data and evidence indicate that if SURTASS LFA sonar operations occur in proximity to pelagic fish stocks, members of some fish species could potentially be affected by LF sounds. However, it is reasonable to consider any possible hearing loss or injury to fishes from SURTASS LFA sonar transmissions to be limited to the LFA mitigation zone (180-dB sound field), and a negligible portion of any fish stock would be present within this zone at any one time during actual sound transmission. Even assuming that all fish exposed within the LFA mitigation zone were to be affected, the percent of fish catch within the NMFS Fisheries Resource Region—Pacific Coast potentially affected would be negligible compared to the tonnage of fish harvested commercially and recreationally in the same oceanic region. The Navy has therefore determined that the proposed SURTASS LFA sonar employment is consistent with Section 30234.5 of the California Coastal Act.

Sections 30235-30237 are not applicable because the proposed action does not involve revetments, breakwaters, water supplies, flood control, or the Bolsa Chica.

Article 5 - Land Resources

Sections 30240-30244 of the Act are not applicable to the proposed action because they are related to land resources including habitat areas, agriculture, timberlands, and archaeological or paleontological resources.

Article 6 - Development

Sections 30250-30255 of the Act are not applicable because they relate to coastal development.

Article 7 - Industrial Development

Sections 30260-30265.5 of the Act are not applicable because they relate to industrial development.

Conclusion

Based on the provisions, considerations, facts and analysis presented above, the Navy has determined that the proposed SURTASS LFA sonar employment, if undertaken, would be conducted in a manner that is consistent with the enforceable policies of the California Coastal Act to the maximum extent practicable.

ATTACHMENT A
ANALYTICAL CONTEXT

In developing the framework for the DOEIS/EIS, the Navy recognized that it needed to address the following issues:

- Adequacy of scientific information on human divers - Data regarding the effects of underwater low frequency (LF) sound on humans are limited. As a result of this, the Navy sponsored independent scientific research to study the potential effects of LF sound on human divers.

- Adequacy of scientific information on marine animals - Data regarding the effects of underwater LF sound on marine animals, and in particular marine mammals, are limited. As a result of this limitation, the Navy conducted a series of original scientific field research projects to fill the most critical of the data gaps regarding the potential effects of LF sound on the behavioral responses of free-ranging marine mammals. This research effort is referred to as the Low Frequency Sound Scientific Research Program (LFS SRP).

- Analytical approach - Given the data limitations, it was necessary to develop a prudent and conservative approach to the evaluation of potential environmental impacts from SURTASS LFA sonar. A prudent approach was utilized throughout the DOEIS/EIS and its supporting studies.

These topics are addressed in detail in the following material.

A.1 Adequacy of Scientific Information On Human Divers

The Navy sponsored research to study the potential effects of LF sound on humans in the water. This research was conducted by teams of independent scientists from universities and from military research laboratories. The research is described below. Based on results from this research and in conjunction with guidelines developed from psychological aversion testing, the Navy concluded that LF sound levels below 145 dB would not have an adverse effect on recreational or commercial divers. This led the Navy Submarine Medical Research Laboratory (NSMRL) to establish a 145-dB received level (RL) criterion for recreational and commercial divers. The Navy-sponsored studies on human divers included:

- Tests on Navy divers. This research was conducted by the Applied Research Laboratory, University of Texas, from 1993 to 1995 under the direction of NSMRL. In this study, 87 subjects (Navy divers) participated in 437 tests designed to determine the received sound level threshold below which there was no risk of auditory damage. This research resulted in the establishment of a damage risk threshold of 160 dB received level for less than 2 minutes at one time and for less than 15 minutes a day. The 160-dB RL threshold was the maximum level recommended as standard guidance for divers who were equivalent in medical health and fitness to Navy divers.

- A study to develop guidance for safe exposure limits for recreational and commercial divers who might be exposed to LF sound. This research was conducted by scientists from the Office of Naval Research (ONR) and NSMRL between June 1997 and November 1998 in conjunction with scientists from University of Rochester, Georgia Institute of Technology, Boston University, University of Pennsylvania, Naval Medical Center San Diego, Duke University, Divers Alert Network, and Applied Research Laboratory, University of Texas. This study, which is incorporated as Technical Report 3 to the DOEIS/EIS, developed guidance criteria for human exposure to LF sounds such as those transmitted by the SURTASS LFA sonar system. Results were based on computer modeling and animal and human studies during which subjects were exposed to known levels of LF sound for known periods of time.

  Human guidelines were established based on psychological aversion testing. There was only a two percent aversion reaction subjectively judged as "very severe" by divers at a level of 148 dB. NSMRL therefore determined that scaling back the intensity by 3 dB (a 3 dB reduction equals a 50 percent reduction in signal strength) would provide a suitable margin of safety against psychological aversion for divers. Hence, NSMRL set the RL criterion for recreational and commercial divers at 145 dB. This criterion was endorsed by the Department of the Navy, Bureau of Medicine and Surgery (BUMED) on 18 October 1999.

The Navy's adoption of the 145-dB guidance for operation of low frequency underwater sound sources in the presence of divers is considered a conservative, protective decision. During operation of the SURTASS LFA sonar, the distance from the source to where the RL is 145 dB (the 145-dB sound field) varies from site to site due to the high variability in underwater sound propagation characteristics and deployment protocols. The most reliable method for ensuring that the criterion of 145-dB maximum RL is maintained at known recreational and commercial dive sites involves the application of validated underwater acoustic models of sound propagation using site-specific environmental parameters. Results provide an estimation of sound pressure level (SPL) as a function of range and depth for each specific site.

A.2 Adequacy of Scientific Information on Marine Animals

Many human activities generate loud underwater sounds, and there is an urgent need for better methods for measuring and estimating potential risk. The quantitative assessment of potential risk is complicated by the scarcity of data in several areas:

- Hearing loss due to sound exposure in air is well studied in humans and some other terrestrial animals. Data regarding underwater hearing capabilities of marine mammals are rare and limited to a few of the smaller species that make convenient subjects in captivity.

- Knowledge of the functions of the sounds produced by most marine mammals is limited.

- Data on the responses of marine mammals to LF sounds are limited.

These data gaps have necessitated the use of various models and extrapolations in order to provide a rational basis for the assessment of potential risk from exposure to LF sounds. To fill some of these gaps, the Navy performed underwater acoustic modeling and supported the LFS SRP to study the potential effect of LF sound on free-ranging marine mammals. This research did not specifically address the issue of LF impact on marine mammal hearing; rather, it focused on the behavioral responses of baleen whales to controlled exposure from SURTASS LFA sonar-like signals.

In general, understandings on the mechanics of hearing and the biological functions of sounds for marine mammals have improved considerably over the past decade. Specific information on the effects of most types of human-made underwater noises on marine animals is incomplete but has also increased in recent years. However, as the environmental evaluation of the SURTASS LFA sonar system progressed, the Navy recognized that additional research was required in several areas to fill some basic gaps in scientific knowledge. This included research on the potential effects of LF sound on human divers (as discussed above) and research on the potential effects of LF sound on marine mammal behavior.

While recognizing that not all of the questions on the potential for LF sound to affect marine life are answered, and may not be answered in the foreseeable future, the Navy has combined scientific methodology with a prudent approach throughout the DOEIS/EIS process to protect the marine environment.

Although there are recognized areas of insufficient knowledge that must be accounted for when estimating the potential direct and indirect effects on marine life from SURTASS LFA sonar, the present level of understanding is deemed adequate to place reasonable bounds on potential impacts.

The following discussion on marine animals addresses the three potential areas of impact and injury, behavioral effects, and masking.

A.2.1 Estimating the Threshold of Potential Injury to Marine Animals

Potential auditory injury involves impacts to an animal's hearing including permanent threshold shift (PTS). Clinically, temporary threshold shift (TTS) serves as an indicator that more increased exposure, either through increased exposure time or significantly louder levels, may lead to PTS. TTS occurs when an animal's normal hearing is impaired for a period of time due to impingement upon the ear of a loud sound. After termination of the sound, normal hearing ability returns in as short a time period as minutes, or as long a period as days. The occurrence of TTS is strongly dependent on the frequency, intensity, and duration of the sound exposure event. Animals and humans experience TTS under natural conditions as a result of exposure to abiotic sounds (e.g., thunder, lightening strikes, wave noise) and sounds from other animals. Although not necessarily harmful, an organism experiencing TTS could miss important signals. For example, TTS could influence an animal's chances of avoiding a predator or finding food.

Use of Baleen Whales (Mysticetes) as Surrogates for Other Marine Life

The rationale for using representative species to study the potential effects of LF sound on marine animals emerged from an extensive review in several workshops by a broad group of interested parties: academic scientists, federal regulators, and representatives of environmental and animal welfare groups. The outcome of these discussions concluded that baleen whales (mysticetes) would be the focus of the three phases of the LFS SRP and surrogates for other marine animals in the analysis of underwater acoustic impacts. Mysticetes were chosen because: 1) they produce and use LF sounds, 2) they are considered most likely among all marine animals to have the best hearing in the SURTASS LFA sonar frequency band, 3) they have protected status under law, and 4) there is prior evidence of their avoidance responses to LF sounds.

The composite audiogram shown in Figure A-1 (Marine Mammal Audiograms) illustrates the contention that mysticetes have the best LF hearing of all marine mammals. Studies on pelagic fish and sea turtles indicate that their LF hearing is not as sensitive as that of baleen whales. Deep-diving species such as sperm and beaked whales are presumed not to have LF hearing as good as that of baleen whales. Therefore, all of these groups or species were considered to be at lower risk from LF sound than baleen whales.

One goal of identifying the species most sensitive to LF sound was to produce a model of response that could be applied to other species for which data were lacking. This was also an important element in the selection of species for the LFS SRP research, and was intended to produce estimates of environmental impact that would be conservative when applied to other species.

Potential of Injury to Marine Mammals

Marine mammals rely on hearing for a wide variety of critical functions. Exposure to sounds that permanently affect their hearing ability poses significant problems for the survival and reproduction of these animals. Many human activities generate loud underwater sounds, and there is an urgent need for methods of estimating potential risk. The quest for a quantitative assessment of risk potential is complicated by scarce data in two areas. First, direct measured data regarding underwater hearing capabilities of marine mammals are generally limited to a few of the smaller species that make convenient subjects in captivity. Second, hearing loss due to sound exposure is well studied in humans and other terrestrial animals, but data for marine animals are sparse. These data gaps have prompted the use of various models and extrapolations, in order to provide a rational basis for the assessment of risk potential.

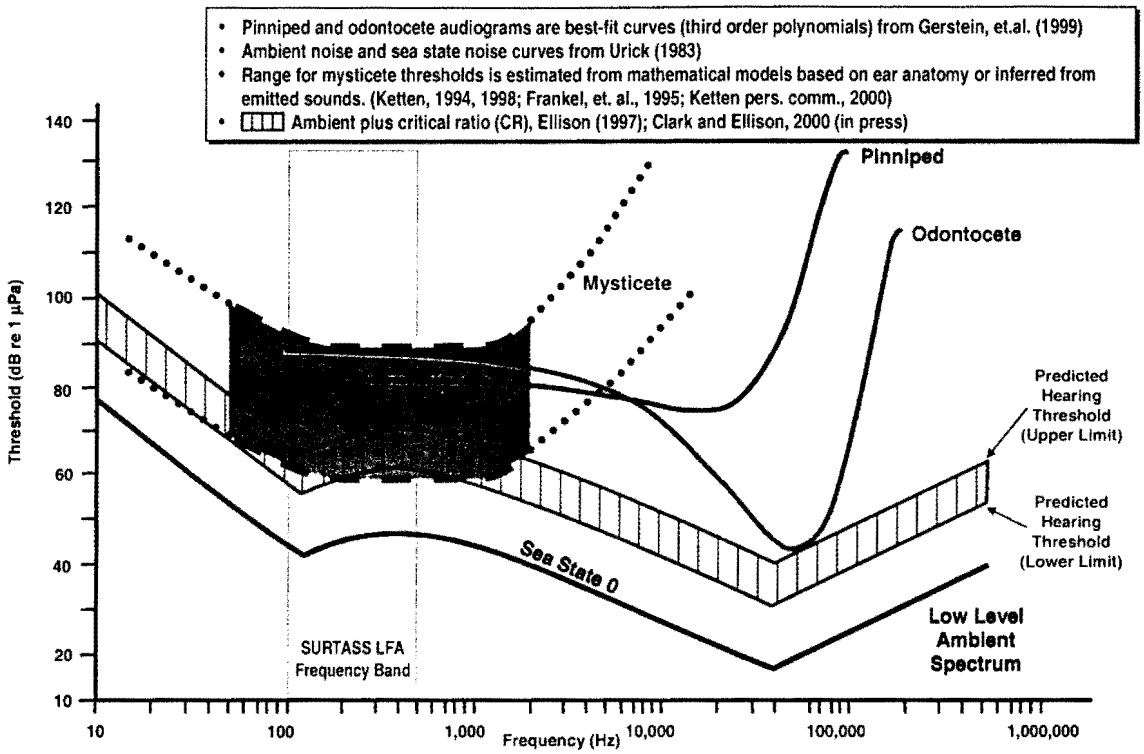

Figure A-1. Marine Mammal Audiograms.

Marine Mammal Hearing Thresholds

Assessment of potential risk to a particular species must begin with an estimate of the range of frequencies at which the animal's hearing is most sensitive, and the associated thresholds. The range of sounds produced by a species is generally associated with ranges of good hearing sensitivity, but many species exhibit good hearing sensitivity both above and below the frequency range of sounds they produce. Closely related species of similar body size, vocalization range and ecological habitat are often presumed to have similar hearing. Anatomical models of inner ear function have been used to extend the scope of limited audiometric data (Ketten, 1992, 1994, 1997, 1998). In Dr. Ketten's work, the resonant properties of the basilar membrane provide clues to the probable range of animal hearing. Ketten (1998) delineates marine mammal functional hearing ranges into three categories: 1) infrasonic balaenids (mysticetes) with functional hearing from 15 Hz to 20 kHz, good sensitivity from 20 Hz to 2 kHz, and speculated threshold of best hearing at 80 dB re 1 µPa; 2) sonic to high frequency species with functional hearing range from 100 Hz to 100 kHz with widely varying peak spectra and a minimal threshold commonly at 50 dB re 1 µPa; and 3) ultrasonic dominant species with functional hearing range from 500 Hz to 200 kHz, good sensitivity from 16 to 120 kHz, and minimal hearing threshold commonly at 40 dB re 1 µPa.

Figure A-1 illustrates the hearing range for baleen whales as estimated from scientific methods as well as mathematical models based on ear anatomy or inferred from emitted sounds (Ketten, 1994, 1998; Frankel et al., 1995; Ketten, pers. comm., 2000). Also shown in this figure are the

best-fit curves for pinniped and odontocete audiograms (Gerstein, et al., 1999), and an estimate of the lower bound of ambient noise (Urick, 1983).

Selection of the 180 dB Reference Point

In terms of the potential for biological risk, it is important to note that individuals will vary somewhat due to age and physical condition in both their pre-exposure hearing sensitivity, and in the severity of the consequent biological effects. The risk continuum presented in the DOEIS/EIS estimates that 95 percent of the marine mammals exposed to a single ping in water of 180 dB re 1 μPa could experience a risk of prolonged disturbance of a biologically important activity. With regard to the potential for hearing damage, this level is comparable to Ward's (1997) acceptable one-time exposure limit described for humans.

The present scientific consensus is that serious problems in marine mammals' hearing capability can occur at single-ping RLs of 180 dB and above, generally independent of signal duration or frequency. Therefore, it is assumed that for SURTASS LFA sonar, the 180-dB sound field represents a single-ping RL that can be considered to be a scientifically reasonable estimate for the potential onset of injury.

Some of the scientific and technical workshops and meetings at which this consensus was developed are:

- High Energy Seismic Survey [HESS] Team Workshop, Pepperdine University School of Law, June 12-13, 1997 (Knastner, 1998);

- Office of Naval Research Workshop on the Effects of Man-Made Noise on the Marine Environment. Washington, DC, February 9-12, 1998 (Gisiner, 1998); and

- National Marine Fisheries Service (Office of Protected Resources) Workshop on Acoustic Criteria, Silver Spring, MD, September 9-12, 1998.

Comparison to Fish Hearing Studies

Hastings et al. (1996) studied the effects of intense sound stimulation on the ear and lateral line of the oscar fish (*Astronotus ocellatus*). They found that there was some damage to the sensory hair cells of two of the otolith organs, the lagena and utricle, when the fish were exposed to continuous underwater sound at 300 Hz and 180 dB for one hour. The interpretation of these results was that exposure to a pure tone, high intensity sound continuously for one hour has the potential to damage the ear of fish.

Other studies also suggest that intense sound may result in limited damage to the sensory hair cells in the ears of fish. Cox et al. (1986a, b; 1987) exposed goldfish (*Carassius auratus*), a fresh-water fish with specialized and sensitive hearing, to pure tones at 250 and 500 Hz at 204 and 197 dB, respectively, at durations on the order of two hours, and found some indication of hair cell damage. Enger (1981) determined that some ciliary bundles (the sensory part of the hair

cell) of the inner ear of the cod (*Gadus morhua*) were destroyed when exposed to sounds at several frequencies from 50 to 400 Hz at 180 dB for 1-5 hours.

Given that the physiology of inner ear hair cells is considered to be similar among vertebrates, and that exposure to 180 dB in water is expected to yield the same shear forces on the inner ears of fish and marine mammals, it seems a valid conclusion that the single-ping 180 dB criterion for potential injury to fish stocks from SURTASS LFA sonar can be considered to be relatively conservative.

A.2.2 Estimating the Potential for Behavioral Effect

Marine mammals rely on underwater hearing for a wide variety of biologically critical functions. The primary concern here involves the possibility that exposure to SURTASS LFA sonar signals could potentially affect their hearing ability or modify biologically important behaviors. An individual exposed to LF sound levels high enough to affect its hearing ability could potentially have reduced chances of reproduction or survival. Given the hypothetical situation that animals could be exposed to sound levels that might affect hearing ability, than the possibility could exist that significant portions of their stocks could potentially experience lower rates of reproduction or survival. On the behavioral side, if it is conjectured that a LF sound source is loud and can be detected at moderate to low levels over large areas of the ocean, the concern is that large percentages of species stocks might be exposed to moderate to low received sound levels. Thus, if it is speculated that these animals experience prolonged disturbance of biologically important behaviors, then such exposures could potentially have an impact on rates of reproduction or survival.

Low Frequency Sound Scientific Research Program

Knowing that cetacean behavioral responses to LF sound signals needed to be better defined using controlled experiments, the Navy helped develop and supported the three-year LFS SRP beginning in 1997. The LFS SRP was designed to supplement the limited scope of data from previous studies. This field research program was based on a systematic process for selecting the marine mammal indicator species and field study site locations, using inputs from several workshops involving a broad group of interested parties (academic scientists, federal regulators, and representatives of environmental and animal welfare groups). In designing the LFS SRP, the Navy chose to minimize the potential of risk to animals that were the subject of the study.

The LFS SRP produced new information about behavioral responses to LF sounds at RLs from 120 to 155 dB. Controlled experimental tests were performed in three phases, involving the following species and settings:

- Phase I: Blue and fin whales feeding in the Southern California Bight (September – October 1997);
- Phase II: Gray whales migrating past the central California coast (January 1998); and
- Phase III: Humpback whales off Hawaii (February – March 1998).

Relevance of LFS SRP for Risk Assessment and Quantifying Potential Impacts to Marine Mammals

Prior to the LFS SRP, the expectation was that whales would begin to show behavioral responses at received levels (RLs) of 120 dB (Malme et al., 1983, 1984). Immediately obvious responses were expected for levels >140 dB (Richardson et al., 1995). The LFS SRP experiments detected some short-term behavioral responses at estimated RLs between 120 to 155 dB. In the Phase II research, avoidance responses were sometimes obvious in the field. For Phase III, analysis of behavioral response measures revealed subtle, but statistically significant, effects. However, research scientists did not consider any of the behavioral responses to be indicative of prolonged disturbances of a biologically important behavior.

The underwater acoustic modeling analyses conducted in the DOEIS/EIS, subsequent to the LFS SRP, have demonstrated that the range of exposure levels for subject animals during the LFS SRP covered an important part of the RL range (120 to 155 dB) that would be expected during actual SURTASS LFA sonar operations.

Results from the DOEIS/EIS modeling presented in Figures A-2a through A-2c (Modeled Received Levels vs. Percentage of Modeled Pings and Probability of Risk (For All Mysticetes, Odontocetes, Pinnipeds [31 sites])) illustrate that the preponderance of all modeled RLs for these marine mammals fall below the 155-dB level, which is within the range of exposures studied during the LFS SRP. Thus, it follows that the scientific conclusion based on the LFS SRP research data does encompass the majority of SURTASS LFA sonar operational scenarios.

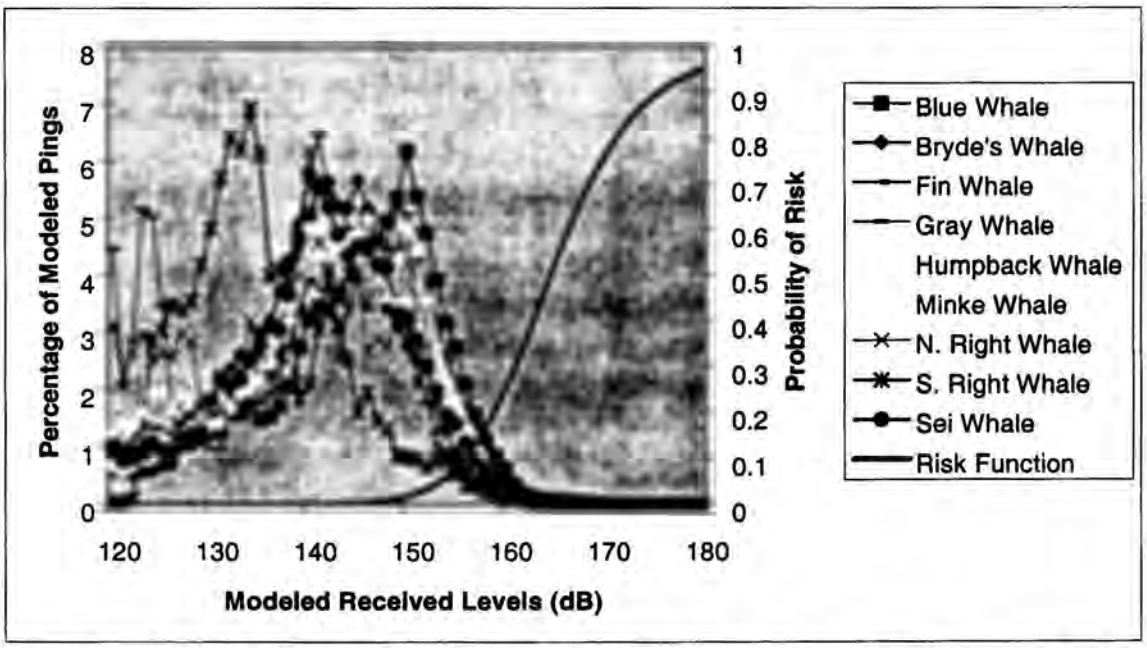

Figure A-2a. Modeled Received Levels vs. Percentage of Modeled Pings and Probability of Risk (For All Mysticetes [31 Sites])

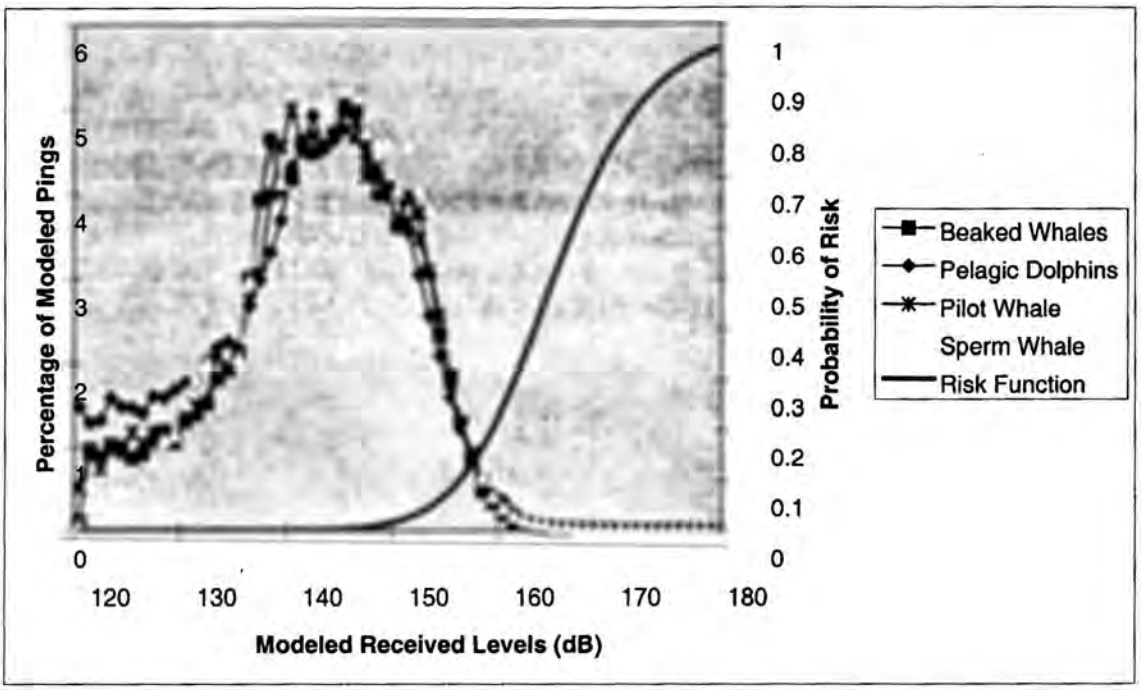

Figure A-2b. Modeled Received Levels vs. Percentage of Modeled Pings and Probability of Risk (For All Odontocetes [31 Sites])

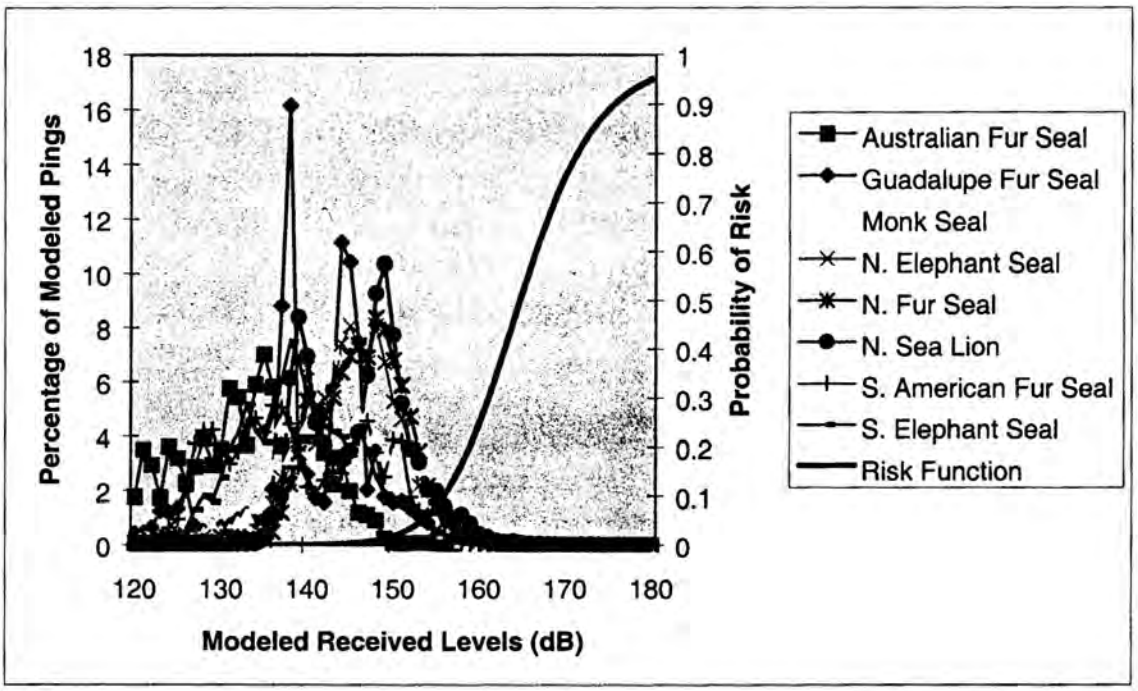

Figure A-2c. Modeled Received Levels vs. Percentage of Modeled Pings and Probability of Risk (For All Pinnipeds [31 Sites])

A.2.3 Masking

Masking is the concealment or screening of a sensory process. In the marine environment, this refers to biologically important sounds being masked, or screened, by louder noises, or sounds, within the same frequency band.

Masking in fish stocks are discussed in the DOEIS/EIS. Existing evidence supports the hypothesis that masking effects could potentially be significant for fish that have best hearing at the same frequencies of SURTASS LFA sonar. However, given the 10-20 percent duty cycle and maximum 100-second signal duration, masking would be temporary. Additionally, the 30-Hz (approximate maximum) bandwidth of SURTASS LFA sonar signals is only a small fraction of the animal's hearing range—most fish sounds have bandwidths >30 Hz.

As in bony fishes, masking effects for shark stocks would be most significant for those species with critical bandwidths at the same frequencies as SURTASS LFA sonar. However, the low duty cycle and maximum 100-second signal transmission window, would lead to only temporary masking, since the intermittent nature of the signal reduces the potential impact. Although long-term effects of masking sounds on sharks have not been studied, these are not expected to be severe because of the limited SURTASS LFA sonar bandwidth (approximate maximum of 30 Hz), and the fact that the signals do not remain at a single frequency for more than ten seconds.

Likewise for sea turtles, masking effects are potentially significant for those species that have critical hearing bandwidths in the same frequencies as SURTASS LFA sonar. However, masking of this nature would be temporary for the above reasons, and the geographical restrictions imposed on all SURTASS LFA sonar operations would limit the potential for masking of sea turtles.

As discussed in the DOEIS/EIS with regard to masking in marine mammals, any masking effects would be temporary and are expected to be negligible, because the SURTASS LFA sonar bandwidth is very limited (approximately 30 Hz), signals do not remain at a single frequency for more than ten seconds, and the system is off at least 80 percent of the time.

A.3 Analytical Approach

The underwater acoustic analyses in the DOEIS/EIS incorporate many biological and physical parameters. These parameters allow many situations to be modeled within a common framework. When scientific experts selected the values for these parameters, the best scientific and technical data and information were used, with the goal of selecting the most likely value for each parameter. Each judgment was, however, intentionally tempered by a conservative bias.

Conservative Assumptions in Research and Modeling

As part of the Navy's prudent approach, a variety of conservative assumptions were used in research and modeling efforts.

These include the following:

- **Human Diver Hearing:** The comprehensive study conducted by ONR and NSMRL between June 1997 and November 1998 in conjunction with a consortium of university and military laboratories (see TR 3) concluded that the maximum intensity used during testing (157 dB RL) did not produce physiological evidence of damage in human subjects. Furthermore, there was only a two percent aversion reaction subjectively judged as "very severe" by divers at 148 dB RL. NSMRL adopted a very conservative approach and determined that scaling back the intensity by 3 dB (which equates to a 50 percent reduction in signal strength) would provide a suitable margin of safety for commercial and recreational divers. Hence, operation of SURTASS LFA sonar systems would be restricted to 145-dB received levels in known areas of recreational and commercial diving.

- **Use of Baleen Whales as Surrogates:** Baleen whales (mysticetes) were selected, after review by an independent, broad group of interested parties, as the marine animals most at risk. Baleen whales were used as surrogates for other marine animals in these studies because: 1) they produce and use LF sounds, 2) they are considered most likely among all marine animals to have the best hearing in the SURTASS LFA sonar frequency band, 3) they have protected status under law, and 4) there is prior evidence of their avoidance responses to LF sounds.

- **Use of 180-dB Threshold:** An assessment of the point above which LF sound could potentially cause the onset of injury to marine animals was made, based on scientific research and review of data. A single-ping RL of 180 dB was assumed for the modeling; this level is considered conservative, as detailed herein.

- **Site Selection:** For the acoustic modeling, locations covering the major ocean regions of the world were carefully selected to represent reasonable SURTASS LFA sonar employment. Sites were selected to model the highest potential for effects from the use of SURTASS LFA sonar, and incorporated the following factors:

  - Closest operationally plausible proximity to land (from a SURTASS LFA sonar operations standpoint), where biodiversities are high, and/or offshore biologically important areas are present (particularly for animals most likely to be affected);
  - Acoustic propagation conditions that allow minimum propagation loss or transmission loss (TL) (i.e., longest acoustic transmission ranges); and
  - Time of year selected for maximum animal abundance.

- **Risk Threshold:** The assumption that risk could begin at 119 dB is a practical approximation of the RL below which the risk of a prolonged disturbance of a biologically important behavior approaches zero. In all three phases of the LFS SRP, most animals showed minimal response to SURTASS LFA sonar signals at RLs up to

155 dB, and those individuals that did show a response resumed normal activities within tens of minutes.

- **Cumulative Exposure:** Another conservative assumption involved the potential effects of cumulative exposure. The analysis assumed that the single-ping equivalent (SPE) level scaled in accordance with previous studies of TTS that dealt with continuous sound, even though SURTASS LFA sonar pings would be separated by 6 to 15 minutes of silence. The 20 percent (maximum) duty cycle of SURTASS LFA sonar transmissions implies that any cumulative effect would be less than that for continuous sounds.

- **Number of Marine Animals Potentially Affected:** The acoustic modeling simulations incorporated conservative assumptions regarding the fraction of the regional stock in the area potentially affected by the hypothetical SURTASS LFA sonar operation and their animal movement patterns. Scientific data are typically reported with 95 percent confidence intervals. However, in order to run the acoustic model, an exact number of animals must be specified. Therefore, the upper end of the 95 percent confidence interval was used for stock densities and abundances.

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STATE OF CALIFORNIA – THE RESOURCES AGENCY GRAY DAVIS, *Governor*

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RECORD PACKET COPY

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CORRESPONDENCE

Attached is a copy of correspondence that the Commission staff letters received by the time of the mailing on the Navy's "LFA Sonar" consistency determination (CD-113-00). In the interest of saving trees, the 250-300 emails the Commission staff received, which all make the same or nearly identical points to the emails at the end of this packet, are not being copied.

California Coastal Commission
45 Fremont St. Suite 2000
San Francisco, CA

Comments on proposed U.S. Navy LFAS
deployment off the California Coastline

Dear Commissioners and Staff: These are my summarized comments on the obvious negative impacts SCUBA divers will experience if the U.S. Navy is allowed to test, or deploy the Low Frequency Active Sonar (LFAS) system.

To begin with, I have been a certified diver since 1969 and am now a Professional Association of Dive Instructors (PADI) divemaster. For several years I worked for Aquarius Dive Shops taking out of town customers on dive tours of the Monterey/Carmel region.

On August 25, 1994 I and 2 friends went diving at Point Lobos State Park just south of Carmel, CA. Upon decent we heard and felt very strange low frequency pulses of sound that caused our lungs to vibrate noticeably! Upon returning to Aquarius employees there said other divers had reported the sounds the day before. I felt that the source of this new, very invasive intrusion into the oceans must be found.

During the period between 8-25-94 and 10-31-94 news agencies from around the world reported the fact divers from CA were experiencing negative impacts from these sounds. CNN, the Associated Press, Hard Copy and all the S.F. Bay area T.V. and newspapers were covering the problem.

On August 31, 1994 I successfully recorded the offending waveforms on an underwater videotape system that also records sound accurately. I immediately took the tape to a Professor at the Naval Postgraduate School (NPS) in Monterey. On September 1, 1994 the NPS professor called to let me know they had digitized the tape and they had "many powerful tools" to analyze it with. With NPS approval, I and a film crew from CNN went to the NPS to listen to and view their results. The NPS computer operator played a segment of the tape I provided and asked if I could hear the offending sounds. I knew the sounds I experienced were of a very low frequency, so I was concerned the tiny computer speakers would not have a sufficient frequency response to reproduce the sounds. I then asked the computer operator if he could 'filter the background noise" as the only sound I could hear was from Snapping Shrimp. He said he couldn't do that, which was quite contradictory to the statement the NPS had many powerful tools at their disposal to analyze the noise. However,t he same NPS Professor was quoted in a local newspaper article as saying the sound was certainly manmade, and could be coming from a Navy ship on a "classified mission."

One of my first calls was to the N.M.F.S. The person, who will remain unnamed at this time said, "Jay, we don't like what's going on here either, but what you are hearing is supposed to be a classified government test." We both agreed that since I was calling and complaining about deleterious effects SCUBA divers were feeling from the sounds, it was very hard to call it a "classified test."

With a simple spectrum analyzer at my disposal, it was discovered the offending waveforms were centered around 38Hz and were being received at levels up to 40dB above the average background noise. The are extremely invasive and annoying at all levels.

This "classified government test" was called the Magellan 2 Sea Trials and was conducted just northwest of San Francisco in the Pacific Ocean between June 30, 1994 and September 30, 1994. They involved transmitting high power density active signals from the vessel Cory Chouest. While the Navy has steadfastly refused to admit these transmissions were the cause of the diver disruption around Monterey in 1994, the fact remains Magellan 2 Sea Trials coincided with the diver complaints. And furthermore, operators from the transmit vessel Cory Chouest itself contacted the CCC directly to confirm the fact the sounds divers were complaining about were being emitted by them. The Natural Resources Defense Council was also contacted by Cory Chouest personnel and told the same fact. The sounds and effects were being created by the vessel Cory Chouest. After reviewing the highly censored documents available concerning the Magellan 2 Sea Trials, it appears the closest the Cory Chouest could have been to Monterey was approximately 150 miles. More information regarding Magellan 2 is available in a document titled, Behavioral Response of Blue Whales to Active Signals was released in June 1997 by the Navy. (document # ada 32874)

This same vessel, the Cory Chouest, was the transmit vessel for the Heard Island Feasibility Test. That test sent the Cory Chouest to the southern Indian Ocean in 1991 to transmit 57Hz CW and FM transmissions to receivers worldwide. That test, which used an array of HLF-4 transducers sent a 215dB 57Hz tone through the Indian Ocean, and across the Pacific Ocean which was received by a hydrophone array near Monterey, CA. The same 215dB 57Hz transmissions went the other direction out of the Indian Ocean and were received in the North Atlantic at Bermuda Island. This proves the fact the LFAS system has the ability to transmit below 100Hz, which is in direct conflict with the statement, "The source frequency is between 100 and 500Hz (the LFA system's physical design does not allow for transmissions below 100Hz) which is made on page 2 of the Navy Consistency Determination (CD).

The fact divers near Monterey were negatively impacted by sounds transmitted by the Cory Chouest when it was at least 150 miles away produces an obvious concern when reviewing the Navys "preferred alternative" Alternative #1. This would allow the Navy transmit vessels to approach the coastline at a range of 13 miles and transmit at full power. Over 10 times closer than when they conducted Magellan 2. And, since they will use "classified frequencies and waveforms" , no matter how accurately divers or researchers may record they events the Navy can refuse to talk due to security reasons. That concept is absurd. Once the sounds are transmitted they certainly are not classified to the Navys perceived threat vessel. They will know exactly what frequency and waveform they are being illuminated by. The only possible reason for the Navy to claim the transmissions are classified is to defeat the complaints of SCUBA divers, swimmers, snorkelers and other effected parties.

In Phase 3 LFAS testing conducted off Hawaii, a dolphin researcher, Ms. Chris Reid was negatively impacted by 250Hz transmissions from the Cory Chouest. In a lawsuit filed by Ms. Reid against the operators of the Cory, the scientists from the vessel

suggested Ms. Reid was exposed to a received level (RL) of 125dB. The effects Ms. Reid suffered from were diagnosed as being similar to a "trauma victim." She had difficulty walking, talking, etc. after an exposure of approximately 20 minutes. These effects are spoken of in a test called "Exposure Guidelines for Navy Divers Exposed to Low Frequency Active Sonar." Possible impacts are listed as:

1. Auditory
2. Vibro-tactile
3. Contractile forces of muscles
4. Irregular heartbeat
5. Lung-gas interface
6. Rectified diffusion
7. Central Nervous system/vestibular
8. Cavitation
9. Hyperthermia
10. Tissue shearing due to radiation pressure

That test also suggested the test subjects reported these symptoms during and after exposure.

1.vibrations
2. numbness
3. vertigo
4.imbalance
5. motion sickness
6. dizziness
7. abdominal/chest sensations

To suggest the Navy has a right to subject completely unknowing recreational divers to any or all of these effects seems inconceivable. In the Navy analytical Context page A-11 they say "...there was only a 2% aversion reaction subjectively judged as "very severe" by diver at 148dB RL. NSMRL adopted a very conservative approach and determined that scaling back the intensity by 3dB (which equates to a 50% reduction in signal strength) would provide a suitable margin of safety for commercial and recreational divers." I believe if the Navy had followed a conservative approach, they would have determined at what point real recreational divers felt a moderate or negligible reaction. To reduce the RL by 3dB might possibly bring the reactions down into the "severe" range, not nearly enough to provide a margin of safety to recreational divers. The 145dB level the Navy has requested to be adopted in Alternative #1 is 100 times more powerful than the RL that effected Ms. Reid in Phase 3 LFAS testing. Furthermore, the method the Navy plans to use to determine what the RL may be at "known divesites" is through the use of "validated underwater acoustic models of sound propagation using site specific environmental parameters. Results provide an estimation of sound pressure level as a function of range and depth for each specific site." There is no way to accurately predict what a RL will be at any divesite, known or unknown due to local, daily variations in the current, temperature and density of the water, as well as upwellings that continually disturb the oceans thermoclines and acoustic "ducts." A 3dB margin for error is certainly not sufficient.

In the Navy DOEIS/EIS tech report #3 they put forth the testing conditions they subjected their volunteer military divers to. First, they only used 250Hz as the test frequency. In their own words 250Hz was the least aversive frequency and 100Hz was the most aversive. All three phases of LFAS testing also employed the 250Hz "least aversive frequency". Tech report #3 displays the glaring deficiencies regarding diver safety of the proposed LFAS deployment perfectly.

To keep this brief, I believe the Navy has put the cart before the horse in asking the CCC to authorize LFAS use off the California coastline before they have released the Final DOEIS/EIS. I believe the Navy cannot answer the public comments effectively and therefore are trying to get your approval of an admittedly dangerous system. Please demand the Navy postpone the upcoming December 12, 2000 Coastal Commission meeting until they have answered the Draft DOEIS/EIS public comments.

I will close with this quote from Marine Mammals and Sound (Richardson, Greene, Malme, Thompson pg. 381.

"Intense sounds in air or water can produce discomfort and other non-auditory effects in humans. Little has been published about the non-auditory effects in terrestrial mammals, let alone marine mammals. However, non-auditory effects of strong underwater sounds apparently have military relevance. Respiratory cavities of various sizes can be induced to resonate in response to strong underwater sounds of appropriate wavelengths (Duykers and Percy 1978; ARPA 1995). This phenomenon has apparently been studied to evaluate the feasibility of using strong underwater sounds to deter human divers from approaching sites of military significance. Recently, human divers have reported discomfort when exposed to sounds from a powerful low frequency sonar at very long ranges."..."If some military sonar systems have significant non-auditory effects on humans, there is reason for concern about there effects on marine mammals. Results of ongoing research in this area should be made public to better define the implications for marine mammals."

Thank You, Jay R. Murray

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November 15, 2000

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CALIFORNIA
COASTAL COMMISSION

To: California Coastal Commission Members
c/o Mark Delaplaine, Federal Consistency Program
45 Fremont Street Suite 2000
San Francisco, California 94105
FAX: 415-904-5400 Phone: 415-904-5289
Contents: Four Pages
Re: Navy proposal to deploy LFA SURTASS in California's coastal ocean

Dear Mr. Delaplaine: Please provide all members of the Coastal Commission with a copy of this letter before the hearing on LFA SURTASS on December 12. Thank You.

Dear Members:

I am concerned that the U. S. Navy is seeking your authorization to deploy LFA SURTASS off the coast of California. I hope you will deny and reject their request.

In September 1999 I became aware of this proposed deployment of a towed transponder that would generate 230 dB repeated pulses of low-frequency sound suddenly in different spots throughout the worlds' oceans with the intention of discovering silent submarines by surprise. I have a solid background in biological science (prior to changing careers) but I make no claims to have the breadth of knowledge to critique the field of marine acoustics. However, I do not think this is necessary to be able to conclude that the EIS fails miserably as a tool for assessing potential impacts to living organisms and in fact provides some data, and excludes some data, that makes it reasonable to conclude that it is not in the best interests of the American people to deploy LFA SURTASS. The following are the reasons for my opinion:

1. The EIS cited research (most from the 1970-'s through '80's) on the acoustic sense organs of various marine organisms. It cited a few research or experimental programs that found many organisms exhibit the ability to sense low frequency sounds, and cited even less study on animal response and/or physical damage due to loud (high-decibel) low-frequency sound. Yet, despite an almost complete lack of research on the critical topic, the EIS states the **assumption** that **all animals**, including squids & octopus, turtles, bony and cartilaginous fish, diving birds, all marine mammals, would be less affected than the great whales. Any grad student would be laughed out of class if they extrapolated from fish or great whales to birds or turtles. Yet, this **assumption** was used to decide that a brief remedial "research program" (the "MMRP") on impacts should therefore study whales, and that the results of this MMRP would be used as the basis forassessing potential impacts on all creatures. This was supposed to make up for the lack of real information.

2. Even if the assumption noted in #1 were true, then for the MMRP to enable the authors to

conclude "no or little impact" the data should support that conclusion. To the contrary, research showed that using single pulses of low frequency sound at 120 dB, 5% of exposed whales suffered damage, and 100% suffered damage at 180 dB. A portion of that damage was permanent, irreparable damage. This means premature death to the animal that was injured, possibly fast or possibly lingering death. The **only** logical conclusion is that from the 230 dB source outward, until the sound attenuates below the level of no damage (around 6 km, to below 120 dB), that animals would be injured. Yet the EIS blithely misrepresents this data: it shows a diagram claiming that 1 km from the 230 dB source, the sound would be 180 dB and implies that there would be no damage beyond that zone. This is clearly illogical.

After this little sleight of hand, the EIS simply glides smoothly to what I believe is the real agenda of its makers, which is to save governmental face and use the EIS to legally request "incidental take" of rare and endangered species in that little bitty 1 km zone of 180-plus dB, leaving unstated the fact that the zone of damage (down to 120dB) would extend as far as 6 km radius. Add to that the third dimension since the ship is moving, and the area impacted adds up to ten to twenty cubic miles of ocean per hour. The data cited reveal it, but the EIS doesn't say it. The reader must figure it out. Conclusion: unless this transponder is towed over four miles deep, there will be a lot of injured great whales, plus those thousands of other species that may or may not be less sensitive than the great whales, depending on whether or not that initial assumption (see #1) was correct. Think of mowing a lawn, that is LFA SURTASS at work.

3. The limited MMRP movement and behavior study showed that when single pulses of sound at 140 dB were used to test behavioral reactions of humpback whales, 5 of 17 whales stopped vocalizing, and most of the others had changes in their vocalization (longer, shorter, different.) (Noone knows what the whales were doing; there was not a diver in the water to visually monitor behavior because this sound level would be dangerous to human health.) Yet the EIS concludes that this data constitutes proof of "no impact." What?? Please draw your own conclusions. I concluded that the authors of the EIS would say whatever they wanted no matter what the facts are. The facts are that the whales responded to the sound, and we don't know more.

4. The EIS cites a study that found blue whales occasionally generating sound at 160 dB and then happily concluded that this must mean whales are just fine with that level of sound. In fact, most animals that make very loud noise occasionally use it for very critical purposes: great pain or great aggression being most likely. A screaming woman can break eardrums and glass. A roaring lion is communicating important information. These are not inconsequential uses of vocalization. Failure to recognize the importance of occasional loud sound in an otherwise fairly quiet environment is another example of poor application of biological science to this EIS .

5. The EIS suggests that whales could swim to evade the sound. In fact, the sound would not necessarily be a continuum in which directions away or toward the sound could be perceived. The Appendix clearly diagrams how thermal layers as well as bottom topography concentrate and reflect the sound. Even in a clearly perceived continuum, small or slow-moving animals, or animals whose eardrums, swim bladder, or lateral lines were already injured by the pulse certainly could not evade the sound. This is a specious claim by the EIS.

6. The MMRP experimented with single blasts of sound up to 140 dB, and then extrapolated from the results cited in #3 above to try to imagine the consequences of multiple pulses. The experimental model they used was low-decibel repeated sound studies in human beings. The assumptions were questionable, and the model even more so. **It is this model, which is really no more than an untested hypothesis, which is the basis for the EIS conclusion that LFA SURTASS would very minor impact on great whales and by assumption, any other marine organisms.** The validity of the "minimal impact" conclusion in the EIS hangs on this very crooked thread.

7. The preferred alternative for deployment would exclude the use of LFA SURTASS within the close coastal zones, the polar seas, and a couple of island archipelagoes known as breeding grounds for species of marine mammals which are rare and endangered in U.S. waters. Even school children know that whales, even pregnant and baby whales, are found in the open oceans. What about the rest of the world's marine mammals, and our un-endangered species, not to mention all those other species of animals that are so lightly assumed to be tougher than the sensitve, may I say delicate?, great whales, those creatures presumably invincible in the face of ten trillion (230) decibels of sound? Incidental take takes on a new dimension.

8. Another EIS, for extending use of the Kauai transmitter (formerly ATOC) was produced by Marine Acoustics Inc. (the same organization that is responsible for the LFA SURTASS EIS), This other document describes the results of a limited research program that was no more than some field samples of sound attenuation of a 180 dB transmission. In this EIS, the authors present the actual data very cleverly to obscure how loud the sound actually is, and then developed some fancy computer models that prop up their stated conclusions. The models are actually contradicted by the field data, but you'll never find that out by reading the text.

Since the LFA SURTASS EIS did not provide raw data, the reader is left trusting the conclusions of the authors. I don't trust them because I have seen what they have done on the ATOC EIS. My mistrust of the scientific integrity of those who are producing the LFA SURTASS EIS, combined with the whole string of questionable or erroneous assumptions, limited and inconclusive research, and weak and untested models makes the MMRP and its use in the EIS a mockery of science. As science used for public policy, it is even worse. The consequences are potentially far reaching.

9. The LFA SURTASS EIS left out inconvenient information, such as: A research diver observing porpoises who was inadvertently exposed to 140 dB test cycle in Kauai was hospitalized and suffered permanent trauma and reported the porpoises "going crazy." Whales in the Mediterranean in 1999 which were subjected to LFA testing were killed. Since the draft EIS was released, some very loud low-frequency sonar experiements in the Bahamas were conducted, and at least one pod of small whales beached and died with ruptured eardrums. How many other animals sank? Noone knows. We can't go in the water because it's too dangerous for us.

I think and believe that it is time to tell the Navy to stop messing with this device which has cost us over $300 million. This country has wasted $300 million dollars before and survived, and it could certainly survive this waste of money. It would be far worse to waste more life as well.

Three concluding thoughts:

First: I know very little about military science, but the following thought may be worth considering: if LFA SURTASS were put to use in wartime, wouldn't it be a pretty easy target once it started blasting out sound to try to surprise a silent sub? It might find a submarine before the sub blew it out of the water, then again, it might not even have time to do that.

Second: Enemy submarines close to coastlines are important to know about. If this surveillance system is deployed, I am sure it is only a matter of time before the constraints on coastal areas would be relaxed. Even if the California Coastal Commission rejects deployment off California's waters, if other states permit it, our state waters may be under siege. I hope that the various states will cooperate in denying the Navy's application for deployment. State's rights are something that should not be ignored. Unfortunately, the snow job with the EIR may have succeeded in confusing other states into complacency. I would hope the California Coastal Commission could provide leadership and information to the other states.

Third: If you don't accept that I may be a source of fact or truth on this matter, I ask that you at least wait until the final EIS is released before making a decision. The purpose of an EIS is to help decisionmakers understand likely impacts of a proposed activity so they can make an informed decision. Although the Navy did its best to keep people from knowing about the EIS process, nevertheless dozens of experts found out through the grapevine, and submitted comments. Most of them were adamently opposed to deployment, as you will see when the final EIS is released (it is over six months behind schedule). When that document comes, you may have greater skills than I do in delving into the subject matter at hand. I ask of you to apply your skills as diligently as possible. I am 53 years old, and hope to see a living ocean for another half century and for future generations. Your actions will play a part in my hopes for that future.

Sincerely,

Kay Stewart

Kay Stewart

Copy to: Joel Reynolds, NRDC; Dr. William Head, Cal. State University Monterey; Deane Oberste-Lehn, Retired RAND Corp.; Joan Stewart, Retired SIO

Responses must be provided to the California Coastal Commission by November 22 for the staff to provide them to the members as information packets. Otherwise, comments may be made at the December 12 hearing in San Francisco.

KAY STEWART
Landscape Architect

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NOV 22 2000
CALIFORNIA
COASTAL COMMISSION

November 22, 2000

California Coastal Commission Members
c/o Mark Delaplaine, Federal Consistency Program,
California Coastal Commission
FAX: 415-904-5400

Supplement to letter dated November 15 re: Navy's Proposed "Employment" of SURTASS LFA

Dear Mr. Delaplaine: Please append this letter to my prior correspondence and provide both to the members for their hearing December 12. I received a copy of the Navy's "Consistency Determination" paper to the California Coastal Commission and wish to share a few observations. Page citations refer to this paper.

1. Page 2, pp 4, bullet 1: This document contradicts the Draft Environmental Impact Statement description and diagrammatic representation of the pattern of sound from the array as spherical. Which is correct? How could the Navy change the essential description of the system from the Draft EIS? This makes a difference about where the sound level is spreading.

2. Page 2, pp 4, bullet 3: This document says the source level from the array is approximately 215 dB, while the DEIS described the source level as 230 dB in one place and up to 250 dB in another place. How can this contradiction be justified?

3. Page 4, pp 1, bullet 1: I believe that the DEIS states simply that under the Navy's preferred alternative, the array would not be operated at all within 12 nmi of the coast, not that the sound field would not exceed 180 dB. Please determine if this paper has changed the terms of the preferred alternative.

4. Page 4, pp 1, bullet 2: I believe, again, that the DEIS states simply that the array would not be operated in these areas.

5. Page 4, pp 2 and 3, and other places: I do not think that the term mitigation is used correctly in this document. The Navy is proposing to <u>monitor</u> for the presence of marine turtles and mammals prior to using the array, and to observe for impacts in certain areas. This is not mitigation. Mitigation is a process whereby the party that damages a natural resource/species develops a procedure to replace, augment, or otherwise supplement the numbers or habitat of that species. Monitoring is simply a way to observe the outcome of mitigation. The DEIS and this paper do not propose any mitigation. If there is a decision to approve "employement" which would result in unavoidable take of endangered species, it is my understanding that mitigation is required, not just monitoring of take.

6. Page 4, pp 4, bullet 1,2 and Page 5, bullet 1: Apparently the system that the Navy has used to try

to establish the presence of marine mammals is faulty, because there have been at least one injured diver and killed whales documented while trial runs have occurred. Of course, the Navy does not even mention, and therefore tries to avoid any culpability in these events please see letter 11/15.

7. Page 5, pp 3: Under the no action alternative, the cost of more fuel, more staff, etc. is not really a function of the no action alternative, because the SURTASS LFA is not a proven technology, so it is assumed that for the time being all other surveillance devices will be employed while the system is tested.

8. Page 7, pp 5: Once again this paper misrepresents the real data. 5% of whales exposed to sound level or 120 dB were found to have behavioral responses of avoidance due to minor (will heal or recover sooner or later) or major physical injury, and 100 % did so at 180 dB, where permanent damage occurred. The Navy has created euphemisms to obscure the nature of reality. Recoverable injuries or behavior which changes temporarily due to such injuries is called TTS (temporary threshold shift, meaning the animal is assumed to lose part of its hearing for a while) which becomes PTS (permanent threshold shift) at 180 dB, which means that injury has permanently reduced the animal's hearing capability. Long and short: physical injury leads to behavioral phenomena, and 5% of whales experience it at 120 dB and 100% are incapacitated at 180 dB. Don't let the euphemisms fool you. This is the whole substance of the Navy's arguments. The use of words like "onset of potential injury" at 180 dB is more distortion and euphemism, to obscure the truth. Calling permanent injury at 180 dB a "prolonged disturbance of a biologically important behavior" is more of the same.

9. Page 8, pp 2: Even if the assumption here is correct, diving birds have lungs which could be damaged by compression, so the elimination of seabirds from the EIS is illogical and irresponsible. California's coastal and pelagic waters are the habitat of several dozen birds that dive for food. Also, the assumption that is stated here, that only tissue with different acoustic impedance is the basis for potential damage and/or sensitivity to exceedingly loud noise. In the DEIS bibliography, citations indicted that various organisms without this physical distinction ("tissue with different acoustic impedance") have been found to have the ability to sense low frequency sounds. The physical and neural system that has been set up to enable an organism senses its environment which may be at risk of overload whether it is a compression injury or other stimulus/response. The assumption is unsupported and is likely to be poor science.

The remainder of Page 8 is the conclusions based on the misleading, poorly supported, and insupportable statements provided in the previous pages. The conclusions are erroneous because th support is erroneous.

10. Page 11, Article/Section 30234: states there is no application (NA) of this technology to commercial fishing. Since the DEIS and this document made no effort to assess the impacts on any species of animals other than marine mammals, the Navy has no way to conclude that there is no application of this section to the proposal.

Thank you for considering my remarks in your deliberations. Sincerely,

Kay Stewart Kay Stewart

ıd small whales to be killed this year, beyond the large hales already reported on for the IWC. A video of the)99 drive fisheries kill was shown at the IWC meet-g in Adelaide, prompting outrage from delegates. The ıpanese delegation was only outraged that the video as shown, and later admitted on camera that killing ethods had to be improved. Members of the Japa-ɜse public and press are generally unaware that such ınts occur in Japan and are often shocked to discover at such large numbers of dolphins, porpoises and nall whales are still killed.

Should the **orcas of Puget Sound, Washington tate** be listed as Threatened under the Endangered ɔecies Act (ESA)? These are the almost sacred J, K, ıd L pods, probably the most watched and researched ild whales in the world. They also may be the most ıemically contaminated marine mammals in the orld. This southern resident killer whale population cluded 98 individuals by mid 1995. By October 1999 is number had dropped to 83 whales. Possible rea-ɔns for the terrible 15 percent decline included high vels of contaminants, lack of prey resources, increased hale-watching activities in the San Juan Islands, or a ɔmbination of impacts.

Transient whales were far more contaminated than ɔuthern resident whales. Southern resident whales had gher PCB levels than northern residents or Prince Wil-ım Sound residents, probably from eating different ɔecies of prey, or from different areas. Females typi-ılly have lower levels of PCBs than do males; moth-s unwittingly transfer contaminants to their offspring rough their milk, and broad trends by sex suggest a long term problem. Stress from human pressures or inadequate food resources could compromise imm system responses to toxin loads; these whales carry levels of PCBs that represent a tangible health risk.

Workshops of experts were convened in April and September to deal with what was happening. There was no opposition to a Threatened listing, but no consensus was reached either. The experts could agree only that worldwide production of persistent chemicals that mimic hormones should cease, and that the two dams that block salmon from the Elwah River should be removed immediately.

An ESA Threatened listing may facilitate increased budgets for research, education and solutions, a designation of critical habitat, or the development of a recovery plan. The listing process can take a long time. Not everyone feels that it is necessary or appropriate. Some felt that the population and range changes are part of a larger picture of climate change. Others believe that this population, now ranging far out of Puget Sound, is adapting to changes. Canada has already listed this population as Threatened, but there are differences between each country's definitions. A Threatened li ing might have strong implications for fishing, loggi development, dams and polluting, but CSI believes that these orcas are giving us enough clues to act, and **we must act.** To voice your opinion on this issue please contact Ms. Donna Wieting, Chief Marine Mammal Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910-3326, Phone: (301) 713-2322, Fax: (301) 713-0376.

Louder Is Not Better

By William Rossiter, CSI President

Whales and dolphins and caring people are not win-ng the war of human noise in the ocean. Despite pub-ɜity, investigation and even ridicule the noisemakers ıve persisted, ignoring criticisms and logic, to press r approval of whatever noises they want to make. ıe National Marine Fisheries Service (NMFS), ıderfunded, overworked, and pressed on all sides, ants to approve permits based on rules substantiated by scientific data. NMFS has made an extraordinary effort to make good rules for defining the approvable levels of sound, just short of where injuries and significant biological responses might occur in marine mammals. The experts, having inadequate data, have been unable to give NMFS the numbers it needs. in the absence of rules, and looking for ways to reduce the pressure, NMFS is reported to have quietly adopted

World denied this project, perhaps because of the public relations quagmire.

Meanwhile, the **Delaware Bay High Frequency Acoustic Experiment** (see last *Whales Alive!*) began in early September, despite concerns that the sounds could harm infant bottlenose dolphins and sea turtles as they were preparing to migrate. University of Delaware scientists said that they were convinced that this would not happen, but did not add that they would follow up to make certain, because they won't.

And ATOC is back, under a new name, with a permit entitled "Taking Marine Mammals Incidental to Operation of a Low Frequency Sound Source by the North Pacific Acoustic Laboratory" (NPAL). NPAL's permit application public comment period also closed in late September. Using the ATOC seabed power cable and sound source near Kauai, Hawaii, a 75 Hz, 260 watt, 195 decibel (with respect to 1 micropascal) signal would be transmitted over six 20-minute periods every fourth day. A Draft Environmental Impact Statement was prepared by the Office of Naval Research, and Marine Acoustics, for the Scripps Institution of Oceanography, which also has established the threshold for risk of harm as a single ping at 180 decibels, defined further as the onset of TTS, and Level A harassment under the current MMPA. The language is reminiscent of the LFA's, using the same formula of assertive guesswork. The permit uses the MMRP to substantiate claims, without acknowledging the NRC's critique of the MMRP (above). How bad is it? Professor Paul K. Anderson, a Member of the ATOC MMRP Advisory Board, released a public statement entitled "Another 5 years of ATOC: Science Under False Pretenses?" You don't have to guess what it says. It's available upon request from CSI.

With several noise-related permits and at least one EIS pending, NMFS is under enormous pressure. Without facts to stand on, constrained by workload and budget limits, squeezed by politics and power plays, NMFS has many opportunities to give in to the noisemakers. CSI is grateful for the skill and expertise of the NMFS staff at the epicenter of this issue. We urge everyone concerned with the welfare of marine mammals to call for and support strong, enlightened NMFS decisions based on the best science, and above all, the Precautionary Principle.

10 November 2000

Mark Delaplaine
California Coastal Commission
45 Fremont, Suite 2000
San Francisco, CA 94105-2219

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NOV 15 2000
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COASTAL COMMISSION

SUBJECT: ATOC alias NPAL alias LFA

Dear Mark:

I learned from a friend in Kauai, where Scripps wants to expand the ATOC acoustic transmission program, that the name has been changed to North Pacific Acoustic Laboratory (NPAL). And when I went to Scripps to get the DEIS on NPAL (public comment period past), I learned from Susie Pike the ATOC mailing list had been greatly reduced for NPAL (to only Hawaiians, except for a few on the Mainland. I was deleted). THUS: Two effective ploys to lessen public awareness of, and opposition to, their plan.

Also the cover that ATOC was academic research for climate purposes is now blown: NPAL is being funded by Office of Naval Research (ONR); and will be doing "long-range underwater sound transmission studies". THUS: NPAL being used to get data for Navy's LFA program.

The Hawaiian Department of Land and Natural Resources (DLNR) held public hearings on Kauai and Oahu for the NPAL DEIS. Susie Pike said the Final EIS will probably be completed Jan-Feb 2001; followed by hearings re Scripps Permit Request for 5-year NPAL program. Important to have Permit hearings on Mainland as well as Hawaii. Is it possible for CCC to conduct such hearings in California? or convince DLNR to do so? or some other government agency? This is last opportunity to stop NPAL. The ramifications affect entire Pacific Ocean and other oceans of the world.

Re the unilateral reduction of ATOC mailing list for NPAL: shouldn't Scripps have sent out letters asking if addressees wanted to remain on

the mailing list for NPAL? That has been the procedure used by the National Park Service re the Yosemite N.P. Master Plan series of public hearings and DEIS and FEIS. If Scripps refuses to do that, can one request their complete ATOC mailing list, evoking the Freedom of Information Act if necessary?

Scripps still has copies of NPAL DEIS and 2 Addendums, which can be requested by phoning Susie Pike at (858) 534-8031.

Final EIS on LFA was supposed to have been completed in June 2000, but another friend recently got a letter from C. Spikes that FEIS still in Navy "internal review". In an article in most recent Cetacean Society International (CSI) newsletter (Oct 2000), it says: "The LFA Final EIS is expected almost any day, NMFS may approve it, and a legal battle will begin to sort the wheat from the chaff." Do you know when the FEIS on LFA will be released?

I just received a mailing from Earth Island Institute (EII) to "Stop the Navy's Whale and Dolphin Killing!" that included a postcard addressed to J.S. Johnson to "halt all testing and cancel all future deployment of the Low Frequency Array (SURTASS LFA) ..."; a four-page letter urging opposition to LFA; and, of course, request for money to EII.

The EII letter contained such statements as: "We've already launched a direct action campaign to halt the Navy's sonar testing". "...we are working with a coalition of scientists and activists to halt all tests and construction of loud low frequency sonar detectors. We're also mounting a hard-hitting media campaign to alert the public to this new danger to whales and dolphin". "...our marine mammal project staff is meeting with members of Congress to develop a strategy for cutting off funding for the Navy's sonar tests". "And we're laying the groundwork to take the Navy to court". Are you aware of these EII claims? I don't recall EII being at hearings on LFA DEIS or submitting comments to the DEIS; or being publicly vocal during the critical DEIS stages of LFA. Nor have they been reporting on LFA (except one article) regularly like CSI has.

Lastly, has Scripps removed their transmitter and cable from Pioneer Seamount?

Please reply ASAP via e-mail to dolgeo@earthlink.net as I expect to travel to San Diego sometime next week. Thanks.

Best regards,

Deane

Deane Oberste-Lehn
P.O. Box 369
Menlo Park, CA 94026

e-mail dolgeo@earthlink.net

Mark D.

20 November 2000

California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA

RECEIVED
NOV 21 2000
CALIFORNIA
COASTAL COMMISSION

SUBJECT: Navy SURTASS LFA Sonar Program

Dear Commissioners:

I was surprised to learn that the Navy is requesting a California Coastal Commission (CCC) hearing scheduled for 12 December 2000. In the Consistency Determination paper I received from Mark Delaplaine, the Navy cites and bases it's case on the DOEIS/EIS (DEIS) dated July 2000. The DEIS is greatly flawed. It is not an impartial evaluation of the LFA sonar system, as claimed by the Navy, but biased to promote its own vested interests. The CCC, in a 7-page letter to the Navy, succinctly commented: "Fundamentally, the EIS: (1) ignores important information; (2) is deficient in its description of cumulative impacts; (3) relies on unjustified and/or overly simplistic assumptions; and (4) arrives at conclusions that are not warranted based on the research and science that have been performed to date."

Since the preparation of the DEIS, more and stronger evidence has been obtained that very high dB, low frequency sonar transmissions have caused marine mammal deaths and injuries. The Final EIS (FEIS) was due June 2000, but reportedly is still in "internal review". The Commissioners should withdraw the Navy LFA hearing until at least 60 days after release of the LFA FEIS -- public comment period on the FEIS, followed by notification of the CCC hearing.

<u>The NO ACTION ALTERNATIVE is the Only Rational Option</u>

The LFA sonar system should be terminated because it is neither viable nor survivable. A surveillance system should be able to detect potential or existing adversaries without revealing to that adversary that it has detected and is tracking the adversary, and without revealing its own

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location. Any active sonar system, such as the LFA, can be detected by an adversary; and the large unusual looking and slow moving LFA surface ship can be easily located.

Thus an adversary can (a) track and monitor the operations of the LFA ship; (b) take either evasive measures, or counter measures to foil the LFA sonar capability, during peace time/'cold war' periods; or (c) render useless or destroy the highly visible and vulnerable LFA surface ship when overt hostilities are initiated.

Deployment of the LFA system would encourage other countries (NATO already has a LFAS system which has been testing in the Mediterranean Sea and Atlantic Ocean) to operate their own active sonar systems to incapacitate the LFA system by sound interference and search for their adversaries, including the U.S. The result would be an escalation of ocean noise. The consequences could be devastating to marine animals.

The LFA is a poorly conceived and highly vulnerable system. The Navy should terminate the LFA program, and concentrate its efforts on the Advanced Deployable Systems (ADS), a new passive sonar system that is being developed for coastal deployment.

Major Flaws in the LFA DEIS

The Navy claims that its acoustic models can accurately predict received level (RL) of sound dBs at any range and depth in real time during operational deployment are unjustified. The factors affecting sound propagation in the ocean are both dynamic in time and space regarding ocean water conditions; and complex regarding bottom topography, rock/sediment type and thickness. As the sound source level (SL) is constantly moving, the range and angle of incidence of the sound transmission on the ocean bottom is constantly changing, thus bottom absorption, reflection and refraction are also constantly changing. And consequently so are ocean surface reflections and refractions. Sound transmission channeling is not predictable in the Navy's over simplified theoretical models.

The complex dB pattern of the bottom-bounce transmission mode is especially well illustrated in topographically complex sites, such as Site

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#8 near San Nicholas Island in coastal Southern California, shown in OEIS/EIS Technical Report 2. The Site #8 acoustic model also shows a near range (about 2-4 nmi) acoustic shadow zone (very low to zero dB) that would mislead any visual observer regarding behavioral impacts on marine mammals at the ocean surface and would also register no change on the passive acoustic monitoring system. Yet at ranges and depths farther from the acoustic source, RL are amplified causing complex patterns over relatively short distances of high RL at depth and a high RL zone near the ocean surface ranging many nmi (16-18 nmi in the Site #8 example). Thus both deep diving and shallow diving marine animals can be injured and/or harassed at many nmi from the acoustic source.

Major deficiencies in the DEIS include considering only hearing and immediate behavioral responses of just four whale species studied over very short time periods. High dB low frequency sound transmissions in the ocean cause physical and mental injury to both marine mammals and humans at long ranges - as evidenced by the Phase III Hawaii tests and reports of other divers and marine mammal researchers. Cumulative impacts of repeated exposure over longer time periods have not be done and present a serious void in evaluating the potential harm to marine animals and humans. The 145 dB RL postulated by the Navy as a safe threshold for human exposure is invalidated by the Chris Reid ensonification of an estimated 125 dB and other prior evidence. The Navy 180 dB threshold for marine animals is likewise much too high. Also invalid is the Navy extrapolation of their short studies on just four baleen whales to all marine animals and to the proposed long term operation of the LFA on a global scale.

Several examples of evidence and analyses not acknowledged or discussed in the DEIS are:

(a) Research on a mass stranding of Cuvier's beaked whales in the Mediterranean Sea that coincided closely in time and location with LFAS tests by the NATO RV *Alliance*. The strandings, which occurred 12 and 13 May 1996, were reported in the 5 March 1998 issue of NATURE, a highly respected international scientific journal. The journal article also referenced three previous atypical mass strandings of Cuvier's beaked whales in the vicinity of the Canary Islands during NATO operations there.

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(b) The Natural Resources Defense Council (NRDC) report, "Sounding the Depths - Supertankers, Sonar and the Rise of Undersea Noise", dated March 1999. This document scopes the undersea noise problems, including strong criticism of the LFA system. It lists 15 sites off the coasts of the U.S. that are critical marine animal habitat, whereas only one is mentioned in the DEIS.

(c) Ensonification of a marine mammal expert while in the water observing spinner dolphin pods in Honokohau Harbor and Hoona Bay (Kona coast of the Big Island of Hawaii) during Navy LFA field tests in Phase III of their playback experiments on humpback whales (26 Feb - Mar 98) that occurred on 10 March 98. This incident was collaborated in time and proximity by a hydrophone recording near Keohole Point. The RV *Cory Chouest* was seen approaching from the north near the end of the 55-minute hydrophone recording. A lawsuit was brought against the Navy based on injuries and trauma to Chris Reid, the marine mammal expert, so it is obvious why the Navy would not mention this important empirical evidence of not only injury to a human, but also the trauma to the dolphins Chris Reid was observing at close range. The Chief Scientist aboard the *Cory Chouest*, Kurt Fristrup, admitted that on 10 March 98 during the time interval of ensonification and hydrophone recording, the LFA system was transmitting, and he estimated that the received level (RL) was 125 dB at Keohole Point.

Chris Reid, in legal Declarations, stated "After spending 35-45 minutes in the water, I experienced a loss of equilibrium and other symptoms of physiological distress. As I am in excellent health and in similar water conditions almost daily, I can only conclude that my physical discomfort resulted from exposure to the sonar testing."... "On March 10, spinner dolphin pods in Honokohau and Hoona Bay appear to be dangerously close to the shoreline clustering in a tight defensive posture on the surface and exhibiting constant and excessive vocalization." ... "I was snorkeling/diving at about 300 ft distance from them while in Hoona Bay and both heard and felt the LFAS testing sequence of a period of about 45 minutes. The dolphins behavior can be described as erratic, their vocalizations and time on the surface appeared unusual, and they were clearly very agitated and defensive. I have logged thousands of hours in the water and on boats observing dolphins over the last 10 years and consider this behavior to be extremely abnormal." Four months later,

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Chris Reid stated that she was continuing to have physical, emotional and mental health problems. The doctor who examined Chris Reid two times (March 10 and 11) diagnosed her symptoms as severe body and mental trauma.

Navy Credibility Gap

The Navy claims they will monitor known recreational and commercial dive areas to avoid injuring or disturbing divers; and notify the Divers Alert Network, diver organizations and marine tour operators of its LFA transmissions in the area. Obviously that did not occur in the LFA tests in Hawaiian waters where Chris Reid was injured and a marine mammal tour group recorded the LFA transmissions. And what about the activities of marine mammal researchers and marine photographers who can be almost anywhere in the ocean?

If the Navy doesn't comply with its own declared commitments to protect humans in the water; they certainly can't be trusted to prevent or mitigate harm to marine mammals and other marine life.

Thank you for considering my comments and recommendations on the Navy SURTASS LFA sonar system.

Deane Oberste-Lehn

Deane Oberste-Lehn, PhD
Research Scientist
P.O. Box 369
Menlo Park, CA 94026

11/21/00 16:15 FAX 650 321 1387 KINKOS MENLO PARK 005

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COASTAL COMMISSION

September 28, 2000

Dear Earth Island Member,

The U.S. Navy is running experimental sonar tests that kill dolphins and whales.

The sonar tests -- designed to detect enemy submarines at long distances -- blast the ocean with some of the loudest sounds ever made. In my 15 years of work to protect marine wildlife this could be the worst threat dolphins and whales have faced.

The Navy claims this loud low-frequency sonar testing has no connection to marine mammal deaths. And up until now, we haven't had the hard evidence to prove them wrong.

But now, we've got the evidence. In March, the Navy ran a sonar test off the coast of the Bahamas. The next day, injured dolphins and whales began washing up on two Bahamian beaches. Six beaked whales died. They suffered from painful ear hemorrhages -- injuries known to be caused by blasts of sound.

I have to tell you how important you and other Earth Island members were when the evidence surfaced. Your commitment to the survival of whales and dolphins made all the difference. Thanks to your past support, Earth Island was ready.

We've already launched a direct action campaign to halt the Navy's sonar testing. We've got to act fast -- before huge military pork-barrel spending creates an unstoppable juggernaut.

You can help by sending the enclosed postcard to the Navy's sonar environmental impacts manager.

You can also help by making a contribution to help jumpstart this new campaign.

Your contribution and activism are crucial now, because the whales who beached themselves -- and died agonizing, slow deaths

(Over, please)

Even some of the Navy's own top experts admit -- off the record -- that this very loud sonar system is a costly boondoggle that won't work and could backfire by exposing U.S. surface fleets and submarine locations to the enemy.

We've got to force the Navy to change course -- before more whales and dolphins die.

With your continued participation and support, we are working with a coalition of scientists and activists to halt all tests and construction of loud low frequency sonar detectors. We're also mounting a hard-hitting media campaign to alert the public to this new danger to whales and dolphins.

At the same time, our marine mammal project staff is meeting with members of Congress to develop a strategy for cutting off funding for the Navy's sonar tests.

We prepared an investigation of the Navy's sonar testing program -- and we've made sure every member of Congress has a copy.

And we're laying the groundwork to take the Navy to court -- if that's what it takes to prevent massive death and injury of marine mammals.

This battle pits a small group of people with a deep commitment to the survival of whales and dolphins against the money and might of the U.S. Navy.

But Earth Island has proved before that with persistence, no-holds-barred direct action, and hard-hitting media, our small organization can face down major corporations and government bodies -- and win protection for dolphins and whales.

Just this year, we helped stop one of the world's largest corporations -- Mitsubishi. Our hard-hitting direct action forced this mega-corporation to cancel its plan for a massive industrial plant in the gray whales' last pristine Baja California birthing lagoon.

And over the past decade, we have won a series of landmark victories that are forcing the worldwide tuna industry to end the largest slaughter of marine mammals in history -- the killing of 7 million dolphins.

(Over, please)

November 5, 2000

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CALIFORNIA
COASTAL COMMISSION

Mark Delaplaine
C/O California Coastal Commission
45 Fremont Street, Room 2000
San Francisco, CA 94105

Dear Mr. Delaplaine,

Please include the following documents which will go the the Commissioners for the upcoming meeting on December 12th; Article titled Sound and Fury, article titled Beneath the Silent Sea, text to Larry regarding decibel levels, article titled Navy Role in Whale Deaths, text titled U.S. Navy, High Intensity Sonar, and Marine Mammals: A Chronology, and the article titled U.S. Navy's Low Frequency Active Sonar and Other Acoustic Technology:Cause for Concern. Also, if I am able to obtain more of the Channel 2 newscast videos on the LFAS topic by the time I mail this to you, I will include one for you. If the videos might be of any help whatsoever in stopping the Navy's use of LFAS, let me know and I will send 30 to you immediately for inclusion in the package to the Commissioners.

Telephone (415)789-9498, FAX (415)789-9598, email- mahalia@mahalia.net

Sincerely,

Mahalia Pugatch

Mahalia Pugatch

Sound and Fury

US Navy threatens whales to safeguard foreign interventions

by Chris Clarke

A recently-declassified high-tech US Navy project to aid in detection of hostile submarines is shaping up as a major new threat to marine life. Nonetheless, the Navy is pressing ahead with the development of the project amid a growing chorus of opposition. The International Marine Mammal Project has learned that the Navy's official justification for the project is misleading, and that its major purpose is to provide political cover for interventions in foreign countries.

The project, called the Surveillance Towed Array Sonar System Low Frequency Active acoustic sonar system (SURTASS LFA), is designed to take advantage of the special acoustic properties of high-decibel, low frequency sound in seawater to detect what the Navy claims are increasingly quiet foreign submarines.

In years past, the US Navy and its allies have monitored movements of enemy submarines through a network of hydrophones (underwater microphones) placed on the seabed. This network, the Sound Surveillance System (SOSUS), proved effective for decades in monitoring the positions of Soviet nuclear-powered submarines in deep water in the Atlantic and Pacific oceans. Additionally, a previous generation of SURTASS ships without an LFA component listened for subs by means of a string of towed hydrophones. However, as propulsion technology advances, the Navy claims that passive sonar will soon prove inadequate to a new generation of quieter subs with redesigned propellers and more efficient power systems.

Enter SURTASS LFA, which consists of underwater megaphones, suspended from ships, that broadcast very loud pulses of low frequency sound into the ocean water. (That's the LFA part.) The sound travels readily through the ocean and echoes off solid objects, submarines among them. (Thus the term "active" sonar, as opposed to a "passive" system that merely listens to sounds the target ships make.) The rebounding sound is then picked up by an array of microphones towed underneath Navy vessels. (That's the SURTASS part.) The signals are then uploaded into shipboard computers, which interpret the echoes to distinguish submarines from rocks, schools of fish and sunken WWII destroyers. The Navy's claim is that SURTASS LFA will allow a fleet to detect even the quietest submarines as they lie on the bottom of the ocean waiting to ambush unsuspecting aircraft carriers.

But of more than three dozen mentions of SURTASS LFA in leading defense trade publications since 1990, none have described the system as a counter to quiet subs in the open ocean. The US Navy wants SURTASS LFA for use in littoral (coastal) anti-submarine warfare (ASW), to protect its ships and crew during interventions in foreign lands, where losing even one Navy sailor may prove politically damaging. And this expensive political cover may come at the expense of the health of marine mammals and other wildlife worldwide.

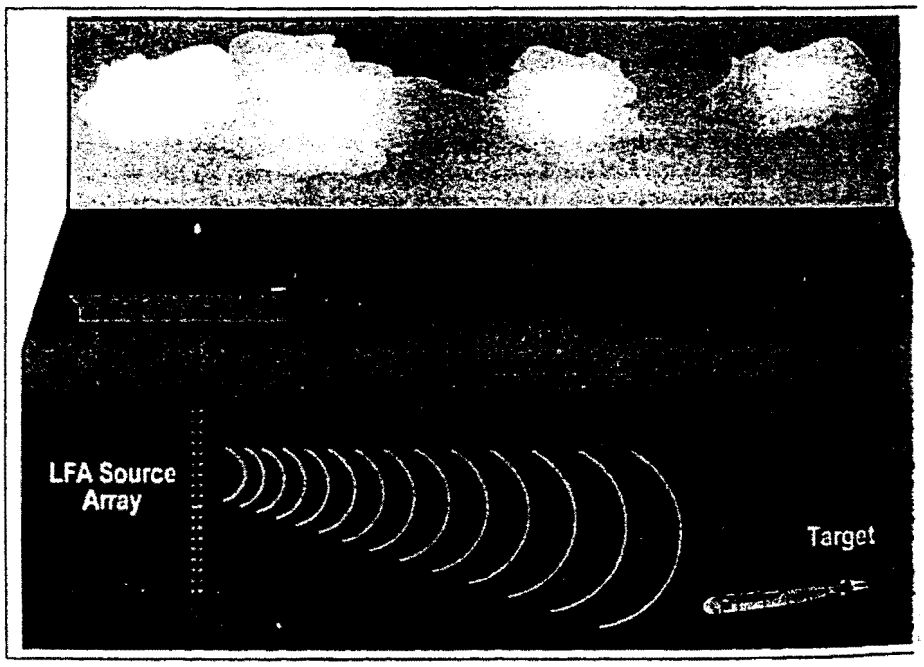
What SURTASS LFA does

Sound travels much more readily in water than it does in the atmosphere. Some marine biologists have speculated that whale songs emitted off the coast of Newfoundland are audible to whales in the Caribbean Sea. And whatever the medium, low frequency sound carries further than higher-pitched sound. You can hear the bass line in a rap song long before the car stereo responsible hoves into view, where the higher notes are often harder to resolve at a mere block or so. Older, passive systems for submarine detection such as SOSUS have long taken advantage of the extreme degree to which low-frequency sound will propagate in water. Diesel-electric submarine engines, the turbines on nuclear subs, prop wash, and the generated by a sub under power all create lo quency vibrations, which we and other things hear as sound.

The speed of sound in water depends water's temperature, salinity, and pressure. sound travels from warmer surface water deeper layer (which oceanographers call the mocline, often at about 500 meters) that m transition into colder water, the speed o sound wave slows. Like a beam of light thr glass lens, the sound will bend toward the tion in which speed is slowed. At about a sand meters below the surface, the weigh kilometer of ocean increases the ambient pressure. Sound travels faster in this highly surized water than in water at normal pr and thus at about 1000 meters the emitted will start to bend up toward the surface Thus there is a layer of ocean in which the reflected in turn between the thermocline a zone of increasing pressure, can travel for a icant distance. This is much the same phe non as fiber optics, in which light bounci the walls of the optical fiber is transmitt remarkable distances and around curves.

And much like fiber optics, the "sound nels" created between the thermocline ar thousand-meter level transmit a wealth of mation that anyone with a good comput the right algorithms can decipher. Which cisely what SOSUS and previous versic SURTASS did. During the Cold War, the tions of Soviet subs were accurately deter by detecting their low frequency signals f handful of positions, allowing for known o graphic conditions, and crunching the num

SURTASS LFA OEI



LFA is intended for use in the world's biologically-rich coastal regions during US incursions into other countries, to reduce the likelihood of politically damaging casualties.

Nowadays, the US Navy says that's not enough. Quieter ships, combined with an ambient ocean noise level that grows as more and more merchant ships ferry global commerce across the seas, make it increasingly difficult to find enemy subs as they lurk. True, the submarines once operated by the Soviet Union are now in the hands of people who are probably our friends, but the Navy warns against the day when advanced technology falls into the hands of those whose power might not be of the super variety. "The danger", wrote Navy Captain N. E. Rondorf in a May 11, 1999 letter to Mark Giese of the Wisconsin Humane Society,

... lies in the proliferation of submarines by nations whose interests may be hostile to the United States and its allies. LFA sonar will allow the detection of these potential threat submarines and provide the ability to successfully defend our forces against the stealthy, well-armed submarine threat. LFA sonar is critical to protect United States sailors, soldiers, ships and equipment.

Rondorf failed in his letter to specify precisely where those hostile subs would be found, and why they might be hostile. As we shall see, these questions prove central to the origin and intended use of SURTASS LFA.

The Danger to Wildlife

Why are representatives of the Wisconsin Humane Society, and of dozens of other animal welfare and environmental organizations, corresponding with the US Navy about SURTASS LFA?

Beneath the top few feet of seawater, the ocean is a dark place. The same water that conducts sound so well scatters and absorbs sunlight. Thirty meters down, human divers find the sea a murky, slightly mysterious place. Not much deeper than that, only the sparse bioluminescence of a handful of creatures provides any light at all.

Any ocean species that relies on remote sensing rather than just waiting for food to swim into its mouth had better find some sense other than vision to rely on. A few, such as the great white shark, have developed extraordinary olfactory senses. Others have invented whole new senses: electric rays are thought to scope out their neighborhood by discharging and then measuring the electrical impedance of nearby objects.

But for most marine species, especially those whose ancestors came from the land with a developed set of terrestrial senses, hearing is the key to the door of perception. Marine mammals in particular are renowned for their sharp ears. Bottlenose dolphins can distinguish between a cube and a sphere of similar size, just by listening to their echoes. A mother humpback whale can keep track of her calf by voice, and vice versa, over a distance of miles.

Imagine being told to drive down to the soccer field and pick up your kid, and to stop at the grocery store on your way back, all the while blinded by a brilliant strobe light. This is more or less the scenario activists fear: that the deafeningly loud sound pulses generated by SURTASS LFA will prevent marine mammals from feeding, from navigating successfully to calving grounds, from finding members of their families. Animals other than marine mammals are also potentially threatened by SURTASS LFA. Many seabirds are known to be quite sensitive to low frequency sounds in air, and it's a safe bet that diving seabirds such as the common murre are sensitive to underwater LF sound as well. Some species of salmon are repelled by sounds of frequencies less than 150 cycles per second or Hertz (Hz). Other fish are vulnerable to damage in their swim bladders and other organs from certain types of low-frequency sound.

Activists and the Navy disagree as to the subjective intensity of the sound generated by SURTASS LFA. On paper, the numbers are apparently unambiguous. Eighteen bathtub-sized speakers, suspended approximately a hundred meters below the hull of the ship, will emit synchronized pulses of sound ranging in frequency from 100 to 500 Hz. The pulses will reach intensities as high as 230 decibels (dB) at the source. (Decibels are calculated on a logarithmic scale; a 20 dB sound is ten times louder than a 10 dB sound, and a 30 dB sound a hundred times as strong. The human nervous system processes sounds on a similar logarithmic scale, which is why a lawnmower in the next yard doesn't sound five thousand times louder than a normal conversation.) Within a nautical mile of the SURTASS LFA array, the Navy says that sound intensities will fall off to below 180 dB, an intensity which it claims poses no long-term threat to marine life.

After sweeping up and down the water column to a point 300 nautical miles away from the source, the noise may still be as loud as 140 dB. Most people find their threshold of immediate pain at about 135 dB. Standing next to a jet engine at full power, you'd be subjected to a noise level of 160 dB. A minute and a half of 1 sound will cause permanent hearing lo human ears.

Problems arise in translation from a and from human to nonhuman ears. only travels further and faster in water than i but the relationship between a sound's inte and the pressure it exerts on objects is differe water. Acoustic scientists disagree as to what of sound in air would be the equivalent of a dB pulse from a SURTASS LFA array 300 n cal miles away, but most generally subtract 2 from underwater sound intensities to find e alently loud sounds in air at sea level. In words, sounds in water are about 500 times w er than subjectively similar sounds in However, in its July 1999 Draft Ove Environmental Impact Statement/Environm Impact Statement (OEIS/EIS) for SURT LFA, the Navy states that

... due to the relative impedance of air and w (the stiffness or density of the medium) a rou 5,000 times greater power level (35.5 dB) is n sary in air than in water to produce an equiv power level. Therefore, 61.5 dB must be subtr from a sound level in water to produce an eq lent acoustic intensity in air. ...[A] 60 dB diffe represents a million-fold power difference; so, [si can easily be seen how misleading it can be compare underwater sound that a system TASS LFA sonar makes with in-air sound th jumbo jet makes.

In other words, the Navy disagrees that 2 is the correct conversion factor, arguing ins for 35.5 dB, but then – as if to offer a com mise between the two positions – subtracts t both.

Battery by Boom Box

An exact correlation between sounds in air water may never be agreed upon. However one disputes the fact that a 230 dB soun water poses an immediate and severe thre humans and wildlife in the vicinity. Ironically best existing set of safety standards for exposu low-frequency sonar comes from the same i tution planning to contravene those stano with SURTASS LFA: the US Navy. In *Exp Guidelines for Navy Divers Exposed to L Frequency Active Sonar*, a 1996 report b Michael Pestorius of the University of Tex Austin and Capt. M.D. Curley of the N Submarine Medical Research Laboratory Groton, Connecticut, the authors describe a who was exposed to an underwater low cy sound of 160 dB. After twelve min diver experienced "dizziness, somnolence, ina ty to concentrate and residual tingling in ar He received medical attention on the spot recovered, only to suffer a relapse an hour the event and another while driving home

the hospital the next day. The diver, 32 years old at the time of exposure, later complained of irritability and memory loss, and underwent treatment for seizures and chronic depression.

Based on this and other examples of adverse human reaction to low-frequency subaquatic noise, the Navy established a 140 dB threshold of safety for human exposure to LF sound. One hundred forty decibels, says the Navy, is the loudest underwater sound to which a diver can safely be exposed.

A sound of 140 decibels is one ten-thousandth the intensity of a 180 dB sound, the Navy's "safe" level for marine mammal exposure to LFAS. The Navy claims that marine mammals, with their extraordinary sensitivity to the slightest sounds, can withstand a sound ten thousand times more intense than that proven to cause human beings immediate and lasting damage.

There is abundant and increasing evidence that the Navy is as wrong as common sense would dictate. On May 12 and 13, 1996, twelve Cuvier's beaked whales beached themselves in a 39 kilometer stretch of the Kyparissiakos Gulf, along Greece's Ionian coast. A thirteenth was found in an advanced state of decomposition two weeks later. Cuvier's beaked whales rarely beach themselves: Dr. A. Frantzis, in a short article published in the peer-reviewed journal *Nature* on March 5, 1998, observed that the NATO vessel *Alliance* had conducted LFA tests in the Kyparissiakos Gulf beginning on May 11. Frantzis noted "We know that LFAS was used in the Kyparissiakos Gulf. We also know that no other LFAS tests or mass strandings have occurred in the Greek Ionian Sea since 1981. Taking the past 16.5 years into account, the probablility of a mass stranding occurring for other reasons during the period of the LFAS tests is less than 0.07%."

A similar incident took place as this article was being prepared, on March 15, 2000, when the US Navy tested active sonar equipment off Abaco Island in the Bahamas. Within two days, thirteen whales had beached themselves on Abaco, Grand Bahama, and Eleuthera islands. The toll included Cuvier's whales, dense-beaked whales, an unidentified species of baleen whale, a minke whale and a spotted dolphin. According to the US National Marine Fisheries Service, two whales were bleeding from the eyes, suggesting acute trauma .

The Navy has denied any connection between the whale deaths and the active sonar tests. However, Michael Breynan, Director of the Bahamian Fisheries Department, told the Associated Press that he was unaware of any similar incident happening before in the Bahamas. Biologist Ken Balcomb, who has been involved in cetacean field research in the Bahamas since 1992, says that one or two whales strand in the Bahamas in an average year.

Scientists and environmental organizations, including Earth Island Institute, are calling on the Navy to suspend all LFA tests while an investigation is conducted into the strandings.

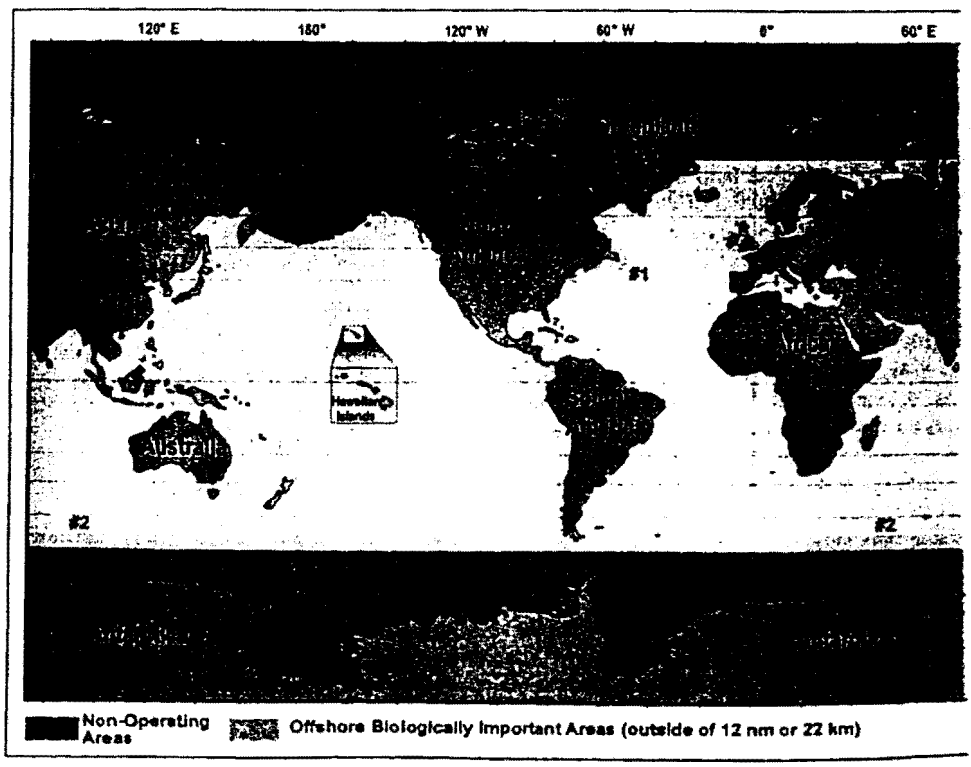
Other SURTASS LFA tests have done damage to whales. In March 1998, two humpback whale calves died after being separated from their mothers during tests of SURTASS LFA off the Hawai'ian Islands. (The tests were Phase III of the SURTASS LFA Scientific Research Program (SRP), phases I and II having taken place off the California Coast near San Nicolas Island in fall of 1997, and west of Monterey Bay in January 1998, respectively.) Humpbacks keep track of their young by voice, and any injury to the calves' (or mothers') hearing may have prevented them from reuniting with family members. Contemporary reports in the Honolulu *Star-Bulletin* described an unusually whale-free whale watching season following the tests.

Low-frequency noise need not kill an animal outright to do damage to the marine ecosystem. As noted, whales and other marine mammals rely on their hearing to feed and breed. Even if a whale is not mortally wounded by the intense shock of an LFA "ping," any hearing loss the whale suffers as a result may keep that whale from finding food, traditional breeding grounds, or members of its pod. As Benjamin White Jr. of the Animal Welfare Institute puts it, " A deaf whale is a dead whale, but it can take a very long time to die."

Animal activists and marine biologists say that even a few uses of an LFA system could damage populations of marine species past the point recovery is likely, and fear that such damag not be visible for weeks or months after the goes off. They decry the fact that the Navy's OEIS/EIS claims SURTASS LFA poses no whelming threat to cetaceans or other wi despite the fact that the Navy's tests includ long-term monitoring of animals in the test Migrating gray whales swerved dramaticall their normal route while LFA SRP phase II v progress near San Francisco Bay, and again d the next winter's southward migration. D phase I of the SRP in the Channel Islands researchers noted that fin and blue whales resp ed to the pings by decreasing the number of vocalizations: shutting up, in effect. Cetacean ogist Lindy Weigart of Canada's Dalh University notes that "we don't even know these vocalizations are used for, but the best gu that they are important in mating. A decrea calling whales... could easily translate into mates being located and thus a decline in po tion." In a response to the draft OEIS/EIS, We said "The most biologically significant effects a population parameters such as birth rate, gr rate, death rate, etc. These are largely unknown moreover unknowable, for most populatior cetaceans. A very limited, short-term study... w certainly not even begin to address such ques of biologically significant impact."

It is instructive to note that despite marked effects the LFA SRP activities hac marine mammals, none of the SRP test p even reached intensities as high as 160 dB a

The Navy's version of where SURTASS LFA will be u
SURTASS LFA draft OIES/



source. SURTASS LFA's planned operating intensity, as noted before, is 230 dB: ten million times more intense than 160 dB.

The Navy has responded to concerns about SURTASS LFA's potential for devastation of marine life by agreeing to a couple of mitigations, including attempts to monitor for the presence of marine mammals by high-frequency sonar and shutting down the system in their presence, a proposition of dubious likelihood during hostilities. At the forefront of the Navy's environmental promises is a stated commitment to refrain from using SURTASS LFA in proximity to the coastlines of the world, where much of the oceans' known biological diversity lies. A technical report for the SURTASS LFA EIS prepared on the Navy's behalf (and with Navy funding) by scientists at the University of California, Santa Cruz's Institute of Marine Sciences, baldly and repeatedly states that SURTASS LFA will not be used in nearshore waters, thus minimizing the effects on the biologically-rich littoral (coastal) environment. The Draft OEIS/EIS says that the Navy won't be using SURTASS LFA anywhere where a signal of 180 dB would be detectable within 12 nautical miles of land.

Looking at these assurances, and at the map in the OEIS/EIS of SURTASS LFA Sonar Potential Operating Areas (see graphic), one could logically reach the conclusion that SURTASS LFA is intended for use in the open ocean, much as SOSUS was used to detect the Soviet submarines of a generation ago. This conclusion would be reached in error. SURTASS LFA is intended, and has apparently always been intended, for use along the world's coastlines.

Going Coastal

In 1982, during the Falklands Islands war, an Argentinean fighter plane fired an Exocet missile at the British ship *Sheffield*, sending it to the bottom and killing twenty sailors. The incident propelled the navies of the world – or at least those whose governments insisted on invading other countries – to adjust their expectations of the kinds of risks they would face in wartime. The subsequent demise of the USSR capped this sea change in naval strategy. As the nature of naval warfare shifted from a long-term game of chess on the high seas to something more closely resembling Whack-A-Mole, anti-submarine warfare strategy and equipment came up lacking. Passive low-frequency sonar had been, and still is, adequate for detection of even the quietest submarines in deep water. Despite the increasing noisiness of the world's oceans, an undisputed fact which the US Navy advances as justification for SURTASS LFA, marked advances in computing and remote sensing more than make up for any increased masking of submarine noise. In February, 1997, the US Navy's Director of Submarine Warfare Rear Admiral Edmund Giambastiani told *Jane's Defense Weekly*, "Our view is that because of significant capabilities in processing, sensor apertures and the ability to net sensors together, passive is not dead... We feel there is [sic] still a lot of dB out there that we can mine."

On the continental shelf, it's a different story: passive sonar has never been effective in the littoral (coastal) environment. Shallow water, contorted rocky coastlines, and changes in salinity near estuaries and lagoons have been a source of frustration for anti-submarine warriors relying on sonar. Inconsistencies in the acoustic medium make passive sonar next to useless in the littoral environment. As long as littoral warfare remained a sideline to the main event on the high seas, this technological blind spot was considered not much more than an annoyance. But as littoral anti-submarine warfare moved to center stage, discussion of active sonar began in earnest, and that's when the LFA component was added to a SURTASS that had worked just fine on the open ocean. As Norman Friedman put it in a June 1, 1995 essay in *International Defense Review*:

During the Cold War, the major navies were concerned mainly with countering nuclear-powered submarines, often (though not always) in deep water, where low-frequency, long-range [passive] *sonar was the best sensor. Further, had a Third World War actually broken out, Western navies would have hunted Soviet submarines anywhere in the world's oceans, attacking them whenever they were found and, given the scale and scope of the war, errors would have been acceptable. Today, from a technical point of view, the threat now coincides quite closely with that faced by smaller navies for many years: diesel-electric submarines operating in coastal (littoral) waters. In addition, a limited operation against a Third World country entails different rules, and operations are likely to be geographically constrained and may be short of war, so that a potentially hostile submarine will have the initiative. Indeed, attacks which are premature or which accidentally sink other countries' submarines will cause grave diplomatic problems, possibly even leading to the operation being terminated.*

Of the many references to SURTASS LFA in defense trade publications throughout the 1990s, none – zero – have mentioned a use other than protecting US Navy ships as they enter the littoral waters of hostile foreign nations. There are no references to combat on the open ocean, nor to defending the coasts of the United States. LFA is, and has always been, intended for use in the world's biologically-rich coastal regions during US incursions into other countries, to reduce the likelihood of tactically acceptable but politically damaging casualties. The US Navy has weighed the extinction of marine mammals against potential political inconvenience, and decided in t of politics.

There are plenty of places where contin shelves extend far enough from the coa Navy could illuminate the shallow w remaining outside their "180 dB at 12 nau miles" limit. There are also plenty of places in world where the shelf is only a narrow strip a the coast, or where broad shallow seas hold diverse marine life that an arbitary 12-mile l means little in any biological sense. Such pl include potential political hotspots like the coasts of Ecuador and Peru; the horn of Africa Bay of Bengal; the East China, South China, Yellow seas; the Adriatic and Ionian seas; the Sea; and the Persian Gulf. It is possible that the Navy, out of a deep and abiding respect for ma life and the sanctity of its promises, will ref from ever using SURTASS LFA in such vulner areas. It is far more likely that the exigencie combat and – to be fair – an officer's concern the safety of the personnel under his or her c mand will outweigh concern for wildlife. O SURTASS LFA is deployed, it will be used w ever it is deemed necessary.

SURTASS LFA is not the first or only exan of a technology injurious to wildlife created to s port an interventionist foreign policy. It may, h ever, be the first time a weapon other than nuclear arms threatens the inadvertent of a whole raft of species. Viable alternative LFA exist in the field of littoral antisubmarine w fare. ASW helicopters, intelligent torpedos, other tech solutions have been advanced as L replacements. There is also the radical notion forestalling the conflict before it begins, by refr ing from selling diesel-electric submarines nations we know we'll likely be invading, or reconsidering the lost art of diplomacy with gunboats to back it up. Only public oppositio SURTASS LFA will force consideration of th alternatives. Whether the Navy sacrifices mar mammals out of fear of stateside political opp tion to its operations depends largely on the vo of the US citizens the Navy so fears.

What you can do: Please write or call y Representative and Senators, urging them DEFUND the Navy's LFA program (if you not know who your members of Congress contact your local Registrar of Voters or C Hall; the Congressional switchboard is (2 224-2121). Send the same message by writing calling President Bill Clinton, The White Ho 1600 Pennsylvania Ave., Washington, D (202) 456-1414 or e-mail <presiden house.gov>. For more info, send your e-n address to IMMP <marinemammal@ear island.org> and ask to be put on our special L alert list.

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Main Article 1675 words
With sidebars 2750 words

Beneath the Silent Sea

The Department of the Navy is up to something mysterious and it has me troubled. My usual suspicion of their incentives drives this concern, but this new project seems particularly sinister, and I believe it will impact our global quality of life as deeply as our fearful web of nuclear deterrence. While the proposed project may not immediately thicken the winds of anxiety that blew through Los Alamos a half-century ago, it will spread that anxiety into our oceans, sharing it with whales, dolphins, pelagic (deep ocean) fish and countless other species that inhabit the sea. The consequences of this may not become immediately apparent to us, but as the project develops it will surely compromise the health of our co-species around the globe and coincidentally the availability of our own food supply.

What the Navy is proposing – and to some extent already doing, involves generating extremely loud noises in the ocean, loud enough to be heard hundreds to thousands of miles across the sea. While they have some history with this technique in a questionable program named Acoustic Thermography of Ocean Climate (ATOC,) purportedly monitoring the long term temperature trends of the deep ocean, the new proposal threatens to ratchet up the overall human generated noise in the oceans to an unprecedented degree. The program is named Surveillance Towed Array Sonar System (SURTASS) utilizing Low Frequency Active Sonar (LFAS.) The Navy's stated objective is to monitor hostile submarine activity using long wavelength sonar in a crude adaptation of a communication and navigation technique used by whales, schooling fish and other deep water organisms. The Navy will be doing this without regard for the existing web of sounds that keep the ocean creatures in touch with their kin, their surroundings and their food sources. So far they have been able to roll their proposals forward with limited resistance from the public because few people are conversant in the issues and people by-and-large consider the deep ocean a silent expanse of uninhabited water. While polluting the seas with extreme noise seems intuitively inadvisable, in order

to really understand the issues we need to overcome our anthropocentricity – we need to consider the possibilities of things outside of our usual range of perception and we need to recognize that often our most "cutting edge" technologies are only rough approximations of the elegant natural phenomena that weave the fabric of our universe together.

The Silent Sea

The ocean is not a visual place. Under the best of circumstances underwater visibility is 100 feet; sunlight does not penetrate down below a few hundred feet from the surface, much less when the water is teeming with plankton, algae and other food sources. The perceptual vocabulary of the sea is auditory, chemical and electrical. We don't realize this because our organs of auditory, electrical and chemical perceptions are poorly adapted to underwater use. We are not likely to sniff for underwater odors, trying to speak underwater is almost as futile, and our ears don't translate underwater sounds well in a submerged pressure gradient. Much of the sounds we do "hear" underwater such as those generated by whales and dolphins, we hear through our bodies – and then only within our auditory range of 20Hz – 20kHz. We know that dolphins sing in pitches well above 120kHz and whales sound in deep tones as low as a few cycles/second, though acoustical energy generated by the bodies of whales or even large schools of fish can be lower still.

Over the past few decades we have developed an understanding of the properties of the higher frequencies used by dolphins. Due to their short wavelength, we use these high frequencies in ultrasonic imaging. Soft tissue does not resonate and interfere with short wavelengths, this allows high frequency sound to "see" through skin, muscle and fat. Dolphins use ultrasound to help distinguish soft tissue from bone in their prey – enabling them to feed effectively. It is likely that they use this imaging in the complex array of their communication as well. Lower frequency "infrasound" use by animals is more of a mystery to us. One of the properties of infrasound is that the longer wavelengths tend to adhere to the curvature of the globe. Longer wavelengths are also less subject to diffusion and absorption by obstacles in the water. The large wave fronts are too large to "see"

anything but the largest geographical features. Sea mounts, islands and continents are distinguishable, boats and kelp beds are not. This makes low frequency ideal for navigation and long distance communication. We know that elephants use infrasound to communicate and navigate over land distances of up to ten kilometers, and while nobody has asked them, informed speculation would indicate that whales use their low frequency sounds to communicate and navigate over long distances as well.

So what about the "less complex" organisms; the schooling fish, sea turtles, pelagic crabs, jellyfish, shrimp and the panoply of other denizens that migrate seasonally around the seas? While it is likely that these migrations are informed by factors such as temperature, salinity and the magnetic flux of the earth, it is just as reasonable to assume that underwater acoustics also plays a part; that the low frequency sounds of waves undulating and hitting the shores, submarine tectonic and volcanic activity and acoustical ambience also details the maps that migrating creatures follow.

In the cases of tuna and other schooling fish, the acoustical energy generated by their bodies helps the individual fish synchronize with the low frequency swimming oscillations of the entire school. The lateral line and swim bladder of the fish is an evolutionary adaptation of our own ears – a sensor of vibration and an organ of balance and motion. These organs allow a fish to sense or "hear" motion by way of pressure gradients in their surroundings. When individuals at the perimeter of the school respond to exterior movement such as that generated by a predator, their evasive action transmits the pressure gradient of the predator's motion into the body of the school, informing the school of the appropriate evasive action – without the individual's need to communicate the specifics of the threat. By this mechanism a school of fish – as a body –will respond to motion in less than $1/50^{th}$ of a second.

While the energy sensed by schooling fish is not "sound" in the general sense that we perceive it – i.e. vibrational energy that *we* can hear, it is none-the-less acoustical energy. It is low frequency energy that these animals rely on to establish their placement within the body of the school. These fish may even get acoustical feedback in this range from their environment as the long wavelength, low frequency energy of the school reflects off

of the sea mounts, islands and continents, helping the school establish their placement in the ocean.

This may all seem a bit too speculative; this line of conjecture is not firmly supported by a general body of scientific inquiry – I can only leave that judgement to the scientific community and their funding sources. Meanwhile we have a military program of global oceanic consequences rolling ahead with a dearth of public information or understanding. It might be prudent to speculate a bit in hopes that we avoid learning the truth the hard way, and too late.

So what is the Navy Really up to?

What the Navy is proposing is a system of very high powered sound generators placed in various places around the oceans – some stationary, others towed behind ships. These sound generators are capable of generating 250 dB (re: 1 mPa) noise, noise that is 100,000 to 1 million times louder than the loudest whale and perhaps a billion times louder than the subtle acoustical signals used by other animals. The Navy wants to generate a thrum of noise in all oceans where they have interest in submarine activity. They claim that their long wave sonar system will allow them to keep track of hostile submarine activity throughout the seas, though the physics of this is questionable.

The sounds that SURTASS LFA generates includes pulsed and swept tones between 100Hz and 10 kHz. The underwater wavelength of these fundamental tones are between 50 feet for 100 Hz and 6 inches for 10 kHz. These wavelengths even at high volume would only be suitable for sonar detection within a few miles of the source due to diffusion and the curvature of the earth. Though by combining and sweeping these tones, combination tones with wavelengths of hundreds to thousands of feet can be created. This is somewhat akin to Frequency Modulated (FM) radio waves creating lower frequency artifacts that can be translated into audio band information. Herein lies the crux of the technology: Combing higher frequencies in various ways will create low frequency, long wavelength tones. These longer wavelengths adhere to the curvature of the earth, "seeing" over the underwater horizon, enabling the system to broadcast and compromise thousands of cubic miles of ocean. By structure, these long wavelengths are too long to

detect small objects; detecting a 200' submarine across thousands of cubic miles of ocean with a 500' wave front is akin to searching for amoebas in a swimming pool with a telescope.

So while the Navy is portraying SURTASS as a surveillance tool, it is more likely that they are setting up a global submarine communication system that will enable them to keep in constant contact with the entire nuclear fleet – in a crude approximation of how a school of fishes keep in contact. Up until recently submarines relied upon low frequency radio waves for communication. These long wavelength radio waves also adhered to the curvature of the globe allowing over-the-horizon capabilities. Radio waves don't penetrate the ocean surface, so in order to receive these long radio waves, the submarines need to tow long antennae – a mile or more in length – on the ocean surface. With recent advances in satellite surveillance these antennae are fairly easy to spot making the system unworkable for clandestine deployment of our nuclear arsenal. On the other hand, underwater sound communication is completely clandestine to current surveillance technologies – it can't be detected from above the ocean surface and the long wavelengths make the source difficult to pinpoint underwater. With the volume levels and wavelengths currently used in the ATOC system, long distance communication between Monterrey and Hawai'i is possible – a distance of about 3000 miles. For these reasons, sound communication "beneath the silent sea" is irresistible to the Navy – particularly if they keep the public in the dark about the true nature of their work.

Is it more sinister to use this pernicious technology for communication rather than using it for surveillance? From my perspective any reason is the wrong one for violating the sanctity of the sea, but what irks me most about it is that while the Navy is portraying their system as a defensive system, it is in fact an offensive tool – they are torquing up the global fear with the justification that danger is everywhere. Is this a justification for environmental disruption at this scale?

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Sidebars:

Why the confusion?

Perhaps the greatest source of confusion around the discussion of underwater acoustics lies in how we quantify and qualify the submarine environment. The terms used are the same as terms used in an air environment, but the properties of water and air differ significantly. Air is compressible, water is not; sound travels five time faster in water than in air, and thus the wavelengths are 5 times longer; the ocean has a distinct sound reflective boundary at the surface that channels longer wavelength sound. The deep ocean has a thermoclime akin to the stratosphere that also enables "channeling" of acoustical energy.

The decibel (dB) is used to evaluate energy levels in both environments, but a dB is not a specific quantity of energy, rather it is an expression of relative energy levels. The decibel is a logarithmic scale, so every increase of 10 dB represents a tenfold increase of energy. 10 dB indicates ten times more energy than 0 dB, 20 dB is 100 times more, 30 dB a thousand, 60 dB a million and so forth. In air the reference level of 0 dB equates to the energy level at the lowest threshold of human hearing. This measure has no significance underwater, so the reference level shifts down to a mathematically more convenient number, resulting is a 60 dB relative difference between air and water decibel measurements.

There they go again...

It is hard to conceive the extent of damage that extreme acoustical energy can cause. The noises generated by SURTASS LFA are the loudest noises ever generated by humans with the possible exception of the noise at nuclear "Ground Zero." Since the beginning of the Navy's use of this technology, environmental scientists have advised against it. It is not surprising that after almost every known Navy test, whales and dolphins show up on beaches for "mysterious reasons," some with bleeding eyes, damaged and infected cochlea and other unusual tissue damage. It would be hard to determine the extent of sea life that sinks to the ocean floor once killed by Low Frequency Active Sonar.

The Canary Islands - A total of 21 whale strandings in 1985, 1988, and 1989 were linked to visible US Navy maneuvers. These were the only times whales were reported to strand in the Canary Islands. (*Nature*, 1991)

The Atlantic Coast - In a 1987 Navy experiment, dolphins exposed to 235 decibels of sonar stranded and were found to suffer from lung tissue explosion. Since this revelation, there has been a great deal of resistance to obtain autopsies that check for this particular problem.

Northern California -The first public test of ATOC in November of 1995 was followed by the beaching of three humpback whales – all buried before autopsies could be performed.

The Haro Strait, San Juan Islands - In the Summer of 1996, 195 decibels were sent into this key waterway used by orcas, porpoises, seals and other mammals, followed by an increase in strandings of these mammals. *ABC News* recently reported that the previously thriving orca population from this area is now in enough trouble to be considered eligible for the Endangered Species list.

The Mediterranean Sea near Greece - In 1996, twelve Cuvier beaked whales exposed to NATO sonar were found stranded. At the same time 200 stranded dolphins and were suspected of suffering from tissue explosion. (*Nature*, 1996)

The Hawaiian Islands - In 1998, three whale calves and one dolphin calf were found dead or abandoned during and immediately following sonar testing, even though in 15 years of research this phenomenon had never been observed. One of these was a distressed whale calf that breached 230 times and pectoral slapped 658 times in front of Dr. Marsha Green's research team in a four-hour period before the sun set on his distress. In addition, a pod of dolphins was observed by naturalists familiar with normal dolphin behavior huddling unusually close to the shore near the surface and vocalizing excessively while the sound was on.

California - Since the testing in California began in 1997, sonar exposed whales immediately began to strand in increased numbers. In addition, there was a report of

uncharacteristically aggressive behavior. More recently, *The Malibu Times* reported in January, 1999, that more than 150 gray whales were found dead due to starvation along their migratory route where testing took place in 1998. On October 3 1999, three pilot whales beached of on U.S. Virgin Islands St. Croix, St. John, and St. Thomas, coincident with Navy maneuvers

Australia - The Australian government has questioned a connection between observed US Navy and NATO maneuvering and strandings off their shores.

The Bahamas - Most recently in March 2000, about a dozen beaked whales stranded on various beaches, a rare occurrence as they are not typically schooling animals – a 1998 report in *Nature* found that only four beaked whale strandings had occurred since 1963. National Marine Fisheries spokesperson reported that two of these whales had eyes that were bleeding, "suggesting acute shock trauma." (*S.F. Chronicle* March 22, 2000.)

Without exception the Navy maintains that these strandings are only "anecdotal," that there is no connection to their testing and thus refuse to consider them worthy of being pursued.

Want more information?

There are quite a number of organizations and websites with information on SURTASS LFA and ATOC, from the informative and action oriented – to the sentimental and hysterical. Some helpful information can be excavated from the following:

The Natural Resources Defense Council has information under the Marine Mammal link at their website http://www.nrdc.org.

The Ocean Mammal Institute has helpful information at http://www.oceanmammalinst.com.

A diverse listing can be found at http://www.angelfire.com/ca/fishattorney/lfaslinks.html

Information about SURTASS LFA from its proponents can be found at http://www.trwiuss.com/pmw182.

Information about the Acoustic Thermography of Oceanic Climates (ATOC) can be found at http://atoc.ucsd.edu.

For a glowing Environmental Impact Statement sponsored by the Navy, you can visit their site at http://www.surtass-lfa-eis.com. This site has an executive summary of the 400 page EIS full of hard scientific phrases such as "conservative assumptions," "risk continuum" and "...it has been postulated." Typically the EIS evaluation of animal evasive response is based on equivalent assumptions of human behavior and perceptions.

About the Author:

Michael Stocker is an acoustician and technologist. He is currently writing "Hear Where We Are: Reawakening the Sensuality of Sound Perception," a book exploring how sound affects our sense of placement and how we humans and other animals use sound to connect with our surroundings.

The following text includes some answers to questions about sound posed by Larry Morningstar. I have heard many of these questions more than once, so these answers may illuminate some questions you may have about decibels, sound levels and the differences behaviour of sound in water and air. – Larry's questions are in *italics.*

Larry,

To answer your questions:

1) I am still a bit unclear over the difference between the comparison of dB in water and air...

The real problem here is that people want to try to draw numerical analogies between two dissimilar things. This is somewhat akin to trying to determine how many angels fit on the head of a pin. While there may be some useful reasons to determine the relative acoustical wattage – how much physical "work" is done with the sound power in air over water, the real answer is that sound works differently in air than in water.

Part of the confusion is the use of decibels for measurement. "Decibels" are not an absolute quantitative measurement but rather a convenient way of expressing relative quantities - the ratio between a reference point and the quantity you want to express. In order to establish a relative level between two "quantities" of acoustical energy, you must first establish your reference point. For the sake of convenience, this point is established as "Zero," so 0 dB actually represents a quantity of "something."

In an airborne acoustical environment, this "Zero" level has been established as the absolute minimum acoustical energy needed to excite the human tympanic membrane and is equivalent to the expression of atmospheric pressure of 20microPascals or .0002 dyne/cm2. (With this "absolute reference" to human perception, you may already see where this measurement has its drawbacks.)

To derive this 60 dB difference between the sound pressure level (SPL) in air versus water thatb the Navy uses in their arguments, the same benchmark of human hearing was established - i.e. "0dB" is equivalent to the absolute minimum acoustical energy needed to excite the human tympanic membrane underwater. I don't think that this benchmark was established by putting people's heads underwater, rather some other mechanical means was probably used. Through this highly precise, and very objective process, it was determined that about 60 dB more energy was needed in the system to get the desired results, so the reference of 1 micro Pascal was established for underwater acoustical measurement.

Now, I could be a bit off on this. They could have used 1 mPa because the number was convenient - then put the subjects heads underwater - but as you see, this "60 dB difference" thing is relative to human perception as a starting point. Because our ears are poorly adapted to underwater hearing, the whole argument is rather specious.

Outside of this basic "numbers comparison" thing, air and water behave entirely different when excited with sound. Air is compressible so sound attenuation in air over distance is inversely proportional to the square of the distance. Water is not compressible so it doesn't work this way. Water works more like a piston, so attenuation is NOT inversely related to the square of the distance, but rather depends on many other factors such as the environmental geometry, temperature, pressure gradients, turbulence, diffusion, turbidity etc. To bring these factors to the table in the discussion would confuse things far too much, so for the sake of argument, 60 dB has been used.

*2) Is the following statement from you article *unarguably* true? Please understand, I don't doubt it, I have just heard so many varying opinions on this, including the Navy saying that we are overstating sound intensities by a million times.*

>...The noises generated by
>SURTASS LFA are the loudest noises ever generated by humans,
>with the possible exception of the noise at nuclear "Ground
>Zero."

There may be studies of extremely high levels of acoustical energy that I am not aware of, but if this is the case, it would likely have been some other military application where destroying things was the objective. I would stand my credibility on this comment.

*3) You mention 250 dB at source for LFAS deployment. I am interested where that number comes from. The figure we have been working with is an *effective* source level of 240 dB for an array of towed transmitters.*

I don't recall the actual source of 250 dB. If you are working with 240 dB, I wouldn't quibble. While this 10 dB difference is 10 times the energy, at these levels the argument is akin to whether it takes six hundred or six thousand 20-megaton bombs to destroy a country...

I hope this helps. If you have any other questions, please feel free to call me. I am not a big e-mail fan, so I don't always respond to these letters.

Best Regards,

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Navy Role in Whale Deaths?

The recent increase in beached Gray whales along their spring migratory route may actually be a good thing. Death accompanies life – and with the estimated 26,000 whales now traveling the west cost of the continent – up from just a few thousand in 1946 – it would follow that more whales are also not surviving the journey. Illness, collision with cargo ships and starvation due to limited food supply always take a toll. However, what is remarkable about this year's attrition – over 30 in the San Francisco bay area alone as of late March – is that few of these individuals show signs of typical death; most have good body fat, few have the regular pattern of propeller inflicted contusions, and most appear by all other terms to be healthy. This inconsistency has raised speculation about the cause, and suspicion is high that somehow we humans may have some unnatural role in the deaths.

A coincidental event that may point to a human role in the deaths is that in October 1999, the U.S. National Marine Fisheries Services approved an Environmental Impact Statement (EIS) permitting the U.S. Navy to indiscriminately deploy an underwater communication system called Surveillance Towed Array Sonar System (SURTASS) utilizing Low Frequency Active Sonar (LFAS.) This system uses extremely loud noises to communicate with – and purportedly to locate – submarines across thousands of miles of open ocean throughout the world. In order for the system work the Navy needs to generate noise with 100,000 to 1 million times the acoustic energy of the loudest whales.

The EIS generated by Navy scientists explains in glowing terms how the whales and dolphins are not bothered by this noise, though much evidence to the contrary was excluded from the report. Reports of high numbers of unusual cetacean strandings coincident with Navy tests were brushed off as "anecdotal" by the Navy. Included in

these anecdotal events are the twelve Cuvier beaked whales and 200 dolphins stranded on the shores of the Mediterranean near Greece during a 1996 NATO test; the more than 150 Gray whales found dead due to starvation along their California migratory route where testing took place in 1998; the October 1999 stranding of three pilot whales in the U.S. Virgin Islands shortly after Navy tests; and most recently this year, the March 13 – 17 stranding of 17 beaked whales in the Bahamas during tests.

Many of these individual animal showed signs of unusual tissue damage including hemorrhaged eyes, imploded lungs and other organ damage hard to explain by typical catastrophic natural events or illness. The circumstantial evidence indicates that as the Navy's use of SURTASS – LFAS and associated technologies increases, so too do the incidents of unusual and unexplained cetacean deaths, strandings and disorientations.

What is SURTASS-LFAS and why does the Navy need it? If the Navy is to be believed, SURTASS is a long range sonar system that enables them to locate and track hostile submarines throughout the Seven Seas using extremely loud, low frequency, long wavelength noise that can be heard thousands of miles from its source. These long wavelengths of 500' or greater are supposed to bounce off relatively miniscule objects – 200' submarines – in thousands of cubic miles of ocean to give the Navy concise information about the vessel's identity and location. In scale and application this would be akin to using a telescope to locate amoebas in a swimming pool.

It is more likely that SURTASS –LFAS is a communication system enabling the Navy to communicate on a moment by moment basis with their Nuclear Fleet. Until the development of this underwater communication system, nuclear submarines – which otherwise can remain submerged and hidden for months – relied on long wavelength radio transmission for communication. Radio waves do not effectively penetrate water, requiring the subs to drag a long antennae – one to two miles long – along the surface of the ocean. In the last ten years orbital satellite metal detection instruments have become much more sensitive; a satellite orbiting at 150 miles can now easily detect a two mile cable on the ocean surface. Therefore, with the current state of the art in satellite

surveillance, these long antennae seriously compromise the surreptitious benefits of the subs. With this situation, the Navy has needed to develop a less obvious method to communicate, and an obvious choice was to keep all communication underwater.

In an earlier benchmark program called Acoustic Thermography of Ocean Climates (ATOC) the Navy proved it could send and receive coherent sound between Monterrey, California and Kauai, Hawai'i – a distance of over 3000 miles. ATOC dates back as far as 1987, uses stationary transmitters broadcasting on a regular and predictable schedule. Unlike ATOC, SURTASS is transportable, and since the system approval by the National Marine Fisheries Service it can be used at the Navy's discretion. And while the SURTASS system cannot be heard above water, nor be precisely located underwater, it can definitely be heard underwater. This feature is creating a serious liability to whales, dolphins, fish and other deep water animals. Because the ocean is not a visual place – visibility in the best of circumstances is 100' – ocean animals rely on acoustical, chemical and thermal cues to determine where they are, where their kin is and where food is. Polluting their environment with excessive unwanted noise will only have a deleterious affect on their ability to survive.

If there is some good fortune in the most recent strandings of beaked whales in the Bahamas and the dramatic increase in unusual strandings in California, it is that public suspicion has been aroused. The Bahamas incident occurred during the Navy Littoral Warfare Advanced Development Sea Test (LWAD 00-1), also concurrent with the gray whale spring migration strandings. Outcry has reached a pitch, and scrutiny of the Navy methods has become more acute. The Natural Resources Defense Council and Humane Society of the United States – among other organizations – have driven strong opposition to the project. Increased pressure on the National Marine Fisheries Service, and unresolved questions of the NMFS staff have directed them to reevaluate the Navy EIS in light of the omitted information. As of May 25, the Navy's scheduled test LWAD 00-2 off the east coast of the United States has been temporarily postponed, indicating at least a small victory for the oceanic environment.

While this minor reprieve is hopeful, it is a relatively small step against the tide of a program that has expanded over the last decade. To date $350 million has been spent on the SURTASS-LFAS system alone. With this much momentum, and the critical "need" for the program, it is unlikely that the Navy will just "grab their toys and go home."

The U.S. Navy is obligated to respond to review and inquiry by U.S. governmental organizations such as the NMFS, the Supreme Court, and ultimately the voting public. Unfortunately with globalization being the catchword for today's "planetary management," it will take a global effort to halt this devastating technology. And if the Navy has temporarily halted a test off U.S. coastal waters, they are none-the-less proceeding with LFAS test in the Mediterranean Sea titled "Dynamic Mix" with our NATO allies. This test began in late May and will run into June in the Kyparissiakos Gulf off the coast of Greece.

About the Author:

Michael Stocker is an acoustician, naturalist and technologist. He is currently writing "Hear Where We Are: Reawakening the Sensuality of Sound Perception," a book exploring how sound affects our sense of placement and how we humans and other animals use sound to connect with our surroundings.

U.S. Navy, High Intensity Sonar, and Marine Mammals: A Chronology

1980-1995 - Navy defines new, more silent submarines as a threat because passive listening devices deployed on ocean floor cannot detect them. Without preparing an environmental impact statement (EIS), as required by the National Environmental Policy Act (NEPA), the Navy decides to develop Low Frequency Active Sonar (LFAS) to detect silent submarines and proceeds with the design, engineering, fabrication, software preparation, hardware manufacturing, ship leasing, and other components of a full-scale development program. Without an EIS, formal consultations with the National Marine Fisheries Service (NMFS), or permits under the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA), the Navy conducts extensive tests of LFAS in various locations in international waters. Navy incorrectly claims above laws do not apply in the Exclusive Economic Zone (EEZ) of foreign nations.

1995 - Natural Resources Defense Council (NRDC) responds to information about planned deployment of the LFAS system by sending a letter to the Secretary of the Navy calling attention to all the environmental laws violated during the development and testing process. By this time, Navy has spent tens of millions of dollars on development and testing of LFAS. NEPA forbids such expenditures prior to the preparation of an EIS.

1996 - Navy responds to NRDC challenge by committing to preparation of an environmental impact statement for routine deployment of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar. Proposed EIS does not include assessment of environmental impacts of use during threat or warfare conditions. Navy also commits to Scientific Research Program (SRP) to test effects of low-level LFAS broadcasts on limited number of whale species. Navy consults with NMFS and receives permits for testing, which include required mitigation measures and required suspension of testing, if whales behave in unusual ways such as repeated breaching, pec fin or tail slapping.

1997 - The Marine Mammal Commission discusses the Navy's LFAS in its 1997 Annual Report to Congress. In this report the Commission pointed out that if the LFAS system were made available for worldwide use as proposed by the Navy, all species and populations of marine mammals, including those listed as endangered and threatened under the ESA possibly could be affected. The Commission also pointed out that the Navy's notice about their LFAS deployment plans made no mention of the MMPA which prohibits harassment of marine mammals as a result of activities such as the proposed sonar. Finally, the Commission pointed out that the possible effects of the LFAS on marine mammals could include:

- death from lung hemorrhage or other tissue trauma;
- temporary or permanent hearing loss or impairment;
- disruption of feeding, breeding, nursing, acoustic communication and sensing, or other vital behavior and, if the disruption is severe, frequent, or long-lasting, possible decreases in individual survival and productivity and corresponding decreases in population size and productivity;
- psychological and physiological stress, making animals more vulnerable to disease, parasites, and predation;
- changes in the distribution, abundance, or productivity of important marine mammal prey species and subsequent decreases in both individual marine mammal survival and productivity and in population size and productivity.

With regard to the last point, the Commission noted that changes in prey species possibly could be caused both directly and indirectly by the LFAS transmissions. For example, transmissions conceivably could kill or impair development of the eggs and larval forms of one or more important marine mammal prey species. They might also disrupt feeding, spawning, and other vital functions or cause shifts in distribution patterns of certain important prey species and make some prey species more vulnerable to disease, parasites, and being eaten by other predators.

July-October 1999 - During the public comment period for the DEIS, numerous organizations, scientists and individuals file comments and questions regarding deficiencies in the DEIS. See http://manyrooms.com/deisdocs.html for some of these comments.

October 3, 1999 - Four beaked whales strand in the Caribbean, one each on St. Thomas and St. John and two on St. Croix. Two of the whales die. A professor who was conducting underwater reef studies with his students on October 3rd near St. John said their work was interrupted by a series of underwater sounds so loud they had to get their heads out of the water. Dr. Antonio Manucci, head of the Marine Mammal Stranding Network in Puerto Rico said there was "circumstantial evidence of underwater sound associated with whale strandings". Manucci also said, "the Navy has requested that one of the heads of the whales be studied by an expert at Harvard University". Dr. Darlene Ketten, a specialist in auditory trauma at Harvard University confirmed she would visit Puerto Rico to join Manucci's investigation. Inquiries made to Dr. Manucci's office about results of the investigation have not been answered.

August-November 1999 - During the public comment period on the Navy's request for a Letter of Authorization to take marine mammals by harassment during deployment of LFAS, numerous organizations and individuals file comments with NMFS pointing out deficiencies in Navy research on LFAS to date. Those comments include the fact that the scientists conducting the studies underlying the DEIS have not yet completed their analysis of the results and that the full source level of LFAS was never tested.

January 2000 - A formal notice of violation is sent to Secretary of Commerce William Daley and Secretary of the Navy Richard Danzig. This notice is based on the Navy continuing to make irreversible and irretrievable commitments of resources to SURTASS LFA deployment prior to completing an EIS, which is a violation of NEPA and ESA. The notice is sent pursuant to an ESA requirement for sixty days notice to the Secretary of Commerce and the violator prior to the initiation of court action.

February 29, 2000 - Ten environmental organizations and an elected official file suit in Honolulu Federal Court challenging the Navy plans to deploy SURTASS LFA. Suit alleges illegal commitments of resources, lack of objectivity in the EIS process, and NMFS' improper consideration of application for authorization to harass marine mammals during deployment of LFAS given Navy violations of NEPA and ESA. (See http://go.to/lfaslawsuit or http://www.ilhawaii.net/~light/lfaindex.html)

March 2, 2000 - After asking if more tests on LFAS are planned for the future, Dr. Marsha Green, President of OMI, receives an E-mail from the Office of Naval Research, describing new plans by Navy to conduct further LFAS testing in the Azores in July-August 2000 as part of the LFA SRP and, perhaps, elsewhere later. (See http://www.ilhawaii.net/~light/gisiner.html)

March 14, 2000 - Hawaii County Green Party files motion to reopen their 1998 case based on the above Navy plans to conduct additional LFAS testing in the marine environment. (In 1998 the Navy told the court that LFAS testing was complete. This resulted in two lawsuits attempting to stop the testing being declared moot.) Motion discusses Navy position that permits are not required for testing in foreign EEZs, which can extend up to 200 miles from the foreign three-mile limit.

March 15, 2000 - Green Party learns of second E-mail from Office of Naval Research stating that permits are required for testing outside the three-mile limit of a foreign country and within foreign EEZs. This contradicts the earlier Navy position that permits were not required in foreign EEZs for LFAS tests conducted previously. (See 1980-1995)

March 16, 2000 - Green Party files supplement to motion to reopen their 1998 case bringing the above email to the attention of the court.

Week of March 13-17, 2000 - Seventeen cetaceans strand in Bahamas (seven died) at the same time Navy conducts tests and exercises using various sonar devices, including high intensity (235 dB) broadcasts. The tests are known as Littoral Warfare Advanced Development (LWAD) Sea Tests. The Bahamas test is LWAD 00-1. Navy claims stranding is coincidence. Stranded whales come from at least four different species in three families of two suborders of cetaceans. Six animals were sent to

frequency active sonar, such as LWAD 00-2 intends to use (e.g. Mediterranean 1996), and it relies upon an inadequate discussion of available data.

May 10, 2000 - Environmental groups and scientists hold a press conference in Washington, D.C. calling for a moratorium on any further high intensity sonar testing. Ben White, Animal Welfare Institute coordinates the press conference and speakers. Joel Reynolds, NRDC Senior Attorney, introduces the issues. Ken Balcomb, Director of the Center for Whale Research, reports on the emerging evidence that the whale deaths in the Bahamas trace to some form of shock trauma. Blood in the eyes, and type of tissue damage all point to some explosive or high intensity sound source. Dr. Marsha Green, President of OMI, discusses the impact of sound on cetaceans and problems with the Navy's extrapolating from the results of tests done at low levels to conclude that active sonar deployed at much higher levels will not be harmful. Dr. Naomi Rose, Marine Mammal Scientist for the Humane Society of the United States, issues the call for the moratorium. Dr. Charles Bernard, former Navy weapons development specialist, criticizes the LFAS technology from a military perspective.

May 12, 2000 - NRDC and HSUS send a letter to Secretary of the Navy Richard Danzig urging postponement of LWAD 00-2. The letter raises numerous legal and scientific objections to the test.

May 15, 2000 - Attorney for plaintiffs in February 2000 litigation sends second set of comments on LWAD 00-2 OEA to NMFS. The comments direct NMFS' attention to evidence in the DEIS for SURTASS LFA deployment that the claims of safe levels in the OEA actually derive from the Scientific Research Program (SRP) conducted as part of the LFAS DEIS preparation. The comments suggest that the Navy's failure to directly include the DEIS information with the OEA constitutes a serious omission and that, had those documents been included, NMFS would have been required to wait to give approval for LWAD 00-2 tests because such decisions cannot be made based on draft documents.

May 9-19, 2000 - Navy pressures NMFS to not require formal consultations for LWAD 00-2 tests off New Jersey coast. Environmentalists and scientists opposed to LFAS deployment mount campaign to build support for the formal consultations recommendation.

May 19, 2000 - Patricia Kurkul, Regional Administrator, Northeast Region, NMFS sends letter to Navy stating that NMFS is "not able to concur with your determination that the proposed action is not likely to adversely affect listed species." The letter cites the limited time given to NMFS to review the project; the deficiencies in the OEA, including a failure to include the latest research evidence available on various issues; the imprecise descriptions given of the intensity of planned broadcasts; questionable evidence, methodology, and conclusions regarding impacts on marine life; and inadequate discussion of potential impacts on turtles. The letter concludes that "NMFS recommends formal consultation under Section 7 of the [Endangered Species Act]."

May 24, 2000 - A letter signed by 52 organizations is individually delivered to each congressional office asking Congress to convene an oversight hearing to investigate the environmental hazards of active sonar devices in use or planned for future use by the US Navy. The letter also asked for an immediate cessation of all development, testing and deployment of the Navy's proposed LFAS System until such time as Congress determines it is necessary and can be used safely in the ocean environment.

May 25, 2000 - Navy cancels LWAD 00-2 tests off New Jersey coast. Instead, density surveys of marine mammals will be conducted using only commercial locators and passive arrays. There will be no use of LFAS.

May 26, 2000 - Federal Defendants file opposition to motion to reopen 1998 Hawaii case. Opposition includes a statement that the planned testing on sperm whales in the Azores will not take place in 2000.

May 28, 2000 - Attorney for plaintiffs in February 2000 Hawaii litigation files motion to supplement the earlier motion to reopen the Green Parties' 1998 case. The new motion brings LWAD 00-2 to the court's attention and argues that the Navy plan to conduct further tests with low frequency active sonar in the marine environment, possibly affecting marine mammals, is further support for the argument that the 1998 case is not moot.

July 6, 2000 - OMI and others are notified by the Office of Naval Research that all requests for the Delaware Bay Environmental Assessment must be submitted in writing. Letter or fax acceptable. OMI faxes written request for EA to Office of Naval Research. As of August 10, 2000 we have not yet received it.

New Jersey Department of Environmental Protection (DEP) does not grant approval for Delaware Bay Experiment. A letter from Richard Kopp, Land Use Management Director of the New Jersey DEP, states the Navy, "has failed to demonstrate the proposed [Delaware Bay] experiment will not present more than minimal interference with marine fish or fisheries." Kopp's letter details numerous deficiencies in the Navy's application including inadequate research into the effects of underwater sound on marine life, an inadequate plan to address any marine life problems that may occur and a failure to consider alternative experimental methods such as using a wave tank. Kopp also advises the Navy to allow more time when seeking approval of future applications

July 8, 2000 - The following public notice is published in the Hawaii Office of Environmental Quality Control Publication, "The Environmental Notice":

> **Project:** U.S. Navy Potential use of the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar in Waters Surrounding the State of Hawaii.
> **Federal Action**; Direct Federal Activity
> **Federal Agency**: Department of the Navy
> **Contact**: Joseph S. Johnson, (703) 604-7882
> **Consultant**: Marine Acoustics, Inc.
> **Contact:** Clayton H. Spikes, (703) 465-8404
> **Location:** Ocean Waters surrounding the State of Hawaii
> **Proposed Action:** The U.S. Navy is proposing the potential use the SURTASS LFA sonar in waters surrounding the State of Hawaii, excluding ocean areas necessary to prevent exposure of 180 decibels within 22 kilometers / 12 nautical miles of land and 145 decibels within known recreational and commercial dive sites. SURTASS LFA sonar is intended to provide improved submarine detection capabilities, thereby sustaining its antisubmarine warfare mission.
> **Comments Due:** July 31, 2000

Individuals and organizations send comments about inadequacies in LFAS testing program and in the DEIS to Hawaii Coastal Zone Management Program.

July 10, 2000 - Judge Kay denies request to reopen 1998 case and dismisses 2000 case. Judge does note that a recently released report from the Woods Hole Oceanographic Institute on the 1998 Hawai`i testing contains evidence that LFAS broadcasts lead to changes in humpback whale songs, that such singing is considered to be related to mating, and, therefore, that the new study suggests severe restrictions on the use of LFAS in Hawaiian waters would be appropriate.

July 28, 2000 - Assistant Secretary of the U.S. Navy Robert Pirie tells CNN that U.S. Navy did have an operational sonar exercise in the Bahamas in March 2000, "that was closely correlated with the ...strandings and that's the source of our concern."

The Navy has not yet announced when the final EIS will be completed.

Glossary:

DEIS - Draft Environmental Impact Statement
EEZ - Exclusive Economic Zone, a zone beginning outside the three-mile limits of nations bordering oceans and extending up to 200 miles
EA - Environmental Assessment
EIS - Environmental Impact Statement
ESA - Endangered Species Act
HSUS - Humane Society of the United States
LFA or LFAS - Low Frequency Active Sonar
LWAD - Littoral Warfare Advanced Development
MMPA - Marine Mammal Protection Act

The U.S. Navy's Low Frequency Active Sonar and Other Acoustic Technology: Cause for Concern

Marsha L. Green, Ph.D.
Ocean Mammal Institute
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Low frequency active sonar (LFA sonar) is a dangerous technology that has the potential to kill, deafen and/or disorient whales, dolphins and all marine life, as well as humans, in the water. It is the loudest nonexplosive sound ever put into the world's oceans. The U.S. Navy is planning to deploy it in 80% of the world's oceans at an effective level of 240 decibels (dB) in order to detect quiet submarines. NATO also has this technology and in 1995 LFA sonar testing by NATO in the Mediterranean was correlated with stranding of beaked whales.

Background Information on the Impact of Underwater Noise on Marine Mammals and Fish

There is a significant body of research showing that whales avoid underwater sounds starting at 110-120 dB re 1 μ Pa. (In this paper all decibel levels refer to a reference pressure level of 1 μ Pa). Several studies (Malme et al., 1983, 1984, 1986, 1988) show that grey whales begin to avoid sounds at exposure levels of 110 dB and more than 80% of the whales showed avoidance to sounds of 130 dB. Ninety percent of the whales avoided airgun pulses at 180 dB. Typically whales slowed down and moved around the sound source. At times they moved into the shallow surf zone to avoid the noise, respiration rates increased and there were indications that mother-calf pairs were more sensitive to the noise than other whales.

Bowhead whales react to a received level of 115dB and Ljungblad et al., (1988) noted behavioral changes in bowhead whales more than 8 km away from seismic vessels with received noise levels of 142 – 157 dB. Bowles et al., (1994) reported that sperm whales stopped vocalizing in response to a seismic vessel hundreds of kilometers away.

In a report submitted to National Marine Fisheries Service in March, 1998 on the impact of engine noise on the Hawaiian humpback whale, researchers at the Ocean Mammal Institute found that whales swim 2 to 3 times faster away from engines of 120 dB than they do around quieter engines. Research by the Ocean Mammal Institute

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also shows that the presence of a boat up to ½ mile away significantly changes the behavior of humpback whales.

While cetaceans show avoidance behavior to sounds starting around 115 dB, more intense sounds can cause physiological damage. Noise also can mask biologically important signals such as vocalizations by other animals. Richardson et al., (1991) suggest that if baleen whales show low auditory thresholds for low frequency sounds, then sound levels of 195-210 dB might result in immediate damage to their auditory organs. Lien et al., (1993) studied reactions of humpback whales in response to explosions and drilling off Newfoundland. Their data revealed only small changes in residency, movements and general behavior. However, two humpback whales trapped in fishing gear after the explosions were found to have severely damaged ear structures similar to blast injury in humans. Lien et al. noted that the whales showed no dramatic behavioral reaction to these harmful sounds and cautioned that whales' visible short-term reactions to loud sounds may not be a valid measure of the degree of impact of the sound on them.

In their chapter "Underwater Noise Pollution and its Significance for Whales and Dolphins", (In Simmonds and Hutchinson, 1996), Jonathan Gordon and Anna Moscrop state that shock waves caused by intense underwater sound sources can cause direct tissue damage. Animals with air filled lungs and swim bladders are especially vulnerable because of the large difference in impedance between air in the lungs and their body tissues or sea water. Submerged animals exposed to explosions at short range showed hemorrhage in the lungs and ulceration of the gastro-intestinal tract.

Sound also can have a deleterious biological effect by initiating the growth of stabilized microbubbles that are known to exist in mammalian tissue. Gas bubbles larger than a few tens of microns can block capillaries which can lead to pathological conditions. Crum and Mao (1996) calculated the growth rates of bubbles exposed to low frequency acoustic fields. Their results indicate that for sound pressure levels in excess of 210 dB (re 1μ Pa) significant bubble growth can be expected to occur, and divers and marine mammals exposed to these conditions could be at risk. Dr. Crum (personal communication) has also indicated that microbubble growth could be enhanced by acoustic fields of less than 210 dB.

Loud underwater sounds also, of course, affect fish and other marine life. Studies show harmful effects of even moderate noise on hearing in fish and the viability of fish eggs exposed to noisy environments was significantly reduced (Myrberg, 1990). On March 10, 1998 the "Seattle Times" reported that hundreds of dead

fish appeared in Lake Washington after 240 dB airgun blasts were used to test for earthquake faults. Seismometers dozens of miles away picked up the air gun pulses and nearby residents felt their beds shaking.

Documented Effects of Sonar on Whales and Humans

After WWII the Norwegians used sonar to hunt whales because they found the sonar frightened especially baleen whales and caused a predictable flight response making them easier to catch. (Mitchell et al., 1981) Sperm whales became silent, stopped their activities and scattered in response to military sonar signals (Watkins et al., 1985) and humpback whales showed avoidance when sonar was played back to them (Maybaum, 1989).

In 1991 Simmonds and Lopez-Jurado in Nature noted the association between three strandings of whales (including two pygmy sperm whales, a bottle-nosed whale and eighteen beaked whales) in the Canary Islands in 1985, 1988 and 1989 and the times at which naval fleets had been visibly operating in the area close to stranding sites. Local people were aware of such naval maneuvers only three times since 1985 and on each occasion mass live strandings occurred. In a more recent statement in Nature (March 5, 1998), Alexandros Frantzis linked a stranding of Cuvier's beaked whales in the Mediterranean to military low frequency active (LFA) sonar trials the day before. Cuvier's beaked whales rarely strand. A Bioacoustics Panel investigated this stranding and it is clear that the NATO vessel transmitting the LFA sonar came within 10 km of the beach where the whales stranded. The panel concluded these whales were exposed to LFA sonar at 150-160 dB.

The US Navy's proposed LFA sonar will produce a sound field of 150-160 dB up to at least 100 miles away from the transmitting vessel, putting large numbers of whales, dolphins and other marine life at risk. In July and early August, 1998 a beaked whale and a sperm whale were found dead on Kauai (Hawaii) during or shortly after the Navy was engaged in maneuvers in Hawaii (RIMPAC '98). There is evidence that a stranding of beaked whales in the Caribbean in October 1999 was due to LFA sonar as people in the water heard the loud sounds and got out of the water. Dolphin strandings in the Florida Keys in January, 2000 were correlated with Navy maneuvers in the area as was a stranding of several species of whales and dolphins in the Bahamas in March, 2000. The Navy reported they were using only an activated sonobuoy system during the Bahamas stranding as part of an exercise called LWAD 00-1, although their Overseas Environmental Assessment for the exercise stated they would use several types of sonic devices.

The Bahama stranding was unprecedented because it involved multiple species and numbers rarely, if ever seen on those islands. It is the second well-documented stranding of beaked whales during sonar testing. (The first being the Mediterranean stranding in 1996 documented in Nature, 1998). At least two of the stranded whales in the Bahamas were bleeding from their eyes and necropsies showed tissue damage by a pressure wave. This shock trauma evidence is consistent with exposure to high intensity active sonar.

A spokesperson for National Marine Fisheries Service (NMFS) was quoted in the press saying the Navy's Overseas Environmental Assessment prepared for the tests near the Bahamas, "called for sounds of about 200 dB at 6,600 to 9,500 cycles per second." Since the Navy says they did not use Low Frequency Active Sonar in the Bahamas, the evidence suggests they have other active sonars in addition to LFAS, that can disorient cetaceans and possibly cause strandings.

The Navy also was planning to conduct an LWAD 00-2 exercise off the coast of New Jersey starting May 22, 2000. Patricia Kurkul, the Regional Administrator for NMFS sent a letter to the Navy shortly before May 22 stating that the Overseas Environmental Assessment they prepared for NMFS review just prior to the testing was incomplete and underestimated the biological impacts to animals exposed to the proposed sound levels. She goes on to say, "One weakness in the OEA is the discussion of the source levels. The specifications given in Table 2.21 are vague, as the XF-4 array is described only as greater than 210 dB re 1 μPa + 1 meter. It is important to know how much greater than 210 dB the sound source will be as well as whether the sound is sweeping or pure tones. We also have questions regarding the impulsive and coherent source sound pressure levels and the rates of sound decay versus distance from the source .... The information provided in the OEA on the acoustics appears to be incomplete and therefore difficult to assess the project's impacts. For instance NMFS believes the increase to 194 dB in Table 4.2-5 for "temporary threshold shifts", is questionable ...." Ms. Kurkul continues with many other critical comments on the Navy's assessment of the impact of LWAD 00-2 tests on marine animals. Her comments concur precisely with many of the criticisms of the Navy's Draft EIS on LFAS made by scientists and sent to NMFS last fall. The unfortunate thing is the Navy has consistently denied the criticisms and continues to present inadequate assessments of the potential damage from their underwater acoustic testing. The Bahamas stranding during LWAD 00-1 was possibly the result of the Navy's unwillingness to acknowledge reasonable cautionary statements raised by scientists and environmentalists about acoustic impacts on marine mammals.

On August 25, 1994 a scuba diver was accidentally exposed to testing of the US Navy's LFA sonar system. (Comments submitted at Public Hearing of California Coastal Commission, 12/12/97). The ship

transmitting the sonar was over 100 miles northwest of the diver who reported distinct and disorienting lung vibration as a result. Pestorius and Curley (1996) exposed Navy divers to low frequency active sonar and reported that one of the divers had to be hospitalized and was later under treatment for seizures. A Hawaiian resident who was in the water when the Navy was conducting their low frequency active sonar test in Hawaii in March, 1998 was disoriented and nauseous afterward and had to see a physician who diagnosed her with symptoms comparable to acute trauma. (Declaration filed in court, March 25, 1998.) The Navy admitted that this swimmer was exposed to the sonar at 120 dB while she was in the water, far below the operational sonar at 240 dB. In her court declaration this woman also detailed the behavior of nearby dolphins while the broadcast was taking place. The dolphins' behavior, in her view as a naturalist and long term observer of dolphins, was abnormal, including staying close to shore, staying near the surface and vocalizing excessively.

According to the Navy's own test results on the bioeffects of low frequency (100-500 Hz, which is the frequency range of LFA) underwater sound on human divers, at 140-148 dB a small number of divers rate their aversion to the sound as very severe. At 157 dB they estimate that at least 20% of divers will immediately abort an open ocean dive. At 160 dB they say the lung resonance created by LFA may induce "significant decrements in vestibular function." This effect on vestibular function may have caused the stranding of the beaked whales in the Mediterranean (Nature, 1998) when they were exposed to the sonar at 150-160 dB. Lung hemorrhaging was observed in rodents exposed to 170-184 dB. Above 184 dB liver hemorrhage and soft tissue damage are likely. The Navy says significant concussion effects are unlikely to occur at levels below 194 dB but don't explain how they reached this conclusion. According to the Navy's Draft Environmental Impact Statement the sonar sound field around the transmitting ship will be 180 dB up to 1 km away and 150-160 dB up to 160 km away (100 mi). This means that many marine animals will be exposed to LFA sonar levels capable of causing stranding and, possibly, lung hemorrhaging over large areas of the ocean.

U.S. Navy's LFA Sonar Tests on Whales (1997-1998)

From 1980 to 1995 the Navy developed and tested LFA sonar without obeying any of the applicable environmental laws. While the Navy was illegally developing and testing LFA sonar, they were also building a ship (TAGOS-23, estimated cost $60 million) to deploy the sonar. The Navy finally agreed to prepare an Environmental Impact Statement (EIS) after being challenged by environmental groups. They hired Christopher

Clark (Cornell U.) and Peter Tyack (Woods Hole Oceanographic Institute) to test the effects of the sonar on blue, fin, gray and humpback whales in 1997 and 1998. It is important to note that the LFA sonar test levels were always much lower than the actual sonar which is about 240 dB.

In 1997 and 1998 the Navy conducted tests of LFA sonar on blue, fin, grey and humpback whales. The tests were done to develop data for their federally mandated Environmental Impact Statement. As stated above, it is important to remember that the tests always used sound levels that had at least 5,000 times less acoustic intensity and 70 times less pressure than the actual sonar. Figure 28 in the "Quicklook" which briefly summarizes Phase I of the testing on blue and fin whales off California (available from Dr. Christopher Clark, Cornell Univ. Laboratory of Ornithology, Ithaca, NY) indicates that blue whales decreased their vocalizations by about 50% and fin whales decreased by about 30% when the LFA sonar sound was on. Since whale vocalizations are believed to be used to attract and find mates, interference with their vocalizations could affect long-term reproductive rates. In Phase II of the tests on grey whales Dr. Peter Tyack reports the whales moved 1-2 kilometers laterally to avoid the 185 dB test sound source. He said the whales started their avoidance over 1 km away from the playback source.

Hawaii Test

LFA sonar was tested on humpback whales in Hawaii during March, 1998. During the one month test period, two cetacean calves (a humpback calf and a spinner dolphin calf) were observed in the test area without their mother by research personnel from the Ocean Mammal Institute. A third lone, melon-headed whale calf was also found in the test area by tourists.

On March 9, 1998 OMI's research team observed and recorded detailed behavioral data on a lone humpback whale calf for four hours from a shore-based research site. The calf breached 230 times (an average of 57 times per hour) and pec-slapped 671 times (an average of 167 times per hour) in four hours. This calf was very agitated and appeared to be exhausted as it got dark. Researchers lost track of the calf at nightfall and could not find it the next day. The Navy's scientists refer to this abandoned calf on pp. 25 and 26 of the "Hawaii Quicklook" and say, "This would be a highly unusual event under normal conditions . . . ." On March 12, 1998 OMI personnel and other individuals on nearby boats observed and photographed a lone dolphin calf about 3 weeks old. On about April 3, 1998 people noticed and later rescued a very dehydrated, lone melon-headed whale calf that was near death. While this calf was discovered a few days after the testing stopped, it was clear it had been separated from its mother for several days.

Abandoned cetacean calves are very rare. At the Ocean Mammal Institute we have never observed or heard of anyone else observing an abandoned cetacean calf in nine years of research in the Hawaiian Islands. The fact that we have never seen abandoned calves before and that all 3 of these lone calves were found during or immediately after the testing in the relatively small LFA testing area north of Kona, and no where else in the Hawaiian islands, suggests there may be a relationship between the LFA sonar tests and the abandoned calves. The sonar tests may cause disorientation (as it possibly did in the stranded beaked whales in the Mediterranean, discussed in Nature) so mothers and calves become separated and then cannot find each other. Or, perhaps, the mothers died. Dr. Linda Weilgart, who has studied whale communication for 16 years, in her testimony before a federal judge to stop the Hawaii LFA sonar test stated, "it is entirely plausible that unnatural acoustic disturbances to which these animals are not adapted could interfere with the crucial mother-calf bond." The sighting of three abandoned calves in one month in the LFA testing area and no where else, is a very serious warning about the possible effects of LFA sonar that needs further investigation.

Testimony from whale-watch boat captains, an aerial survey done by the Ocean Mammal Institute and data collected by the Navy's shore-based research team all indicate that whales left the LFA test area during the testing. Ocean Mammal Institute did an aerial survey of whales around the Big Island on March 12, 1998 and found no whales around and just north of Keohole Point which was defined by the Navy as the northern area where the LFA test sound would have the highest impact reaching shore. By contrast, aerial surveys done around the Big Island in March, 1993 and March, 1995 showed that the largest concentration of whales was around and just north of Keohole Point, the same area that was devoid of whales in 1998. OMI's aerial survey team did, however, see whales just south and north of the sonar test area.

The Navy's shore-based research team counted significantly fewer whales after March 18, 1998 than during that time period in previous years when the sonar was not being tested. One Kona whalewatch company suspended operations one month earlier than usual because they hadn't seen a whale for 5 days in late March, 1998..

Data from the Navy's Hawaii tests also show that 14 out of 17 or 80% of singing humpback whales tested stopped singing when exposed to the low level sonar. Since singing may have a reproductive function in humpback whales this could affect long term reproductive rates in this endangered species.

Summary: Cause for Concern

Available evidence indicates there were effects from the low level sonar tests as follows:

1. LFA sonar tests caused large decreases in vocalizations in blue and fin whales.
2. LFA sonar tests caused grey whales to alter their migration route to avoid the test sound.
3. Eighty percent of singing humpback whales stopped singing when exposed to the low level test sound.
4. Three lone cetacean calves were found in the small LFA test area off Hawaii during and immediately after the tests.
5. Aerial surveys and other sources indicate whales left the LFA sonar test area during the March, 1998 tests in Hawaii.

It is important to remember that all these LFA sonar tests were conducted at levels using at least 5,000 less acoustic intensity and 70 times less pressure than the actual sonar which will be deployed at a source level of 240 dB. The highest test level used in Hawaii was 203dB but most of the time it was much lower. On page 5 of the "Hawaii Quicklook" the scientists hired by the Navy say, "The research did not use the full source level of LFA." On p. 6 they say, "... this Phase III research was specifically designed to expose animals to LFA sounds at levels that are not harmful." Even at these low levels, specifically chosen to be not harmful, whales left the test area, three abandoned calves were found in the area and 80% of the whales tested stopped singing. In the Executive Summary they say, "... it will be difficult to extrapolate from these results to predict responses at higher exposure levels." But now the Navy is doing exactly what their own hired scientists said it would be difficult to do. In their Draft Environmental Impact Statement the Navy concludes that it is safe to deploy the sonar at 240 decibels even though testing was done at sound levels 5,000 times less intense than their deployment level. This is not sound decision-making.

Since LFA sonar was tested on only 4 species of whales for about one month each at an acoustic intensity at least 5,000 times lower than the actual sonar, we know virtually nothing about what impact the real sonar will have on humans, whales, dolphins, fish and other marine life. Are we willing to spend millions, and perhaps billions, of dollars on a system that puts all marine life at risk based on such glaringly inadequate information?

The only responsible course of action is to not deploy this damaging technology.

Marine Mammal Commission Cautions about LFA Sonar

The Marine Mammal Commission, a federal agency charged with protecting marine mammals discussed the Navy's LFA sonar in its annual report to Congress (Jan. 31, 1998). In its report the Commission pointed out that if the LFA system were made available for worldwide use as proposed by the Navy, all species and populations of marine mammals, including those listed as endangered and threatened under the Endangered Species Act possibly could be affected. The Commission also pointed out that the Navy's notice about their LFA sonar deployment plans made no mention of the Marine Mammal Protection Act which prohibits harassment of marine mammals as a result of activities such as the proposed sonar. Finally, the Commission pointed out that the possible effects of the LFA sonar on marine mammals could include:

- death from lung hemorrhage or other tissue trauma;
- temporary or permanent hearing loss or impairment;
- disruption of feeding, breeding, nursing, acoustic communication and sensing, or other vital behavior and, if the disruption is severe, frequent, or longlasting, possible decreases in individual survival and productivity and corresponding decreases in population size and productivity;
- psychological and physiological stress, making animals more vulnerable to disease, parasites, and predation;
- changes in the distribution, abundance, or productivity of important marine mammal prey species and subsequent decreases in both individual marine mammal survival and productivity and in population size and productivity.

With regard to the last point, the Commission noted that changes in prey species possibly could be caused both directly and indirectly by the LFA sonar transmissions. For example, transmissions conceivably could kill or impair development of the eggs and larval forms of one or more important marine mammal prey species. They might also disrupt feeding, spawning, and other vital functions or cause shifts in distribution patterns of certain important prey species and make some prey species more vulnerable to disease, parasites, and being eaten by other predators.

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NAVY SONAR PROGRAM PUTTING ALL OCEAN CREATURES AT RISK

Hi, It's Mahalia, sending information on the Navy's use of sonar in Hawaii which is threatening the existence of whales, dolphins, and other

sea life, and it is also dangerous to humans. Their current use of and plan for the proliferation of sonar on a planetary scale is one of the most vile activities I have ever heard of, truly an environmental nightmare. I spoke with Marsha Green, scientist, and head of the Ocean Mammal Institute, who feels as I do, that we are perched on the edge of a monumental environmental disaster, that will have ramifications effecting the entire planet, if the Navy is not stopped in their deployment of sonar.

The following is the basic part of a letter that I have sent to governmental people, friends, etc. If you decide to help , it will save a great deal of time for you.

After the letter there is an excellent paper with the background of the situation and pertinent details. It lays out exactly who to contact in the government, and lists web sites with further information. I have also included information on the lawsuit which has just been filed against the Navy. (the initial law suits referred to in the informational paper were dropped by the courts as moot when the Navy temporarily stopped testing in Hawaii !!) The Navy has admitted that they will begin testing on new types of whales (particularly sensitive to sound!!) in the Azores in a few months and may return then to Hawaii in addition. The details on this are in an update at the end of the email. Please let me know your thoughts on the matter or if you have any questions, and please pass this on to everyone you know who may me interested in writing letters, in contributing money, or in assisting in any other way. Believe it or not, there are very few people working on this, and so much needs to be done. Aside from writing to the leaders listed below, getting the congress to act is primary (see details in the email), media coverage is necessary, and funds are needed. Thank you for your consideration. Mahalia

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Dear

It has recently come to my attention that the high decibel levels that the Navy is using, and plans to use on a global scale, are placing whales, dolphins,and all marine life at severe risk. The testing of the Low Frequency Active Sonar in Hawaii, at lower decibel levels than are proposed to be used globally, have already shown to cause whales to thrash and breach for hours and to beach themselves and to die. The purpose of the sonar is to find any silent submarines that could be a threat to the US. Some defense analysts state that the sonar system is designed to face a threat profile that is currently insufficient to warrant funding of the program.(Billions have already

been spent!!) Technology has advanced since the time the Navy initiated this program, other non threatening methods are available, and the cold war is over. The sonar is an expensive waste of taxpayers money, and threatens to cause extinction to many of our fellow creatures that are a part of the web of life of our planet.

Low Frequency Active Sonar (LFAS) harms ocean life.
Congress has not been told the truth about LFAS. Congress must conduct a review of whether the Navy is conducting an environmental impact process that is open, comprehensive, and objective, or ignoring evidence and analysis that would call into question the safety of the SURTASS LFA system.

Congress must also conduct a review on whether the SURTASS LFA technology is obsolete. The technology may actually pose a threat to U.S. submarines by creating bounced signals foreign nations can detect.

Congress must ask the General Accounting Office to conduct an independent review of the SURTASS LFA program.
National Marine Fisheries Service must delay all actions until receiving a completed Environmental Impact Statement.
No further rule making proposals can occur until a full opportunity for environmental review of the completed Environmental Impact Statement by the public and Congress has been assured.
The Environmental Impact Statement process must not be circumvented and the sonar technology; which has already caused the deaths of numerous whales, be denied any advanced letter of authorization from National Marine Fisheries Service.

Who is protecting America's shores from Low Frequency Active Sonar?

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The Following is an excellent article which summarizes the history and status of Low Frequency Active Sonar, testing and use.

The US Navy's Low Frequency Active Sonar:
A Dangerous & Deadly Threat to Whales & Dolphins

A) LFAS... WHAT IS IT?

** The full name is "SURTASS LFAS" a U.S. Navy acronym for "Surveillance Towed Array Sensor System/ Low Frequency Active Sonar."
Often referred to as LFAS or LFA Sonar or just LFA

** A loud, underwater sonar designed to detect today's quiet submarines.

** A loud, underwater sonar whose long-term effects on marine life are unknown to science.

B) HOW LOUD IS IT?

** Broadcasting at up to 240 decibels (dB), this low frequency sound can travel thousands of kilometers and can injure, deafen, and even kill marine mammals, as well as humans, who are too close to the source.

** 240 dB has been said to be the loudest underwater sound ever made by man, aside from an explosion.

** The decibel scale is logarithmic, so a small increase in decibel level greatly increases the acoustic intensity.

1) A BRIEF HISTORY OF LFAS

In the 1980s the US Navy began development of a Low Frequency Active (LFA) Sonar system in order to detect a new class of so called "silent submarines," in case any of our cold war adversaries might develop such a fleet. This project remained virtually unknown until 1995, when -- with LFA Sonar (LFAS) on the verge of being deployed in 80% of the world's oceans -- the Natural Resources Defense Council (NRDC) became aware of the program and of the fact that the Navy had never filed an Environmental Impact Statement (EIS). NRDC sent a letter to the Navy threatening to sue because the Navy was violating numerous environmental laws. To avoid a lawsuit from NRDC, the Navy decided to file an EIS on LFAS.

To obtain data for their draft EIS -- the first step in the EIS process -- the Navy conducted experiments to determine at what sound level LFAS would harm marine life. In 1997 and 1998 the Navy conducted tests of LFA Sonar on blue, fin, grey, and humpback whales off the coasts of California and the Big Island of Hawaii -- in a National Marine Sanctuary for Humpback Whales. It is important to note that test levels were always much lower than the 240 dB level at which the Navy wants to deploy LFAS.

In March 1998 the Navy came to the waters off the Big Island of Hawai'i and began broadcasting LFAS. Almost immediately whale watch boat captains began reporting whales leaving the test area, and these reports were filed with the National Marine Fisheries Service (NMFS). A swimmer who was in the ocean at the time of one of the tests was ensonified by the LFAS transmission at 120 dB. [Note, since the decibel scale increases exponentially, the proposed 240 dB deployment level is NOT twice the 120 dB that this swimmer was exposed to, but -- and this is not a typo or a miscalculation -- it is one trillion times as strong! That is one million millions times as strong.... a totally incomprehensible number for most of us.] She was diagnosed within an hour of her exposure as having symptoms comparable to acute trauma.

Three abandoned cetacean calves were sited in the area of the Hawaiian testing: two whale calves and one dolphin calf. One abandoned calf would be extremely unusual, and three -- all of different species -- is unprecedented. NMFS claimed that they did not believe the reports of these abandoned calves, although two of the sitings were made by an experienced research team from the Ocean Mammal Institute (OMI), and the third abandoned calf was actually rescued and sent to Honolulu. The OMI research team observed the abandoned humpback whale calf as it breached an incredible 230 times and pec-slapped 671 times in four hours! This calf was very agitated and appeared to be exhausted as it got dark.

The NMFS permit under which the tests were being conducted stated that the tests would be suspended if whales left the test area or if other acute behavioral responses occurred, but NMFS did not suspend the tests. The failure to suspend testing and the injury to the swimmer were part ofthe reason that three separate law suits were filed to stop the testing.

A previous lawsuit had already been filed to prevent the testing before it began. The Navy subsequently quit testing and stated to the courts that they had no intention of conducting further tests. At that point, the court dismissed these four lawsuits as moot, without ruling on their merits. The Navy now claims that, "Previous legal challenges in Hawaiian courts have confirmed that the requirements of applicable environmental law were met in all cases." That claim is totally unwarranted, and blatantly misrepresents the facts.

The Cold War is over. Nevertheless, the Navy continues to spend public resources on LFAS. To date they have spent over 350 Million US tax dollars on this project.

For much more information on LFAS testing in Hawaiian waters, the abandoned whale and dolphin calves, and effects of LFAS on people in the water, go to: http://www.oceanmammalinst.org/mgpaper.html

2) DANGERS OF LFA SONAR

According to Linda Weilgart, PhD -- a research associate at Dalhousie University, in Halifax, Nova Scotia, and a leading expert in sperm whale acoustic communication: "Sound travels very efficiently in water, and the lives of fish andwhales revolve around sound. They use sound to feed, mate, navigate, detect predators, and communicate with one another.
"Use of LFAS could well alter hearing ability in whales and other marine animals over a 15-mile radius, and could cause profound behavioral disturbance over an area bigger than Texas.

"The Navy says it has proven through its own studies that LFAS has no significant impact on any marine animal. But its studies were carried outover a matter of weeks on only four species. Its study did not include the deep divers such as the Cuvier's beaked whale, which are thought to be most at risk because the sound is loudest down deep. The Navy's claim is simply ludicrous.
"I have studied whale communication for 17 years. I know how difficult it is to study whales in the wild. Painstaking research over many years yields only the tiniest glimpse of whales' lives.
"The Navy has studied only short-term, observable reactions, which are all but meaningless."

-- From an article titled "When Sound Is Dangerous," by Dr. Linda Weilgart, published in the Christian Science Monitor, 10/28/99. The complete article can be found at http://www.csmonitor.com/durable/1999/10/28/fp21s2-csm.shtml

In testimony for one of the lawsuits filed to stop the Navy's testing of LFAS in Hawaiian waters, Dr. Linda Weilgart wrote that she thought the sounds might disrupt the mother - calf bond. That is apparently exactly what did happen in the cases of the three abandoned calves mentioned above. Dr. Marsha Green of the Ocean Mammal Institute believes that LFAS disorients whales and dolphins so much that mothers and calves get separated, and whales and dolphins strand themselves on beaches. It is important to remember that 1) whales and dolphins have extremely sensitive hearing, 2) water is an extremely good transmitter of sound, and 3) that LFAS's low frequency sounds are extremely loud, with the potential of bone crushing intensity.

The extremely high energy sound waves required by LFAS pose a serious danger to many forms of marine life, including sea turtles and fish. The sounds can be heardas far away as New Zealand and California.

The Navy tested LFAS at levels between 140 decibels (dB) and 180 dB, occasionally as high as 205 dB. Their plan is to deploy it at a source level of up to 240 dB. That would be over 1,000,000,000 ** that's ONE BILLION ** times louder than 145 dB (again, remember that decibels are a logarithmic scale: 20 dB is not 2x as loud as 10 dB, but 10x as loud), the level which the draft Environmental Impact Statement finds acceptable for divers. It would be one of the most powerful underwater sounds ever created by humans, with the exception of the soundswithin close range of an explosion. When you consider that the scientific assumption prior to the latest Navy tests was that whales would avoid sounds of 120 dB, you get an idea of how incredibly dangerous the Navy's

LFAS could be... especially to whales and dolphins with their super sensitive hearing.
According to researcher Dr. Marsha Green of the Ocean Mammal Institute, "No one knows the impact to marine life at 240 decibels. If at 140 decibels we see abandoned calves, whales leaving the test area, and 80% of whales stopping their songs, we can't imagine what would happen at 240 decibels, except to know that the LFA sonar will put all marine life at risk in all the oceans of the world."

A March 5, 1998, article in the respected scientific journal "Nature" conclusively linked a NATO test of LFAS in the Mediterranean Sea to the mass strandings of 12 Cuvier's beaked whales, which beached themselves and died, apparently as a panic reaction to the sound. The Navy totally disregarded this event in their Draft Environmental Impact Statement. When questioned on this, Joe Johnson of the Navy stated that it was "not a peer-reviewed study but was a letter to the editor." In actuality, it was a peer reviewed article in one of the most highly respected scientific journals. As Dr. Lee Tepley states, "Furthermore, there was a study by NATO which would probably never have been done if not for the letter by Dr. Frantzis. Many scientists participated in the NATO study which is about 100 pages long.... It does include data that show that the LFAS ship came within less than 10 kilometers of the beach where the whales were stranded and that the whales were exposed to a sound level of at least 150-160 dB which is very loud - clearly loud enough to have caused something bad to have happened to the beaked whales." A copy of the article "Does Acoustic Testing Strand Whales?" by Professor Alexandros Frantzis of the University of Athens is posted at http://www.geocities.com/shootdaguy/frantzis.jpg

3) DISREGARD FOR THE ENVIRONMENTAL IMPACT STATEMENT PROCESS

Soon after issuing the draft EIS, the Navy applied to NMFS for a five year permit to deploy the system based on the draft EIS. There are serious questions about whether NMFS can objectively evaluate that application.

The Navy is asking NMFS for permission to "harass marine mammals" with "an incidental take" (incidental take = killing) of those same marine mammals, some of which are on the endangered species list. Horrendous!

US law requires -- and this is written into the Navy's DEIS -- that the Navy consider a "No Action Alternative." This would be a decision that the environmental impacts of the system are too great to allow it to be deployed.

It is notable that the names of two members of the NMFS Office of Protected Species appear in the Navy's DEIS as preparing the document. This same office is now supposed to decide whether the DEIS provides sufficient assurances to allow the issuance of a permit. The person to contact at NMFS is one of the two people appearing as an author of the Navy document. This presents a blatant conflict of interest.

The NMFS has joined the US Navy in making a mockery of the EIS process, and in showing an utter disregard for the input of citizenry, environmental groups, and experts on cetacean hearing and communication.

4) EXCERPT FROM A RECENT MESSAGE BY LANNY SINKIN, A HILO ATTORNEY WHO IN 1998 FILED TWO OF THE FOUR LAWSUITS TO STOP THE NAVY'S TESTING OF LFAS IN HAWAIIAN WATERS:

Will SURTASS LFA destroy all life in the ocean? Almost certainly not.
Will SURTASS LFA kill all the whales? Probably not, depending on how

extensive and loud the use is. Short of making those kinds of claims, however, the possibilities we have raised regarding potential damage from SURTASS LFA are all within the realm of possibility.

The burden of proof is on the United States Navy. The Navy is proposing to deploy a low frequency active sonar system into the world's oceans. Will that system harm marine mammals, marine flora, or other marine life? Has the Navy taken a hard look at that question? Is the evidence available sufficient to take a hard look at that question? If there are major gaps in the evidence, does the precautionary principle call for the Navy to avoid deployment? The Navy is avoiding all these questions.

Returning to the question of alternatives, the fact is that on April 26,

1999, the United States Navy awarded a contract for $107 million to Lockheed Martin Corporation of Manassas, Virginia for "Phase II [I wonder what Phase I was] of a deep water, undersea surveillance system." The system is described as a "long life, passive acoustic surveillance system that can be configured for multiple mission applications." Among the applications are "long-term barrier and field acoustic surveillance, long-range acoustic surveillance coverage of open ocean areas, and acoustic surveillance in areas with high ambient noise."

Can this passive system detect the type of submarines for which SURTASS LFA was supposedly developed? I do not know. What I do know is that advances in technological capabilities have been huge since the initial decision in the late 1980s to develop SURTASS LFA. I would make an educated guess that the passive system discussed above tied into highly sophisticated computers capable of identifying whatever sounds are recorded or at least of picking out signatures of engine sounds is capable of detecting the newer silent submarines.

A primary purpose of the National Environmental Policy Act (NEPA), under which the Navy is now preparing an environmental impact statement, is to

force decision makers to consider alternatives, including the alternative to take no action. Even when the Navy finally agreed to prepare an EIS under threat of suit by NRDC, the Navy did notconsider any alternatives to SURTASS LFA and continued to spend money preparing to deploy SURTASS LFA. With the Navy having already spent more than $350 million preparing for deployment, the questions of objectivity are most obviously directed at the Navy, not at those who question whether the Navy is adequately considering the environmental impacts of deployment. When you add into the mix that the Navy has deliberately omitted any discussion of the adverse effects of testing off Hawai`i presented to the federal courts during the testing and has refused to independently investigate those reports, the picture begins to emerge of an agency caught in the headlights of an old policy on which hundreds of millions of dollars have been spent and blinded to the truths emerging about why that policy was a mistake.

5) CONCLUSIONS

Neither the Navy nor NMFS should make the final determination as to whether or not LFAS is needed for national security. This decision should be made by Congress which, in the process, should not only consider the dangers that LFAS poses to whales and dolphins, but also the many arguments that LFAS is not needed. For example, in it's comments to NMFS on the Navy's application, the Sierra Club states, "Defense analysts for military publications such as Jane's Defense Weekly and US Government budget critics have argued that LFAS is designed to face a threat profile that is currently insufficient to

warrant funding of the program." Many other arguments can be presented against the continued
funding of LFAS, such as simple counter measures that could be taken by silent submarines.

6) WHAT YOU CAN DO:

Contact your Senators and Congressperson as well as all Presidential candidates. See below.

Insist that all forward movement on the LFA Sonar program stop immediately.

Tell them that Low Frequency Active Sonar harms ocean life.

Insist that:

** Congress be told the truth about LFAS.

** Congress conduct a review of whether the Navy is conducting an environmental impact process that is open, comprehensive, and objective, or ignoring evidence and analysis that would call into question the safety of the SURTASS LFA system.

** Congress also conduct a review on whether the SURTASS LFA technology is obsolete, safer alternatives exist, and the technology may actually pose a threat to U.S. submarines by creating bounced signals foreign nations can detect.

** Congress ask the General Accounting Office to conduct an independent review of the SURTASS LFA program.

** National Marine Fisheries Service delay all actions until receiving a completed Environmental Impact Statement.

** No further rule-making proposals can occur until a full opportunity for environmental review of the completed EIS by the public & Congress has been assured.

** The EIS Process must not be circumvented and that LFAS technology; which has already caused the deaths of numerous whales, be denied any advanced letter of authorization from NMFS.

** Ask who will protect America's shores from Low Frequency Active Sonar?

*****

To find the name of your US Congressperson and send them an email message, go to:

http://www.house.gov/writerep
FOR MARIN: Lynn Woolsey
439 Cannon, Washington, D.C. 20515
(202) 225-5161
(415) 507-9554
email: lynn.woolsey@mail.house.gov
*****

To send email messages to your US Senators or to search for their names, go to:

http://www.senate.gov/contacting/index.cfm
FOR MARIN: see Barbara Boxer and Diane Feinstein below
*****

A) PRESIDENT & PRESIDENTIAL CANDIDATES

** President Bill Clinton president@whitehouse.gov

** Vice President Al Gore vice.president@whitehouse.gov
Website/Interactive Town Hall: www.algore2000.com/townhall
Email: vice.president@whitehouse.gov
Phone: 615-340-2000

** Bill Bradley
Website: www.billbradley.com
Email: campaign@billbradley.com
Phone: 888-643-9799

** George Bush
Website/Email: www.georgebush.com/contact/index.html
Phone: 512-637-2000; Fax: 512-637-8800

** Heather Harder
Email: HARDER2000@aol.com

** Dr. John Hagelin -- Natural Law Party/Reform Party
HagelinJ@aol.com

B) Also send copies of your letters to these key legislators:

** Representative Patsy Mink (D-HI, 2nd Dist.)
a consistent opponent of the Navy's LFA Sonar
Please express your gratitude for her awareness of and opposition
to Navy's LFA Sonar, and continue to send her updated information.
It would be highly desirable for her to talk to Senators Inouye and

Akaka, to express her concerns to them.
Another possibility would be for Rep. Mink to circulate a letter to

her colleagues in the House, giving them an overview of the Navy's
LFA Sonar, and encouraging them to take a stance against it.

Representative Patsy Mink
2135 Rayburn House Office Building
Washington, DC 20515-1102

phone: (202) 225-4906
fax (202) 225-4987

email: http://www.house.gov/writerep

** Senator Daniel Inouye (D-HI)
the ranking Dem. on subcommittee on defense and
a member of the subcommittee on oceans and fisheries
Senator Dan Inouye
722 Hart Senate Office Building
Washington, DC 20510
phone: 202) 224-3934

email: senator@inouye.senate.gov
email: http://www.senate.gov/~inouye/webform.html

The person in Senator Inouye's office dealing with the LFA

issue is Frank Kelly.

** Senator Barbara Boxer (D-CA) is likely to be sympathetic

Barbara Boxer
112 Hart Senate Office Building
Washington, DC 20510

phone: (202) 224-3553

email: senator@boxer.senate.gov

** Senator Diane Feinstein (D-CA) is crucial

Dianne Feinstein
331 Hart Senate Office Building
Washington, DC 20510

phone: (202) 224-3841

email: Senator@feinstein.senate.gov

** Senator Feingold (D-WI) has sponsored several bills to stop funding the Navy's ELF project, which is an extra low frequency communication system with submarines

Senator Russell Feingold
716 Hart Senate Office Building
Washington, DC 20510

phone: (202) 224-5323

email: russell_feingold@feingold.senate.gov

** Senator Herb Kohl (D-WI) - a co-sponsor of Sen. Feingold's bill to stop funding the Navy's ELF project

Herb Kohl
330 Hart Senate Office Building
Washington, DC 20510

phone: (202) 224-5653

email: senator_kohl@kohl.senate.gov

** Senator Ron Wyden (D-OR) a co-sponsor of Sen. Feingold's bill to stop funding the Navy's ELF project

Ron Wyden
516 Hart Senate Office Building
Washington, DC 20510

phone: (202) 224-5244

email: http://www.senate.gov/~wyden/mail.htm

** Senator Tim Johnson (D-SD) - a co-sponsor of Sen. Feingold's bill to stop funding the Navy's ELF project

Tim Johnson
502 Hart Senate Office Building
Washington, DC 20510

phone: (202) 224-5842

email: tim@johnson.senate.gov

7) SOURCES OF FURTHER INFORMATION

** Cheryl A. Magill's "Stop LFAS Worldwide" websites are excellent:

http://manyrooms.com/

http://www.angelfire.com/ca/fishattorney/lfaslinks.html
nearly 400 links to www resources on this issue

http://manyrooms.com/contacts.html
has a quick over-view of whom to contact

** The Ocean Mammal Institute's website is simple and clear. They have a draft letter, a petition, and the addresses of key people to

write and fax. OMI's website is

http://www.oceanmammalinst.org/

http://www.oceanmammalinst.org/faq-lfa.html
For a FAQ (frequently asked questions) sheet on LFAS

** Dr. Lee Tepley's site has a wealth of information including technical

data on decibel levels.

http://home1.gte.net/leetpley/lfassummary.html

** NRDC, the Natural Resources Defense Council was the original whistle blower on the Navy's LFAS programs, and maintains an informative site.

http://www.nrdc.org

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Note: this article has borrowed heavily from the writings of Dr. Marsha Green, PhD; Dr. Linda Weilgart, PhD; Dr. Lee Tepley, PhD; Cheryl Magill of the stop LFAS mailing list, Lanny Sinkin, an attorney from Hilo who filed two of the 1998 lawsuits to stop the Navy from testing LFAS in Hawai'i's Humpback Whale Sanctuary, Jan Evans of stop LFAS, and the NRDC from their website.

Larry Morningstar
mana7@aloha.net

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:-.,_,.-:`` Ocean Sanctity Mail List ``'*:-.,_,.-:*

:-.,_,.-:` STOP LFA SONAR & ATOC NOW! `'*:-.,_,.-:*

Purpose of this list:
To Preserve Ocean Sanctity.
To ensure a safe home for Whales and Dolphins and all

creatures of the sea, and a safe place for humans to visit.
To Stop Navy LFAS & ATOC Sonar Testing and Deployment

Providing:
Updates and Alerts about efforts to end the Navy's use
of these technologies which are exceedingly dangerous
to all marine animals, especially whales and dolphins
with their super-sensitive hearing

Volume - low, usually not more than one message per week,
except when there is the need for an **Alert**

To subscribe to this list:
just send a message with the words:
"subscribe: Ocean Sanctity Mail List"
to: mana7@aloha.net
To unsubscribe to this list:
just send a message with the words:
"unsubscribe: Ocean Sanctity Mail List"
to: mana7@aloha.net

And remember...

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"Never doubt that a small group of
thoughtful, committed citizens
can change the world."

Margaret Mead

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URGENT UPDATE 3-6-00

There is a major new development. I now have proof that the Navy is planning further testing of the LFA system
before completing their environmental impact statement. Those plans include possibly returning to Hawai`i to broadcast at levels 5 to 1,000 times more intense than they used in 1998, when the whales left the testing
area.
The suit I filed in 1998 on behalf of the Hawai`i County Green Party was dismissed as moot by the judge because the Navy represented to the court that no further testing prior to completion of the EIS would be
reopen the 1998 case and ask that case be consolidated with the case just filed (same judge/same facts). I am preparing that motion to file with a tentative filing date of Monday.
I will keep you informed.

Aloha,
Lanny

Lanny Sinkin
58 Furneaux Lane, Suite 5
Hilo, Hawai'i 96720
(808) 961-9100; FAX (808) 934-9609
light@ilhawaii.net

To learn about the Low Frequency Active Sonar law suit challenging the

Navy
in order to protect the whales, please visit:
http://go.to/lfaslawsuit
or (if that redirect address is too busy)
http://www.ilhawaii.net/~light/lfaindex.html

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LAWSUIT UPDATE 3-6-00

PRESS RELEASE

CONTACT: Lanny Sinkin (808) 961-9100

Today [Tuesday, February 29], ten national and Hawaiian organizations and an elected official
filed suit in a Honolulu federal court to halt the US Navy's preparations to deploy a low
frequency active sonar system, known as LFAS.

The suit alleges that the Navy is violating environmental laws by spending hundreds of millions of dollars on the sonar system before completing the analysis of the system's environmental effects.

The suit also alleges that the Navy is conducting a biased environmental study designed to justify the expenditures already made, rather than objectively evaluate the potential for harm to whales and other marine life.

The plaintiffs claim that the sonar system poses a threat to marine life, including whales, and to human swimmers and divers.

The suit also seeks an injunction to prevent the National Marine Fisheries Service fromprocessing a Navy application for a deployment permit until the Navy is in compliance with environmental laws.

Increased concern about the safety of the low frequency sonar system emerged during testing off the Island of Hawai`i in March 1998. Whale watch captains reportedthe Humpback
Whales to be leaving the testing area. A snorkeler in the water during a broadcast emerged with symptoms a doctor described as similar to a trauma patient in ahospital. Four law suits,
which sought to stop the testing, were declared moot by the courts when the Navy ended thetesting and left Hawai`i.

The new law suit alleges that the draft environmental impact statement deliberately omitted allof the evidence presented by those filing the suits during the Hawaiian testing.

The plantiffs filing the suit are the Hawai`i County Green Party; Julie Jacobson, a member of the Hawaii County Council; Ocean Mammal Institute; Animal Welfare Institute; Sea Shepherd Conservation Society;
Stop LFAS Worldwide Network; Silent Oceans Trust,Inc.;Kohanaiki`Ohana; Universal Cetacean Institute; Orca Quest; and Whale Rescue Team.

----------end of press release----------

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COLLABORATING ORGANIZATIONS

We would like to thank the following organizations for their support, which in turn has allowed us to broaden our impact:

The Sierra Club brings members to experience our field internship programsand for the past seven years has made annual donations to OMI to support our research.

Earth Island Institute provides OMI a platform to educate others about the results of our research at the annual Whales Alive Conference in Maui. They also joined us in our federal lawsuit to stop the LFA sonar testing in Hawaii.
http://www.earthisland.org

The Hawaiian Island Humpback Whale National Marine Sanctuary uses OMI's research findings to help protect the whales around Maui.

Animal Welfare Institute joined us in our federal lawsuit to stop the LFA sonar testing in Hawaii.

Greenpeace Hawaii joined us in our federal lawsuit to stop the LFA sonartesting in Hawaii.

Earthtrust joined us in our federal lawsuit to stop the LFA sonar testing in Hawaii.

Earthjustice Legal Defense for their legal representation in our federal

lawsuit to stop the LFA sonar testing in Hawaii.

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CONTACT CONGRESS !

URGENT ACTION ALERT - STOP NAVY PLAN TO RESUME LFA TESTS!

Date: Mon, 13 Mar 2000 18:05:10
From: Light Worker Center <light@ilhawaii.net>

Hawai`i County Green Party Challenges Navy Plan to Resume Testing Low Frequency Active Sonar System - Call for Congressional Action
Legal Challenge to Further Testing According to an email received by Marsha Green, Ocean Mammal Institute, from Dr. Robert Gisiner, Office of Naval Research, the United States Navyis now planning to conduct further tests of the Low Frequency Active Sonar System known as SURTASS LFA. The correspondence between Dr. Greena and Dr. Gisiner is posted at http://www.ilhawaii.net/~light/gisiner.html
These tests will probably target Sperm Whales in the Azores as the primary species. A search may be made for the very elusive Beaked Whales in the Azores or Dominica. The Navy may return to Hawai`i for further testing on Humpback Whales. If the Navy returns to Hawai`i to follow up on the 1998 tests on Humpback Whales, Dr. Gisiner's email states that the Navy would like to achieve received levels (the intensity received by the whale) of 160 to 180 decibels (dB). In the 1998 tests off Hawai`i, very few whales received levels reaching 140 dB. The proposed new levels would, therefore be 10,000 times more intense than the levels causing whales to leave the 1998 testing area, which also happens to be a favorite breeding and calving area for the Humpbacks. (The decibel scale is logarithmic - 150 dB is 10x as

intense as 140 and 160 is 100x as intense as 140) These levels would also be from 5,000 to 500,000 times more intense than the 125 dB exposure which traumatized a swimmer in the water in 1998. On February 29, environmental and cultural organizations joined an elected official in filing a suit challenging the Navy's preparations to deploy this system in 80% of the world's oceans. A release explaining that suit is included below. This new information radically changes the Navy position in 1998. At that time, various suits were filed challenging the testing. The Navy stopped testing and went to the courts to state that they did not intend to conduct any more tests and that the research was complete. Based on those representations, the courts dismissed the cases as moot. Given the new plan to conduct further tests, the Hawai`i County Green Party is returning to the judge in the 1998 case and asking that case be reopened and consolidated with the case filed this year, which is before the same judge. The Party will seek an injunction preventing any further testing.

Need for Congressional Action

The time has come for Congress to step up to its responsibilities to exercise oversight over the United States Navy. Please communicate today to your Senators and Representative. The basis message which you are urged to put into your own words and speak from your own heart is: The Navy is preparing to deploy a low frequency active sonar system that seriously threatens the marine environment, including endangered whales and other species. The Navy illegally spent hundreds of millions of dollars on this system despite never completing the environmental impact statement. The momentum of these illegal expenditures is causing the Navy to ignore credible evidence that this system is too dangerous to deploy. The time has come for Congress to exercise oversight by asking the General Accounting Office (GAO) to conduct an audit of the entire SURTASS LFA program and to hold hearings in the appropriate committees into the conduct of the Navy in this manner. Ask your congressional representatives to either request a GAO audit and communicate with the appropriate committee responsible for this program to urge that committee to request a GAO audit.

Also ask your congressional representative to call for a moratorium on any further testing of this system until the litigation now pending in Honolulu is decided.

If you do send a letter to your congressional delegation and are not in Hawai`i, please send a copy of your letter to:

Senator Daniel K. Inouye
722 Hart Senate Office Building
Washington, D.C. 20510

Senator Inouye is a ranking Democrat on the subcommittee on Defense and amember of the subcommittee on Oceans and Fisheries. He has been asked to request a GAO audit.

If you are moved to take further action, please communicate your views to:

Secretary of the Navy Richard Danzig
1000 Navy Pentagon
Washington, D.C. 20350-1000
Telephone: (703) 695-3131
Fax: (703) 614-3477

THE SURTASS LFA THREAT

The Surveillance Towed Array Sonar System (SURTASS) Low Frequency Act (LFA) Sonar is an extraordinarily powerful system the Navy seeks to

deploy in 80% of the world's oceans. One observation about the potential effects of this system on marine mammals, such as whales, comes from the United States Marine Mammal Commission:
U.S. Marine Mammal Commission - Annual Report for 1997 Page 169 - Low Frequency Active Sonar
"the possible effects could include: death from lung hemmorrhage or other tissue trauma; temporary or permanent hearing loss or impairment; disruption of feeding, breeding, nursing, acoustic communication and sensing, or other vital behavior and, if the disruption is severe, frequent, or long lasting, possible decreases in individual survival and productivity and corresponding decreases in population size and productivity; annoyance and subsequent abandonment or avoidance of traditional feeding, breeding, or other biologically important habitats and, if suitable alternative habitats are not available nearby, decreases in both individualsurvival and productivity and in population size and productivity; psychological and physiological stress, making animals more vulnerable todisease, parasites, predation; and changes in the distribution abundance, or productivity of important marine mammal prey species and subsequent decreases in both individual marine mammal survival and productivity and in population size and productivity."

PRESS RELEASE
FOR RELEASE TUESDAY, FEBRUARY 29, 2000

On Tuesday, February 29, ten national and Hawaiian organizations andan elected official filed suit in a Honolulu federal court to halt the US Navy's preparations to deploy a low frequency active sonar system, known as LFAS. The suit alleges that the Navy is violating environmental laws by spending hundreds of millions of dollars on the sonar system before completing the analysis of the system's environmental effects. The suit also alleges that the Navy is conducting a biased environmental study designed to justify the expenditures already made, rather than objectively evaluate the potential for harm to whales and other marine life. The plaintiffs claim that the sonar system poses a threat to marine life, including whales, and to human swimmers and divers. The suit seeks an injunction to stop the Navy from making any further "irreversible or irretrievable commitments" to deployment of the sonar, until the environmental impact statement is complete and the federal court finds the statement to be adequate.
The suit also seeks an injunction to prevent the National Marine Fisheries Service from processing a Navy application for a deployment permit until the Navy is in compliance with environmental laws.

Increased concern about the safety of the low frequency sonar system emerged during testing off the Island of Hawai`i in March 1998. Whale watch captains reported the Humpback Whales to be leaving the testing area. A snorkeler in the water during a broadcast emerged with symptoms a doctor described as similar to a trauma patient in a hospital. Four law suits, which sought to stop the testing, were declared moot by the courts when the Navy ended the testing and left Hawai`i.

The new law suit alleges that the draft environmental impact statement deliberately omitted all of the evidence presented by those filing the suits during the Hawaiian testing. The plantiffs filing the suit are the

Hawai`i County Green Party; Julie Jacobson, a member of the Hawaii County Council; Ocean Mammal Institute; Animal Welfare Institute; Sea Shepherd Conservation Society; Stop LFAS Worldwide Network; Silent Oceans Trust, Inc.; Kohanaiki `Ohana; Universal Cetacean Institute; Orca

Quest; and Whale Rescue Team.

For further information about the law suit and the SURTASS LFA threat, visit http://go.to/lfaslawsuit or

http://www.hawaii.net/~hgmhanlex.html.

The opening of this additional front in the legal arena means that financial support to pay the expenses of the litigation is even more needed. To make a tax deductible contribution, you can make out a check

to "ISF/Stop LFAS." To contribute funds for unrestricted use, you can make out a check to "Stop LFAS." Send your contribution to:
Stop LFAS
P.O. Box 944
Hilo, Hawaii 96721.

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THE SURTASS LFA THREAT

The Surveillance Towed Array Sonar System (SURTASS) Low Frequency Act (LFA) Sonaris an extraordinarily powerful system the Navy seeks to deploy in 80% of the world's oceans. One observation about the potential effects of this system on marine mammals, such as whales, comes from the United States Marine Mammal Commission:

U.S. Marine Mammal Commission - Annual Report for 1997
Page 169 - Low Frequency Active Sonar

"the possible effects could include:

death from lung hemmorrhage or other tissue trauma;
temporary or permanent hearing loss or impairment;
disruption of feeding, breeding, nursing, acoustic communication and sensing, or other vital behavior and, if the disruption is severe, frequent, or long lasting, possible decreases in individual survival and productivity and corresponding decreases in population size and productivity;
annoyance and subsequent abandonment or avoidance of traditional feeding, breeding,
or other biologically important habitats and, if suitable alternative habitats are not available nearby, decreases in both individual survival an productivity and in population size and productivity;
psychological and physiological stress, making animals more vulnerable to disease, parasites, predation; and
changes in the distribution abundance, or productivity of important marine mammal
prey species and subsequent decreases in both individual marine

mammal survival and productivity and in population size and productivity."

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UPDATE

There is a major new development that is confidential for the moment. I now have proof that the Navy is planning further testing of the LFA system before completing their environmental impact statement. Those plans include possibly returning to Hawai`i to broadcast at levels 5 to 1,000 times more intense than they used in 1998, when the whales left the testingarea.

The suit I filed in 1998 on behalf of the Hawai'i County Green Party was dismissed as moot by the judge because the Navy represented to the court that no further testing prior to completion of the EIS would beconducted. This new evidence is a basis for me to move the court to reopen the 1998 case and ask that case be consolidated with the case just filed (same judge/same facts). I am preparing that motion to file with a tentative filing date of Monday.

I will keep you informed.

Aloha,

Lanny
Lanny Sinkin
58 Furneaux Lane, Suite 5
Hilo, Hawai'i 96720
(808) 961-9100; FAX (808) 934-9609
light@ilhawaii.net

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Following please find a newly updated version of Bobbie Sandoz's "Beached Canaries" article. Bobbie gives us a glimpse into the reasons for whale and dolphin strandings. At the end of the article, she gives a list of recent strandings. Bobbie is the author of another article we recently sent out about "Little Elian."

Aloha nui,
Larry Morningstar
mana7@aloha.net

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"BEWARE, THE BEACHED CANARIES*" What Stranded Dolphins and Whales are Trying to Tell us About a Global Emergency Beneath the Sea"

By Bobbie Sandoz, MSW - Author/Therapist/Columnist/Speaker

(*The death of canaries taken into coal mines warned the miners of trouble below.)

In the last few months, hundreds of dolphins are washing up dead along European shores while dolphins and whales are again playing with people in Hawaii after two years of ignoring them following our government sonifying these high level beings in their own Marine Sanctuary. This grateful return of their friendliness toward humans in Hawaii is clearly an act of forgiving the unforgivable.

In January, hundreds of dolphins stranded along our eastern coast, while a superpod of orcas off California circled a group of boats to flirt and play with the people aboard, then remained afloat on the surface as the sun set on their fins. A similar contrast occurred last summer when a group of San Juan Orcas appeared in time to appreciate a human concert given in their honor, showing particular interest in Amazing Grace, or forgiveness without merit, while hundreds of their gray whale cousins washed up dead on west coast shores.

Although these events contribute to an uneasy yet growing pattern of marine mammal strandings juxtaposed to their kindness to us, there has been little media coverage of this disturbing phenomenon or a true investigation of why it is happening. Are we so indifferent that we don't really care or is there a massive cover-up....or both?

strongly disagree with government-funded "experts" on the true effect of an extremely intense and apparently lethal force going into the ocean called low frequency active sonar (LFAS) that appears to be leaving a trail of corpses in its path. Yet, in spite of the controversy over its safety, our government is pushing forward to deploy this risky technology in 80% of the world's oceans in an apparent effort to get it underway before the public learns more about it.

Will we remain cooperatively in denial, uninformed, and dangerously silent in the face of this potential planetary holocaust as we have in the past, or will we awaken in time to stop this serious threat to all marine life? And, if we fail to respond, what will the consequences be for our own survival and souls?

In view of a possible cover-up buttressed by our indifference, could it be that the intelligent dolphins and whales are making their way to our public and popular shores before dying in order to serve as "beached canaries" that warn of something amiss in their hidden world beneath the sea? If so, will their massive deaths at our feet pull us out of deep moral slumber or fall on the cold hearts of an uncaring species?

The LFAS Story

Following a brief yet troubled period of LFAS testing at levels far below those planned for actual use that resulted in trauma and death, this reckless technology is in the process of being pushed toward premature deployment in 80% of the world's oceans.

Sadly, slick propaganda programs dispensed by in-house "experts" have succeeded in convincing a slumbering media and uninformed populous that the dolphins and whales are unaffected by intensely explosive blasts ripping through their ocean home with sustained intensity for hundreds of miles, causing damage and death in their wake.

Thus, in contrast to government claims of safety, outraged boat captains, swimmers, independent researchers, and environmentalists have observed this technology to be highly disruptive and deadly to marine life, even at the considerably lower decibels used during brief public testing than those planned for actual extensive and classified use.

Even more frustrating, the National Marine Fisheries Service (NMFS), established to protect marine life, appears to be aligned with the government-funded "experts" promoting LFAS. They also appear to be ignoring required protocol in order to prematurely slip the U.S. Navy a permit to harass and kill whales which will serve as the green light needed to unleash this risky technology into full and unfettered, classified deployment.

Eerily, the NMFS is also the organization assigned to oversee the testing done on the "beached canaries" stranding on our shores. Yet, while they publicly serve as the protector of marine life, behind the scenes they seem to prefer keeping these strandings in the category of an "unsolved mystery" to risking discovery of a possible connection to sonar exposure by checking their ears for rupture or their tissue for signs of explosion and shredding. Instead of conducting these revealing tests, they offer vague explanations that don't hold up, while focusing their search for answers solely on viruses, red tides, and other toxic algae that were neither in the problem areas nor have caused this kind of cetacean carnage in the past.

In view of this seeming bias in favor of LFAS and the dual role it creates for the NMFS, should they ever concede to test the ears or tissue of stranded marine corpses for sonar exposure, the public would be wise to insist that non government-funded and

independent researchers deaf witness to their exams.

It's also important to notice that the brain and tissue fissures, lesions, and ruptures as well as mass starvation consistently found in these and other recent marine mammal corpses resemble the symptoms of sonar exposure described by the Marine Mammal Commission when in 1997 they predicted that lung and tissue hemorrhage and trauma in marine mammals (and fish) as well as cavity explosion and hearing loss causing subsequent starvation was likely to occur if LFAS was employed worldwide as proposed.

So why is the connection between these known symptoms of sonar exposure (similar to microwave explosions) and those found in stranded marine mammal corpses being ignored -- especially when sonar activities are rumored to be taking place in several of the affected areas?

And, now that we are on the brink of full deployment of this unexamined force, will the American public awaken in time to make the connection, check its validity, and if there is a connection, stop the madness? Or, will we remain drugged by our usual denial and the silence of fear and apathy as we have during other holocausts at human hands, enabling yet more government crimes against nature and others as well as ourselves?

Could this be the pivotal point at which humans decide if we will orchestrate our own self-destruction with our typically passive response to impersonal government actions or rally as caring individuals in time to uncover the path of our more conscious, courageous, and higher selves as well as a safe and golden future for our world, ourselves, our children, and our grandchildren?

I was pondering these questions one day as I swam in a bay amidst 50 dolphins who approached and circled me, then stayed to play for over an hour. I was surprised by their visit in view of my mood, since they usually avoid me when my thoughts are weighty. But, on this particular day they swam near me to play, show off their babies, and engage me in beguiling and flirty gazes. I reflected on my decade of friendship with these high-level beings and the notable lessons I had learned from them that I had not learned from humans about how to be a more loving and joyful human being.

I wondered as I swam if my species would have the wisdom to allow the sweet grace of these bright and loving beings to serve as mirrors reflecting our need to seek a higher place in ourselves where we might act as kindly toward others as cetaceans do. I also thought of the American Indian elders predicting that whatever happens to "the great beast" -- or whale -- will also happen to humanity, and I wondered which fork in the road of our forecasted futures we would take -- the Apocalypse or golden age.

Then it occurred to me that as humanity stands at the portal of the new millennium, it is in our power to select which road we will travel. We can continue to kill the saints and sages in our midst or change the course of human history by surrendering our self-centered ways to their more lofty and loving teachings.

Yet before we can claim this higher potential, we must address what kind of species we truly want to be and which future we wish to create. We must then commit to becoming and creating whatever we choose. I also realized that to succeed in doing this we need look no further than to the model of loving kindness the dolphins and whales offer or the manifesting tools the dolphins revealed to me in "Listening to Wild Dolphins" which I have woven into my suggestions for how we can respond to the LFAS challenge.

INFORMATION AND RESOURCES

***PATTERN OF STRANDINGS THAT MAY LINK TO LFAS ACTIVITY:

* EUROPE - In February, 2000, 100s of dolphins began washing up on European shores.

* THE ATLANTIC COASTLINE - On January 21, 2000, Katie Couric asked on "The Today Show" why hundreds of dolphins are beaching along the Atlantic coastline. Although brain and other tissue lesions have been found in these cetaceans, one of the symptoms predicted by the Marine Mammal Commission in 1997 for LFAS exposure, ears are not being checked. In view of the far-reaching effect of sonar exposure predicted by independent researchers, some suspect apparent NATO sonar in the general area may be the cause.

* FLORIDA - On January 3, 2000, Associated Press reported that scientists were trying to determine why dolphins have been washing up dead on northwest Florida shores over the last month. Although a previously severe outbreak of red tide did not kill dolphins, it appears that only red tide and other toxins are being examined as a possible cause, rather than also include an examination of their ear canals to prove or disprove the important variable of possible sonar exposure.

* THE VIRGIN ISLANDS - In early October, 1999, scientists in the water heard sonar sounds, followed by multiple cetacean strandings in the area. Government-funded ear canal testing expert Dr. Darlene Ketten from Woods Hole Oceanographic Institute, was summoned by many groups to run ear canal tests, but results have not yet been revealed. If they are, citizens must determine if anyone other than government-funded scientists were present in order to neutralize any conflicts of interest.

* THE CANARY ISLANDS - A total of 21 whale strandings in 1985, 1988, and 1989 were linked to visible US Navy maneuvers. These were the only times that whales were reported to strand in the Canary Islands. (Nature, 1991) Award-winning French biologist Dr. Michael Andre, free from our government's influence, learned from necropsies while studying the decline in sperm whales in this area that two of the whales (who were involved in the increasing whale collisions with boats in the area) were deaf as suspected.

* THE ATLANTIC COAST - In 1987, dolphins exposed to 235 decibels of sonar stranded and were found to suffer from tissue and lung explosion. (This information was allegedly found by Dr. Joe Geraci and buried in reports on file.) Since this revelation, there has been a great deal of resistance to obtaining autopsies that check for these types of problems, also predicted by the Marine Mammal Commission in 1997 (possibly based on Dr. Geraci's findings) to be a consequence of LFAS.

* THE HARO STRAIT, SAN JUAN ISLANDS - In the Summer of 1996, 195 decibels were sent into this key waterway used by orcas, porpoises, seals, and other mammals, followed by an increase in strandings of these mammals. ABC News recently reported that the previously thriving orca population from this area is now in enough trouble to be considered eligible for the Endangered Species list.

* THE MEDITERRANEAN SEA NEAR GREECE - In 1996, twelve Cuvier's beaked whales documented to be exposed to NATO sonar at 150-160 decibels were found stranded. At the same time about 200 stranded dolphins were suspected of suffering from tissue explosion. (Nature, 1996) LFAS levels to be used by the U.S. are reported to be 180 decibels in areas near shore and could go considerably higher, once deployment is underway and this program is classified.

* THE HAWAIIAN ISLANDS - In 1998, three whale calves

and one dolphin calf were found dead or abandoned during and immediately following sonar testing, even though in 15 years of research this phenomenon had never been observed. One of these was a distressed whale calf who breached 230 times and pectoral slapped 658 times in front of Dr. Marsha Green's research team in a four-hour period before the sun set on his distress. In addition, a pod of dolphins was observed by naturalists familiar with normal dolphin behavior huddling unusually close to the shore near the surface and vocalizing excessively while the sound was on.

* CALIFORNIA- Since the open testing in California began in 1997, sonar exposed whales immediately began to strand in increased numbers. In addition, there was a report of uncharacteristically aggressive behavior which is known to be a symptom of LFAS exposure. More recently, The Malibu Times reported in January, 1999, that more than 150 gray whales were found dead due to starvation along their migratory route where testing took place in 1998. Starvation can be a result of deafness, but ears were not checked in these cetaceans, even though the cause of death has remained a mystery.

* AUSTRALIA - Rumor has it that the Australian government has questioned a connection between observed US Navy and NATO maneuvering and strandings off their shores.

* UNKNOWN - In view of indications that brain and body tissue explodes and body cavities (bladders, lungs, and ear canals) rupture when exposed to sonar blasts, it is plausible to assume that most affected marine mammals will sink to the ocean floor, rather than make their way to a beach in order for us to view their plight. And who knows what the effect this risky technology has on the thousands of other, smaller forms of marine life, less able to withstand such a powerful force.

***For More Information and Evidence of LFAS Problems,

*GENERAL INFORMATION:

http://www.angelfire.com/ca/fishattorney/lfaslinks.html
http://www.oceanmammalinst.com; and
http://www.nrdc.org;

*LEGAL INFORMATION AND CURRENT LAWSUIT AGAINST THE US NAVY:

http://www.ilhawaii.net/~light/lfaindex.html

*TECHNICAL INFORMATION:

http://home1.gte.net/leetpley/lfasupdate.htm

*ASK YOUR LOCAL ABC AFFILIATE TV STATION TO AIR: "WHEN THE WHALES STOP SINGING"

This excellent news special report on the Navy's Low Frequency Active Sonar (LFAS) was filmed by Dan Noyes of KGO TV News: ABC TV in San Francisco. Ask your ABC station manager to call KGO News in San Francisco to request a copy of this two part special to air in your vicinity. KGO News has agreed to send out copies of this video to other ABC stations, and to give them permission to air it. It is a short video, only 10 minutes long, and can be run as part of a news program.

***INTERVIEW AUTHOR AND PANEL OF INDEPENDENT EXPERTS ON LFAS who sincerely hope they are wrong about their concerns regarding the potential danger of LFAS, but believe people should know what they have uncovered in the event they are not wrong:

Dr. Marsha Green (OMI/Marine Biologist/ Professor) 610-670-7386
Lanny Sinkin (Attorney) 808-961-9100
Dr. Lee Tepley (Physicist) 650-961-7440

Dr. Linda Weilgart (Independent Marine Biologist) 902-479-1861
Cheryl Magill (LFAS Activist) 650-429-2116
Bobbie Sandoz, MSW (Author) - 808-524-6775
Dr. Naomi Rose, (Director, Humane Society of the United States - HSUS)

WAYS TO RESPOND

*We must first face the seriousness of the threat LFAS poses to marine life and ourselves. For only then, will we break our silence and engage in clear but gentle action with the urgency this issue deserves.

*We must then let our Congressional representative, ultimately responsible for this program, know of its possible consequences and insist that they stop all forward movement of this program until it can be proven that it will not cause the massive destruction concerned non-government scientists and citizens fear.

*We must then insist on extensive and highly monitored necropsies of currently stranded mammals, including full ear exams -- since such tests could expose possible sonar exposure. Only by having this information will we know if the sonar technology is connected to these deaths as many environmentalists suspect.

*We must then insist that the National Marine Fisheries Services (NMFS) halt all movement toward deployment of this unexamined power.

*We must demand that the possibility of a conflict of interest on the part of NMFS be seriously scrutinized in view of their apparent bias and seeming partnership with the U.S. Navy in this risky government operation they have been charged with overseeing.

*We must send copies of all correspondence on this and other protests to the media, our president, and congressional representatives -- since such letters give witness to our concerns and constitute our greatest power to influence or reverse government decisions we do not approve.

*Some, including myself, will view this issue as important enough to organize a peacefully powerful march in Washington since visibility and numbers are imperative to change in this country.

*Hopefully, responsible media will invite the listed panel of independent experts who have uncovered evidence that points to potentially serious and illegal errors and omissions made in the process of testing and activating this technology they consider far more dangerous than claimed.

*Teachers may wish to introduce this topic in their classrooms and invite students to uncover, lobby for, and implement solutions. In doing this, we enlist the spirits and insights of this national treasure to help us become our best selves while teaching the art of kindness, cooperation, and friendship with our global family.

*Those aligned with spirit can inspire continuous prayer for all concerned -- including those in control of this formidable technology who genuinely believe in its merits and their right to employ it without sincerely inviting the public's awareness, opinion, or approval. Hopefully, clergy of all faiths will be moved to hold prayer vigils to bring this matter to a unifying, loving, and safe resolution. Although everyone was surprised that we moved through the millennium without incident, few noted a possible connection between this unexpected peace to a massive and powerful prayer vigil organized by Marianne Williamson and James Redfield.

*Many will want to participate by using one of the manifesting tools I learned from the dolphins for creating the world we desire. To do this we need to identify exactly

what we want instead of what we don't want and then place all of our energies, prayers, and focus on drawing that picture to us. This focus becomes even more powerful if we unite our combined energies as the dolphins do to create a large and harmonious group holding a common dream with love and joy in our hearts.

*****If we succeed in gathering together a large enough group to lovingly concentrate our intention on this dream until it is fulfilled, we will discover a power beyond anything we have yet witnessed on this planet. And once we learn to do it, we will no longer feel the need to quarrel and fight among ourselves and against others -- or develop weapons considerably more dangerous than the "enemies" we fear.

Nor will we continue to allow our businesses, government, or military to treat us like children, while excluding us from the management of our lives, our country, and our world as they fund and implement plans without our knowledge or permission. Once we exercise the power of our own voices and visions to reclaim self-governance, we will no longer view big business interests or our government and military as separate from ourselves or dangerous to our lives or planet.

***** How perfect that we can use this unique yet effective manifesting tool the dolphins have shown us to safely return their ocean home to them and self-governance to ourselves. Let's experience this radical new power by taking our first steps on the path to a better future and the world of our dreams.

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Author: Bobbie Sandoz
March, 2000
Phone: 808-524-6775 Fax: 808-538-0423
Website: www.bobbiesandoz.com

AVAILABLE FOR RADIO AND TV INTERVIEWS
Author Bobbie Sandoz (Listening to Wild Dolphins) and a panel of non-government experts can expose potentially dangerous problems connected to Risky Sonar Technology.

Bobbie's most recent book is
"Listening to Wild Dolphins, Learning Their Secrets for Living with Joy"

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IMPORTANT

LETTER REGARDING ALTERNATIVE METHODS TO DETECT SUBMARINES

Dear Mahalia,

In talking to the Secretary of the Navy yesterday, I noted that the decision to develop low frequency active sonar resulted from internal Navy discussions in the early 1980s. The threat was new, silent submarines supposedly being developed by the Russians and the supposed inability of the existing passive listening devices on the ocean floor to detect such submarines.

Regarding that initial decision, there are three points to be made:

1. That decision was not made with outside input and no internal environmental impact statement was prepared. The decision took place, therefore, primarily on technical grounds, i.e. what technology was

available at that time as a possible alternative to the passive devices deployed already. The focus was not on environmental effects, particularly effects on cetaceans and other marine life dependent on sound. We believe that if the Navy had focussed on the environmental issue, they would have decided to invest in improving other technologies.

2. The LFA decision was made in the midst of the Cold War. That war is now over. The Russian submarine fleet is not being modernized.

3. There apparently was no reconsideration of the LFA decision during the ensuing 17-18 years.

I proposed to the Secretary that the advances in passive acoustic technology during that period made the LFAS unnecessary. Those advances have taken place in two areas: the devices themselves are far more sensitive and the computer analysis of what the devices pick up is far more sophisticated.
When I said to the Secretary that LFAS was unnecessary because the advances in passive acoustics had been so great, he replied that there was still a concern about submarines parked off our coast and not moving.

While I did not have time to follow up on that point, the response is that for a submarine to reach our coast it would have to pass by the passive acoustic devices. Those devices would locate the submarine and the pointat which the submarine stopped.

Also, passive devices are continuous devices. They can always be on. An LFAS system is used intermittently in different geographic locations. The passive system is, therefore, far more reliable in determining the location of a submarine we are concerned about than the hit or miss LFAS.

Last year, the Navy gave a contract for more than $100 million to Lockheed Martin for the deployment of a passive acoustic system for open ocean surveillance and for shore area surveillance. We believe that the Navy knows full well that LFAS is an obsolete and less effective technology and that only the expenditure of more than $350 million and bureaucratic momentum keep this system alive.

Best wishes for your meeting. I hope this message is helpful.

Aloha,

Lanny

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FINALLY !! THE FIRST BREAKTHROUGH

Navy Drops Criticized Sonar Test Off N.J.

Children touch beached whale in Bahamas in mid-March where eight animals

died in one day. Critics say Navy's noise bursts are breaking whale eardrums. (AFP)

By Marc Kaufman
Washington Post Staff Writer
Saturday, May 27, 2000; Page A02

The Navy has abandoned plans to test controversial sonar systems off the New Jersey coast following protests by federal regulators and environmental groups that the intense sounds can harm whales and other ocean life.

In a brief statement yesterday, the Navy said its Littoral Warfare Advanced Development test 45 miles off the New Jersey coast this week will proceed but will "not include active acoustic sources."

The decision, which environmentalists hailed as a first, marks an escalation in a growing dispute over whether efforts by the Navy to test and deploy new types of sonar submarine detection systems are dangerous to sea life. It also comes two months after a dozen whales stranded themselves on two beaches in the Bahamas one day after Navy exercises nearby used the loud, intense noises.

Many scientists believe that whales and other marine mammals can be harmed by the extremely high-decibel sounds--some significantly greater than the sound of a 747 jet at takeoff--created as part of the Navy's new "active" sonar systems. The animals, which rely on sound the way humans rely on sight, can suffer directly with burst eardrums and permanent hearing loss, and indirectly with harmful changes in behavior.

Earlier this month, the Commerce Department's National Marine Fisheries Service (NMFS) sent a letter critical of the proposed test off New Jersey to the Office of Naval Research, saying that the Navy's assessment of potential environmental damage was inadequate. The letter from regional administrator Patricia Kurkul also criticized the Navy for not giving the agency adequate time to review the proposal.

In addition, a letter to the Navy from the director of the U.S. Marine Mammal Commission, a 12-member group of scientists appointed by the president, warned of increased public opposition if the Navy didn't do a better job of investigating the Bahamas incident and others like it.

"If the investigation does not identify the cause of the strandings and steps that can be taken to avoid similar occurrences in the future if the Navy activities are implicated, it is highly likely that efforts to stop the development and use of high-energy sound sources will intensify and possibly block activities important to national defense," wrote director John R. Twiss Jr.

The Navy said soon after the Bahamas incident that it followed standard procedures to protect wildlife and had concluded there was no connection between its exercises and the strandings. A Navy official said yesterday that an "independent review of acoustic, oceanographic and environmental data" is being conducted "to determine whether Navy activities may have had a role in the Bahamas mammal strandings."

The official also said the active sonar tests off New Jersey were dropped because the exercise could not be delayed to allow time to "clarify inconsistencies and points not well understood" regarding the objections by the NMFS.

According to Joel Reynolds of the Natural Resources Defense Council, an environmental group long critical of the Navy's active sonar systems, the decision to cancel active sonar tests off New Jersey marks a significant change. "We think this is very important because the Navy has now been told it cannot simply reserve a vessel, schedule an exercise and proceed without worry of environmental impacts when dealing with low-frequency sonar systems," Reynolds said. "This is the first time where [the NMFS] told the Navy that it cannot move forward because of a failure to comply with the Endangered Species Act."

According to Reynolds and federal regulators, the site off New Jersey is

particularly rich in sea life and would be home to billions of spawning squid in the late spring. The endangered sperm whale feeds on young squid and would likely be in those waters as a result.

The Navy's environmental assessment statement for the tests off New Jersey said that both low- and mid-frequency sonars would be researched, some reaching higher than 210 decibels, as well as sonic effects of small explosions bouncing off the sea floor. In addition, officials said the Navy would deploy the same "sonobuoys"--devices that generate sound waves in the water--as the Navy used in the Bahamas.

Low- and mid-frequency sonar emits sounds that the Navy believes can identify ships better than conventional sonar, especially in shallow coastal waters.

According to NMFS officials, the larger issue of the Navy's use of active, low-frequency sonar worldwide will be revisited this summer when the agency and the Navy release environmental impact statements on a broader use of the technology known as the Surveillance Towed Array Sensor System (SURTASS). Environmental groups have sued to block that system, saying the Navy should have produced an environmental impact statement much earlier.

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http://washingtonpost.com:80/wp-dyn/articles/A14741-2000May26.html

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COURT RULING

On Friday, June 9, the Ninth Circuit Court of Appeals ruled that the National Marine Fisheries Service (NMFS) violated the National Environmental Policy Act (NEPA) because NMFS signed agreements with the Makah to support an application for whaling before preparing the environmental assessment required by NEPA. The essence of the ruling relied on the section of NEPA that prohibits irreversible and irretrievable commitments of resources before completed required environmental analysis.
The ruling in the Makah case is very encouraging. The exact arguments and even the cases cited to support those arguments are already before the court in Honolulu in our opposition to the Federal Defendants' motion to dismiss the case filed in February challenging the US Navy plan to deploy low frequency active sonar (LFAS). The essential argument in that case is that the $350+ million spent by the Navy developing and preparing to deploy LFAS violated the same NEPA prohibition.
The ruling by the appellate court is based on simply signing an agreement, not committing massive amounts of resources, as the Navy has done.
As soon as I read the opinion on the web <http://www.ce9.uscourts.gov>www.ce9.uscourts.gov I called the clerk for

Judge Alan
Kay and the U.S. attorney representing the defendants to inform them of my intention to argue this case on Tuesday in opposition to the motion to dismiss.

Quotes from the opinion:

In summary, the comprehensive "hard look" mandated by Congress and

required by the statute must be timely, and it must be taken objectively and in good faith, not as an exercise in form over substance, and not as a subterfuge designed to rationalize a decision already made.

Furthermore, this court has interpreted these regulations [implementing NEPA] as requiring agencies to prepare NEPA documents, such as an EA or an EIS, "before any irreversible or irretrievable commitment of resources." [citing earlier decisions] Thus, the issue we must decide here is whether the Federal Defendants prepared the EA too late in the decision-making process, i.e. after making irreversible and irretrievable commitment of resources. We conclude that they did.

The Federal Defendants did not engage the NEPA process "at the earliest possible time." Instead, the record makes clear that the Federal Defendants did not even consider the potential environmental effects of the proposed action until long after they had already committed in writing to support the Makah whaling proposal. ... " ... These events demonstrate that the agency did not comply with NEPA's requirements concerning the timing of their environmental analysis, thereby seriously impeding the degree to which their planning and decisions could reflect environmental values. [citing an earlier case.

It is highly likely that because the Federal Defendants' prior written commitment to the Makah and concrete efforts on their behalf, the EA was slanted in favor of finding that the Makah whaling proposal would not significantly affect the environment.

NEPA's effectiveness depends entirely on involving environmental considerations in the initial decisionmaking process. ... We hold that by making a firm commitment before preparing an EA, the Federal Defendants failed to take a "hard look" at the environmental consequences of their actions and, therefore, violated NEPA.

Our conclusion about the EA in this case raise an obvious question: Having already committed in writing to support the Makah's whaling proposal, can the Federal Defendants now be trusted to take the clear-eyed look at the whale proposal's consequences required by the law, or will the new EA be a classic Wonderland case of first-the-verdict, then-the-trial? In order to avoid this problem and to ensure that the law is respected, must we -- and can we -- set aside the FONSI [finding of no significant impact] and require the Federal Defendants to proceed directly to the preparation of an Environmental Impact Statement? On reflection, and in consideration of our limited role in this process, we have decided that it is appropriate only to require a new EA, but to require that it be done under circumstances that ensure an objective evaluation free of the previous taint.

-------end of quotations----------

The fact situation in the Hawaiian case supports exactly the same ruling, only more so because the premature illegal commitments are massive. Even the unusual request made in our case for the court to

order an independent contractor brought in to restore integrity to the compromised EIS process finds support in the last section quoted.

Every journey into a court room is made with the expectation of the unexpected. We cannot know how Judge Kay will view the issues presented. We do know that a ruling from an appellate court exactly on point helps our position. Tuesday, we may know more, depending on whether the judge rules from the bench or takes the case under advisement for a later ruling. Stay tuned.

Aloha,
Lanny

****
****

CONTACTS

Ocean Mammal Institute
P.O. Box 14422
Reading, PA 19612
(610) 670-7386 800-226-8216
email Marshag@alb.edu Attention: Marsha Green
email onealkiwi@aol.com Attention: Joyce ONeal-assistant
web www.oceanmammalinst.org

Larry Morningstar (newsletter)
mana7@aloha.net

Lanny Sinkin (Attorney filing lawsuit against the Navy)
58 Furneaux Lane, Suite 5
Hilo, HI 96720
(808)961-9100 office
(808) 934-9609 FAX
light@ilhawaii.net

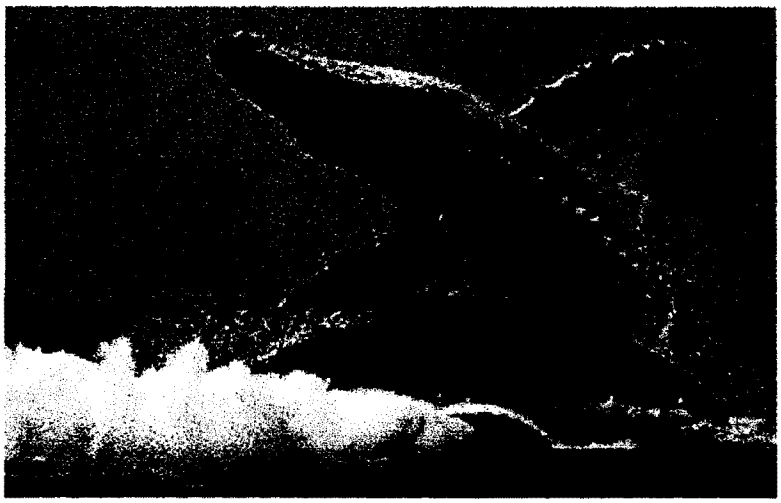
Earth Island Institute (415) 788-3666 X146 788-7324 FAX
Mark Berman-International Marine Mammal Project , berman@eii.org
300 Broadway, Suite 28
San Francisco, CA 94133
Ben White-Animal Welfare Institute (360)378-8755

National Resources Defense Council
(415)777-0220
Andrew Wetzler-Coastal Isssues (323) 934-6900 X316 Los Angeles
www.nrdc.org

Pamela Polland (808)878-3220 peemer@aloha.net (808)878-6644 FAX
Citizens Opposing Active soanr Technology P.O. Box 88, Maui, HI
96790 www.mauimuse.com

Ocean Mammal Institute

Collaborating Organizations



We would like to thank the following organizations for their support, which in turn has allowed us to broaden our impact:

The Sierra Club brings members to experience our field internship programs and for the past seven years has made annual donations to OMI to support our research.

Earth Island Institute provides OMI a platform to educate others about the results of our research at the annual Whales Alive Conference in Maui. They also joined us in our federal lawsuit to stop the LFA sonar testing in Hawaii. http://www.earthisland.org

The Hawaiian Island Humpback Whale National Marine Sanctuary uses OMI's research findings to help protect the whales around Maui.

Animal Welfare Institute joined us in our federal lawsuit to stop the LFA sonar testing in Hawaii.

Greenpeace Hawaii joined us in our federal lawsuit to stop the LFA sonar testing in Hawaii.

Earthtrust joined us in our federal lawsuit to stop the LFA sonar testing in Hawaii.

chronicle

Associated Press

Children on East Grand Bahama island reached out to touch the tail of a whale beached on the coast at High Rock.

Navy Testing Coincides With Whale Beachings

Fatal strandings on coast of Bahaman islands

WASHINGTON POST

Scientists are trying to understand why about a dozen whales became stranded last week on two beaches in the Bahamas, a highly unusual event that coincided with U.S. Navy operations in the area.

Beach-goers pushed several of the beaked whales back into the waters after the 12- to 15-foot mammals mysteriously swam or washed ashore Thursday, one day after a Navy exercise in which loud noises were propagated through waters in the region. Five of the animals ultimately died ashore.

The mass stranding occurred less than a week after two other whales washed ashore in a different part of the Bahamas during a period of "live fire" naval exercises in that region.

A Navy spokesman in Virginia said yesterday that the Navy had followed all standard procedures to protect wildlife and had concluded there was no connection between the exercises and the strandings.

Nonetheless, the two events have brought fresh attention to a longstanding concern that certain military activities, especially the generation of loud or low-frequency underwater sound waves, may be taking a toll on marine mammals and other kinds of sea life.

The beaked whales involved in the Bahamas incident are in the dolphin family and are related to killer whales. They are not listed as threatened or endangered, but scientists said that is partly a reflection of how little is known about how many of the animals there are. Beaked whales are renowned for their long, deep dives and their secretive behavior.

Beaked whales are relative loners that tend not to swim in pods. That has led some scientists to suspect that each of the few instances in which they have washed ashore in large numbers may have been caused by a short-term, wide-ranging insult, such as a pulse of sound energy, which can cause an intense wave of high pressure.

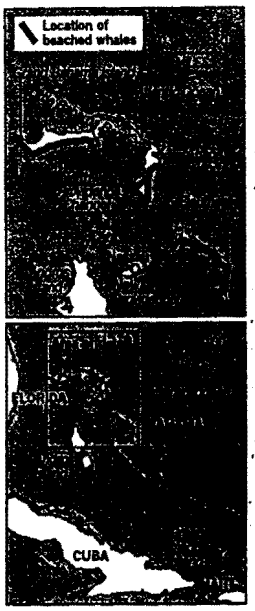
A 1998 report in the scientific journal Nature found that only seven strandings of more than four beaked whales had been documented worldwide since 1963. The report focused on the most recent of those events, in the Mediterranean Sea during an 18-hour period in May 1997, and found that it corresponded with "sound detecting system trials" of a submarine sensing system conducted by NATO.

Last Wednesday, the U.S. Navy conducted a test of the Bahamas involving "sonobuoys," devices that generate sound waves in water. The Navy had consulted in advance with the National Marine Fisheries Service, as required by the Endangered Species Act, to devise a plan for ensuring that the tests would not harm endangered or threatened wildlife. The plan included aerial surveys and acoustical searches for nearby animals, said Kathy Wang, of the fisheries service Southeast regional office in St. Petersburg.

The Navy spokesman would not reveal details of the test, but Wang said the plan called for sounds of about 200 decibels at 6,600 to 9,500 cycles per second. "Two of the whales had eyes that were bleeding," she said, "suggesting acute shock trauma."

BEACHED WHALES

Marine biologists blame the beaching of about a dozen whales on the south side of three islands in the Bahamas this week on recent Navy anti-submarine technology tests.



Associated Press Graphic

Wang said two baleen whales washed ashore dead in the Bahamas the previous week during a period of U.S. Navy live fire. But that was limited to "nonexplosive small-arms fire" that could not have harmed the whales, said a Navy source who spoke on condition of anonymity.

Wang said tissue samples obtained from four of last Thursday's dead whales are to be sent to marine fisheries service scientists for analysis and may reveal some details about the cause of death.

11/2/00

Dear Ms. Wan,

Please deny the Navy's request to depoly low-frequency noise until further study is done on it. You must not let them use it until you can insure the safety of marine life in the oceans. Thank you.

Sincerely,

Amanda Johnson

Ms. Amanda Johnson
25400 Oak St Apt 15
Lomita, CA 90717

Denese G. Pender
516 Shay Avenue
Santa Rosa, California 95401-6074

Sara Wan, Chair
California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, CA 94105

11/6/00

Re: The Navy's Low Frequency Active Sonar

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Denese G. Pender

Denese G. Pender

RECEIVED

NOV 1 3 2000

CALIFORNIA
COASTAL COMMISSION

2340 Carol Avenue
Mountain View, CA 94040
November 6, 2000

California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, CA 94105
Subject: Don't let the Navy deploy LFA in the Pacific

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California
waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Linda Johnson

Linda Johnson

2340 Carol Avenue
Mountain View, CA 94040
November 6, 2000

California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, CA 94105
Subject: Don't let the Navy deploy LFA in the Pacific

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California
waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

George Wortiska

RECEIVED
NOV 0 9 2000
CALIFORNIA
COASTAL COMMISSION

Nov. 6, 2000

Dear Mr. Delaplaine:

I am writing to you to convey my concern to the California Coastal Commission about the LFAS testing by the US Navy.

I have studied the navy's documentation of their testing. I don't believe that the Navy is testing in a way that will adequately determine the damage that will be done to sealife through the tremendous sounds that the sonar system is producing. More thorough testing is necessary.

Nor do I believe that the technology is necessary in this day and age. I would prefer that we put 350 million dollars, or whatever the navy is spending, into peace studies, not war efforts.

I hope you stand with the many citizens of this state who want to protect sea life.

Thank you,

George Taylor
100 Toyon Dr.
Fairfax CA 94930

Mark

SP/FC

FAX COVER PAGE

RECEIVED
NOV 08 2000
CALIFORNIA
COASTAL COMMISSION

Date: Wed Nov 8 14:14:35 CST 2000

Message Reference: PLAN7219 01275982

From: fax@email.planetfeedback.com

Attention: Sara Wan

Subject: Important Consumer Feedback from Mona Swearingen.

Destination Fax: 4159045200

Number of pages including cover: 2

This message was generated by PlanetFeedback, Inc.
For more information, call please call (513) 421-0494

The following letter is being sent to California Coastal Commission by
PlanetFeedback.com at the request of Mona Swearingen at mswearingen@juno.com.

This letter also is being sent to everyone on the cc: list provided by Mona Swearingen. PlanetFeedback.com rates companies on customer service. Keep up the good work!
==========

November 8, 2000

TO:
California Coastal Commission

FROM:
Mona Swearingen
27464 Bahama Avenue
Hayward, CA 94545

RE: PLANETFEEDBACK INCIDENT NUMBER 300188

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active Sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Mona Swearingen

CC:
Gray Davis

==========
PlanetFeedback.com is a Web site that helps consumers focus and send
their feedback directly to companies. The information enables companies to improve customer service and earn consumers' long-term loyalty.

Find out more at <http://www.planetfeedback.com>.

To learn more about our commitment to customer service, go to <http://www.planetfeedback.com/manifesto>.

Mark Delaplaine

From: A.Concerned.California.Voter@yahoo.com
Sent: Tuesday, November 21, 2000 8:16 AM
To: mdelaplaine@coastal.ca.gov
Subject: Deploy the Navy's LFA system now!!!

FROM:

NAME: A Concerned California Voter A Concerned California Voter
ADDRESS: A Concerned California Voter
San Diego, CA 92109

Dear Dear Chair Wan:

NRDC continues to misinform and flat out lie to the American People! The Navy has conducted an Environmental Impact Survey and has found that the system is safe. California is the ONLY state to not support this finding. As an American I am proud to have a Navy that cares about my freedoms and rights. I hate to tell you but our Founding Fathers did not have "animal rights" anywhere on the Constitution. Sure we need to be good stewards of the environment but we also need our country safe. The California Coastal Commission needs to understand the fundamentals of a Free country....freedom is not free, it comes with a price and if a few marine mammals are harrassed so be it!!!

1792 New York Drive
Altadena, CA 91001
2 November 2000

RECEIVED
NOV 06 2000
CALIFORNIA
COASTAL COMMISSION

Sara Wan, Chair
California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, CA 94105

RE: NAVY'S PROPOSED LOW-FREQUENCY ACTIVE SONAR SYSTEM

Dear Ms. Wan:

The U.S. Navy has asked the California Coastal Commission for permission to operate a new extended-range submarine detection system in the Pacific Ocean that will blast ocean waters with noise billions of times louder than that known to disturb whales. I am deeply concerned about this plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters. The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, or many other marine animals.

Low-Frequency Active Sonar (LFA) presents a serious and wide-ranging threat to California's marine life. A single LFA transmitter would generate sound in the range of 235 decibels, flooding hundreds of square miles of ocean with noise. Two hundred thirty-five decibels is millions of times more intense than the 160-decibel level known to harm human divers. The sheer force of 235-decibel blasts could cause permanent hearing loss, serious physical injury, or even death to whales and other creatures unfortunate enough to be swimming near an LFA transmitter. But what concerns marine scientists even more than physical injury is the impact that LFA could have on the behavior (such as breeding, feeding, and migration) and viability of entire populations of marine mammals. It is exactly these effects on vital activities, experienced over hundreds of miles of ocean, that pose the greatest risk to California's marine mammals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Jan Allison

Jan Allison
M.A. Ecology, UCSC

Mark Delaplaine

From: Tay1405@aol.com
Sent: Wednesday, November 01, 2000 8:38 PM
To: mdelaplaine@coastal.ca.gov
Subject: Navy's LFA system plan

Dear Ms Wan:
Please add my voice to the chorus of those complaining about the ill-considered and dangerous plan of the Navy to deploy low-frequency active sonar system(s). The magnitude of decibels is outrageous, especially in the absence of studies that show minimal damage to the wildlife in our coastal waters. My understanding is that your denial of the Navy's request would be consistent with--actually required by--your commission's responsibilities.
Please forward a copy of my e-mail to each commissioner.
Thank you.
Stanford H. Taylor
1405 S. Oakland Ave.
Pasadena, CA 91106

Mark Delaplaine

From: Adria-Ann L McMurray [aamcmurray@juno.com]
Sent: Wednesday, November 01, 2000 7:41 PM
To: mdelaplaine@coastal.ca.gov
Subject: Respect our marine life

I oppose the Navy's proposal to blast LFA sonar in our coastal waters.
This poses an unacceptable threat to marine animals.
Please forward this letter to all coastal commissioners.
Sincerely,
Adria-Ann McMurray
834 San Carlos Ave.
Albany, CA 94706

Mark Delaplaine

From: jhnewtalk@yahoo.com
Sent: Wednesday, November 01, 2000 5:25 PM
To: mdelaplaine@coastal.ca.gov
Subject: Dont let the Navy deploy LFA in the Pacific and stop the nets off the coast

FROM:

NAME: John Hill
ADDRESS: 25360 Anderson Avenue
Barstow, CA 92311

Dear Dear Chair Wan:

How are you? The navy wants a submarine sonar or noise production permit. Please deny this permit for the harm it will do to the sea life.

Also will you work to make permenant the ban on gill nets that work the coast of California for the harm they do to coastal life.

With peace,

John Hill

November 2, 2000

RECEIVED
NOV 06 2000
CALIFORNIA
COASTAL COMMISSION

Sara Wan, Chair
California Coastal Commission
45 Fremont St., Suite 2000
San Francisco, CA 94105

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific. Please forward a copy of my letter to each commissioner.

Sincerely,

Amanda Johnson

Amanda Johnson
25400 Oak Street Apt #15
Lomita, CA 90717

November 2, 2000

NOV 06 2000

California Coastal Commission
45 Fremont Street
San Francisco, CA 94105

To California Coastal Commission

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

The Staff at the Environmental Action & Resource Center
CSU, Chico
Chico, CA 95929

Sara Wan, Chair
California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, CA 94105
Phone: (415) 904-5289
Fax: (415) 904-5400

RECEIVED
NOV 07 2000
CALIFORNIA
COASTAL COMMISSION

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Dorea Henderson

Dorea Henderson
PO Box 6597
Incline Village, NV 89450

RECEIVED
NOV 0 7 2000
CALIFORNIA
COASTAL COMMISSION

November 2, 2000

Sara Wan, Chair
California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, Ca. 94105

Dear Ms. Wan:

I am deeply concerned about the Navy's plan to expose marine mammals living in California's coastal waters to loud noise billions of times louder than that known to disturb whales. The Navy's proposed deployment of its Low-Frequency Active Sonar (LFA) poses a serious threat to marine life in California waters.

This same technology, tested in other parts of the world, has caused whales and dolphins to beach themselves and experience a slow and painful death. These mammals are intelligent and sensitive creatures and we need to protect them.

The Navy's most recent studies have not adequately addressed the short and long term affects of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine life.

The California Coastal Commission has a responsibility to assure the safety and protection of the wildlife that inhabits California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Karen Chepeka

Karen Chepeka
2113 Huntington Street #C
Huntington Beach, Ca. 92648

Cc: Shirley Dettloff

Mark Delaplaine

From: Powms@aol.com
Sent: Thursday, November 02, 2000 4:54 PM
To: mdelaplaine@coastal.ca.gov
Subject: Navy and LFA

Dear Sara Wan,

As a citizen I wish to add my voice to those who feel that the proposal by the Navy to deploy devices to create hugely loud low frequency noises in the ocean is potentially a disaster for marine mammals as well as other natural life forms. We needn't turn the ocean into a desert, devoid of life, in order to protect ourselves. We need to learn to share the planet with other forms of life and allow them some chance to live with as little human interference as possible.

Sincerely,
Paul O. Williams

Mark Delaplaine

From: christine s haley [cshaley@juno.com]
Sent: Thursday, November 02, 2000 8:13 AM
To: mdelaplaine@coastal.ca.gov
Subject: navys request to deploy LFA's

Dear Ms. Wan,

I am writting to you to urge you and the other commisioners to deny the Navy's request to deploy Low-Frequecy Active sonar systems in the Pacific waters. I am deeply concerned about the unknown factors that could prove to be harmful to our precious ocean wildlife. I am deeply concerned about the mere idea of introducing these incredible sounds to our ocean neighbors.

The California Coastal Commision has a responsiblity to protect the marine animals off of the California coast. Please use this power to DENY the Navys request.

Thank you,

Christine Haley
719 Paseo Camarillo #134
Camarillo, CA 93010

Mark Delaplaine

From: bilpry@juno.com
Sent: Thursday, November 02, 2000 7:31 AM
To: mdelaplaine@coastal.ca.gov
Subject: Dont let the Navy deploy LFA in the Pacific

FROM:

NAME: William C. Pryor
ADDRESS: 2011 W. Katella Ave. No. 51
Anaheim, CA 92804

Dear Dear Chair Wan:

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals. Thank you.
Sincerely, William C.Pryor

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters.
I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Mark Delaplaine

From: Cheri A. Pillsbury [cpillsbury@netbos.com]
Sent: Wednesday, November 01, 2000 10:47 PM
To: mdelaplaine@coastal.ca.gov
Subject: LFA in the Pacific

November 1, 2000

Subject: Don't let the Navy deploy LFA in the Pacific

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

This is a horrible idea, and one with far-reaching negative influences. Please oppose this, and please forward a copy of my letter to each commissioner.

Sincerely,

Cheri A. Pillsbury
2351 E. Anita St.
Stockton, CA 95205

Sara Wan, Chair
California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, CA 94105

RECEIVED
NOV 17 2000
CALIFORNIA
COASTAL COMMISSION

Subject: Don't let the Navy deploy LFA in the Pacific

Dear Ms. Wan,

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

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The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Owen Siegel
90 Chambers Street
New York, N.Y. 10007

Mark Delaplaine

From: Wallace D. Racey [raceyengr@juno.com]
Sent: Wednesday, November 01, 2000 4:27 PM
To: mdelaplaine@coastal.ca.gov
Subject: Re:Naval LFA deployment in the Pacific.

> Sara Wan, Chair
> California Coastal Commission
> 45 Fremont St., Ste. 2000
> San Francisco, CA 94105
>
> Subject: Don't let the Navy deploy LFA in the Pacific
>
> Dear Ms. Wan,
>
> I am deeply concerned about the Navy's plan to expose marine animals
> living in California's coastal waters to loud, low-frequency noise.
> The Navy's proposed deployment of its Low-Frequency Active sonar system
> poses a serious threat to marine mammals, and other ocean life, in
> California waters.
>
> The Navy's most recent studies have not adequately addressed the
> short-term and long-term impacts of the LFA system on whales, dolphins,
> porpoises, sea turtles, and a host of other marine animals.
> The California Coastal Commission has a responsibility to assure the
> long-term safety and protection of the wildlife that inhabit
> California's > coastal waters. I urge you and the rest of the commission to
> deny the Navy's request to deploy LFA in the Pacific.
> I cannot believe that anyone in their right mind would consider such a
> destructive move.
>
> Please forward a copy of my letter to each commissioner.
>
> Sincerely,
>
> Wallace D. Racey
> 9489 Orange Street
> Alta Loma, CA 91701-4149
> raceyengr@juno.com <mailto:raceyengr@juno.com>
>

Mark Delaplaine

From: scott.troup@intel.com
Sent: Wednesday, November 01, 2000 12:52 PM
To: mdelaplaine@coastal.ca.gov
Subject: Dont let the Navy deploy LFA in the Pacific

FROM:

NAME: Scott Troup
ADDRESS: 3472 Calle Margarita
Encinitas, CA 92024

Dear Dear Chair Wan:

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Mark Delaplaine

From: rhondalc3@yahoo.com
Sent: Wednesday, November 01, 2000 12:49 PM
To: mdelaplaine@coastal.ca.gov
Subject: Dont let the Navy deploy LFA in the Pacific

FROM:

NAME: R Coulston
ADDRESS: MIddlefield Rd
Mountain View, CA 94043

Dear Dear Chair Wan:

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters. If noise pollution is a serious concern for humans, then it stands to reason that it would also be detrimental for all creatures. Animals use sound for many purposes which aid their survival. Please do not hinder their ability to live.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters. I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Rhonda Coulston

Mark Delaplaine

From: len_fischer@excite.com
Sent: Wednesday, November 01, 2000 1:23 PM
To: mdelaplaine@coastal.ca.gov
Subject: Dont let the Navy deploy LFA in the Pacific

FROM:

NAME: Leonard Fischer
ADDRESS: 155 Loma Verde
San Lorenzo, CA 94580

Dear Dear Chair Wan:

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low-frequency noise. The Navy's proposed deployment of its Low-Frequency Active sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The California Coastal Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabit California's coastal waters.
I urge you and the rest of the commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each commissioner.

Sincerely,

Leonard Fischer

Mark Delaplaine

From: lcatapano@nrdc.org
Sent: Tuesday, October 31, 2000 8:27 AM
To: mdelaplaine@coastal.ca.gov
Subject: test message

FROM:

NAME: Lisa Catapano
ADDRESS: 71 Stevenson Street, #1825
San Francisco, CA 94105

Dear Dear Chair Wan:

I am deeply concerned about the Navy's plan to expose marine animals living in California's coastal waters to loud, low frequency noise. The Navy's proposed deployment of its Low-Frequency Active (LFA) sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

The Commission has a responsibility to assure the long-term safety and protection of the wildlife that inhabits California's coastal waters. I urge you and the rest of the Commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each Commissioner.

Sincerely,

STATE OF CALIFORNIA – THE RESOURCES AGENCY

GRAY DAVIS, *Governor*

CALIFORNIA COASTAL COMMISSION
45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

Tu 5 a

Addendum

Date: **December 4, 2000**

To: **Commissioners and Interested Persons**

From: **Peter Douglas, Executive Director**
Mark Delaplaine, Federal Consistency Staff

Subject: **Consistency Determination CD-113-00**
U.S. Navy, Low-Frequency Active (LFA) Sonar Program

The Commission staff has written two comment letters to the Navy requesting additional information on its Low-Frequency Active (LFA) Sonar Program; the first, dated October 26, 1999, was the staff's comments on the Draft EIS[1] for the LFA program, and the second, dated November 29, 2000, was in response to the Navy's consistency determination (but was also intended to provide more specificity on some of the first letter's questions). The second letter contained some of the same questions as the first, with several new questions and more specific clarification on some of the questions from the first letter (Attachment 2). The Navy has responded to the first letter in a letter dated November 30, 2000 (Attachment 1), but not to the second. The second letter requests information not covered (or not fully covered) in the Navy's response letter. Because the Navy has not responded to this second, November 29, 2000, letter, the overall staff recommendation to the Commission remains unchanged at this time.

The Navy's response letter, which the staff received on December 4, 2000, provides additional information and analysis on the following issues:

1. Information deficiencies.
2. Need for further studies before (or concurrent with) LFA deployment.
3. Very small number of areas identified as biologically sensitive and important.
4. What happens when 180 dB extends beyond 1 km (e.g., in the "SOFAR" [sound frequency and ranging] channel).

---

1 Draft Overseas Environmental Impact Statement/Environmental Impact Statement (OEIS/EIS) Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") Sonar Program, U.S. Navy, July 1999.

5. Effectiveness of the active acoustic monitor HF/M3 (High Frequency Marine Mammal Monitoring sonar).
6. 180 dB, non-serious injury, and non-injurious harassment criteria.
7. Consensus views concerning the Navy's risk analysis.
8. Attenuation distances (e.g., distance from the source to the 145 dB contour (the level proposed for diver protection).
9. 1996 mortality of Cuvier's beaked whales in the Mediterranean Sea.
10. Objectivity of the Navy's diving studies, in terms of their relevance to civilian divers, and review by Navy's Bureau of Medicine and Surgery (BUMED).
11. Potential for lung resonance at < 100 Hz frequencies.
12. Incident of swimmer disorientation during the Navy's Phase III LFA testing in Hawaii.
13. Status of additional studies and analyses.
14. Cumulative impacts concerns.
15. Monitoring issues.

However, as stated above, the Commission staff's November 29, 2000, letter requested information not covered (or not fully covered) in the Navy's November 30, 2000, response letter, including: (1) monitoring details; (2) operational questions; (3) suggested additional restrictions that may be warranted; and (3) recommendations from other agencies for the Navy to consider. The staff therefore continues to recommend that the Commission object to the Navy's consistency determination at this time, based on lack of information.

In addition, two corrections/clarifications to the staff recommendation are warranted, based on informal comments received from the Navy and the Natural Resources Defense Council (NRDC):

(1) The Navy states that its review of the Bahamas strandings concluded that "LWAD" (a small-scale submarine tracking exercise) was over 35 miles to the east of the strandings, and the exercise commenced 5 hours after the stranding began, and, therefore, that it could not have been responsible for the strandings. The Navy's preliminary review of the incident is attached (Attachment 3).

(2) NRDC points out that the letter ascribed to the U.S. House of Representatives Committee on Resources (Exhibit 11 in the staff recommendation) did not represent the Resources Committee, but instead simply represented the opinion of the 26 members of the House who signed the letter.

Also attached is correspondence received on the project since the time of the mailing (when previously-received letters were mailed to the Commission) (Attachment 4).

Attachments: (1) Navy letter to CCC, Nov. 30, 2000
(2) CCC staff letter to Navy, dated Nov. 29, 2000
(3) Navy review of Bahamas incident, letter to NMFS, dated June 9, 2000
(4) Additional Correspondence: Earth Island Institute (Nov. 29, 2000), NRDC (Dec. 5, 2000), and Hal Whitehead and Linda Weilgart (Dec. 4, 2000)

DEPARTMENT OF THE NAVY
NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY
NAVAL SUBMARINE BASE NEW LONDON
GROTON, CONNECTICUT 06349-5900

IN REPLY REFER TO:

3950
Ser 01C/270
November 30, 2000

Mr. Mark Delaplaine
Federal Consistency Supervisor
California Coastal Commission
45 Fremont, Suite 2000
San Francisco, CA 94105-2219

Dear Mr. Delaplaine:

I am pleased to forward the enclosed Navy Responses to California Coastal Commission (CCC) Comments on the Draft Overseas Environmental Impact Statement/Environmental Impact Statement (OEIS/EIS) for the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar in response to your letter of October 26, 1999.

These responses to CCC comments will be incorporated into the Final OEIS/EIS in accordance with the National Environmental Policy Act (NEPA). This document will be provided to the Commission upon filing with the United States Environmental Protection Agency.

I appreciate your time and consideration in this effort and look forward to working with you and your staff in the future. If you have any questions or require any additional information, please do not hesitate to contact the undersigned at (703) 604-7882.

Sincerely,

JOSEPH S. JOHNSON
Deputy, Special Programs
By Direction of the Commanding Officer

Attachment 1

Navy Responses to California Coastal Commission (CCC) Comments on the Draft OEIS/EIS for SURTASS LFA Sonar[1]

Page 2 Overall Comments Para 1: We have several serious concerns about the overall adequacy of the EIS. Fundamentally, the EIS: (1) ignores important information; (2) is deficient in its description of cumulative impacts; (3) relies on unjustified and/or overly simplistic assumptions; and (4) arrives at conclusions that are not warranted based on the research and science that have been performed to date. The clearest example of these deficiencies is the discussion of marine mammal response to LFA signals in the range of 120-160 dB RL (Received Level) range, the EIS extrapolated from this range to a conclusion that any RL <180 dB is acceptable.

Response: In developing the draft OEIS/EIS, the SURTASS LFA Program worked extensively with the public, regulators, environmental organizations and scientific institutions to assure that the analytical process was scientifically rigorous.

(1) All available information that is practical and reasonable to address the issues was analyzed for this analysis. Both the Navy and the scientific team (Doctors Peter Tyack, Chris Clark, and Kurt Fristrup) believe the discussions are adequate and that important information has not been ignored.

(2) The discussion of potential cumulative impacts in the draft OEIS/EIS is responsive. Many of the potential cumulative impacts that could be associated with SURTASS LFA sonar operations have been considered in the analyses. Moreover, all observations made during the Low Frequency Sound Scientific Research Program (LFS SRP) suggest that the modest impacts terminate when transmissions stop. Thus, the maximum scale on which cumulative impacts would be expected to occur would be a 20-day mission.

Any cumulative effects on fish (including sharks), sea turtle or marine mammal stocks from implementation of the proposed action is estimated to be extremely small. This can be attributed to the following:

- The system would be operated for a relatively brief period of time on an annual basis (estimated maximum of 432 hours per vessel per year).

- The system would operate at a low duty cycle (on no more than 20 percent of the time), and for relatively short periods of time in any given area. Even if considered in combination with other underwater acoustic effects, such as commercial shipping, other operational, research, and exploration activities (e.g., acoustic thermometry, hydrocarbon exploration and production), recreational water activities, and naturally-occurring sounds (e.g., storms, lightning strikes, subsea earthquakes, underwater volcanoes, whale vocalizations, etc.), the SURTASS LFA sonar system does not add appreciably to the number of acoustic events to which fish, sea turtle and marine mammal stocks are exposed.

[1] Other CCC comments are addressed via the Navy's consistency determination of 6 Nov 00.

- The system would not be stationary.

- A maximum of only four systems would be operational (with usually only 1-2 at sea at any one time, and almost always in separate oceans).

The potential for cumulative effects of oceanic ambient noise levels from SURTASS LFA sonar operations should also be addressed. Urick (1983) stated that ambient noise is what remains after accounting for all identifiable noise sources. Thus, any potential for cumulative impact should be put into the context of recent changes to ambient sound levels in the world's oceans.

National Resources Defense Council (NRDC) (1994) states a widely held premise that ambient noise in the world's oceans has been increasing over the past 50 years, mostly due to shipping and that this increased noise level could potentially affect marine mammals and sea turtles. The scientific evidence that this is occurring is supported by the following:

- National Research Council (NRC) (2000) acknowledges Urick's (1986) statement that "there is a global increase of sound levels in the sea resulting from shipping, recreation, aircraft, and naval operations as well as research," and supports the characterization of the existing ambient sound field in terms of the levels, frequencies, and locations of sources, particularly in terms of areas particularly important for marine mammals.

- Holmes (1997) states that shipping traffic has increased enough over the past 30 years to raise background noise levels in the deep ocean roughly 5 dB within the 50-500 Hz frequency band in the busier waters of the Northern Hemisphere.

- Ross (1976) estimated that shipping had caused a rise in ambient noise levels of 10 dB between 1950 and 1975, and he predicted another 5-dB increase by the 21st Century.

- Aggregate traffic noise arises from the combined effects of all shipping at long ranges, originating between 10 km (5.4 nm) to distances up to 4,000 km (2,160 nm) in deep water. Shipping noise generally dominates ambient noise at frequencies between 20 and 300 Hz (Richardson et al., 1995).

- Based on recent evidence, researchers have concluded that ambient noise levels in the oceans have increased dramatically in the last decade, with the vast majority being directly attributed to commercial shipping (NMFS, 1998; NRDC, 1999).

- Research has shown large ships entering or leaving port are likely to cause a change in the behavior of marine mammals (Tyack, 1998).

- With the advent of the global economy the size of the merchant fleet has doubled, tonnage has quadrupled, and the cumulative effects from so much traffic dominates the lower frequency in many regions of the world (NRDC, 1999).

- In the early 1930s, the world merchant fleet was made up of some 30,000 ships, but by the early 1980s it had reached 75,000 ships (Cuyvers, 1984; NRDC, 1999).

- Curtis et al. (1999) determined that in the North Pacific Ocean the LF components of ambient noise consist of whale, shipping, and wind-generated sounds.

There are sources other than shipping that contribute to ambient noise in the oceans, including natural sounds (e.g., earthquakes, storms, snapping shrimp, marine mammals, fish, etc.) and other manmade sources (e.g., hydrocarbon exploration and production, drilling, and aircraft sonic booms).

When transmitting, SURTASS LFA sonar will add to regional noise levels. To determine the significance of this effect, the operation of SURTASS LFA sonar systems (maximum of four worldwide) was compared to oceanic shipping, the dominant contributor to low frequency (LF) ambient noise in the oceans. Sound would be introduced into the ocean from SURTASS LFA sonar signals only when the sonar was actually transmitting. The nominal annual and 30-day deployment schedule for the SURTASS LFA sonar system would involve a maximum of 432 hours of active transmissions per system per year. This equates to 18 days per system, or 72 days for all four (maximum) SURTASS LFA sonar systems combined.

Oceangoing merchant vessels, on the other hand, transmit sound into the ocean constantly whenever they are underway. The four SURTASS LFA sonars would be transmitting sound into the ocean for a total maximum of only 72 days per year vs. 21.9 million days per year for the 60,000 vessels of the world's merchant fleet (assuming 80 percent of the merchant ships at sea at any one time). Therefore, within the existing environment, any potential for accumulation of noise in the ocean by the intermittent operation of SURTASS LFA sonars would be negligible.

In summary, any potential for cumulative effects from SURTASS LFA sonar operations is extremely small and will be diminished further by limitations proposed for employment of the system (i.e., geographical restrictions and monitoring mitigation). .

(3) Where necessary, the analysis relies on conservative procedures and assumptions in research and modeling that were independently developed by the scientific team:

- **Human Diver Hearing:** The comprehensive study conducted by ONR and NSMRL between June 1997 and November 1998 in conjunction with a consortium of university and military laboratories (see TR 3) concluded that the maximum intensity used during testing (157 dB RL) did not produce evidence of physiological damage in human subjects. Furthermore, there was only a two percent aversion reaction subjectively reported as "very severe" by divers at 148 dB RL. NSMRL adopted a very conservative approach and determined that scaling back the intensity by 3 dB (which equates to a 50 percent reduction in signal strength) would provide a suitable margin of safety for commercial and recreational divers. Hence, operation of SURTASS LFA sonar systems would be restricted to 145 dB in known areas of recreational and commercial diving.

- **Diver 145-dB Geographic Restrictions Not Included in Modeling:** In order to facilitate the modeling of potential impacts to marine mammals, the geographic restriction of 145 dB for recreational and commercial dive sites was not included in the AIM analysis. For regions with known recreational and commercial dive sites (predominantly coastal), this is more restrictive, in that its application overrides the 180-dB restriction, requiring the SURTASS LFA sonar vessel to operate farther offshore.

- **Use of Baleen Whales as Indicator Species:** As described in Subchapters 1.4.1.1 and 4.2, baleen whales (mysticetes) were selected, after review by an independent, broad group of interested parties, as the marine animals most at risk. Baleen whales were used as indicator species for other marine animals in these studies because they are the animals that are the most likely to have the greatest sensitivity to LF sound, are known to use sounds for communication, and have shown avoidance responses to LF sounds.

- **Site Selection:** For the acoustic modeling, locations covering the major ocean regions of the world were carefully selected to represent reasonable SURTASS LFA sonar employment. Sites were selected to model the highest potential for effects from the use of SURTASS LFA sonar, and incorporated the following factors:

  - Closest operationally plausible proximity to land (from a SURTASS LFA sonar operations standpoint), where biodiversities are high, and/or offshore biologically important areas are present (particularly for animals most likely to be affected);
  - Acoustic propagation conditions that allow minimum propagation loss or transmission loss (TL) (i.e., longest acoustic transmission ranges); and
  - Time of year selected for maximum animal abundance.

- **Use of 180-dB Threshold:** An assessment of the point above which SURTASS LFA-generated sound could potentially cause the onset of injury to marine animals was made, based on scientific research and review of data. A single-ping RL of 180 dB was assumed for the modeling; this level is considered conservative, as detailed herein.

- **Risk Transition:** The parameter of the risk continuum that controls how rapidly risk transitions from low to high values with increasing RL was set at a value that produced a curve with a more gradual transition than curves developed by the analyses of migratory gray whale studies of Malme *et al.* (1984). The choice of a more gradual slope than the empirical data was consistent with other decisions to make conservative assumptions when extrapolating from other data sets.

- **Risk Threshold:** The assumption that risk could begin at 119 dB is a practical approximation of the RL below which the risk of a significant change in a biologically important behavior approaches zero. In all three phases of the LFS SRP, most animals showed little to no response to SURTASS LFA sonar signals at RLs up to 155 dB, and those individuals that did show a response resumed normal activities within tens of minutes.

- **Cumulative Exposure:** Another conservative assumption involved the potential effects of cumulative exposure. The analysis assumed that the single-ping equivalent (SPE) level scaled in accordance with previous studies of TTS that dealt with continuous sound, even though SURTASS LFA sonar pings would be separated by 6 to 15 minutes of silence. The 20 percent (maximum) duty cycle of SURTASS LFA sonar transmissions implies that any cumulative effect would be less than that for continuous sounds.

- **Number of Marine Animals Potentially Affected:** The acoustic modeling simulations incorporated conservative assumptions regarding the fraction of the regional stock in the area potentially affected by the hypothetical SURTASS LFA sonar operation and their animal movement patterns. Scientific data are typically reported with 95 percent confidence intervals. However, in order to run the acoustic model, an exact number of animals must be specified. Therefore, the upper end of the 95 percent confidence interval was used for stock densities and abundances.

There is another additional important, yet subtle, point inherent in this methodology. The cumulative effect of a series of modestly conservative choices yields a substantial conservative bias in the overall results. For example, suppose ten choices are made, each having a 60 percent chance of being conservative. Suppose the model results can be considered correct (accurate or conservative) if at least half of these decisions are correct. Then the chance that the model results can be considered correct would be greater than 80 percent. This calculation follows from the cumulative binomial distribution; similar considerations hold for the risk continuum and the acoustic integration model structure.

(4) The conclusions of this analysis are based on the independent scientific analysis. The conclusions warrant a determination of consistency with the California Coastal Act and met the requirements of other applicable federal regulations, such as the issuance by the National Marine Fisheries Service (NMFS) of a letter of authorization (LOA) under the Mariner Mammal Protection Act (MMPA). In addition the Long Term Monitoring Program has been designed to ensure that these conclusions are valid.

The following paragraphs discuss the erroneous conclusion about "RLs <180dB are acceptable."

1. The LF Sound Scientific Research Program (LFS SRP) included three intensive field studies of four baleen whale species. Each of these field studies would have constituted a major project by any standard (e.g. National Science Foundation grants for marine biology).

2. The expressed goal of the LF SRP was to study possible behavioral responses to signals at received levels (RLs) that were low enough to ensure that no animal ran the risk of injury. Each transmission was designed to ensure that the animals under study experienced RLs less than or equal to 155 +/- 5 dB.

3. The extensive visual observations and acoustic data sets collected during these studies provided statistical evidence documenting changes in behavior in relation to LFA transmissions. However,

each individual change in behavior - each data point in the statistical analysis - fell within the range of behavioral variation documented during control conditions. None of the observations or data suggested anything that could be construed as diminishing survival or reproduction. These sentences illustrate the important distinction between statistically significant and biologically significant changes in behavior. One represents a response that can be measured, the other represents a response that has consequences for an individual's lifetime or reproductive success.

4. The LFS SRP scientists developed a model to reconcile the absence of biologically significant responses during the LFS SRP studies with the presumption that there is a risk of injury at RLs above 180 dB. This model was called the "risk continuum," and one of the important aspects of this model is that risk (of biologically significant effects) changed smoothly with increases in RL.

5. Any hypothetical risk continuum can be evaluated using the LFS SRP results by predicting the chances of seeing a biologically significant response in the data. If a hypothetical risk continuum predicted a 99.9999% chance of seeing at least one biologically significant response in the data, it would be reasonable to reject it as inconsistent with the data. If a hypothetical risk continuum predicted a 1% chance of seeing at least one biologically significant response in the data, it would be consistent with the data. However, it would be reasonable to reject it because there are more elevated estimates of risk that would also be consistent with the data. The risk function used in the OEIS/EIS is conservative, in that it predicts that there was a better than 95% chance of seeing a biologically significant response in the LFS SRP data. The 95% criterion is a widely adopted scientific convention for rejecting hypotheses because they are inconsistent with data.

6. It is important to remember that the draft OEIS/EIS calculates two measures of biological impact: one addresses the potential for significant change in biologically important behavior, the other address the possibility of injury. The 180-dB threshold is used to mark the onset of risk of injury. The risk continuum addresses the potential for biologically significant responses at RLs less than 180 dB.

Page 2 Overall Comment Para 2: We recommend a return to the Navy's previous approach adopted prior to publication of the EIS and one we supported in our review and concurrence with the Navy's Phase I and II LFA research. That approach is to perform additional scientific studies that establish (rather than extrapolate and speculate) safe levels of use, and only then to proceed to operate at the higher noise levels. We believe the Navy should conduct further studies of effects on marine resources, or at *least* perform additional studies concurrently with LFA operations, attempting to document impacts at these higher noise levels. The Navy also needs to collect, maintain and publish monitoring results for the life of the program. Given the steady increases in anthropogenic sound in the marine environment, and the difficulty in truly understanding the effects of underwater sound on marine mammals, there will continue to be unresolved questions about the wisdom and safety of the use of active sonar technology. The use of loud low frequency active sonar equipment, whether it is being used for commercial, scientific or military purposes, needs to be accompanied by significant studies of the effects of these types of anthropogenic noises in order for policymakers to approve and the public to accept their use.

Response: The studies performed to date are more than adequate to warrant the safe employment of the SURTASS LFA sonar as proposed, and this employment is consistent with the California

Coastal Act and other federal regulations. Nevertheless, the Navy has adopted a prudent approach using conservative assumptions for identifying and analyzing potential impacts to the environment.

Although findings from the LFS SRP have not revealed any significant change in a marine mammal's biologically important behavior[2] in response to operations, the Navy and the National Marine Fisheries Service (NMFS) consider it prudent to continue monitoring of potential effects of the SURTASS LFA sonar. The Navy will provide a Long Term Monitoring (LTM) Program whose principal objectives will be to:

- Conduct Navy and independent scientific analyses of the effectiveness of proposed mitigation measures, make recommendations for improvements where applicable, and incorporate them as early as possible, with NMFS concurrence;

- Provide the necessary input data for reports to NMFS on assessment of whether any taking of marine mammal(s) occurred within the LFA mitigation zone (180-dB sound field) during SURTASS LFA sonar operations;

- Study the potential effects of Navy SURTASS LFA sonar-generated underwater sound on long-term ecological processes relative to LF sound-sensitive marine mammals and sea turtles, focusing on the application of Navy technology for the detection, classification, localization, and tracking of these animals; and

- Collaborate, as feasible, with pertinent Navy, academic, and industry laboratories and research organizations, and where applicable, with Allied navy and academic laboratories on field research efforts to help fill scientific data gaps.

The LTM Program has been budgeted for five years. At the end of the five years and based on results of five years of SURTASS LFA sonar operations (provided to NMFS via annual reports and applicable regulations), it will be determined whether a follow-on program will be necessary.

In some of the LFS SRP Phase I experiments (studying the responses of feeding blue and fin whales), the SURTASS LFA source was transmitting at operational power levels. Even under these circumstances very few animals were exposed at received levels as high as 155 dB. The research was specifically designed so as to NOT expose animals to higher received levels. These research results confirmed what is predicted from the Acoustic Integration Model (AIM) that a very small percentage of animals will be close enough to the SURTASS LFA sonar to experience levels above 155 dB. It is not feasible for the Navy to perform field tests at full-scale SURTASS LFA sonar operational power levels and received levels higher than 155 dB to the animals. The Navy would not seek a scientific research permit for such an effort. Any such experiments should be undertaken under controlled laboratory conditions. Moreover, the Navy believes there is adequate data to assess what the potential for impacts would be for RLs $\geq$ 180 dB RL, without the need to try to actually expose animals to that RL.

[2] Biologically important behaviors are those related to activities essential to the continued existence of a species, such as feeding, migrating, breeding and calving.

Unclassified LF ocean ambient noise data collection would be carried out coincidentally in the ocean basins in which SURTASS LFA sonar operations occur using standard Navy recorders and the passive (SURTASS) array, whenever feasible.

SURTASS LFA sonar program will recognize any exclusion areas where anthropogenic noises are restricted by a regulatory agency (e.g., NMFS, California Coastal Commission) to all producers of subject noises.

Page 3 Specific Comment Para 1: Figure 2-2 on Page 2-10 represents a relatively simplistic approach to categorizing biologically sensitive regions of the world's oceans. The EIS portrays the vast majority of the world's oceans as non-sensitive; nevertheless within those areas there are regions of greater and lesser biological productivity, sensitivity, and at least seasonally high concentrations of marine mammals. This type of information should be provided, and areas of lesser sensitivity considered higher priority for LFA use. Also, although it is outside of our agency's scope of concern, given the unexplained and, therefore, potentially extreme sensitivity of Cuvier's beaked whales in the Mediterranean Sea to LFA noise (see comments on EIS p. 4-2-57 below), that area should be given special consideration and protection, at least until more is known about this species' hearing sensitivity.

Response: The process of selecting the offshore biologically important areas may have appeared simplistic, but it was not. The process to determine these biologically important areas and the 12 nautical mile restriction was rigorously undertaken by independent marine biologists and NMFS personnel. The OEIS/EIS recognizes that there are areas of greater or lesser biological productivity, sensitivity, and at least seasonally high concentrations of marine mammals and has set up specific geographic restrictions for these reasons. The operation of SURTASS LFA sonar would be geographically restricted via the criterion not to exceed 180 dB RL within 22 km (12 nm) of any coastline (including islands) and in offshore biologically important areas[3], and via the criterion not to exceed 145 dB at known recreational and commercial dive sites.

Cuvier's beaked whale strandings in the Mediterranean Sea are discussed below. All available information indicates that odontocetes to include beaked whales have their best hearing in the mid- to high frequency ranges and do not possess exceptional low frequency hearing sensitivities. Odontocete hearing thresholds are estimated to be up to 50 dB better at 2,000 Hz (60 dB), than at 200 Hz (110 dB).

Page 3 Specific Comment Para 2: Page 2-11 indicates the 180 dB noise contour is based on spherical spreading modeling (presumably a 20 log R calculation). When LFA is used in areas of high sound conductivity (e.g., the "SOFAR" [sound frequency and ranging] channel), spherical spreading ceases to be an appropriate model. What is the maximum distance of the 180 dB noise contour if the sound were to be projected into or within this channel?

[3] Offshore biologically important areas are defined as those areas of the world's oceans outside of 22 km (12 nm) of a coastline where animals of concern (those animals listed under the Endangered Species Act and/or marine mammals) congregate in high densities to carry out biologically important activities. These areas include migration corridors, breeding and calving grounds, and feeding grounds.

Response: For very short ranges (less than 1 km) for this type of sonar system, spherical spreading is an accurate model. There are acoustical environments where propagation may slightly exceed 1 km. If and when LFA ever operates in these favorable acoustic environments, as part of the LTM program, the 180 dB RL field will be measured. However, mitigation is applied to the sound field (180 dB), not a specific range.

Page 3 Specific Comment Para 3: Page 4.2-48 optimistically assumes the Navy can achieve a 70-90% probability of detecting a marine mammal within the 180-dB, 1-km contour, using a combination of visual monitoring and passive and active acoustic monitoring. This is based on a 70% effectiveness attributed to the active acoustic monitor (using HF/M3 (High Frequency Marine Mammal Monitoring) sonar). No justification for this assertion is provided, and we are not aware of any information that would support this claim. Further studies and/or field verification (which could be accomplished with studies using tagged animals) is needed to substantiate these claims. In addition, concerning visual monitoring, no limitations are proposed during periods of low visibility (e.g., night and foggy conditions); therefore the effectiveness of visual monitoring may be compromised. Passive acoustic monitoring only works if animals are vocalizing, and, therefore, while we support a multi-modal monitoring effort such as proposed, we question the Navy's assumption as to how effective it will be.

Response: Test data on *Tursiops,* in controlled experiments using the HF/M3 Sonar indicate good correlation between estimated and measured detection ranges. The Final OEIS/EIS will reflect available test data, including results of the HF/M3 sonar effectiveness evaluation. A synopsis of the testing will be provided during the briefing to the California Coastal Commission on 12 December 2000.

Page 3 Specific Comment Para 4: Table 4.2-11 on page 4.2-49 shows the HF/M3 sonar as being at 220 dB at 1 m, and page 4.2-53 states it would attenuate to 193 dB in a 7 m radius. Please explain how this calculation is made.

Response: The RL at 22.4 m is 193 dB based on spherical spreading. The Final OEIS/EIS will be corrected to reflect this.

Page 4 Specific Comment Para 1: Pages 4.2-26 to 4.2-30 discuss the proposed "180 dB criterion" and new categories of effects which the Navy calls "non-serious injury" and "non-injurious harassment." These terms are not well defined. The further discussion on Pages 4.2-56 and 57, which analyzes "non-injurious harassment" and/or "disturbance of a biologically important behavior," appears to dismiss the significance of such harassment" unless reproductive successes are affected." This discussion assumes that serious injury could occur only at levels >195 dB. These categorizations are speculative, and we are not aware of any relevant data available to support them. We would like to see a peer review and analysis by independent scientific experts for these categorizations and conclusions.

Response: Based on public comments and discussions with NMFS, the terms serious injury, non-serious injury and non-injurious harassment are not used in the Final OEIS/EIS.

The general consensus is that the 180-dB level should be considered as the point above which some potentially serious problems in marine mammals' hearing capability could start to occur.

Some of the scientific and technical workshops and meetings at which this consensus was developed are:

- High Energy Seismic Survey [HESS] Team Workshop, Pepperdine University School of Law, June 12-13, 1997 (Knastner, 1998);

- Office of Naval Research Workshop on the Effects of Man-Made Noise on the Marine Environment. Washington, DC, February 9-12, 1998 (Gisiner, 1998); and

- National Marine Fisheries Service (Office of Protected Resources) Workshop on Acoustic Criteria, Silver Spring, MD, September 9-12, 1998.

The SURTASS LFA Sonar OEIS/EIS adopted the conservative assumption that all animals exposed to RLs at or above 180 dB would be counted as injured. A SURTASS LFA sonar single-ping RL of 180 dB is considered a scientifically reasonable estimate for the potential onset of injury to exposed animals.

Page 4 Specific Comment Para 2: Page 4.2-53 states the HF/M3 would be lowered in power if an animal approached this source. Is the HF/M3 sonar omnidirectional? The schematic on Page 2-14 makes it appear to be more effective at detecting above the vertical line array (VLA) than below. Can it detect an animal directly below the VLA? Wouldn't the LFA loudspeakers themselves interfere with the signal and detection directly below the VLA?

Response: The HF/M3 sonar is installed on the SURTASS LFA sonar transmit vertical line array (VLA) just above the first projector at a nominal depth of 86 m (282 ft). The area covered by the HF/M3 sonar is nominally 2 km (1.1 nm) omni-directional (horizontal) from the source array with a vertical beam width of 10 degrees. The only blind spots for the HF/M3 sonar would be a small volume directly above and below the VLA. Because the SURTASS LFA sonar vessel is moving, these blind spots are not stationary.

The HF/M3 sonar is not effective during actual LF transmission, but it is effective within 5 seconds after the end of each SURTASS LFA sonar transmission.

Page 4 Specific Comment Para 3: Page 4.2-57 states that "The reference points of 120 dB and 180 dB were chosen for the risk function on the basis of consensus views....by scientists who play leading roles in identifying ocean noise pollution as a potential problem for marine mammals." Please provide detailed elaboration to support this statement.

Response: The reference points were established by the SURTASS LFA team and their scientific advisors, Drs. Tyack, Clark and Fristrup. These scientists have published numerous papers on marine mammal behavior and underwater sound.

Page 4 Specific Comment Para 4: Also, for the purposes of illustration and understanding the sound attenuation and maximum potential impact, we would appreciate it if the Navy would provide an estimate of the maximum distances from the source to the 145 dB contour (the level proposed for diver protection), as well as to the 120 dB contour, since 120 dB is likely to represent the lower limit of potential impact.

Response: The ranges and the volumes vary under different oceanographic conditions; however, the Navy will apply geographic restrictions mitigation to the sound field levels not to exceed 180 dB and 145 dB (divers), regardless of the ranges from the source. In the area south of the Channel Islands during the fall, the SURTASS LFA sonar vessel would have to be between 33 to 39 nm offshore in order to maintain a sound pressure level of less than 145 dB within 3 nm of the shore. Offshore of central California in the fall and spring, this distance would be approximately 25 to 56 nm.

The 145-dB received level criterion for recreational and commercial divers was established by research conducted by the Naval Submarine Medical Research Laboratory using experts in diving physiology and medicine. This criterion has been endorses by the Bureau of Medicine and Surgery (BUMED) of the Department of the Navy.

Page Specific Comment Para 5: Page 4.2-57 states that "The next level of risk is tissue damage then mortality, which would require even higher RLs. Since the potential for SURTASS LFA sonar to cause these risk levels is negligible, they are not addressed in the risk assessment." It is disappointing that the Navy's EIS does not directly address the serious and alarming May 1996 mortality of Cuvier's beaked whales in the Mediterranean Sea, which, according to "Nature (March 5, 1998)" was most likely to have been the result of NATO LFA sonar operations. The lack of discussion of this incident and its implications in the EIS is a glaring omission. A credible EIS needs to analyze all relevant information and provide full disclosure of impact potential to reviewers and decision-makers.

Response: The SURTASS LFA sonar system that is the subject of this consistency determination before the California Coast Commission was not involved in either the beaked whale standings in the Kyparissiakos Gulf in Greece or the Bahamas. The sonars of concern for these events differ both in frequency and signal characteristics from the SURTASS LFA sonar. Documentation of these strandings will be included in the Final OEIS/EIS and are synopsized below.

Two papers have suggested that beaked whales tend to strand when there are naval operations offshore. Simmonds and Lopez-Jurado (1991)[4] reported on four mass strandings of *Ziphius cavirostris* between 1985-1989 in the Canary Islands. All of these mass strandings involved *Ziphius* stranding at the same time as other beaked whale species. Local people reported that naval ships were observed from shore near the stranding sites during three of the four mass stranding events, and these were the only times that such military maneuvers were observed from 1985-1989. No data were provided on the acoustic signals – if any - transmitted by the naval ships; however, it is very unlikely that any sonar transmissions would have involved frequencies below 1 kHz. Frantzis (1998)[5] reported on another mass stranding of 12 or more *Ziphius cavirostris* sighted

[4] Simmonds, M.P. and L.F. Lopez-Jurado. 1991. Whales and the military. Nature 351:448.
[5] Frantzis, A. 1998. Does acoustic testing strand whales? Nature 392:29.

along 38 km (20.5 nm) of coastline on 12-13 May 1996 in the Kyparissiakos Gulf in Greece. There was no external sign of injury or disease in any of these juvenile whales, and many had recently been feeding.

In searching for a potential cause of these strandings, Frantzis (1998) noted a warning had been issued to mariners indicating that a test of a NATO low frequency sonar called LFAS was being conducted in the gulf at the same time as the strandings. Frantzis (1998) presented data on the number of strandings analyzed by half-year from 1992-1996, and stated that no mass strandings or LFAS tests had occurred in the Ionian Sea since 1981, except during the four-day period 11-15 May 1996. Frantzis (1998) concluded that the probability of this association of the mass stranding and the sonar exercise was <0.07. The statistical analysis was not described in the article, but it appeared to treat each four-day period during the 16.5 years from 1981 – 1997 as an independent event during which strandings and sonar tests could be counted. The probability of the mass stranding occurring during the four known days of sonar testing was then simply calculated by dividing the four days by the number of days in 16.5 years = 0.066%.

The Frantzis (1998) article stimulated the North Atlantic Treaty Organization (NATO) Supreme Allied Commander, Atlantic Center (SACLANT) Undersea Research Centre (SACLANTCEN) that conducted the sonar tests to convene panels to review the data and to develop an environmental policy. The report of these panels (SACLANTCEN, 1998)[6] presented more detailed acoustic data than were available for beaked whales stranded in the Canary Islands. The NATO sonar transmitted two simultaneous signals lasting four seconds and repeating once every minute. The simultaneous signals each were broadcast at source levels of just under 230 dB re 1 μPa at 1 m. One of the signals covered a frequency range from 450-700 Hz and the other one covered 2.8-3.3 kHz. The *Ziphius* strandings in the Kyparissiakos Gulf occurred during the first two sonar runs on each day of 12 and 13 May 1996. The close timing between the onset of sonar transmissions and the first strandings suggests closer synchrony between the onset of sonar transmissions and the strandings than was presented in Frantzis (1998). However, the Bioacoustics Panel convened by NATO was unable to reach a definitive conclusion due to the lack of evidence of direct physical injury because no viable tissue samples suitable for laboratory analysis were recovered from any of the animals. Their official finding was "An acoustic link can neither be clearly established nor eliminated as a direct or indirect cause for the May 1996 strandings."

The Simmonds and Lopez-Jurado (1991) and Frantzis (1998) papers served an important function to alert marine mammalogists and the public of coincidences of rare strandings with military operations. However, two problems prevent stronger inference. The papers do not have the appropriate design for statistical analysis of conditional probability, and no such correlative study can provide evidence for causation. Both papers started with stranding events and then looked for some other rare event that might coincide. This strategy is useful to identify coincidences, but is not appropriate for a statistical analysis of conditional probability unless independent tallies are made of the two kinds of events. Both papers suggested that naval sonars may have caused these strandings, but neither performed a systematic survey of naval or sonar exercises. SACLANTCEN (1998) attempted a correlative study relating all tests of the NATO sonar with Italian and Spanish stranding records. SACLANTCEN (1998) reported that the same NATO sonar described in

[6] SACLANTCEN. 1998. Summary Record and Report, SACLANTCEN Bioacoustics Panel, La Spezia, Italy, 15-17 June 1998.

Frantzis (1998) was used in six sonar tests in the Mediterranean near the Spanish or Italian coasts; five additional low frequency sonar tests were conducted by NATO in the Mediterranean from 1981-1992 using source levels below 215 dB re 1 μPa at 1 m. The SACLANTCEN (1998) review of Italian and Spanish stranding records revealed no other coincidence of beaked whale strandings near the time and place of these sonar tests.

These papers raise concern about the effects of noise on beaked whales, but they provide no guidance as to what exposures may be dangerous and which are safe. Correlative studies cannot prove causation; all of these reports agree on this issue. Simmonds and Lopez-Jurado (1991) stated: "Very little is known about the biology of *Ziphius*, so the reason for the unusual strandings can only be the subject of speculation." Frantzis (1998) agreed: "Little is known about whales' reactions to LFAS; to obtain definitive answers, more information needs to be gathered." The Bioacoustics Panel convened by NATO stated: "Behavioral responses to acoustic transmission must be taken into consideration as a possible cause for strandings: therefore, acoustic characteristics that induce behavioral changes or physical damage to marine animals should be determined."

On March 15, 2000 a number of marine mammals, including beaked whales, stranded in the Bahamas. The U.S. Navy launched an in-depth investigation of this phenomenon with scientists from NOAA's National Marine Fisheries Service and others to determine the possible cause of the strandings. The investigation has focused on a transit of seven ships and three submarines through the area of the Northwest New Providence Channel during the morning and afternoon of March 15th in an effort to determine if any action by these vessels could have created an environment hazardous to marine mammals, and particularly beaked whales. The Navy is reviewing acoustic, oceanographic, biological and environmental data to determine whether these transit activities may have had a role in the strandings. Preliminary analysis indicated that one submarine sonar and five of the seven ship sonars were in use during the transit, and their operating frequencies and power settings were part of the investigation. Each sonar was a standard, mainframe mid-frequency (3 to 5 kHz) sonar of the type commonly found on surface combatants and submarines in most of the world's navies. They operated with standard power outputs and modes.

The SURTASS LFA sonar program has focused on the issue of the potential for LF sound impacts on all marine animals, including beaked whales. It has been confirmed that SURTASS LFA sonar was not involved in any of the events. All available information indicates that odontocetes have their best hearing in the mid-frequency to high-frequency ranges and do not possess exceptional low frequency hearing sensitivities. Odontocete hearing thresholds are estimated to be 50 dB better at 2,000 Hz (60 dB) than at 200 Hz (110 dB). Thus, even if the investigation ultimately concludes that the mid-frequency sonars in use during the transit caused or contributed to the strandings, such a conclusion would not appear to present any significant new information relevant to the proposed deployment of SURTASS LFA sonar.

<u>Page 4 Specific Comment Para 6</u>: Page 4.3-2 and 3 propose using as maximum 145 dB exposure to divers, based on the study contained in Technical Report #3 which exposed divers to various sounds between 145 dB and 160 dB. During previous submittals to the Commission (Phase I and II LFA research), the Navy indicated that it was relying on guidance from the Navy Bureau of Medicine and Surgery, which had issued interim guidance for operation of low frequency sound

sources. That guidance was a 160 dB maximum for trained Navy divers, and, non-Navy-trained divers, a 130 dB maximum, which is significantly lower than the current proposal for a 145 dB maximum. The studies described in Technical Report # 3 indicate that although its studies did not use Navy-trained divers, the divers represented "volunteers drawn from the military population in the San Diego area." Given that these divers were aware they would be subjected to noise, and were associated with the military, we question whether their experience was analogous to divers in the ocean experiencing sounds of unknown (to them) origin. We would also like to know whether the Navy Bureau of Medicine and Surgery has reviewed Technical Report #3 and, if so, whether it agrees with the Navy's conclusions.

Response: Based on the data from the human diver program (Technical Report 3) the Naval Submarine Medical Research Laboratory developed new guidelines recommending a maximum level of 145-dB sound pressure level (SPL) between 100 and 500 Hz based on actual human diving research. The Bureau of Medicine and Surgery (BUMED) has reviewed and endorsed the recommended guidance for recreational/commercial diver exposure to low frequency water-borne sound in the operating range of the SURTASS LFA sonar and related underwater sound sources. The letter reference is: Assistant Chief, Operational Medicine and Fleet Support (MED-02), Bureau of Medicine and Surgery (BUMED), Department of the Navy ltr 6120 Ser 21/0196 of 18 October 1999.

The investigations into human diver response were measurements of aversion. The divers involved were recreational divers that happened to be in the military, but had only civilian certification for diving. Furthermore, there was a wide variation in diving experience, with some divers having as few as four dives prior to the testing. Waivers of physical and training standards were requested and obtained to allow the use of non-military trained divers. The only physical standards that were adhered to were that divers had to be free of any absolute contraindications for diving as described in the Recreational SCUBA Training Council's guidelines for physicians. The strict protocols used for this research took into consideration that the personnel utilized were from the non-diving military.

The 130-dB SPL guidance for non-trained Navy divers was promulgated by BUMED before the completion of the human diver program, and the 130-dB criterion has been superceded by the 145-dB criterion.

Page 5 Specific Comment Para 7: Technical Report #3 also divulges frequencies at which divers would experience lung vibration, which the document states would happen at 40 Hz (at the surface) to 80 Hz (at a depth of 120 ft.). The Navy purports to operate LFA between 100 and 500 Hz. Given the Navy's ability to operate at multiple and complex frequencies, what measures will be taken to provide assurances that frequencies less than 100 Hz will not be used?

Response: The Navy is fully committed to operate in the manner described in the Final OEIS/EIS and as presented to the California Coastal Commission in the consistency determination. Specifically, the Navy will not operate the SURTASS LFA sonar transmitter below 100 Hz.

CCC Comment 12: Finally, we are perplexed by the Navy's omission in not discussing or analyzing the incident that occurred during the Navy's Phase III LFA testing in Hawaii, when

swimmer Chris Reed was alleged to have become disoriented after being exposed to sound levels around 125 dB.

Response: The Navy did not address Ms. Reid's claim in the draft OEIS/EIS because the credible evidence does not support it.
In her sworn declaration submitted to the federal district court in Hawaii, dated March 18, 1998, Ms. Reid claimed that while swimming off of the Island of Hawaii on March 12, 1998, - less than a week before she signed her declaration- she had witnessed abnormal dolphin behavior (from 300 yards). She also claimed to have suffered an adverse reaction herself from LFA exposure, specifically "....loss of equilibrium, and other physiological distress..."

The Government then submitted a sworn declaration from Dr. Kurt Fristrup, who at the time was directing the LFA research from on board the research vessel *Cory Chouest*. Dr. Fristrup stated that the LFA source had been operated only briefly on the day Ms. Reid claimed to have been exposed, that a point of land had blocked direct transmission from the source to where Ms. Reid was, and that the level of sound where she was would have been "negligible in relation to normal ambient noise." Dr. Fristrup also cast doubt on Ms. Reid having seen the dolphins from 300 yards away.

Ms. Reid responded to this by filing a **new** sworn declaration, in which she claimed to have been exposed to LFA on March 10th, not March 12th, and in which she claimed to have meant to say she saw the allegedly erratic dolphin behavior from 300 feet, not 300 yards.

In addition to these factual discrepancies in Ms. Reid's accounts, it should be noted that Ms. Reid was not using an artificial breathing apparatus (SCUBA), but was free diving. The LFA transmit schedule from several (4+) miles away showed a transmission schedule between 0841 to 0953 HST at a source level of 195 dB (re: 1 micro Pascal). The transmissions lasted for exactly 40 seconds ever six minutes, or 11 percent of the time. A snorkeler would need to swim down to well below six feet to even hear the signal.

At 1,000 yards, one hundred feet deep, the received level, or what could be measured would be approximately 135 dB. The LFA signal used during the SRP is very similar to a humpback whale song with source levels of 165 dB. Even if someone could hear the LFA signal it would be challenging for a non-sonar/whale song expert to differentiate the difference between the manmade (LFA) and the many biological (humpback song) signals.

Ms. Reid's allegation is also contradictory to all medical research in the area. The Naval Submarine Medical Research Laboratory has conducted over four years of study on the effects of LFA signals on human divers. Navy and independent academic medical physicians and clinical scientists have provided medical safety guidelines of over two hours of cumulative exposure at 145 dB (re: 1 micro Pascal). It should also be noted that this medical diver guidance is based on psychological aversion and not physiological injury. The SURTASS LFA Sonar OEIS/EIS Technical Report 3 provides a detailed description of the diver studies.

Several other anti-LFA proponents also claimed to be injured on 8 March 1998, however, that was also one of the days that the system was not transmitting.

Page 5 Possible Additional Information: Technical Report #1, which primarily summarizes past Navy LFA studies (Phases I-III), also (as shown in the following quotes) discusses future studies and/or analyses:

Page 44: "A more objective evaluation of changes of vocal activity as a function of LFA playback condition is now underway."

Page 68: "Our final, more quantitative analysis will test for any systematic decrement in the number of whale tracks....."

Page 73: "Results from these analyses should be available this summer, with manuscripts for peer reviewed journals submitted by the fall."

Page 103: "A broader community of biologists, acousticians, and regulators will be needed to evaluate the potential for biological significance of any reactions."

Page 107: "We will carefully evaluate these sighting data in terms of these two potential avoidance responses."

These excerpts were taken from LFA research reports written in 1997 (Phase I) and 1998 (Phases II & III). Is the information these reports states will be provided at some future date now available? In what form? If they are discussing ongoing or future analyses, can you estimate when they will be made available?

Response: The LFS SRP principal investigators will submit results of the additional analyses for publication in various scientific journals; e.g., *Journal of the Acoustical Society of America; Marine Mammalogy,* etc. The article "Whale songs lengthen in response to sonar" concerning observations of male humpback whales during Phase III of the LFS SRP was recently published in *Nature* by Miller et al. (2000)[7].

Page 6 Cumulative Impacts/Monitoring: Page 4.4-1 assumes that LFA would not "cumulate" with other noise sources, because the other sources would interfere with LFA missions. This statement may be unsupportable for several reasons, among them: (1) the Navy already has the capability to distinguish between different sound sources by analyzing the noise footprint from each source; and (2) to our knowledge, the Navy is not making any commitment to avoid operating within specific distances from other loud sound sources. More importantly, the Navy's cumulative impacts discussion is flawed because it ignores use by other nations (or even other branches of the U.S. military) of the same or similar technology. Once the Navy begins widespread use of this technology, the following may occur: (1) other nations will want to develop and use the same or similar technology, if they have not already done so (clearly NATO is already using the technology); and (2) defense contractors will want to market the technology to other nations. Regardless of how they receive or develop the technology, use of LFA technology by other

[7] Miller, P.J.O., N. Biassoni, A. Samuels and P.L. Tyack. 2000. Whales songs lengthen in response to sonar. Nature 405, 903. Macmillan Publishers Ltd, England.

nations may not occur in conjunction with any restrictions on maximum levels or sensitive areas, such as those agreed to by the Navy. We are concerned about widespread use of the technology.

Response: The Navy can only respond to SURTASS LFA sonar operations that are within the scope of the OEIS/EIS. To speculate to other LF sound sources and the proliferation of other LF technologies is beyond the scope of this analysis. It is also impractical and well beyond the scope of the SURTASS LFA sonar program and the proposed action to determine baseline ocean ambient noise.

Page 6 Cumulative Impacts/Monitoring: We are also concerned that other nations might attempt to thwart LFA detection by sending out "jamming" or confounding signals of its own, which would lead to increased noise effect in the marine environment. What are likely defensive countermeasures that might be developed to protect a submarine from being detected by LFA? Is the U.S. Navy in the process of developing countermeasures of its own to protect against submarine detection by other nations' LFAs? While we understand any such measures may be classified, we would like to know whether any such countermeasures would involve adding noise to the marine environment.

Response: Countermeasures have been evaluated during the validation of the Navy operational requirement for SURTASS LFA sonar. There are no existing countermeasures that produce LF sound. Moreover, naval operations of this nature are classified.

Page 6 Cumulative Impacts/Monitoring: Page 4.4-3 states the Navy intends to conduct annual assessments of potential cumulative impact of LFA operations, involving tabulating non-serious injuries and non-injurious harassment over the initial five year period. Pages 5-2 and 3 further describe on-going operational monitoring. We have a number of questions about these monitoring effects:

1. How will the Navy collect data?

Response: The data will be collected during SURTASS LFA sonar operations under the LTM Program and for reporting to NMFS under the MMPA. In the Navy's annual report to NMFS, there would be an assessment of any long-term and/or cumulative effects attributable to SURTASS LFA sonar operations, including: 1) assessment of any long-term effects from SURTASS LFA sonar operations; and 2) any discernible or estimated cumulative impacts from SURTASS LFA sonar operations. In addition, the Navy's annual report to NMFS would include an assessment of whether any taking of marine mammal(s) occurred within the LFA mitigation zone (180-dB sound field) during SURTASS LFA sonar operations, and reports of any verifiable diver incidents. The nominal inputs to this assessment would be expected to be date, time, vessel, area, number(s) and type(s) of marine mammals affected, assessment basis (observed injury, behavioral response, model calculation), LFA mitigation zone radius, bearing from vessel, and whether operations were delayed, suspended or terminated.

2. Will the Navy be analyzing marine mammals' reactions to noise sources other than the Navy's LFA? Isn't this information necessary for a valid cumulative impact analysis?

Response: The Navy has been and will continue to be instrumental in advancing scientific understanding of the potential effects of sound on the marine environment through the Office of Naval Research (ONR), Marine Mammal Biology Program.

3. Will the Navy's monitoring results be made available to the Coastal Commission and the public? If so, how will this information be provided?

Response: Yes. Monitoring data will be made available to the California Coastal Commission. Copies of the NMFS reports from the LTM Program will be provided to the Commission. The public can obtain the information through NMFS.

4. Will the monitoring end after the initial 5 year period?

Response: The LTM Program described above has been budgeted for five years. At the end of the five years and based on results of five years of SURTASS LFA sonar operations (provided to NMFS via annual reports), it will be determined whether a follow-on program will be necessary.

5. When will the monitoring to provide field verification of the 1-km radius for the 180-dB noise contour be made available?

Response: For most operational environments, including all near California, spherical spreading is an accurate model for the 180-dB sound contour. If and when SURTASS LFA sonar is operating in a ducted or channeled environment, the Navy will conduct direct measurements of the 180-dB contour.

6. Will the operations be conducted during low-visibility conditions, such as night and foggy weather, when visual monitoring will be less effective?

Response: Yes. The scope of our proposal to the State of California includes nighttime and reduced visibility operations.

7. How does passive acoustic monitoring determine the distance to the animal?

Response: Passive monitoring localization is provided through varying rate changes similar to localization of surface ships. This is also similar to the mission of tracking submarines and surface vessels.

8. Will monitoring information be accompanied by an assessment of the extent to which ambient anthropogenic noise levels in the ocean are continually increasing? What efforts will be made to determine and factor into future analyses these increases in ambient noise levels?

Response: It is beyond the scope of the SURTASS LFA Program to record worldwide ambient noise levels. Unclassified LF ocean ambient noise data collection would be carried out coincidentally in the ocean basins in which SURTASS LFA sonar operations occur using standard Navy recorders and the passive (SURTASS) array, whenever feasible.

Page 6 Comment: In light of the above discussion and information needs, we finally question the confidence with which the Navy asserts on Page 4.4-3 that:"...any potential for cumulative impacts from SURTASS LFA sonar operations is extremely small and has been addressed by limitations proposed for employment of the system." To reiterate briefly, among the reasons for our questioning this conclusion are: (1) the lack of reliable cumulative impact information concerning both Navy and other nations' or organizations' use of LFA; (2) the paucity of reliable information on the overall effects of noise on the marine environment; (3) the extreme difficulty of accurately monitoring and measuring the effects of LFAS and other low-frequency underwater noise impacts; and (4) an unsubstantiated reliance on 180 dB as a safety threshold for impacts, based on limited Navy LFA studies primarily exposing animals to <180 dB levels.

Response: Many of the potential cumulative impacts that could be associated with SURTASS LFA sonar operations have been considered in the OEIS/EIS analyses. Moreover, all observations made during the LFS SRP suggest that impacts terminate when transmissions stop. Thus, the maximum scale on which cumulative impacts would be expected to occur would be a 20-day mission.

The potential for impacts from the proposed action would include the possibility of injury to a negligible percentage of fish stocks (including sharks) and sea turtle stocks and the potential of injury to a negligible percentage of marine mammal stocks (within the 180-dB sound field). The potential for effects on the stock of any marine mammal from significant change in a biologically important behavior is minimal.

Any cumulative effects on fish (including sharks), sea turtle or marine mammal stocks from implementation of the proposed action is a long-term issue and is estimated to be extremely small. This can be attributed to the following:

- The system would be operated for a relatively brief period of time on an annual basis (estimated maximum of 432 hours per vessel per year).

- The system would operate at a low duty cycle (on no more than 20 percent of the time), and for relatively short periods of time in any given area. Even if considered in combination with other underwater acoustic effects, such as commercial shipping, other operational, research, and exploration activities (e.g., acoustic thermometry, hydrocarbon exploration and production), recreational water activities, and naturally-occurring sounds (e.g., storms, lightning strikes, subsea earthquakes, underwater volcanoes, whale vocalizations, etc.), the SURTASS LFA sonar system does not add appreciably to the number of acoustic events to which fish, sea turtle and marine mammal stocks are exposed.

- The system would not be stationary.

- A maximum of only four systems would be operational (with usually only 1-2 at sea at any one time, and almost always in separate oceans).

In the case of fish and sharks, there are cumulative effects on their stocks from other human activities (e.g., over-fishing). However, this issue has been addressed from the context of underwater sound, and it was determined that SURTASS LFA sonar sound would not significantly affect these stocks.

The potential for cumulative effects of oceanic ambient noise levels from SURTASS LFA sonar operations should also be addressed. Urick (1983)[8] stated that ambient noise is what remains after accounting for all identifiable noise sources. Thus, any potential for cumulative impact should be put into the context of recent changes to ambient sound levels in the world's oceans.

National Resources Defense Council (NRDC) (1994)[9] states a widely held premise that ambient noise in the world's oceans has been increasing over the past 50 years, mostly due to shipping and that this increased noise level could potentially affect marine mammals and sea turtles. The scientific evidence that this is occurring is presented in the OEIS/EIS.

There are sources other than shipping that contribute to ambient noise in the oceans, including natural sounds (e.g., earthquakes, storms, snapping shrimp, marine mammals, fish, etc.) and other manmade sources (e.g., hydrocarbon exploration and production, drilling, and aircraft sonic booms).

When transmitting, SURTASS LFA sonar will add to regional noise levels. To determine the significance of this effect, the operation of SURTASS LFA sonar systems (maximum of four worldwide) was compared to oceanic shipping, the dominant contributor to LF ambient noise in the oceans. The results of this comparison are presented in the OEIS/EIS, which concluded that, within the existing environment, any potential for accumulation of noise in the ocean by the intermittent operation of SURTASS LFA sonars would be negligible.

The Navy also proposes to conduct the LTM Program under which it would conduct annual assessments of the potential cumulative impact of SURTASS LFA sonar operations on the marine environment based on the best available data. This would include cumulative impact analyses of the annual estimates of taking of marine mammals within the LFA mitigation zone (180-dB sound field), over the initial five-year period of operation.

In summary, any potential for cumulative effects from SURTASS LFA sonar operations is extremely small and has been addressed by limitations proposed for employment of the system (i.e., geographical restrictions and monitoring mitigation). However, this issue will continue to be taken into consideration given the uncertainty of other underwater acoustic sources, and any pertinent results from future research and the LTM Program

CCC Comment 5: We understand that in the context of all the world's noise sources, LFA is not a dominant factor. But the same can be said of any individual source: each one by itself is relatively insignificant, but cumulative impact may be significant. The EIS should acknowledge how little

[8] Urick, R.J. 1983. Principles of underwater sound, 3rd edition. Los Altos, CA.
[9] Natural Resources Defense Council (NRDC). 1994. The sound and the fury: the controversy over ocean noise pollution. The Amicus Jour., Fall 1994. pp. 19-23.

we really know about cumulative noise impacts and should propose studies to fill the date gaps and monitor the effects of human-induced noise on the marine environment.

Response: The SURTASS LFA sonar contribution to the total ocean noise levels would be negligible.

Many of the potential cumulative impacts that could be associated with SURTASS LFA sonar operations have been considered in the analyses. Moreover, all observations made during the LFS SRP suggest that impacts terminate when transmissions stop. Thus, the maximum scale on which cumulative impacts would be expected to occur would be a 20-day mission.

Any cumulative effects on fish (including sharks), sea turtle or marine mammal stocks from implementation of the proposed action is a long-term issue, and is estimated to be extremely small. This can be attributed to the following:

- The system would be operated for a relatively brief period of time on an annual basis (estimated maximum of 432 hours per vessel per year).

- The system would operate at a low duty cycle (on no more than 20 percent of the time), and for relatively short periods of time in any given area. Even if considered in combination with other underwater acoustic effects, such as commercial shipping, other operational, research, and exploration activities (e.g., acoustic thermometry, hydrocarbon exploration and production), recreational water activities, and naturally-occurring sounds (e.g., storms, lightning strikes, subsea earthquakes, underwater volcanoes, whale vocalizations, etc.), the SURTASS LFA sonar system does not add appreciably to the number of acoustic events to which fish, sea turtle and marine mammal stocks are exposed.

- The system would not be stationary.

- A maximum of only four systems would be operational (with usually only 1-2 at sea at any one time, and almost always in separate oceans).

- In the case of fish and sharks, there are cumulative effects on their stocks from other human activities (e.g., over-fishing). However, this issue has been addressed from the context of underwater sound and it was determined that SURTASS LFA sonar sound would not significantly affect these stocks.

There are sources other than shipping that contribute to ambient noise in the oceans, including natural sounds (e.g., earthquakes, storms, snapping shrimp, marine mammals, fish, etc.) and other manmade sources (e.g., hydrocarbon exploration and production, drilling, and aircraft sonic booms).

When transmitting, SURTASS LFA sonar will add to regional noise levels. To determine the significance of this effect, the operation of SURTASS LFA sonar systems (maximum of four worldwide) was compared to oceanic shipping, the dominant contributor to LF ambient noise in

the oceans. Sound would be introduced into the ocean from SURTASS LFA sonar signals only when the sonar was actually transmitting. The nominal annual and 30-day deployment schedule for the SURTASS LFA sonar system would involve a maximum of 432 hours of active transmissions per system per year. This equates to 18 days per system, or 72 days for all four (maximum) SURTASS LFA sonar systems combined.

Oceangoing merchant vessels, on the other hand, transmit sound into the ocean constantly whenever they are underway. The four SURTASS LFA sonars would be transmitting sound into the ocean for a total maximum of only 72 days per year vs. 21.9 million days per year for the 60,000 vessels of the world's merchant fleet (assuming 80 percent of the merchant ships at sea at any one time). Therefore, within the existing environment, any potential for accumulation of noise in the ocean by the intermittent operation of SURTASS LFA sonars would be negligible.

The Navy also proposes to conduct the LTM Program under which it would conduct annual assessments of the potential cumulative impact of SURTASS LFA sonar operations on the marine environment based on the best available data. This would include cumulative impact analyses of the annual estimates of taking of marine mammals within the LFA mitigation zone (180-dB sound field), over the initial five-year period of operation.

In summary, any potential for cumulative effects from SURTASS LFA sonar operations is extremely small and has been addressed by limitations proposed for employment of the system (i.e., geographical restrictions and monitoring mitigation). However, this issue will continue to be taken into consideration given the uncertainty of other underwater acoustic sources, and any pertinent results from future research and the LTM Program.

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STATE OF CALIFORNIA – THE RESOURCES AGENCY GRAY DAVIS, *Governor*

CALIFORNIA COASTAL COMMISSION
45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

November 29, 2000

Joseph S. Johnson
Attn: Surtass LFA Sonar OEIS/EIS Program Manager
901 North Stuart St., Suite 708
Arlington, VA 22203

Re: **CD-113-00**, Consistency Determination, U.S. Navy, Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") Sonar Program

Dear Mr. Johnson:

While we are awaiting your response to our October 26, 1999, comments on the Navy's Draft Overseas Environmental Impact Statement/Environmental Impact Statement (OEIS/EIS) for the above-referenced activity, we have the following additional questions and recommendations for Navy consideration upon reviewing your consistency determination:

Operational Questions

1. If the sound is 180 decibels (dB) at 12 miles from shore, what would normally be the level at 3 miles from shore?

2. Can the concept of ramp-up procedures apply to LFA signals (which can last up to 100 seconds)? Is this feasible, useful, or practical? If not, could ramp-up be applied between successive transmissions (i.e., first transmission at lower power, the next one higher)? If not, please explain why.

3. Would the Navy's mission needs be compromised if the Navy were to adhere to the NOAA Sanctuaries' recommendation that no National Marine Sanctuary be exposed to >180 dB sounds from LFA (see item 4, page 3 below)? If so, why, and to what degree? Also, if so, could passive acoustics (e.g., the Navy's passive Advanced Deployable System, or similar technology) provide the necessary military detection needs within the Sanctuaries? If not, why not?

Monitoring and Reporting Questions

1. What are the details of the Navy's visual, passive, and acoustic monitoring plans?
2. When will the plans be available for review?
3. If they are still incomplete, to what degree is the Navy willing to coordinate with and involve the Commission and its staff in their development?
4. How many visual observers will there be at any given time?
5. What is their minimum training, and what is their military/civilian status?
6. Will whale reactions to < 180 dB (e.g., the range between 120 dB and 180 dB) be monitored and documented?

Attachment 2

7. How much internal coordination will occur between the visual, passive, and acoustic monitors?
8. Who will be pulling the information together and making decisions on whether to reduce power or stop transmissions?
9. Will there be ramp-up procedures?
10. What event, if any, will trigger cessation of LFA transmission (e.g., a whale death or significant adverse physiological reaction)?
11. How often will monitoring reports be published?
12. Will the Navy commit to submitting these to the Commission staff in a timely manner?
13. Will there be independent scientist review of the monitoring, and if so, will those scientists be writing independent analyses?
14. If so, will the Navy commit to submitting these to the Commission staff?
15. Will the monitoring reports divulge the extent of use of the sonar during armed conflict or heightened threat conditions (as described in the Navy's consistency determination), and, if so, will they discuss whether the mitigation and monitoring measures were in effect during any such use?

Possible Additional Restrictions

We would like the Navy to respond to the feasibility of incorporating the following additional restrictions:

1. Limit the request for authorization to a 5-year period (similar to the duration of the NMFS permit), with an agreement to submit a subsequent consistency determination for operations beyond the 5 year period.

2. For this initial 5-year period, agree to not have 2 LFA ships operating off California waters at any one time.

3. Until the effectiveness of the proposed active detection system (HF/M3) is established, agree to not transmit during nighttime or reduced visibility conditions (e.g., fog, or Beaufort sea state conditions greater than category 3).

4. Agree to seasonal limitations and lowered maximum dB levels in areas of known special biological sensitivity located more than 12 nm offshore, to be identified by the Commission staff in consultation with the National Marine Sanctuaries, including the outermost gray whale northbound migration path (i. e., the westernmost migration path, when 1/3 of north-bound whales travel outside of at least three of the four southern channel islands [see attached map]).

5. Understand and agree that operations will cease and the Commission's federal consistency review may be reopened in the event of significant disturbances or significant adverse effects to marine resources, divers, or swimmers, to be determined in consultation with Commission staff.

6. Specifically describe, and commit to continue to fund and perform, additional long-term research on the effects of low-frequency sound on marine resources, for the life of the LFA program.

Recommendations

In addition to these possible restrictions, we request that the Navy consider, and analyze its ability to commit to comply with or make further progress towards meeting, the following recommendations (the first 3 by the National Research Council (made in NRC-2000), and the fourth by NOAA National Marine Sanctuaries and Coastal Zone Management Programs (made in their DEIS comment letter to the Navy dated Oct. 27, 1999):

1. "NMFS, the Navy, and other agencies with responsibilities for marine mammals or that conduct or permit activities that introduce significant levels of sound to the ocean should evaluate the costs and benefits of an array of acoustic receivers designed to monitor both human-generated sound in the ocean and the vocalizations of whales in acoustic hotspots (NRDC, 1999). One possibility is to use existing arrays such as the IUSS (JOI, 1994; Clark, 1995; Gisiner, 1998) developed by the U.S. Navy to detect submarines. ... Whales could be located and tracked in real time and in three-dimensional space, thus identifying natural paths and avoidance paths. "

2. "The concept of Stranded Whale Auditory Test (SWAT) teams ... should be expanded to at least two teams, one on the east coast and one on the west coast of the United States."

3. "If the studies described ... [in the NRC report] are of sufficient priority to reduce uncertainties in the regulation of human-generated sound in the ocean, federal agencies should establish a national facility for the study of marine mammal hearing and behavior. The Committee believes that such a facility might be established at relatively little incremental cost by enhancement of the existing Navy facility. ...The Navy's Marine Mammal Program facility in San Diego keeps marine mammals and already has trained animals and expertise in maintaining them. Its role potentially could be expanded to provide a more widely accessible national facility, including unclassified research. ..."

4. "National Marine Sanctuaries (NMS) are protected for their special national significance and NMS resources (both natural and cultural resources) are subject to a higher level of protection. In keeping with the precautionary principle to protect these areas, the 180 dB zone should be kept out of all NMS."

In conclusion, thank you for your continued cooperation in working with our agency. If you have any questions about these questions and comments, please contact me at (415) 904-5289.

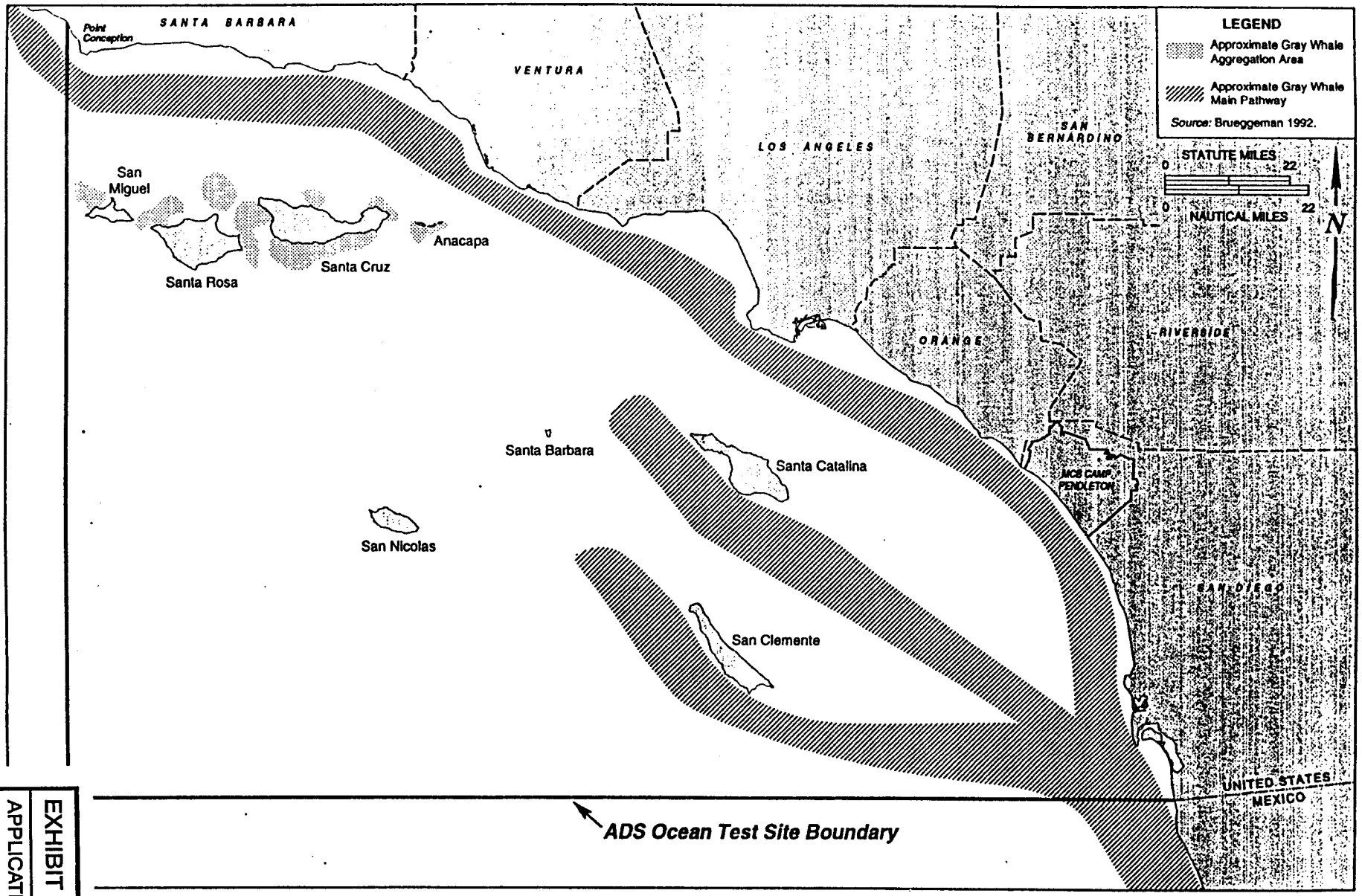
Sincerely,

Mark Delaplaine

MARK DELAPLAINE
Federal Consistency Supervisor

Attachment: Exhibit 8 from Navy consistency determination for Advanced Deployable System

cc: NOAA/Sanctuaries and Reserves
NOAA/OCRM
NMFS



FIGURE

4-2

Gray Whale Aggregation Areas and Main Pathways – Winter/Spring
Southern California Bight

EXHIBIT NO. 8
APPLICATION NO. CD-109-98
Source: U.S. Navy

DEPARTMENT OF THE NAVY
THE ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS AND ENVIRONMENT)
1000 NAVY PENTAGON
WASHINGTON, D.C. 20350-1000

9 June 2000

Ms. Penelope D. Dalton
Assistant Administrator for Fisheries
National Oceanic and Atmospheric Administration
1315 East-West Highway
Silver Spring, MD 20901

Dear Ms. Dalton:

On June 5, 2000 representatives of the U.S. Navy, the National Marine Fisheries Service (NMFS), and the Marine Mammal Commission (MMC) met to review preliminary results of efforts to determine the cause of the stranding of a number of beaked whales in the Bahamas on March 15, 2000. This letter summarizes what we learned during that meeting and describes our future intentions.

The Navy reviewed five naval activities that occurred around the Bahamas from March 12 to 15, 2000. Three of these were at the AUTEC range approximately 60 miles south of the stranding location and include a close air support training mission on March 12, 2000 a foreign navy's use of a dipping sonar from a helicopter that occurred approximately 19 hours before the first whale stranded, and the firing of practice torpedoes (non-explosive) approximately 12 hours before the first stranding. The fourth was a small-scale submarine-tracking exercise conducted as part of the U.S. Navy's Littoral Warfare Advanced Development (LWAD) program over 35 miles to the east and five and a half hours after the stranding began. The fifth was an east-to-west transit of the Northeast and Northwest Providence Channels by U.S. and foreign warships roughly coincident in time to the strandings.

Due to timing and the significant distance from the stranding location, the first four activities listed above had no probability of impact on marine mammals in the area and have been discounted as contributing factors to the stranding. The Navy has taken, and is continuing to take, a thorough review of the transit through the Northeast and Northwest Providence Channels. Several ships used standard, hull-mounted sonar operating within normal mid-range frequencies, power outputs, and duty cycles during the transit. Normal frequency ranges, power outputs, and duty cycles are, respectively: 3.5 and 7.5 kHz, 235 decibels (dBs) and lower referenced to 1 micro Pascal at 1 meter, and "pings" of short duration (one tenth of a second or less duration on a standard duty cycle of 24 seconds). The Navy has also gathered oceanographic, environmental, and acoustical data and is in the process of completing analyses of these data.

From the information your staff presented on the necropsies of the animals, the beaked whales were generally in good health before they stranded and did not strand as a result of chronic disease or malnutrition. The necropsies also indicated that the whales incurred a pressure-related or auditory trauma before stranding. The trauma was precipitous and recuperable; that is, it was not severe enough to cause the whales to die. While the trauma may have precipitated the

Attachment 3

whales' stranding, there is no direct physical evidence to support such a conclusion. The trauma observed in several of the animals is likely to have been caused by a distant blast or an intense acoustic event, particularly one having a pressure distribution profile of an underwater sonic boom. Based on the number and coincidence of strandings, i.e., two species of beaked whales, there is a suggestion that the pressure-related trauma and subsequent stranding might be a situation unique to beaked whales located relatively close to shore. The source of the baro- or auditory trauma indicated in the necropsies of the stranded whales is unknown, although the Navy and NMFS are looking closely at whether the sonars used during the transit could have been the source. Part of the difficulty in identifying a baro- or auditory trauma source that may be unique to beaked whales, is the fact that comparatively little information is known about them, both from a behavioral and a physiological perspective. As noted in the literature, there are gaps in the scientific knowledge of beaked whales. We believe them to be deep diving mammals that spend significant periods of time at depths as great as 1,800 meters.

The Navy is conducting a complete reconstruction of the sound field produced from the sonars on the transiting ships. That effort is undergoing a comprehensive peer review by leading acousticians from outside the Navy. The final reconstruction is expected to be complete by mid-July and the results will be provided to NMFS and MMC. Preliminary results indicate that there was a "surface duct," approximately 400 to 500 feet deep from the ocean's surface, within which most of the sound from the sonars propagated horizontally near the ocean's surface. Within a range of 1,000 meters from the ship in this surface duct, the sound level from the sonars dropped in intensity to less than 180 dB referenced to 1 micro Pascal at 1 meter. The transmission loss (reduction in sound level) was greater at lower depths, meaning that sound levels of 180 dB or higher would not have been encountered until much closer than 1,000 meters from the ship.

As a result of our discussions on June 5, 2000 we believe that the Navy and NMFS agree that priority should be given to conducting research on beaked whales and any potential vestibular or auditory sensitivity inherent in those animals. The Navy has already committed to continue its program of research in this regard, and as part of that research, to specifically address whether sonars pose a risk to beaked whales. The Office of Naval Research (ONR) is the leading organization, worldwide, in funding research into the effects of sound on marine mammals. That research is conducted to ensure that essential naval operations and systems - such as sonar - are operated with minimal impacts upon marine mammals. This year the Navy increased its research budget on this topic by over 50 percent (to over 3 million dollars, annually). ONR programs, including this one, are reviewed frequently by external peer panels, including the National Academy of Science. All work is unclassified and researchers are encouraged to publish their findings in open, peer-reviewed literature.

In summary, the Navy recognizes that the stranding of beaked whales in the Bahamas on March 15, 2000 was an unusual and significant event. To that end, the Navy is conducting an exhaustive review of the ship transits through the Northeast and Northwest Providence Channels. The Navy is also committed to continuing to fund research into acoustic effects on marine mammals and will ensure beaked whales are included in that effort. If, either as a result of research or the investigation into the Bahamas stranding, it is determined that naval sonars can produce barotrauma in beaked whales, the Navy will reassess its use of sonars in the course of peacetime training and implement measures to ensure the least practicable adverse impact on

beaked whales, taking into account essential national security mission requirements. The Navy will also review available information in the scientific community on the habitat and distribution of beaked whales and will work with NMFS and MMC to improve data on that subject. Navy will continue to ensure operational commanders and environmental planners have the most current scientific data in order to assess the potential impacts on the ocean environment from naval operations and ensure that our operations are conducted in a prudent and environmentally responsible manner.

We recognize the critical importance of continuing our investigation as a scientific process and appreciate the information that NMFS has, and will continue to provide. We look forward to our continued coordination to try to determine what caused this tragic event.

ROBERT B. PIRIE, JR.

Copy to:
Marine Mammal Commission

EARTH ISLAND INSTITUTE

RECEIVED

November 29, 2000

Mr Mark Delaplaine
California Coastal Commission
45 Fremont St. #2000
San Francisco, CA 94105
Via FAX: 415-904-5400

Dear Mr. Delaplaine,

On behalf of the International Marine Mammal Project of the Earth Island Institute and our national membership, we write to seriously object to the conclusions reached in the Draft Overseas Environmental Impact Statement and Environmental Impact Statement for SUFTASS LFA Sonar (DEIS). The concerns raised in the DEIS have not yet been addressed by the Navy since the comment period closed in October, 1999. We therefore urge the commission to delay any vote on the determination of consistency with the California Coastal Act of the deployment of the LFAS.

By every measure, the DEIS arbitrarily minimizes the probable effects of LFAS deployment. It completely fails to assess the hearing loss, disruption of feeding, mating, and communication, as well as physiological stress that would be inflicted upon marine mammals and other inhabitants of the marine ecosystems in question.

The DEIS further fails to address any long-term and cumulative impacts, as required by law, or to accurately describe the immense scientific uncertainties associated with this proposed unprecedented sonic assault within LFA deployment areas.

We believe that the DEIS must be withdrawn, LFAS not be deployed, and that the Navy should be required to develop other means for submarine detection.

COMMENTS OF OTHERS:

We wish to formally associate ourselves with the LFAS DEIS comments made by Drs. Lindy Weilgart, Research Associate; Department of Biology, Dalhousie University, and Naomi Rose, Marine Mammal Scientist, Humane Society of the United States.

In addition to their comments, we wish to add:

STRESS:

For more than twenty years, at a cost in excess of ten million dollars, researchers from the US National Marine Fisheries Service have attempted to assess the impacts on dolphins of the chase and encirclement by tuna vessels in the Eastern Tropical Pacific Ocean. Yet even after this extensive and multi-decade effort, the NMFS is still only at the beginning stages of understanding the impacts of physiological stress on the behavior, survival, distribution, and reproductive potential of the several species of dolphins in question.

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San Francisco, CA 94133
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Fax: 415-788-7324

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Attachment 4

It is now becoming clear to scientists that several depleted dolphin populations have failed to recover and that the chase, capture, sonic bombardment, and disruption caused by the purse-seine fishery is the most likely cause. The acoustic and physical abuse of dolphins by these fishing practices cause unobserved injuries and deaths and leave dolphins more vulnerable to predation and disease. Dolphin calves are separated from their mothers, resulting in increased mortality of young dolphins.

There a shred of evidence that the same phenomenon will not occur -- perhaps many times over -- as a result of LFAS. Yet the LFAS DEIS, based on a scant few hours of testing on a minuscule sample of only four species of baleen whales for less than a year -- with no follow-up or long-term assessment -- is prepared to conclude that LFA is safe and ready for deployment. This is entirely capricious.

Compounding the major shortcomings relating to marine mammals, the DEIS provides no credible assessment whatsoever of the impacts on other marine species. What about impacts on fish, sea turtles, and invertebrates?

The DEIS's conclusions are also rendered meaningless by the failure to make any assessment of impacts at the planned full deployment level of the LFAS devices.

The DEIS's cursory and flawed analysis defies scientific, legal, and public policy rationality.

IGNORING KEY INFORMATION:

Among the DEIS's glaring omissions is the failure to address the paper by Dr. Alexandros Franzis reporting on the mass stranding of Curvier beaked whales off the coast of Greece in 1996. Dr. Franzis reported in the British science journal Nature, that both the extremely unusual number of whales stranded and the exact locations of the strandings correlated with the trials of LFA sonar broadcasting from a NATO research vessel. The DEIS has inexplicably withheld any assessment of this event or of NATO's discussions and analysis of it. The DEIS must be revised to include NATO participants' conclusions that the LFAS tests were the probable cause of the strandings. In addition, the stranding of at least a dozen beaked whales in the Bahamas due to a known U.S. Naval acoustic testing event is reason to believe the LFAS will indeed cause harm to the marine environment. Necropsies of the dead whales showed massive trauma to their hearing structures. There is no credible basis for the Navy to ignore this information. The potential risk of mass strandings must be evaluated in light of these past incidents.

In summary, for the reasons stated above, we request the withdrawal of the DEIS and urge that no deployment of LFAS be undertaken. Thank you for considering these comments.

Sincerely,

David C. Phillips
Director, International Marine Mammal Project
Earth Island Institute

NRDC
THE EARTH'S BEST DEFENSE

NATURAL RESOURCES DEFENSE COUNCIL

By Overnight Courier and Facsimile

December 5, 2000

Sara Wan
Chair, California Coastal Commission
Members of the California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219

Re: *Consistency Determination on Surveillance Towed Array Sensor System Low-Frequency Active ("SURTASS LFA") Sonar (CD-113-00)*

Dear Madam Chairperson and Members of the Commission:

On behalf of the Natural Resources Defense Council ("NRDC"), the Humane Society of the United States ("HSUS"), and our over 7.4 million members and constituents, of whom more than 780,000 reside in California, we write to express our deep concern over the U.S. Navy's proposed use of a low-frequency active sonar system ("SURTASS LFA," hereinafter "LFA") off the California coast. The information that the Navy has submitted does not justify deployment of a technology with such wide geographic reach, nor does it allow the Commission to conduct a meaningful consistency review. We therefore urge you to find that, for want of information, the Navy's proposal is inconsistent with California's Coastal Management Program.[1]

I. BACKGROUND

LFA's predecessor was a worldwide ocean surveillance system known as SOSUS (for "Sound Surveillance System"), which the Navy developed and deployed during the early years of the Cold War. Unlike LFA, the system was passive: built to receive signals, not to transmit them. The "active" component of LFA is an array of eighteen loudspeakers lowered several hundred feet from a ship's hull into the ocean and synchronized through electrical lines along a central cable. Sounding in tandem, the speakers create a focused

[1] NRDC is aware that letters of concern are being submitted independently by a number of organizations and individuals. We hereby incorporate by reference those letters and any other comments expressing concern over the operation of LFA in and around California waters.

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strandings were not expected to lead to severe adverse marine mammal reactions" (Staff Report at 24). We should expect nothing less from the Navy than a responsible risk assessment of LFA in light of the strandings—but that assessment has not been provided, nor have data or findings from the Navy's investigation of the strandings been disclosed.

Of course, strandings represent but one impact that sonar systems and other acoustic sources are known or believed to have. LFA itself has been shown to cause avoidance in migrating gray whales and to disrupt vocalization in fins, blues, and humpbacks;[6] other anthropogenic sounds have been linked to disturbances ranging from agonistic behavior and habitat abandonment to threshold shift.[7] Some of these disturbances, such as changes in the songs humpback whales use for mating, may be biologically meaningful in an obvious way, but the meaning of other disturbances are more elusive and less predictable.[8] What distinguishes LFA from other acoustic activities that this Commission has reviewed is its extraordinary range—a function of its low frequency, its high intensity, and its near-global scope of operations.

II. SUMMARY OF ENVIRONMENTAL CONCERNS

The comments that NRDC submitted last fall, in response to the Navy's Draft Environmental Impact Statement ("DEIS") for LFA, contain a detailed discussion of our principal environmental concerns.[9] Briefly summarized, these include the following:

(1) In general, little effort has been made by the Navy to identify data gaps, to describe areas of scientific disagreement or controversy, or to qualify conclusions regarding biological significance in light of either.
(2) Despite the Navy's claim that LFA "would have no significant adverse long-term impacts on the maintenance and enhancement of long-term biological

---

[6] See C Clark, P. Tyack, & W. Ellison, Low Frequency Sound Scientific Research Program Technical Report 1: Responses for Four Species of Whales to Sounds of SURTASS LFA Sonar Transmissions at 10 (Feb. 1999).

[7] For an overview of recent research, see, e.g., National Research Council, Marine Mammals and Low-Frequency Sound: Progress Since 1994 (2000). A general introduction to the issue of ocean noise pollution may be found in Natural Resources Defense Council, Sounding the Depths: Supertankers, Sonar, and the Rise of Undersea Noise (2000) (available at www.nrdc.org), copies of which have been provided to the Commission.

[8] In its recent report on ocean noise, the National Research Council considered the case of gray whales that deviated just a few hundred meters from their migration path in order to avoid an experimental sound source. It concluded that, given the potential for increased predation and other factors, "even a small avoidance could result in unanticipated consequences." National Research Council, Marine Mammals and Low-Frequency Sound at 64.

[9] Staff Report at 1, 24-25. The Staff Report contains a shorter, but useful summary of some of NRDC's concerns and provides a substantial excerpt of NRDC's formal comment letter to the Navy at Exhibit 10. To facilitate further review, we have attached, and incorporate by reference, a complete version of those comments. We have also attached comments from a few of those submitted last fall by acousticians and marine mammalogists from around the world.

productivity," authors of a technical report prepared for the Navy have noted that "no work has been performed that tests the effects of low-frequency noise on ecological processes."[10]

(3) The Navy may have substantially underestimated the effects of its system by assuming that neither significant behavioral impacts nor auditory injury will occur in marine mammals, sea turtles, and other species at exposures below 180 dB. This assumption was based in the DEIS on a selective review of the scientific literature (especially with regard to auditory injury), extrapolations from data obtained (at lower levels of sound) against the cautions of the Navy's own researchers, and speculative treatment of biological significance and other matters that fails to acknowledge scientific uncertainty and disagreement. The assessment of risk at levels below 180 dB is especially pertinent, given the extraordinary range of low-frequency sound in the ocean.

(4) Although active mid-frequency and low- to mid-frequency sonar may have been implicated in recent mass strandings of cetaceans, the potential for strandings from LFA has not at all been addressed.

(5) The monitoring system provided by the Navy is based on two methods whose inadequacies are well known (visual and passive acoustic detection) and one novel method (active acoustic surveillance) whose effectiveness has not been validated and whose own environmental impacts, alone and in concert with LFA, has not been assessed.

(6) It is not clear how LFA and other sources might combine locally to produce adverse cumulative effects. The Navy's treatment of cumulative impacts—comparing LFA's output to the totality of noise produced globally by shipping and other sources—does not properly address the problem on local and regional scales.

(7) For all the uncertainties pertaining to this issue, reasonable alternatives (such as new passive technology) that could reduce or eliminate the system's impacts have not been adequately addressed.

III. THE NEED FOR ADDITIONAL INFORMATION

According to federal regulation, should the Commission find LFA inconsistent with California's Coastal Management Program, it must describe "alternative measures (if they exist)" that would, if adopted by the Navy, "allow the activity to proceed in a [consistent] manner" (15 C.F.R. § 930.42(a)); and, insofar as its finding is based on lack of information, "must describe the nature of the information requested and the necessity of having such information to determine the consistency [of the activity] with the management program" (15 C.F.R. § 930.42(b)).

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[10] Compare D. Croll, B. Tershy, A. Acevado, & P. Levin, Marine Vertebrates and Low-Frequency Sound Technical Report for LFA EIS at xiii (Feb. 28, 1999) with DEIS at 8-1.

beam of sweeps and pure tones that can extend for many hundreds of miles, rising and falling according to the principles of refraction. Low-frequency soundwaves are known to travel very far in water. During at least one LFA field test, sound within the focused beam was predicted to reach 140 dB over 300 nautical miles from the source, more than 20 dB above the level at which behavioral impacts are known to occur.[2] The deployment proposed for the next five years would involve as many as four host ships, with two operating in the Pacific.[3]

As you are aware, there has been mounting concern within the environmental, scientific, and regulatory communities about the adverse impacts of active military sonar. Indeed, the Navy's appearance before this Commission comes nine months after a multi-species mass stranding of cetaceans—which has been strongly linked to the Navy's use of mid-frequency active sonar—occurred in the Bahamas. (Necropsies performed on a number of the beached whales showed bleeding in the ears and other anomalies that were consistent with auditory trauma; aside from the Navy's mid-frequency sonar, just about every other possible source of intense noise in the area has been eliminated as a cause.)[4] A few years earlier, in 1996, a mass stranding of Cuvier's beaked whales occurred off the west coast of Greece. It was correlated, within the correspondence pages of the magazine Nature, with the movements of a low- to mid-frequency active sonar system operated by NATO; a subsequent NATO review determined that the sonar "[had to] be taken into consideration as a possible cause."[5]

Mass strandings are evidence of the most dramatic kinds of risks from active sonar; they are also illustrative of the need for precaution in our assessment of risk and setting of standards, whether it is mid-frequency or low-frequency sonar that concerns us. As the Commission staff rightly notes: "[T]he sounds that may have caused the Bahamas

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[2] See Chief of Naval Operations, Environmental Assessment for Use of Surveillance Towed Array Sensor System Low Frequency Active in connection in Connection with a Submarine Security and Technology Program Test [CNO Project K154-4] (July 1997). Please note that all decibel levels quoted in this letter refer to sound pressure or intensity calculated logarithmically to a reference unit of 1 iPa (micro-Pascal).

[3] Chief of Naval Operations, Draft Overseas Environmental Impact Statement and Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar (July 1999) at 2-5. Citations to this document will appear in the text as "DEIS."

[4] See Letter from Mr. Robert B. Pirie, Jr., Assistant Secretary of the Navy for Installations and Environment, to Ms. Penelope D. Dalton, NOAA Assistant Administrator for Fisheries (June 9, 2000); and National Marine Fisheries Service, NOAA Fisheries Status Report: Preliminary Findings on the Stranding of Beaked Whales in the Bahamas (June 9, 2000). It should be noted that, in addition to the two species of beaked whales suggested by the latter title, at least one and possibly two species of baleen whales stranded as well. Though the Navy's investigation has apparently focused on beaked whale impacts, impacts on baleens must also be considered in any thorough analysis of the event.

[5] Unfortunately, a lack of anatomical data on the stranded whales made causality impossible to confirm. See SACLANT Undersea Research Center, Summary Record, La Spezia, Italy, 15-17 June 1998, SACLANTCEN Bioacoustics Panel at 1-3 (1998) (SACLANTCEN M-133); see also A. Frantzis, "Does Military Acoustic Testing Strand Whales?" Nature (Mar. 5, 1998) ("Scientific Correspondence").

There is a long list of alternatives that one might suggest, beginning with an extension of the Navy's exclusion and safety zones. The Navy believes that 180 dB is an appropriate standard—yet the National Research Council, in its recent report on "Marine Mammals and Low-Frequency Sound," found inter alia that even exposure levels of 150-160 dB would be "difficult to justify" with regard to auditory impacts on baleen whales (despite some environmental impact statements to the contrary); and Hawaii's Coastal Zone Management Program, which reviewed LFA a few months ago, concluded that the Navy's standard was unsupported by evidence and held that marine mammals should be exposed to sounds no more intense than those allowed for human divers (145 dB).[11] Of course, we do not know what level of noise might have caused the mass strandings in the Bahamas, and the Navy has given us no reason to believe that level is 180 dB or above.[12]

What the Navy offers in its submission, in short, is little more than a Hobson's choice between a preferred, but unjustified mitigation scheme and no mitigation at all (see DEIS at 2-7 to 16), and we believe that a full range of alternatives must be considered if its proposal is to come into full compliance with California's Coastal Management Program. For now, however, we do not believe it possible for the Commission to reach the issue of alternatives. We must agree with staff's conclusion that, until the Navy provides the Commission with additional, necessary information, any consideration of alternatives would be "premature." Staff Report at 16.

Last fall, staff submitted formal comments on the Draft Environmental Impact Statement for LFA, the document upon which the consistency determination before you is based. These comments, which are partly summarized in the current Staff Report (23-25), identified a number of problems and omissions in the Navy's risk analysis, mitigation protocol, and monitoring scheme. They noted, inter alia, that the DEIS "(1) ignores important information; (2) is deficient in its description of cumulative impacts; (3) relies on unjustified and/or overly simplistic assumptions; and (4) arrives at conclusions that are not warranted based on the research and science that have been performed to date."[13] The Navy's official response, which to our knowledge came yesterday on 4 December, has not altered staff's conclusion about the need for adequate information.

It should be noted that the Navy has not responded to numerous comments submitted by NGOs, independent scientists, and concerned members of the public, some of which

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[11] See National Research Council, Marine Mammals and Low-Frequency Sound at 53; and Letter from Mr. David W. Blane, Director of Hawaii's Office of Planning, to Mr. Joseph S. Johnson, U.S. Navy Deputy of Special Programs at 1-2 (Aug. 11, 2000)

[12] Indeed, in its summary letter to the National Marine Fisheries Service, the Navy observes that "sound levels of 180 dB or higher would not have been encountered" until an animal was within or well within 1,000 meters of the mid-frequency sonar. Letter from Piric to Dalton at 2 (June 9, 2000).

[13] Comments of Commission Staff to J.S. Johnson, SURTASS LFA Sonar OEIS/EIS Program Manager at 2 (Oct. 16, 1999)

have also been summarized in the Staff Report. For this reason, staff recommends that the Navy extend the Commission's deadline for consistency review—at least until early next year, when replies to public comments will have been published in a final environmental impact statement —but the Navy has not yet seen fit to comply.

We believe that the following information, which the Navy has not yet provided, is minimally necessary to the Commission's consistency review:

(1) Disclosure of all information about the mass stranding of cetaceans off the Bahamas last March, including the "complete reconstruction of the sound field," that has been produced in the course of the Navy's investigation but not released to the public.[14]

(2) A propagation analysis for California waters (such as the Navy prepared for Hawaiian waters when Hawaii's Coastal Zone Management Program went through its consistency review), showing expected received levels within 12 nautical miles of shore and accounting for the occurrence of surface ducts and other oceanic phenomena that slow the attenuation of sound.[15]

(3) An analysis of LFA's range of operations relative to both gray whale migratory paths, which are known to run far offshore along certain stretches of the California coast, and to conventional whale-watching routes, which likewise may venture some distance off the coast. See Staff Report at 29.

(4) A risk assessment that conservatively addresses the potential for mass strandings of marine mammals, with particular analysis of recent stranding events off the Bahamas and Greece (which involved beaked and baleen whales) and with a general historical analysis of stranding records.[16]

(5) An analysis of cumulative impacts that considers how LFA signals might combine locally with commercial activities and other sources of ocean noise off the California coast, including any additional active sonars that the Navy is likely to use in the area. This is especially relevant given the Navy's hypothesis that a combination of lower-intensity sounds, working synergistically, could have caused the mass stranding in the Bahamas.[17]

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[14] Letter from Pirie to Dalton at 2 (June 9, 2000).

[15] See U.S. Department of the Navy, Hawaiian Islands Acoustic Propagation Model Analysis (submitted as enclosure to Letter from Mr. Joseph S. Johnson, U.S. Navy Deputy of Special Programs, to Mr. John Nakagawa, Federal Consistency Coordinator of Hawaii Coastal Zone Management Program (June 19, 2000)).

[16] An historical analysis of beaked whale strandings was undertaken this year, in the wake of the Bahamas incident, by researchers at the Smithsonian Institution, and was recently cited by the International Whaling Commission's Scientific Panel Very rough, preliminary results suggest that a high correlation may exist between multi-species mass strandings and military activity. See Report of the Scientific Committee to the International Whaling Commission at the 52nd Meeting of the IWC (July 2000) (IWC/52). Obviously more work needs to be done in this area, yet, despite calls in formal comments, the Navy to our knowledge has not conducted or sponsored such an analysis.

[17] See Letter from Pirie to Dalton (June 9, 2000). This hypothesis is summarized in the Commission's Staff Report at 24.

(6) A revision of the Navy's risk assessment of behavioral impacts that takes into account (a) the general lack of data on behavioral responses for received levels greater than 150 dB and (b) existing uncertainties over the meaning of biological significance; and a revision of the Navy's risk assessment of auditory impacts, to reflect recent findings of temporary hearing loss in pinnipeds at received levels well under 180 dB.[18]

(7) An explanation of why the proposed safety zone should not be extended beyond the 180 dB isopleth, given the Navy's own assumption that maintaining a 165 dB safety zone (for example) would reduce the probability of "non-acoustic harassment" of marine mammals by over 45%. See DEIS at 4.2-28.

(8) A review of a proposal to add those portions of the Channel Islands, Monterey Bay, and Gulf of the Farrallones National Marine Sanctuaries (as well as any other marine protected areas) that fall outside the 12-nautical mile exclusion zone to the Navy's list of "offshore biologically important areas," which are entitled to a degree of protection under the LFA mitigation protocol (DEIS at 2-9).

(9) A verification of the efficacy of HF/M3, the Navy's new "active" monitoring system (DEIS at 2-13), taking into account its apparent ineffectiveness during LFA transmissions, and a full assessment of its potential environmental impacts.[19]

(10) A validation of present source levels, duty cycles, and annual transmission hours, none of which has as yet been operationally justified as having the least practicable adverse impact on California's marine resources, and a description of steps being taken to reduce impacts by improving the system's efficacy.

(11) A clear timetable for additional research, especially of LFA's long-term impacts, which the Navy acknowledges to be an essential part of any mitigation and monitoring program (DEIS at 2-16) yet has received only lip-service in the Navy's consistency determination; and an account of both secure and provisional budgetary sources that would be used to fund such research over the expected life of the LFA program.

(12) A meaningful, detailed alternatives analysis that considers the extent to which passive acoustic technologies, such as SURTASS Twin Line arrays (a variation on the present SURTASS receiver) and Advanced Deployment Systems (now in development off Camp Pendleton), might substitute for LFA,

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[18] As to the last point, see D. Kastak, R.J. Schusterman, B.L. Southall, and C.J. Reichmuth, Underwater Temporary Threshold Shift Induced by Octave-Band Noise in Three Species of Pinniped," 106 J. Acoust. Soc. Am. 1142-48 (1999).

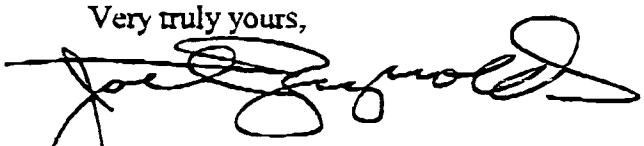
[19] According to the Navy's recently submitted responses to staff's comments, HF/M3 sonar "is not effective during LFA transmissions." See U.S. Department of the Navy, Navy Responses to California Coastal Commission (CCC) Comments on the Draft OEIS/EIS for SURTASS LFA Sonar (submitted as enclosure to Letter from Mr. Joseph S. Johnson, U.S. Navy Deputy of Special Programs, to Mr. Mark Delaplaine, CCC Federal Consistency Supervisor at 11 (Nov. 30, 2000) (received Dec. 4, 2000)).

either in whole or in part, and that describes steps that the Navy is taking to develop appropriate substitutes. This is especially pertinent in light of recent Navy testimony before Congress that suggests advances in passive sonar technology are far exceeding expectations.[20]

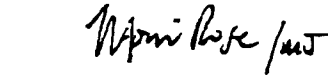
(13) A justification of LFA that answers criticism reported in Jane's Defense Weekly and other sources, regarding the program's tactical utility.[21]

The consistency review that you are currently conducting is California's only opportunity to be heard on a matter of wide-ranging significance. It is crucial that your deliberations proceed with as much necessary information as the Navy can provide. For this reason, we urge the Commission to find the Navy's LFA program inconsistent with California's Coastal Management Program and to identify information needed for a thorough and proper consistency review.

Very truly yours,



Joel R. Reynolds
Senior Attorney
Director, Marine Mammal Protection Program
NRDC



Dr. Naomi Rose
Marine Mammal Scientist
HSUS

Encl.

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[20] See, e.g., Statements of Rear Adm. Malcolm I. Fages, Director of the U.S. Navy's Submarine Warfare Division, Rear Adm. J.P. Davis, U.S. Navy Executive Office for Submarines, and Rear Adm. John B. Padgett III, Commander of Submarine Group Two in the Navy's Northeast Region, before the House Armed Services Committee's Military Procurement Subcommittee on Submarine Force Structure and Modernization (June 27, 2000).

[21] See, e.g., Joris Janssen Lok, "Active Revolution in ASW Sonar," Jane's Defense Weekly 103 (July 2, 1991) (reporting reservations of Marconi Underwater Systems, Inc.).

>Date: Wed, 27 Oct 1999 08:59:17 +0200
>To: eisteam@mindspring.com
>From: Giuseppe Notarbartolo di Sciara <disciara@tin.it>
>Subject: SURTASS LFA Sonar OEIS/EIS
>Bcc: Borsani
>
>Attn: Mr. J. S. Johnson
>eisteam@mindspring.com
>SURTASS LFA Sonar OEIS/EIS Program Manager
>901 N. Stuart Street, Suite 708
>Arlington, VA 22203
>
>Dear Mr. Johnson,
>
>We have read the LFAS EIS, produced by your organization, here in Italy. As persons responsible for the provision of scientific advice to Italian national marine conservation policy, given the likely diffusion of the use of LFAS in Mediterranean marine waters, we are very much concerned that such assessment, which contains statements that to us are insufficiently backed by sound science, will set a dangerous precedent and open the way to widespread misuse of sound producing practice within our marine environment.
>
>In particular we are concerned that the system allows for a fraction of the marine mammal populations to be harmed, and that a single level (180 dB) is assumed, below which all species are safe; this is, in our modest opinion, nonsense from a biological standpoint.
>
>Furthermore, throughout the document we notice a widespread tendency to extrapolate information from one species (sometime humans) to all cetaceans, or from one group of cetaceans (e.g., odontocetes) to another (e.g., mysticetes), and this is of great concern to us as we believe that such extrapolations cannot be safely made.
>
>In particular:
>
>1) the 120 dB level proposed as the lower limit of harmful RL to whales is, to the best of our knowledge, untested for most species of cetaceans

and therefore cannot be assumed a valid rule throughout (page 4.2.- 25);
>
>2) the SURTASS LFA sound is intermittent, as stated in the report, and may therefore startle animals that would possibly avoid a continuous sound or become accustomed to it;
>
>3) the statement is that LFA signal frequencies are below the odontocetes' most sensitive frequencies (4.2.- 26) and therefore levels of 120 dB would not cause threshold shifts in whales is, in our opinion, unjustified;
>
>4) the suggestion that the 180 dB criterion (4.2. - 26) will provoke a non-serious injury to 95% of marine mammals leaves the problem open for the remaining 5%. Is the study does assuming that 5% of the animals may be harmed? This is certainly not a procedure that we would find acceptable in our national waters. In addition, we think that no generalized level can be proposed, given that most species are unknown and that several factors, including a) the base ambient noise levels to which animals are habituated to, b) the age of animals, c) the physiological state (e.g., pregnancy) and other factors are known to influence sensitivity to sound and to disturbance. We suggest that concepts such as continuous dynamic fluctuation of a risk continuum and differentiated risk assessment be given more weight.
>
>5) the repeated references to audiometric data from humans (4.2 - 27) are largely irrelevant to matters related to marine mammals. Along the same lines, one cannot extrapolate from bottlenose dolphins to baleen whales.
>
>Yours sincerely,
>
>
>Giuseppe Notarbartolo di Sciara, Ph.D.
>Junio Fabrizio Borsani
>
>

---------- Internet Header ----------

Sender: disciara@tin.it
Received: from fep01-svc.tin.it (mta01-acc.tin.it [212.216.176.32])
by spamgaaa.compuserve.com (8.9.3/8.9.3/SUN-1.7) with ESMTP id DAA16429
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Date: Wed, 27 Oct 1999 09:03:56 +0200
To: william_rossiter@compuserve.com
From: Giuseppe Notarbartolo di Sciara <disciara@tin.it>
Subject: SURTASS LFA Sonar OEIS/EIS
Mime-Version: 1.0
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Wed, 27 Oct 1999 23:25:51 -0400 (EDT)
Date: Wed, 27 Oct 1999 23:25:32 -0400
From: william rossiter <william_rossiter@compuserve.com>
Subject: di Sciara's SURTASS LFA Sonar OEIS/EIS
Sender: william rossiter <william_rossiter@compuserve.com>
To: Michael Jasny <mjasny@ucla.edu>, Susan Jordan <Sjordan51@aol.com>,
Joel Reynolds <Jreynolds@nrdc.org>, Naomi Rose <nrose@hsus.org>
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By FAX October 27, 1999

Mr. J. S. Johnson
Attn: SURTASS LFA Sonar OEIS/EIS Program Manager
901 North Stuart Street, Suite 708
Arlington, VA 22203
Fax: 703-465-8420

RE: Draft Overseas Environmental Impact Statement/Draft Environmental Impact Statement for the Operational Employment of the Surveillance Towed Array Sensor System Low Frequency Active Sonar

Dear Mr. Johnson,

I have tried repeatedly to fax this set of comments to you, and have not succeeded so far due to no response or engaged lines. Perhaps this is partly because I am telephoning from Singapore. I will continue trying until midnight on 28 October EST, which I believe satisfies your deadline requirement. Even if I am not successful, I will claim the right for these comments to be considered along with others received by your deadline as I have effectively been prevented from submitting them.

As a concerned individual and ocean acoustician of 14 years' experience (including ASW sonar and a long association with marine mammal noise issues), I hereby submit my personal comments on the Draft Overseas Environmental Impact Statement & Draft Environmental Impact Statement for the Surveillance Towed Array Sensor System Low Frequency Active Sonar (SURTASS LFA.

I cannot over-emphasise my hope that the Navy reconsider its current DEIS and prepare a more rigorous, objective and precautionary evaluation of the LFA system, its impact on marine animals and to reconsider all reasonable alternatives that law and public policy demand. The current DEIS is, in my opinion, grossly over-confident and falsely argued I anticipate that the SURTASS LFA is much more likely to have adverse effects, particularly in the long term, than the current DEIS concludes, and I find the reasoning in this DEIS substantially faulted from a scientific viewpoint. In addition, I believe that for a system so powerful, the precautionary principle should be applied. This is particularly relevant when so many species are potential sufferers, and we know so little about so many aspects of their acoustic environment, needs, uses and capabilities.

I would appreciate a confirmation by fax or email that these comments have been received and will be addressed.

Yours Sincerely,

Dr. John Potter
Associate Professor and Head of an Acoustic Research Laboratory.
Email john_p_sg@yahoo.com

Dr John Potter

27 October 1999

Fax: (65) 774 4687
Tel: (65) 96266804

Dr John Potter 27 October 1999

Points of objection and concern

Perhaps the most damaging failure is an apparent repeated failure to acknowledge missing pieces of research and data required to form a sustainable logical chain to the DEIS conclusions. There is therefore a consequent litany of unwarranted extrapolations from limited data and the wholesale adoption of tentatively-proposed relationships as incontrovertable truth. An example is Ridgeway and Malme's cautious suggestion concerning how one might begin to speculate about noise impact by drawing on the understanding we have attained (after many years of study) on human hearing impact in air. This has been seized upon as an established result that can be applied in water when considering marine mammals, which it is not. This greatly undermines the scientific credibility of the DEIS.

I am very concerned at the disparity between scientists in the field, who are virtually unanimous in their consensus that far too little is known about the impacts of anthropogenic noise on the marine environment and marine species, and the confident conclusions of this DEIS. We do not even have the most basic measure, an audiogram, for a Baleen whale. Scientists may disagree about the interpretation of data, but there is no disputing the fact that definitive conclusions cannot be drawn from the information currently available regarding the potential impacts of the LFA system. This critical fact appears not to be acknowledged in the DEIS, and the objectivity of the document is thus severely compromised. No effort is made to investigate or describe areas of scientific disagreement or controversy.

I am also very concerned that the logical construction for the DEIS is to found conclusions on the set of whale data collected through the SRP and data on temporary threshold shift (TTS) in bottlenose dolphins. There is no scientifically-justified basis to extrapolate the dolphin results to Baleen whales, let alone turtles with such blithe confidence. It is far from clear that dolphin results can be considered relevant to other odontocetes, such as sperm whales, which already are very different in their hearing systems [Ketten]. Rather than pursue the objective analysis prescribed by regulation, the Navy has proceeded to fill data and knowledge gaps by extrapolation.

The 180 dB[1] criterion for biological damage (when integrated over the critical bandwidth or greater of the hearing system under consideration) appears to come from a very small set of data on a few bottelnose dolphins. If the value has indeed been selected based on Ridgeway's work that indicated TTS at 172-182 dB, there are serious problems with this approach. Firstly, the extrapolation to such a diverse range of species is unjustified. Secondly, the adoption of a value at the upper end of this range is unjustified.

[1] The dB unit is referenced to 1 $\mu Pa^2/Hz$ intensity throughout this document

Thirdly the validity of the statistical representation even within the species is weak, these dolphins being from a very distinct background, habituation and testing protocol.

For such a radical and important criterion, it deserves very careful justification, with a full explanation of its origins. The result is radical, because 180 dB is a level far higher than any I have heard seriously proposed before for a marine mammal damage limit. It is important, because it forms the basis of the entire DEIS set of conclusions that the proposed mitigation measures are adequate and that no significant damage will occur. I refute both of these claims.

I can see no scientifically-sound basis for extrapolating from dolphins to the other species of concern with respect to the DEIS with any certainty in the absence of further data. It seems unjustified, even, to blithely extrapolate to other odontocetes, such as the Sperm whale, which is already a very different animal from the bottlenose dolphin. See the many papers by [Ketten].

It is my understanding that many marine mammals have a hearing threshold around 40 dB. It is also often broadly assumed that the initiation of pain occurs at some 80-100 dB above the threshold, although recent work from UCSC has indicated that this value should perhaps be revised downwards to about 70 dB. Putting these two very general observations together, pain can certainly be expected in marine mammals from 120-140 dB. This happens to coincide well with the 120 dB level at which significant aversion has been observed in whales (see Tyack et. al., the SRP, etc.). So, while the DEIS attempts to establish a threshold of 180 dB as significant for biological damage, the SRP shows that received levels of 120 dB result in a large number of gray whales deviating from their migration paths. This is inconsistent with the DEIS risk assessment curves which indicate virtually no impact whatever 120 dB.

There may some reasonable basis to suggest that Baleen whales have a higher hearing threshold at lower frequencies as a result of their adjustment to the background level of ambient noise, prior to anthropogenic noise contributions, by the process of evolution. Measurements taken in the southern hemisphere, where anthropogenic noise is less, indicate low seastate levels of 50-70 dB over the range 10-1000 Hz (c.f. Cato, Kibblewhite etc.). We may thus reasonably assume a level of around 60 dB as a baseline in the LFAS frequency band. If this is the case, and it is only speculation so far, supported to some degree by scientific inquiry, then the onset of pain for baleen whales may be in the region of 140-160 dB. By comparison, the ATOC programme (also heavily criticised) used a physiological harm level estimate of 150-160 dB for its EIS, entirely consistent with my broad estimates above. The adoption of the 180 dB value by the LFAS DEIS then appears extraordinary and quite unjustified.

Dr John Potter 27 October 1999

I also think that, where such a powerful source is to be considered, the precautionary principle should be applied in the face of such ignorance. If the Navy does not wish to adopt this principle, it is required to make a careful and detailed, logical argument as to why it is not being adopted. My personal conclusion is that a 140 dB level might be appropriate to adopt as a measure of the threshold of physiological harm to marine mammals, and on no account should a level in excess of 160 dB be adopted for this purpose This still leaves the issue of psychological and long-term impact.

I am astounded that the DEIS concludes that because humpback whales did not permanently abandon their breeding grounds when exposed to 140 dB, no impact of biological significance was experienced. The Navy seems not to agree with my understanding of the accepted position in biological circles that animals sometimes remain in biologically productive areas or continue biologically important activities despite the presence of harmful conditions, because it is so important for them to remain. That they remain does not suggest the animals do not suffer harm. Indeed, in sensitive areas such as breeding or feeding grounds, the potential for harm may be increased due to potentially-extended exposure.

I am also astounded that the DEIS attempts to discount all previous work on avoidance by marine mammals on the basis that the noise sources were unrepresentative of LFAS. Given the wild extrapolations to other species that the DEIS is quite content to make, disqualifying a result on the basis that the source was a little different is ridiculous. We have little enough information as it is. We cannot afford to discount good research without very good reason. I believe that previous avoidance results are relevant, although they should be considered with caution where the sound source is clearly of a different type. This applies equally well to the DEIS use of results for impulsive noise, which they apply to 'pings' of 100 seconds.

I find the assumption that marine mammals will move out of harms way, given the opportunity, to be facile. Firstly, the directional capability of most marine mammals is unknown. The high speed of sound in water makes the time-of-arrival difference method of locating a source direction very difficult underwater. The other recognised method, by interpreting the diffraction and shadowing effects of pinnae morphology, is generally absent since pinnae have generally been abandoned as hydrodynamically inefficient underwater. Northern right whales, for example, should be able to hear oncoming ships, yet many of the fatalities of this species are due to ship strike. Secondly, there is ample evidence of animals choosing to suffer considerable discomfort if there are good reasons not to move away, such as to continue to feed or pursue procreation options. Young men and women in nightclubs routinely display this tendency in the face of crushing TTS Thirdly, in the likely operational context of LFAS deployment, there may be many other sources of harrassment (such as other sonars, overflying aircraft, other ships) which is likely to cause sensory confusion and disorientation.

Dr John Potter 27 October 1999

I object to the description of a quasi-continuous sound lasting up to 100 seconds as a 'ping'. The DEIS proposes that "the risk threshold is lowered by 5 dB per ten-fold increase in the number of sounds in the exposure". This appears to be a gross over-simplification and extension of the original speculation by Richardson and Malme. These authors, having noted and accepted the implications of the lack of any directly relevant data, extrapolated from human in-air data only with the greatest caution and warning about the speculative nature of this suggestion. This work was also mainly concerned with impulsive noise (as from air gun blasts which last perhaps 0.1□0.2 seconds, see [Goold]), rather than quasi-continuous noise. I cannot fail to be suspicious that the DEIS refers to the LFAS transmissions as 'pings' in order to further blur the very real distinction between impulsive and continuous noise impact. These unwarranted extrapolations and distortions appear to lie at the very basis of the 180 dB criterion, which I therefore find entirely unacceptable.

I can find no reference or examination of a recent study of underwater threshold shift in pinnipeds, conducted under an ONR grant at UCSC. Perhaps this work appeared too late to be included. Since the DEIS obviously needs to be re-worked, the second attempt should certainly address this interesting and very relevant piece of work that found a "noise of moderate intensity and duration" (approximately 60-75 dB above threshold after non-continuous exposures of 20-22 minutes) was sufficient to induce temporary threshold shift in some pinniped species. These results obviously conflict with the DEIS's optimistic extrapolations from earlier work and call earlier methodologies into question.

I am very disturbed by the DEIS's apparent limitation of consideration to biological damage, primarily physical trauma. In my opinion, the greater risk from a powerful system that is to have several copies, operated for many hours each year, is the potential impact from long-term effects such as physiological and psychological stress. In the DEIS, all behavioral impacts are ignored as biologically insignificant, which I find extraordinary. Communication, reproduction, feeding and the avoidance of predators are obviously biologically significant to the whole population via the cumulative effects of fitness for life. The impact is to be expected when the exposure is sufficiently frequent to affect an individual's lifespan and/or fecundity, thus impacting the population statistics as a whole. Activities which, if disturbed, could contribute include feeding, socialising, migration, avoidance, and abandonment of critical habitat. It is irresponsible for behavioral impacts to be ignored in impact assessment and mitigation studies. As discussed, the SRP and previous work have indicated that such stress is often observable at levels of 120 dB. I believe the Navy has an obligation to consider the impact of noise down to the 120 dB level and to estimate the coverage in time and space at this isopleth, and the anticipated impact of such coverage.

The DEIS also rests it's case for insignificant impact on many species on the ability to detect marine mammals in a small 'guard ring' around the

source vessel. Firstly, as has already been discussed, this guard ring is based on an unjustified level of 180 dB, a level that I suspect should be much lower, hence making the required 'guard ring" much larger. This is turn would make the proposed observational procedures entirely ineffective at the requires, larger range. Secondly, the likelihood of spotting any single animal during daylight hours, as far as most of the affected endangered and threatened species are concerned, is often estimated at about 50% at best. During the night, the sighting rates can be considered to be much less still Smaller species are even harder to spot. These rates fall further still in bad weather and when crew are used who are not used to the work. One can also reasonably expect that ship's crew, operating an anti-submarine sonar, are not overly excited about calling in a sighting and having the system shut down, when presumably it exposes them or colleagues to submarine attack. All things considered, the visual component of the observation cannot be expected to be effective.

The passive acoustic component may be a little more effective, but only with vocalising animals. Many species do not routinely vocalise, and many individuals in a vocalising species may remain quiet for considerable periods. The passive component therefore also cannot be effective as a mitigation measure. This is particularly so when vocalising whales are known to stop vocalising in response to noise.

Lastly, the active component will suffer greatly in rough weather, being high-frequency and subject to a high level of reverberation from the sea surface and consequent false contacts. These adverse impacts on performance are difficult to predict or quantify in advance. I find no indication in the DEIS that such a system has been built or tested, and so I find the confidence in it's performance unwarranted. I therefore find the mitigation observation package inadequate, and hence the conclusion of negligible impact on many species unproven.

Finally, I am especially concerned that no mention is made of the only well-documented example (that I know of) of a possible LFAS system-related marine mammal impact. I refer, of course, to the stranding of Cuvier's beaked whales during NATO's testing of a comparable system in the Mediterranean Sea [Nature]. A mass stranding of Cuvier's beaked whales occurred in the Kyparissiakos Gulf in the Mediterranean in May 1996, in the vicinity of a NATO LFAS test. This incident was evaluated by an independent scientist and reported in a major international peer-reviewed journal, Nature. It drew considerable attention to the potential impacts of military active sonar, and resulted in NATO SACLANTCEN going to considerable efforts to investigate the incident, for which they are to be commended. The NATO SACLANTCEN study decided that the cause of the stranding was inconclusive, owing to the lack of necropsy and tissue analyses. However, the very rigorous examination by respected scientific experts did agree that the NATO Alliance could well have caused the stranding. This information should obviously have appeared prominently in the Navy's analysis of

"reasonably foreseeable" impacts, which under NEPA include impacts with "catastrophic consequences, even if their probability of occurrence is low." I would have thought that the Navy would have been obliged, under an unbiased and scientifically-defendable DEIS, to have at least attempted a review of available stranding data and the possible correlation with powerful active sonar deployments. Since no such study has been performed, to my knowledge, this is the only scientific peer-reviewed example we have that gives warning of the potential for this kind of impact. For this reason alone, in my opinion the arguments presented in the DEIS would fail a peer-review process for publication. The single fact that this DEIS ignores the Cuvier's stranding would draw critical and damning abuse from a scientific peer-review process. It is but one example of how this DEIS fails when considered against the highest standards of objectivity and scientific reasoning. We can afford to judge this document by no lesser standard, for there is much at stake.

Conclusions

I believe that the Navy has a responsibility, both under law and in fulfillment of their obligations to other inhabitants of this planet to reconsider and re-write the DEIS of the LFAS SURTASS.

My personal inclination would be to start by considering a sliding scale of probabilities (as the DEIS indeed does) based on a 50% level of significant biological impact at 150 dB and long-term psychological impact (that could be serious to the populations as a whole if sufficiently cumulative) at 120 dB.

I find it imperative that the Navy instigates research into the following areas, in addition to those already planned and supported:

0 Medium and high-frequency marine mammal and turtle detection sonar research and development with particular reference to the detection of animals and mitigation of impact inside guard rings.

1 Automatic and intelligent system detection, classification and tracking of vocalisations from passive acoustic sonar data, together with intelligent animal target detection, classification and tracking from active systems data.

Hearing studies based on morphological similarity and direct analysis of inner ear tissues of species potentially affected by LFAS.

2 Finite element and boundary element numerical propagation studies using fine-resolution CAT and other tomographic inversion models of the heads of potentially-affected species to link the hearing morphology results with the received sound level at the animals skin.

3 Historical investigations into possible correlations between adverse marine life impacts and sonar deployments, with the establishment of a clearing

system and database for future deployments to provide a baseline dataset for future long-term impact assessment.

If the Navy continues to maintain that there really is no alternative to the LFAS for national security, then obviously the importance is so high that the relatively minor (compared to the cost, for example, of losing a capital ship) annual expense of a few US$M on vital research cannot be cited as an excuse to delay support.

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27 October 1999

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Dear Mr. Johnson

As a conservation biologist based in Europe I look on the US regulatory system, that encourages and requires a level of openness and scrutiny of the environmental effects of military actions, with respect and enthusiasm. However, while the principles behind this EIS are much to be admired in this case the practice leaves something to be desired. Often this EIS is not as precautionary as it professes to be and it relies I believe on a somewhat partial interpretation of the facts.

I am a cetacean field biologist with a particular interest in cetacean acoustics and some twenty years of practical field experience studying whales and dolphins at sea. I work for the International Fund for Animal Welfare and am also affiliated with the Wildlife Conservation Research Unit in the Department of Zoology of the University of Oxford, however these comments are my own opinions and interpretations as a scientist, not the official position of any organisation. Some of my own research has included attempts to measure the effects of underwater sound on cetaceans and I was invited to and participated in a meeting to discuss the LFA SRP held in Boston.

I have some general comments and some that apply to specific details I can not pretend that this is anything like a thorough review of all the material presented, much of which is new and has not been tested by the normal scientific peer review process. Many of the EIS's findings rest on this untested (and in many cases uncompleted) research and urgent consideration should be given to accelerating the process of presenting and reviewing this material, through workshops and/or a series of special, peer-reviewed, publications.

1. The EIS addresses only some of the potential impacts of using the SURTAS LFA sonar system during development trials and exercises. While I can appreciate that any military organisation is likely to pay scant regard to environmental concerns in times of war or crisis, when the LFA system might be used in earnest, I do feel that it would be appropriate for some of the likely crisis/battlefield scenarios to be at least explored here.

2. While assessing the biological effects of LFAs using a PBR approach the EIS does not give any consideration to any of the other environmental threats or levels of exploitation that marine mammal populations face around the world. Clearly, many threats that considered independently

might be judged to fall below the PBR threshold for concern will, acting together additively, or even synergistically, have a significant effect on populations. Ironically, in several places within the EIS attention is drawn to other threats that populations face in an attempt to show that these animals are facing other problems that may be worse for them than LFA - so why pick on us. If populations are not going to suffer the death of a thousand cuts then a more holistic assessment of all the threats that may be contributing to PBR, including any due to LFA, must be made.

It is essential that what is meant in this EIS by "population" is clearly and unambiguously stated.

3. A particular example of the point (2) made above is the frequent assertion that very few LFAs will be operational in any ocean at any one time Other navies are developing similar systems and if LFA technology proves successful, it is inevitable that every sea power will acquire several systems of their own. Many of these are likely to take (are already taking) a less responsible approach to their use than the US Navy is obliged to.

4. In preparing for this EIS the Navy commissioned a series of substantial research projects, the SRP, and the results of these are often used to underpin the conclusions of the EIS. It should be noted, that in most cases far less field work was undertaken on these projects than was initially felt desirable during the planning stage. In some cases this was due to poor weather, but vessel rescheduling and technical breakdowns also paid a part. The SRP is by far the largest single research project of its kind that has ever been undertaken and a full analysis of the data collected and consideration of the significance of its findings (by both the scientists directly involved and others in the scientific community) is necessary for the proper evaluation of the Environmental Impacts of LFA on cetaceans. It is clear from Technical Report 1 that the scientists involved are still at an early stage in this process. The reports presented are far from complete. They frequently refer to themselves as "quick look reports". Many very substantial data sets have not yet been analysed and in these cases there is no reason to believe that this is because the subsequent findings have rendered the data or the results they might provide not useful If the data were thought important enough to collect in the first place (often at considerable expense) then it must be considered more than likely that their full analysis will provide information that can inform the EIS process.

To cite one specific example, a great deal is made in the EIS of the fact that offshore, grey whale avoidance of the sound source was less pronounced than it was inshore In the technical report a method for analysing whale tracks to come up with a percentage avoidance value for different received levels is outlined in some detail. It appears though that this analysis has not yet been completed and that the apparent difference in behaviour in offshore waters rests purely on scrutiny of tracks in the figures rather than any quantitative analysis. Bearing in mind the many differences between the two experiments, in addition to the fact that they took place at different ranges from the shore, this is an inadequate approach.

Throughout the EIS there is a tendency to accept certain preliminary results from the SRP in preference to other conflicting findings, often from peer reviewed publications. This is poor scientific practice, verging on arrogance

5.The EIS rests on the AIMS model of acoustic exposure and risk. This is an attempt to better predict individuals' acoustic exposure and the ability of cetacean populations to withstand any resultant damage, by modelling animal distribution, abundance and behaviour and integrating this with models of source levels, duty cycles and propagation conditions. The result of such a modelling exercise is only as good as the data that is fed into it. AIMS incorporates of a great quantity of data, much of which (such as diving behaviour, movements and population levels) are very poorly known. In some cases where there is a population or species I happen to know well, I would take issue with the values that have been used. It is necessary to have these input parameters assessed by experts with local knowledge

The model also rests on various unlikely assumptions, for example that whales and dolphins are evenly distributed within a population's distribution. (One example where this assumption is clearly not justified is provided by the northern right whale. In the Atlantic most of the population may be found within a small area (e.g. the Bay of Fundy, and in the past the Roseway Basin) during some periods of the year, while active breeding assemblages may bring in excess of 10% of the world population within a few hundred meters of each other for periods of hours at a time.)

I have watched from the sidelines while the IWC Sci. Comm modelled the effects of different management routines on baleen whale populations during the development of a Revised Management Procedure. The process involved three independent teams each developing their own models while checking , testing an validating the models of the other group. I believe that such a process of openness and scrutiny is essential for the development and verification of a complex model such as AIMS. One particular criticism I have of AIMS is that it appears that the sensitivity of its predicted outcomes to the variability and errors with are likely in much of the data on which it is based, does not appear to have been investigated.

6. In the AIMS models, and in many other parts of the EIS, great confidence is expressed in the ability to accurately model acoustic propagation and thus predict exposure levels Given the uncertainties surrounding all the other data in AIMS it is probable that the received level data is better characterised than any of the other parameters It is a little surprising then to find in Technical Report 1 that although empirical trials of propagation were carried out on many occasions there is only one plot in which measured and predicted received levels are actually compared It is important to have much better information to quantify variability in propagation conditions that can not be modelled. How this has been accounted for in setting a 180dB/ 1km threshold for concern should be stated.

7. **180dB.** The EIS reaches the conclusion that the threshold for non-serious damage is 180dB. This is rather higher than thresholds commonly considered to be appropriate for other powerful sound sources such as seismic or ATOC. For example recommendations of the HESS panel (which considered the potential effects of short duration acoustic pulses on marine mammals) included that "exposure to levels greater than 180dB are likely to have the potential to cause **serious** behavioural, physiological and hearing effects". They go on to state that "at this particular time, the panel hesitates to further qualify the 180dB threshold recommendation until there is more information on such species [i.e low frequency specialists such as large whales]". Seismic pulses last for fractions of seconds compared to the 100sec duration of LFA sonar pulses, which indicates that threshold levels for LFA should be significantly lower.

It is stated that "several studies demonstrated that 180dB is a conservative and protective estimate", full reference must be made to these, I am unaware of any that came to such a bold conclusion.

There are several attempts in the EIS to arrive at the conclusion that 180dB is a level at which PTS or TTS is unlikely in the EIS. None are completely convincing and this section reads almost as though that goal was set at the outset and attempts were made to justify it later.

The arguments are made particularly difficult to follow because the criteria for concern are not unambiguously stated at the outset. Sometimes injury is mentioned, sometimes PTS. TTS might perhaps be appropriate? PTS, for an acoustically oriented animal, must surely be considered as serious injury. Many experts have expressed the opinion that quite subtle effects on behaviour that might affect feeding efficiency, breeding or vulnerability to predators, could have the greatest impacts on cetacean populations.

One line of argument starts with Ridgway's observation of TTS in a **single** dolphin individual at a

level of 192dB which would scale to either 182 or 172 dB when allowance is made for the 100sec length of the LFA pulse. This would seem to lead to the acceptance of 172 dB as a conservative threshold level for TTS and it would be a conservative threshold for a single ping, and that this should be reduced appropriately to allow for exposure to multiple pings. A further conservative assumption would be that low frequency hearing specialists would be as vulnerable to TTS at the frequencies of their greatest sensitively (which probably encompasses those at which LFA operates) as dolphins are at their most sensitive frequencies.

The argument that animals can't be damaged by sound levels of around the same level as their own source levels is an old and fallacious chestnut. There are a number of mechanisms that can protect an animal from its own vocalisations. The fact that one human can cause physical pain and probably induce deafness by shouting into the ear of another should be enough to undermine this argument.

The logic surrounding the choice of B, A and K parameters is outlined in 4.2.5. It is frequently stated that the most conservative values are being chosen but without access to the model it is not immediately obvious which choices of these parameters (especially the K function, will lead to the most precautionary results).

It is surprising that while the A parameter seems to be set entirely in terms of physical damage of some sort the SRP exclusively concentrated on measuring short term behavioural responses. It found these in every case

8. The playback experiments conducted during the SRP only extended to 150dB (and few of them even achieved this level). It was quite correct to take a cautious approach to exposing whales to very high levels during these initial experiments, but it is also unacceptable to advocate that exposing animals to 180dB is safe without a thorough series of trials building up to and including that level.

9. A group which many believe could be particularly vulnerable to disturbance by LFA are deep diving cetaceans, such as sperm whales and beaked whales If LFA is to be used mainly more than 12 miles from the shore then these will also be one of the most commonly impacted groups. An animal like the sperm whale, that may make dives of over an hour, will be difficult to see and avoid using surface observations. Sperm whales may dive to greater than 2,000m. Their ability to avoid loud surface noise sources during these dives may be greatly compromised by limited oxygen supplies, in some cases they may be unable to reach the surface without moving through water ensonified at very high levels. No attempt was made to investigate deep divers during the SRP. Their life styles and sensitivities are so different from those of baleen whales that it would not be sensible to extrapolate results from one group the other.

10. Over the last two years two papers have been published describing the effects on cetaceans of a loud NATO sound source, which has characteristic that are somewhat similar to those of LFA reported the mass stranding of Cuvier's beaked whales in Greece soon after the NATO source had been used offshore, while reported on changes in the vocal behaviour of pilot whales in response to individual transmissions from the NATO source. It is surprising that neither of these readily available research papers have been considered in the EIS. The publication of Frantzis' paper was followed by a NATO workshop to which many acoustic and marine mammals experts were invited. At this workshop, more detailed information on the source and the nature of the exercises before the mass stranding event that had not been made available to Frantzis, was presented and discussed. The new data lent further support of Frantzis' hypothesis that the sonar emissions in some way precipitated the mass stranding. One cetacean hearing expert, Darleen Ketten, suggested that because they have very well developed vestibular systems, beaked whales might be particularly vulnerable to intense sounds at these frequencies. This possibility had not been foreseen before this incident and it further emphasises the dangers of extrapolating results

within what is a very diverse order.

65gfft6 **Mitigation**. The general conclusion of the EIS, which many of us may take issue with, is that the risks posed by LFA to marine mammals and turtles are acceptable provided the proposed mitigation strategy is in place and works effectively (defined as 80% or greater of animals being detected in time to shut down the system before they come within 1km of it) The corollary must be, that if the mitigation procedures are not this effective then it is not safe to continue with the planned deployments and testing of LFA . The effectiveness of any mitigation surveillance can be readily tested by an independent group, and this should be done before further testing continues. If a 180dB threshold is adopted then mitigation measures require that all marine mammals and sea turtles should be spotted at sufficient distance for the of the source to be shut down before they come within 1km of the vessel. (Adoption of a lower threshold, in line with most other regulations, would require monitoring over a much greater range.) There are three components to the surveillance effort, visual, passive acoustic and active acoustic.

The effectiveness of visual monitoring will vary from species to species and also be dramatically affected by sea state, visibility, sun-glare, weather and observer motivation and fatigue It is informative to consider what happens during scientific sightings surveys to assess cetacean populations. A modern sightings survey usually aims to only provide coverage forward of the survey vessel (half the field to be covered by the LFA mitigation team). Observers are usually chosen because they are highly experienced at spotting the target species at sea and are personally motivated to perform what can be a rather monotonous task. A typical sightings team might consist of 3 observers, there will often be two of these teams, plus ancillary observers with big-eye binoculars. Members of the team are rotated to allow them to rest on an approximately 2 hour schedule and a typical sightings team might consist of 10 people. The mitigation team will consist of naval personnel, not necessarily highly motivated and with little incentive to remain so. (Some might even be rather nervous of reporting sightings that could result in costly and inconvenient shut downs.) Scientific sighting surveys usually have only a few target species and this helps them to adopt strategies and search patterns that maximise the probability of spotting these animals, the mitigation team must search for everything from blue whales to turtles! No scientific sightings surveys are able to spot all individuals of any species within 1km It is misleading to state that the field of view for visual observation is 5.6km. Only some very large whales could be sighted in exceptional conditions at such ranges. The EIS provides some values effective strip widths for some species but ESW data can be misleading. Even on the trackline a certain of proportion of animals are missed due to their diving behaviour Also, the effective strip width does not define a corridor in which all animals are seen, rather it is a range from the trackline for which the number of animals beyond the the ESW that are seen is the same as the number of animals within the trackline that are missed. The range over which all animals that make themselves available at the surface are considered to be sighted, is usually very small.

The assertion that the slower vessel speed will increase strip width is unlikely to be correct, it may have some effect on the probability that cetaceans will be spotted on the trackline but it is also informative to note that even from a stationary vessel many gray whales were missed at ranges of 500m and less during SRP Phase II.

Passive acoustic monitoring can be very valuable adjunct to visual searching However, acoustic detectability varies between species and often with an individual's age and sex, time of day and season It would be useful to have additional dedicated hydrophones, including ultrasonic detection systems for small odontocetes (especially porpoises and cephalorynchus sp) and beaked whales. It would also be useful for a scout vessel to conduct passive acoustic (and visual) monitoring ahead of the source vessel to find animals whose visual or acoustic range is rather less than 1km.

The mitigation strategy seems to rest heavily on HF/M3 sonar system and assumes an effectiveness (presumably the proportion of animals detected in time to shut down before they

come within 1km) of 70%. It appears that this system has not yet been developed but its planned performance is far in advance of any similar system in the civilian sphere (even though fisheries applications provides a great financial incentive for the production of high performance sonar systems). I am deeply sceptical that any system can reliably detect a turtle or small cetacean at the range of 1km and reliably distinguish this from a large fish or school of fish or plankton The task of distinguishing marine mammals at the surface from waves also seems daunting

The course of action here must be clear. An EIS whose main conclusions rest on a piece of new technology that has not yet been developed and tested is not acceptable. The first stage must be to have this new technology independently assessed and characterised in realistic field conditions.

One significant additional concern about the use of the HF/M3 system is that it may compromise the effectiveness of the passive acoustic monitoring. For example, passive acoustics can be a very effective way of detecting sperm whales, although there are also substantial periods of time when sperm whales do not vocalise and are also difficult to see as they rest at the surface. But, has shown that sperm whales may fall silent in response to noises similar to those produced by HF/M3 sonar. In some cases then, active sonar may make some animals less detectable overall. At the very least, there should be a period of passive monitoring before initiating HF/M3 transmissions.

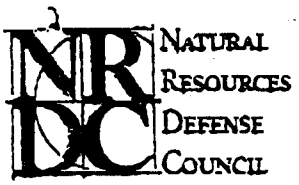
A period of ramp up is suggested for both the LFA source and HF/M3 sonar but in neither case has the simple modelling to determine maximum admissible ramp up rate been presented. An animal swimming away from the source vessel along its trackline at a typical swimming speed and starting from a position next to the source vessel should at not time be subject to a received level of 180dB.

Even the assumption that cetaceans will always move away from harmful stimuli is not born out by field observations For example, while could detect no obvious behavioural responses of humpbacks to blasting activities, later found evidence that the ears of at least some of them had been damaged by this.

I hope that these comments will prove useful to you in reviewing the EIS and help towards a more precautionary assessment of the likely effect of the LFA source on marine mammals.

Sincerely,

Dr Jonathan Gordon



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October 26, 1999

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RE: Draft Overseas Environmental Impact Statement/Draft Environmental Impact Statement for the Operational Employment of the Surveillance Towed Array Sensor System Low Frequency Active Sonar

Dear Mr. Johnson:

On behalf of the Natural Resources Defense Council ("NRDC") and its approximately 500,000 members nationwide, we submit these comments on the Draft Overseas Environmental Impact Statement/Draft Environmental Impact Statement ("DEIS") for the Surveillance Towed Array Sensor System Low Frequency Active Sonar program ("LFA"), prepared by the U.S. Navy.[1] See Environmental Impact Statements; Notice of Availability, 64 Fed. Reg. 41420 (July 30, 1999).

Three years ago, the Navy declared its intention to prepare an environmental impact statement on LFA, one that would take account of biological impacts within and beyond the U.S. territorial sea. 61 Fed. Reg. 37452-53 (July 18, 1996). Given that LFA had

[1] NRDC is aware that comments are being submitted independently by a number of other organizations and individuals, including, but not limited to, the Humane Society of the United States, the League for Coastal Protection, and Cetacean Society International. NRDC hereby incorporates by reference those and any other comments challenging the sufficiency of the DEIS. The comments that follow do not constitute a waiver of any factual or legal issue raised by any of these organizations or individuals and not specifically discussed herein.

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already been used in over two dozen operations without the preparation, in most cases, of an environmental assessment and without regard to state, federal, and international environmental laws, this decision represented a change in policy that was laudable. We write today, however, to express our deep concern with the initial results of this process.

The DEIS prepared by the Navy is deficient in numerous ways. Among other things, it fails to acknowledge important data gaps and scientific controversy, makes unwarranted extrapolations from available data; it excludes contrary evidence and relies on a monitoring plan that is unverified and geographic restrictions that are vague; and its alternatives analysis, its scope, and its treatment of certain endangered and threatened species are inadequate or incomplete. For these reasons and others, the Navy's DEIS falls far short of the high standards set by the National Environmental Protection Act. 42 U.S.C. § 4321 et seq., and provides neither the Navy, the wildlife agencies, nor the public with an adequate basis for decision.

We urge the Navy to withdraw its current DEIS in order to prepare the truly rigorous, objective evaluation of the LFA system and all reasonable alternatives that law and public policy demand.

I. BACKGROUND

LFA's predecessor was a worldwide ocean surveillance system known as SOSUS ("Sound Surveillance System"), which the Navy developed and deployed during the early years of the Cold War. Unlike LFA, the system was passive: built to receive signals, not to transmit them. Hydrophones fixed in critical locations around the globe would record the acoustic signatures of foreign submarines. As submarines grew quieter, with nuclear and electric engines replacing diesel, the Navy kept pace by devising newer and better algorithms for detection. Then, in the 1980s, the paradigm shifted. The Navy began investing its resources in an active, long-range sonar system, one that could detect the presence of deep-sea submarines by bombarding them with high-intensity, low-frequency noise. See Donald White, Low-Frequency, High-Power-Density, Active Sonars, Sea Technology, May 1995, at 54. According to military planners, the sonar was originally developed to meet a perceived Soviet threat. With the fall of the Soviet Union and the end

of the Cold War, the need for the program was questioned by the non-partisan Government Accounting Office. See GAO, Report to the Acting Secretary of the Navy; Undersea Surveillance: Navy Continues to Build Ships Designed for Soviet Threat, GAO/NSIAD-93-53 (1992). But LFA, though scaled down, was not abandoned.

The active component of LFA is an array of eighteen loudspeakers lowered several hundred feet from a ship's hull into the ocean. The speakers are synchronized through electrical lines running the length of a central cable; sounding in tandem, they create a focused beam of sweeps and pure tones a few hundred meters from the source, distance varying by frequency. Beyond the convergence point, this beam of sound extends for hundreds of miles, rising and falling according to the principles of refraction. DEIS at 2-3, 4.2-32 to 33. The low frequencies used by the system—the Navy states its operating range as between 100 Hz and 500 Hz (DEIS at 2-3)—combined with its powers of focalization allow it to scan for vessels at long ranges. During at least one field test, sound within the beam was predicted to reach 140 dB over 300 nautical miles from the source.[2] See CNO, Environmental Assessment for Use of Surveillance Towed Array Sensor System Low Frequency Active in Connection with a Submarine Security and Technology Program Test [CNO Project K154-4] (July 1997). The protocol advanced in the DEIS would involve as many as four host ships, each typically deployed for nine months out of the year and each transmitting for as many as 432 hours on a 20% duty cycle. DEIS at 2-5. We know from an earlier environmental assessment that the system is capable of generating at least 230 dB. See CNO, Environmental Assessment (July 1997). But the exact source level of the proposed action has not been divulged.

Testing of LFA began several years before elements of the program were declassified and the public could learn of its existence. Between August 1988 and July 1994, LFA was deployed in at least 22 separate operations, for which, to our knowledge, no Environmental Assessments were prepared. See SPAWAR, Request for Concurrence in Use of LFA Sound Source in Magellan II, Ser. PNW 182/C225D (July 15, 1994). Eight additional trials took place after July 1994: one in the Hawaiian Islands, one across the

[2] All decibel levels quoted in these comments refer to sound pressure calculated logarithmically to a reference unit of 1 μPa.

Aleutian Islands of Alaska, one west of Vancouver (British Columbia), one in the Gulf of Oman and Persian Gulf, and at least three, perhaps four, off the California coast.[3] For none of these operations was consultation performed under the Endangered Species Act, state agencies involved under the Coastal Zone Management Act, or obligations met under a variety of other environmental laws. Id. During roughly the same period that the Navy was conducting its exercises, NATO was testing a comparable system (with some differences in source level and frequency) in the Mediterranean Sea. A mass stranding of Cuvier's beaked whales in the Kyparissiakos Gulf, an inlet of the Mediterranean off the west coast of Greece, in May 1996, in the vicinity of a NATO test, would draw attention to the potential impacts of military active sonar. See SACLANT Undersea Research Center, Summary Record, La Spezia, Italy, 15-17 June 1998, SACLANTCEN Bioacoustics Panel, SACLANTCEN M-133.

In 1996, after discussions with NRDC and with concern mounting over the effects of anthropogenic noise on marine life in general, the Navy agreed to prepare an environmental impact statement and delay full deployment of LFA until its legal requirements were met. See 61 Fed. Reg. 37452-53 (July 18, 1996). To help resolve some of the uncertainties about the program's impacts, particularly with regard to mysticetes, the great baleen whales, it also agreed to fund a three-phase Scientific Research Program. Those results, though limited, have been incorporated into the DEIS.

II. COMPLIANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT

A. General Standards

Enacted by Congress in 1969, the National Environmental Policy Act ("NEPA") commits the federal government 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."

[3] Compiled from Environmental Assessments prepared by the U.S. Navy. See, e.g., Chief of Naval Operations, Environmental Assessment for Use of Surveillance Towed Array Sensor System Low Frequency Active in Connection with a Submarine Security and Technology Program Test [CNO Project

42 U.S.C. § 4321. To realize these goals, NEPA demands that the "policies, regulations, and public laws of the United States [be] interpreted and administered" in accordance with its principles, "to the fullest extent possible." 42 U.S.C. § 4332. This strong mandate was intended to guide agencies in preparing environmental impact statements (EIS), which are required of all projects that "may significantly degrade some human environmental factor." Steamboaters v. F.E.R.C., 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original). As the Supreme Court explained:

> NEPA's instruction that all federal agencies comply with the impact statement requirement—and with all the other requirements of § 102—"to the fullest extent possible," 42 U.S.C. § 4332, 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).[4]

The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at the environmental consequences of her proposal, before a decision to proceed is made. See 40 C.F.R. § 1502.1 ("Purpose of EIS"); Baltimore Gas & Electric v. Natural Resources Defense Council, 462 U.S. 87, 97 (1983). The EIS must be an objective, neutral document, not a work of advocacy to justify a predetermined result. 40 C.F.R. § 1502.2(g). To help achieve this goal, NEPA sets forth a list of factors that the responsible official must consider "to the fullest extent possible" and include in a "detailed statement":

> (1) the environmental impact of the proposed action,
>
> (2) any adverse environmental effects which cannot be avoided should the project be implemented,

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K154-4] (July 1997). To our knowledge, the exact location of the Magellan II exercise (August 1994) remains classified.

[4] The Ninth Circuit has recognized that the congressional mandate to apply NEPA "to the fullest extent possible" is "a direction to 'make as liberal an interpretation as we can to accommodate the application of NEPA.'" LaFlamme v. F.E.R.C., 852 F.2d 389, 398 (9th Cir. 1988) (quoting Jones v. Gordon, 792 F.2d 821, 826 (9th Cir. 1981).

(3) alternatives to the proposed action,

(4) the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(5) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

42 U.S.C. § 4332(2)(C). Lack of data does not relieve the decision-maker of legal responsibility. What she cannot answer, she is required to analyze, using valid methods and models to identify scientific uncertainties and calculate their risks. 40 C.F.R. § 1502.22(a), (b)(4).

The duty to consider "alternatives to the proposed action"—to "rigorously explore and objectively evaluate all reasonable alternatives"—lies, in the words of regulators, at "the heart" of the entire assessment process. 40 C.F.R. § 1502.14. Agencies must "devote substantial treatment to each alternative" and provide support for their decisions to accept or reject. 40 C.F.R. § 1502.14(b); Natural Resources Defense Council v. Callaway, 524 F.2d 79, 93 n.12 (2nd Cir. 1975). Finally, they must discuss means of mitigating the impacts of their projects, even when those means are not included among the proposed alternatives. 40 C.F.R. § 1502.14(f).

B. Deficiencies in the Navy's DEIS on Low-Frequency Active Sonar

In a number of important respects, the Navy's DEIS fails to meet the high standards of rigor and objectivity established under NEPA:

(1) Need for the Project—It is a fundamental requirement of NEPA that agencies preparing an EIS specify their project's "purpose and need." 40 C.F.R. § 1502.13. The Navy endeavors to fulfill its duty by referencing its interest in "long-range detection" of submarines (DEIS at 1-2)—yet this simple, uncritical assertion is insufficient grounds, for decision-makers and private citizens alike, to discern whether LFA (or an alternative) actually meets the stated "submarine threat." Tactical problems in deployment may undermine the system's effectiveness. If the sonar vessel – with a speed of less than 5 knots while the LFA system is deployed

– is exposed to enemy fire, or if U.S. attack (or other) submarines in the vicinity of LFA are incidentally exposed to enemy receivers – which seems virtually certain to occur within a significant geographic area around the sonar vessel – or if counter-measures and counter-technologies are developed by foreign military forces, deployment of LFA could be worse than ineffective: it could place our own personnel in jeopardy and harm our national interests, strategic as well as environmental. Thus, the EIS must go beyond identifying "need"; it must meaningfully address the long-term potential of the proposed project effectively to address that need.

(2) Incomplete Analysis of the Extent of Deployment—NEPA requires that the Navy evaluate its LFA program as a whole, for it is only in this way that the full impacts of the program can be understood.[5] Nonetheless, the DEIS evaluates only part of LFA's foreseeable deployment. Routine testing, training, and other exercises are considered, but operations undertaken for purposes of surveillance, deployments in direct support of combat, and deployments during "periods of heightened threat conditions, as determined by the National Command Authority," receive no discussion in the document. DEIS at ES-2. These omissions affect the integrity of the entire analysis, since in their absence the significant but plainly foreseeable conditions of adverse impact are categorically excluded. During designated periods of threat, many of the assumptions on which the Navy's findings are based may no longer hold. It is reasonably foreseeable that duty cycles may lengthen beyond 20%, that operations may last beyond a month, that the sonar vessel may hold to a fixed geographic area, and that multiple sources may operate in the same area for an extended period. None of these circumstances is considered.

[5] The courts have required that complex proposals be analyzed in their entirety through a programmatic environmental impact statement. For example, according to the Ninth Circuit Court of Appeals, "[w]here foreseeable similar projects in a geographical region have a cumulative impact, they should be evaluated in a single EIS." City of Tenakee Springs v. Clough, 915 F.2d 1308, 1313 (9th Cir. 1990) (citing LaFlamme v. F.E.R.C., 852 F.2d 389, 401-02 (9th Cir. 1988); accord National Wildlife Fed. V. Appalachian Reg.

Because the goals and purposes of LFA contemplate additional deployments beyond routine training—and without the basic mitigation that has been proposed—the Navy must evaluate their impacts now. To do so later, when still more resources have been committed and the program has been fully integrated into the Navy's operations, would frustrate the purposes of NEPA.

(3) Failure to Acknowledge Data Gaps, and Unwarranted Extrapolations from Limited Data—Agencies have a duty under NEPA to 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 are required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about a program's impacts remain unknown to science.

The Navy's DEIS satisfies none of these requirements. There is a virtually unanimous consensus among marine scientists and bioacousticians that too little is known about the impacts of anthropogenic noise on the marine environment and marine species. Although these experts may disagree about the meaning of a set of data points, there is no disputing the fact that definitive conclusions cannot be drawn from the information currently available regarding the potential impacts of the LFA system. Remarkably, this critical fact is never acknowledged in the DEIS. No effort is made to identify data gaps, to describe areas of scientific disagreement or controversy, or to qualify conclusions regarding biological significance in light of either. And this flaw permeates the DEIS -- a flaw that,

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Com., 677 F.2d 883, 888 (D.C. Cir. 1981); Conservation Law Foundation v. Harper, 587 F. Supp. 357, 364-65 (D. Mass. 1984)).

unless clearly and unambiguously corrected, will undermine the integrity of the entire analysis and, indeed, the LFA program as a whole.

Ultimately, the Navy's findings of biological insignificance rest in essential part on two sources of evidence: (a) data on gray, fin, blue, and humpback whales collected through the Navy's Scientific Research Program ("SRP"), and (b) data on temporary threshold shift in bottlenose dolphins obtained from a study by Navy researchers. Both sets of data are extremely limited in scope and difficult to interpret. Rather than pursue the objective analysis prescribed by regulation, however, the Navy has attempted to fill gaps in information by extrapolating from these data and others in unjustifiable ways. To take just a few examples:

(A) The Navy finds, entirely without support, that none of the behaviors exhibited by exposed animals during the SRP rises to the level of "biological significance." In concluding, for instance, that humpback whales did not permanently abandon their breeding grounds when exposed to 140 dB (DEIS at 4.2-24), the Navy disregards the long-standing belief of the scientific community that animals might remain in biologically productive areas or continue biologically important activities despite the presence of harmful noise. That they remain nearby does not suggest the animals do not suffer harm; on the contrary, it means the risk of harm is increased. As W.J. Richardson noted in 1995: "[If marine mammals] are subject to ongoing stress within that area, there could be long-term effects on individuals and the population." W.J. Richardson et al., Marine Mammals and Noise 396 (1995). The Navy must consider this hypothesis in its assessment of risk.

(B) The Navy assumes, on the basis of the Scientific Research Program, that animals exposed to received levels above 150 dB will experience, at most, the same, supposedly "biologically insignificant" behavioral effects that small numbers of their cohort are said to experience at 150 dB, ignoring the fact that no animals were actually exposed to these levels in the course of research. (It is on this assumption that the Navy bases the A and K parameters of its unprecedented

"risk continuum analysis," which it rightly describes as novel.) See DEIS at ES-10, 4.2-26. The SRP investigators decline to make such claims in their technical report; on the contrary, they note the dangers of doing so, as in this summary of the SRP's third phase: "Responses did not scale consistently to received level, and it will be difficult to extrapolate from these results to predict responses at higher exposure levels." C. Clark, P. Tyack, & W. Ellison, Low Frequency Sound Scientific Research Program Technical Report 1: Responses for Four Species of Whales to Sounds of SURTASS LFA Sonar Transmissions at 10 (Feb. 1999). The significance of this flaw is particularly important in light of the intended deployment of the system at source levels at or exceeding 230 dB.

(C) The Navy relies heavily on its own bottlenose dolphin study to support its "180 dB criterion" for non-serious injury (see DEIS at 4.2-27 to 29) and in so doing improperly extrapolates from a single species to all other odontocetes including the sperm whale (which has been shown in several instances to modify behavior at relatively low levels of marine noise), to mysticetes, to pinnipeds, and apparently to sea turtles as well, despite known anatomical differences in the ears of these species. See, e.g., D.R. Ketten, Marine mammal auditory systems: A summary of audiometric and anatomical data and its implications for underwater acoustic impacts, NOAA Tech. Memo. NMFS: NOAA-TM-NMFS-SWFSC-256 (1998).

(D) The Navy's "single ping equivalent" has its source in an idea, first postulated in 1995, that correlates acoustic injury with repeated exposures. According to the Navy, "[a]s postulated, the risk threshold is lowered by 5 dB per ten-fold increase in the number of sounds in the exposure" (DEIS at 4.2-19)—but that is a gross misstatement of the original. Drs. W.J. Richardson and C.I. Malme, the authors of the study, having noted the lack of any directly relevant data, proceeded to extrapolate from human in-air data analyzed in 1968. Richardson et al. at 372-76. They did so, however, with extreme caution, and in a tone exceptional even for a book-length work as careful and cautious as theirs. "We emphasize," they wrote "that these values are all extremely speculative, given the

unknown relevance of human in-air data to marine mammals underwater" (emphasis in original). Id. at 373. "Again, this 'evidence' is indirect and the conclusion is speculative." Id. at 375. It should be noted, too, that these statements—none of which found its way into the DEIS—were made about impulsive noise (as from air guns), not continuous noise (as from LFA), a distinction made in the 1995 book and supported by consensus of the scientific community, making the Navy's use of this material even more strained. It is astonishing that the Navy would base so consequential a finding as its single ping equivalent, a finding that underlies its virtual dismissal of acoustic impacts on marine mammals beyond the 180 dB zone, on so speculative an idea.

Each one of these lapses implicates a critical aspect of the Navy's analysis, and each one must be addressed and corrected before the EIS is complete.

(4) Exclusion of Relevant Data—Despite the lack of empirical data for many of the Navy's claims and the persistence of evidentiary gaps throughout the DEIS, relevant evidence that runs contrary to the Navy's conclusions was omitted. For example:

(A) Not once in the DEIS does the Navy refer to the mass stranding of Cuvier's beaked whales in the Kyparissiakos Gulf or even to NATO's study of it. This extraordinary event–an event in which a mass stranding was highly correlated with the operation of a low frequency active sonar system by NATO–has been widely recognized for its importance, not only in the scientific community but within the military as well. Indeed, NATO convened meetings at La Spezia, Italy to discuss the circumstances, with many of the represented nations ultimately concluding that measures to prevent similar occurrences in the future were essential. Although NATO's study was itself inconclusive, owing to the lack of necropsy and tissue analyses, even this assessment conceded that the active sonar vessel operated by NATO could well have caused the stranding. SACLANTCEN Bioacoustics Panel at 1-3. This information should surely have figured in the Navy's analysis of "reasonably foreseeable" impacts, which under

NEPA include impacts with "catastrophic consequences, even if their probability of occurrence is low." 40 C.F.R. § 1502.22(b)(4). Furthermore, given the potential for mass strandings indicated in the SACLANTCEN report, the Navy should have attempted to review available stranding data in light of prior active-sonar deployments.

(B) Even as it claims support for its risk-continuum analysis in the SRP, the Navy fails to consider the results of the SRP's second phase, a study of LFA's impacts on the migration of Pacific gray whales. That study showed that, at received levels approaching 120 dB, a large number of gray whales (perhaps as many as 50%) begin to swerve from their migration paths when the LFA source is placed directly ahead or in-shore[6]—a result manifestly at odds with a function that finds virtually no effect whatever at 120 dB. Compare C. Clark et al., Technical Report 1 at 50, 66-68, figs. C-7, C-8, C-10, C-11 and DEIS at 4.2-26, 28. In fact, for some significant percentage of gray whales (but less than 50%), exposure to levels lower than 120 dB may also cause disturbance. Similarly, the DEIS fails to at least consider prior research in other areas of ocean noise pollution, ignoring published studies and unpublished studies from leading researchers on the ecological impacts of airgun surveys, acoustic thermometry, etc.

(C) While freely extrapolating from data produced in its bottlenose dolphin study, the DEIS fails to mention the most recent study of underwater threshold shift in a marine species, conducted by researchers at the University of California, Santa Cruz–a study directly at odds with the extrapolations made by the Navy to support its reliance on a 180 dB impact threshold. This study found that "noise of moderate intensity and duration"—just 60-75 dB above sensation level after non-continuous exposures of 20-22 minutes—was sufficient to induce temporary threshold shift in three pinniped species (the harbor seal, California sea lion, and elephant seal). Not only do these findings conflict with the Navy's

[6] According to the investigators, the avoidance response under these conditions was similar to those observed by an earlier study, which found 50% avoidance in gray whales at 120 dB. See C. Clark et al., Technical Report 1 at 50.

optimistic extrapolations from the earlier study, they also challenge some of the methodologies of the earlier study, suggesting that the numbers produced for bottlenose dolphins may have been overestimated. See D. Kastak, R.J. Schusterman, et al., Underwater temporary threshold shift induced by octave-band noise in three species of pinniped, 106 J. Acoust. Soc. Am. 1142. That the new study appeared in August 1999, shortly after the DEIS release, hardly absolves the Navy for disregarding important contrary evidence: the research was funded by the Office of Naval Research. In any case, the Navy must revise its analysis to take this second data set (and its critique of the first data set) into account.

(5) Limitations in Range of Species and Impacts—The analysis of LFA's potential impacts presented in the DEIS is improperly narrow. It improperly omits consideration of a broad range of potentially affected species, and it provides no discussion of long-term effects such as physiological stress and acute short-term effects (e.g., agonistic response), dismisses effects entirely beyond the 180 dB isopleth, and assimilates the diversity of species to the same Procrustean standard: a reductive approach to time, space, and species that is unjustified by any empirical evidence. The Environmental Protection Agency called for a different approach in its scoping comments three years ago, insisting the Navy assess its program comprehensively as it unfolds "in space and time, in numerous oceanographic conditions [and] under various scenarios of system operations." Letter from R.E. Sanderson, Director, EPA Office of Federal Activities, to Office of the Chief of Naval Operations (Sept. 9, 1996). Until the Navy does so, its analysis of LFA's environmental consequences is incomplete.

(6) Lack of Meaningful Analysis of the LFA's Effects on Salmon and Other Endangered and Threatened Fish—In discounting the likelihood of serious injury to fish, the Navy relies in large part on its twelve-mile coastal exclusion zone, noting that few pelagic species would be found in dense numbers within the 180 dB radius. DEIS at 4.1-7. This conclusion overlooks the presence of

endangered and threatened runs of chinook and sockeye salmon and steelhead trout, which on the sea leg of their migrations travel deep into the Alaska gyre in the Gulf of Alaska. See National Marine Fisheries Service, Our Living Oceans: Report on the Status of U.S. Living Marine Resources (1995) 21-22, NOAA Tech. Memo. NMFS-F/SPO-19 (Feb. 1996). Unfortunately, in modeling for impacts to marine species in northern and southern parts of the Gulf, the Navy apparently did not take account of these vulnerable populations of salmonids (DEIS at 4.2-41 to 47), neither of the potential for acoustic damage nor of the possibility of avoidance and other reactions that have already been documented in Atlantic salmon. See D. Croll, B. Tershy, A. Acevado, & P. Levin, Marine Vertebrates and Low-Frequency Sound: Technical Report for LFA EIS 20-21 (Feb. 28, 1999). Given both their troubled status and their extraordinary importance to the socioeconomy of the Pacific Northwest, it is essential that the Navy perform a more rigorous, detailed analysis of LFA's potential impacts on these species.

(7) Incomplete Analysis of Alternatives—As we have noted, analysis of alternatives lies at "the heart" of the EIS process, requiring agencies to "rigorously explore and objectively evaluate all reasonable alternatives" to their proposed actions and "devote substantial treatment" to each. 40 C.F.R. § 1502.14(a), (b). Furthermore, means of mitigating their activities' environmental impacts must also be discussed, whether or not they appear among the explored alternatives. 40 C.F.R. § 1502.14(f).

The alternatives analysis performed in the DEIS falls short of fulfilling these requirements. Rather than present a full range of alternatives and means of mitigation, and in enough detail that "reviewers may evaluate their comparative merits," the Navy has in effect presented a fait accompli: a choice, barring the outright cancellation of the program, between a preferred mitigation plan or none at all. See DEIS at 2-7 to 16. Alternatives beyond these are neither discussed in the detail that NEPA demands nor shown to be unreasonable and beyond discussion. A full alternatives analysis would, inter alia, consider lower levels of

deployment and compare them to the ones preferred; evaluate the specific potential of new passive acoustic technologies, such as Advanced Deployable Systems, which is currently being tested off the California coast, to substitute in whole or part for LFA;[7] propose areas of exclusion outside the legal territorial zone and the two offshore areas mentioned; put forward possible research programs; and discuss alternative mitigation standards in lieu of the proposed 180 dB. (A 165 dB shut-down range would, according to the Navy's own risk analysis, reduce the probability of "non-injurious harassment" to marine mammals by over 45%. See DEIS at 4.2-28.)

(8) Inadequate and Unverified Monitoring System—The evaluation of risk set forth in the DEIS relies substantially upon a tripartite system of monitoring, consisting of visual observation, passive acoustic detection, and active acoustic surveillance. It is largely on account of this system that the Navy discounts the potential for serious injury to marine mammals (the probability, the Navy writes in summary, would be "nearly zero") and finds the probability of serious injury to fish, sharks, and sea turtles to be "very low." DEIS at ES-11, 18, 19. And it is on the strength of this system that the risk to marine mammals of "non-serious injury," calculated as a percentage of a stock's total population, drops to zero for every species analyzed, save the Eastern North Atlantic stock of blue whales and the Western North Pacific stocks of pelagic dolphins and fin and Minke whales. DEIS at ES-16 to 17, 4.2-41 to 47. But the faith the Navy places in its monitoring methods, two whose inadequacies are well known and one that apparently has not been field-tested, is unwarranted.

(A) The deficiencies of passive acoustic detection and visual observation have long been noted by marine mammalogists. As Dr. Peter Tyack of Woods Hole Oceanographic Institute has observed, the likelihood of spotting any single animal during daylight hours, as far as most of the affected endangered and

[7] The Navy dismisses passive technologies by referring to conclusions drawn by R&D programs in the 1980s. DEIS at I-5. Given the passage of a decade and the Navy's investment since then in new, more

threatened species are concerned, is only 10%; for the giant baleens, the likelihood is 50% at best. During nighttime operations of the sort allowed under LFA, the sighting rates halve to 25% (at most) for the baleens and 5% for other species. These rates, of course, may drop lower where, as here, the spotters are not trained marine mammal biologists. According to Dr. Tyack: "So many animals will be missed by both the visual and acoustic monitoring that it is not credible to assume that turning off the source when whales are sighted will mitigate the impact on more than about half of the potentially exposed animals." See Letter from J. Reynolds to Hon. S. Honigman, General Council, U.S. Navy (August 8, 1997) (quoting comments of Dr. Tyack made at January 1997 meeting with Navy).

(B) The effectiveness of passive acoustic technology has not been quantified, as the Navy correctly states: "[T]he percentage of animals that passes by unheard is unknown." DEIS at 4.2-48. Those animals would include mother-calf pairs of humpback whales, a focus of special concern, which have been reported to keep silent within their Hawaiian breeding grounds; and numerous other, less vocal species. See P. Tyack, Interactions between singing Hawaiian humpback whales and conspecifics nearby, 8 Behav. Ecol. Sociobiol. 105-116. Because the Navy fails to provide a frequency range for its passive localization system, it is impossible to substantiate whether the system even reaches to the lower bands that baleens use. See DEIS at 4.2-48.

(C) The third method of monitoring, newly proposed for LFA, is a high-frequency active sonar called HF/M3 that purports to locate marine mammals, and "possibly" sea turtles as well, within a 1 km range. For the Navy, it is in fact the leading method, the one that boosts detection above the ambiguous success rates of visual spotting and passive acoustic listening. DEIS at 2-15, 2-48 to 49. But the Navy fails to present evidence sufficient to justify its reliance. The effectiveness of the system, calculated at 90% to 95% for marine mammals, then reduced to a more conservative 70%, is based upon "initial engineering estimates," the

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sophisticated passive systems, a fuller discussion is necessary before this alternative can be ruled out.

preliminary nature of which suggests the system has not been extensively studied in the field. DEIS at 4.2-48. It is not clear whether HF/M3 has overcome the difficulties associated with active monitoring of marine mammals, including the tendency of adipose tissue or blubber to absorb oncoming sound waves and muddy the sound signatures received by technicians. Nor is it clear what success rate the system would see with smaller species or individual marine mammals, or with sea turtles or endangered species of fish, although the Navy appears to have weighed the system into its consideration of these species as well. DEIS at ES-18 to 19.

It should be noted, too, that the HF/M3 sound beam, which sweeps 360° along the horizontal axis but stays fixed at 10° along the vertical, covers only a portion of the system's stated range. See DEIS at 2-13. Given the lack of specifications in the DEIS, any analysis of its coverage is necessarily incomplete. A rough, preliminary analysis suggests, however, that within 1 km from the source, i.e., within a sphere of 1 km radius centered on the source, the extent of coverage would be about 23%—less than a quarter of the 180 dB mitigation field.[8] Especially vulnerable would be deep divers, such as elephant seals, whose maximum dive depth exceeds 1.5 km, and sperm whales, whose deepest dives have been recorded at 3 km. See DEIS at 3.2-33, 3.2-57. These animals could enter the 180 dB sphere from below, where the system's coverage is poorest. Given the apparent lack of field tests, the technical obstacles to surveillance, the system's limited coverage, and the glaring absence of ramp-up procedures—a standard element of mitigation in oil exploration and other contexts—it is entirely premature to assume, on the basis of the information presented in the DEIS, that active monitoring would catch an unprecedented 70% of marine mammals within 1 km of the source.

[8] Our estimate assumes a constant slope of 10% along the vertical axis, as stated in the DEIS (2-13). Since the length of the HF/M3 array has not been provided, we are not able to take near- and far-field effects into account.

In making unwarranted claims and overstating the efficacy of its monitoring system, the Navy has underestimated the risk LFA poses the marine environment, in contravention of NEPA.

(9) Vagueness of Geographic Restrictions—The Navy relies heavily on geographic restrictions to limit the risk of non-serious injury and non-injurious harassment to populations of marine mammals, sea turtles, and fish, and makes these restrictions an integral part of its mitigation plan. DEIS at 4.1-9, 4.1-12, 4.2-41 to 47, 5-1 to 3. Yet it gives little attention to biologically important areas outside the 12-mile coastal zone, areas along the coast or further offshore that are vital to the feeding, migration, breeding, or calving of marine species. Only two areas have been designated thus far: a 200m isobath along the eastern seaboard of the United States, which coincides with critical habitat for the endangered Northern right whale; and a strip of water demarcated the Antarctic Convergence Zone, which is seasonally rich in baleens. DEIS at 2-10. Beyond this, the Navy simply indicates the possibility of designating other areas in consultation with NMFS, during this review process, or in the long term. DEIS at 2-9. The issue is confused further by the vagueness of the 12-mile coastal exclusion: it is unclear, for example, whether the exclusion applies to islands and island systems as well as to continents, regardless of size.

Given the Navy's mandate under NEPA to "rigorously explore" and "devote substantial treatment" to each proposed alternative (40 C.F.R. § 1502.14(a), (b)), this level of detail is insufficient. Meaningful treatment necessitates the identification of potential exclusion zones beyond the 12-mile boundary and the outline of a clear, timely, and publicly accountable process by which these and other zones could be reviewed and designated. A number of biologically significant, globally representative areas have already been compiled by the World Conservation Union ("IUCN"), in conjunction with the World Bank and Great Barrier Reef Marine Park Authority. See IUCN et al., A Global Representative System of Marine Protected Areas (1995). We propose, following

the Navy's suggestion (DEIS at 2-9), that during the EIS process the regional and national priority areas implicated by the IUCN's report be reviewed. These areas include but are in no way limited to: the Channel Islands and Santa Barbara Channel (California); the Gulf of Alaska; the Hawaiian Islands; the Marshall Islands; the Great Barrier Reef (Australia); the Gulf of Carpentaria (Australia); the Yaeyama Archipelago (Japan); the Korea Strait; Bohai Bay (China); the Fernando de Noronha archipelago (Brazil); the Atol das Rocas (Brazil); archipelagos west of Iceland; the Milieuzone Noordzee (Netherlands); the Western Mediterranean North for Protection of International Waters for Cetaceans (France, Italy, Corsica); the Gulf of Gabes (Tunisia); the Gulf of Sirte (Libya); and the Aegean Sea (Greece, Turkey).

As it stands, the Navy's consideration of geographic restrictions falls far short of the rigorous analysis and objective evaluation required by NEPA.

(10) Lack of Budget for Completion of Needed Research—Additional research is necessary if the Navy's assessment is to be meaningful. Indeed, the Navy acknowledges the importance of long-term monitoring to a proper assessment of LFA's impacts. DEIS at 2-16. Yet the agency fails both to define a timetable for research and to provide a secure budget for research over the expected life of the program. Furthermore, despite recent advances in the study of threshold shift and other aspects of the noise problem, the Navy neglects to explain, as it must under NEPA (40 C.F.R. § 1522(b)), why other data gaps cannot reasonably be filled before LFA is deployed.

(11) Failure to Comply with Other Applicable Laws—The Navy has stated its intention to apply for an Incidental Harassment Authorization under the Marine Mammal Protection Act and to initiate formal consultation under the Endangered Species Act (DEIS at 5-1 to 6). NRDC will submit comments regarding the Navy's application to NMFS under the MMPA at the appropriate time. Other statutes and conventions of concern include:

First, the Coastal Zone Management Act, and in particular its federal consistency requirements, 16 U.S.C. § 1456(c)(1)(A), which demand that activities having an effect on the natural resources of the coastal zone, whether they are located "within or outside the coastal zone," be carried out "in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." To this end, agencies are required to submit a consistency determination and seek concurrence from relevant state agencies, such as the California Coastal Commission and Hawaii Department of Land and Natural Resources. See 16 U.S.C. § 1456(c)(1)(C), (c)(3)(A). The Navy should indicate its intention to abide by these requirements.

Second, the Endangered Species Act, and in particular its consultation requirements, 16 U.S.C. § 1536, which demand, inter alia, that agencies prepare a biological assessment "for the purpose of identifying any endangered or threatened species which is likely to be affected" by their actions. 16 U.S.C. § 1536(c)(1). The biological assessment that will serve the Navy in consultation with NMFS, i.e., the DEIS, discounts without detailed analysis the presence of certain endangered and threatened species, such as chinook and sockeye salmon, that are known to occupy the system's intended range. See DEIS at 4.1-7. To fulfill its obligations under the ESA, the Navy should ensure that these species are duly treated.

Third, the United Nations Convention on the Law of the Sea (U.N. sales no. E.83.V.5) and other international conventions, treaties, and agreements that aim to reduce marine pollution from energy or noise.

Operation of the LFA system cannot legally be undertaken without compliance with these laws.

(12) Conflicts with Federal, State, and Local Land-Use Planning—The Navy's assessment of LFA's potential conflicts with the objectives of

federal, regional, state, and local land-use plans, policies, and controls—as required by NEPA (40 C.F.R. § 1516(c))—is dismissive. It predicates a finding of consistency on the geographic exclusions discussed above, primarily the restriction of sound above 180 dB from the twelve nautical mile coastal zone, despite evidence that behavioral and physiological impacts are likely to occur in many marine species with exposures to noise below 180 dB. Thus, LFA may impact animals and degrade habitat within National Marine Sanctuaries and state reserves, in conflict with the purpose and intent of those areas. In addition, as noted above with regard to the Coastal Zone Management Act (16 U.S.C. § 1456(c)(1)(A)), LFA may impact the coastal zone in a manner inconsistent with state management plans. The consistency of LFA with these land-use policies must receive thorough consideration in the Navy's EIS.

(13) Lack of Alternatives Analysis Under Section 102(2)(E) of NEPA—Above and beyond the EIS requirement, NEPA directs agencies to "study, develop, and describe appropriate alternatives" to any project that presents "unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. § 4332(2)(E). Courts have concluded that this duty is "both independent of, and broader than, the EIS requirement." Bob Marshall Alliance v. Hodel, 852 F.2d 1223, 1229 (9th Cir. 1988), cert. denied, 109 S.Ct. 1340 (1989). Because its LFA program presents "unresolved conflicts" about the proper use of "available resources," the Navy must explicitly address its separate and independent obligations under section 4332(2)(E).

(14) Timing of LFA Deployment—NEPA prohibits agencies from proceeding with an action before the EIS process has ended. See 40 C.F.R. § 1502.5. We oppose any deployment of the LFA system, for surveillance, testing, or any other purpose, in violation of this requirement. If the Navy intends to proceed during the EIS review period, we request it explain its

rationale for doing so in disregard of applicable law, particularly NEPA's prohibition against actions that would have an adverse environmental impact or limit the choice of reasonable alternatives. 40 C.F.R. § 1506.1.

III. CONCLUSION

For the reasons set forth above, we urge the Navy to withdraw its ODEIS/DEIS on the low-frequency active sonar program, pending further investigation and analysis. Thank you for considering these comments.

Very truly yours,

Joel R. Reynolds
Senior Attorney
Director, Marine Mammal Protection Program

Michael Jasny/JRR

Michael Jasny
Project Associate

Mark D.

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Chair SaraWan and Commission Members
California Coastal Commission
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5 pages

4 December 2000

Dear Chair Wan and Commission Members:

We hereby submit our comments for the public hearing on the U.S. Navy's SURTASS LFA system. We have both been whale researchers for decades, and have spent long periods at sea with sperm whales and beaked whales. One of us (L.W.) specializes in the sounds and communication of whales, and the other (H.W.) in whale behavior, population biology, and ecology. We would appreciate it if you would forward a copy of our comments and this letter to each Commissioner.

Sincerely,

Hal Whitehead, Ph.D.
Killam Professor
Dept. of Biology
Dalhousie University

Linda Weilgart, Ph.D.
Research Associate
Max Planck Institute for Behavioral Physiology

Weilgart and Whitehead 4 December 2000

We urge the California Coastal Commission members to consider the U.S. Navy's LFA sonar system a substantial risk to the long-term welfare of California's coastal marine life. We, as marine mammal scientists, find serious flaws in the assumptions and conclusions of the Navy regarding the "safety" of LFA sonar.

1) We take great issue with the Navy's supposed 180 dB threshold for potential harm for the following reasons:

a) This figure seems partially based on the HESS criteria which deal with impulsive noise sources rather than continuous ones (over a second in length or so), such as LFA sonar. To ignore this distinction seems folly, as numerous studies (see Richardson et al. 1995) have shown that several species of whales react differently to these two types of noise sources.

b) This figure is based on extremely limited information from one (Ridgway lab), or at the most two, studies done under unnatural (captive or semi-captive) conditions. Only roughly four species were studied, and NO information exists for the great whales. Moreover, Kastak et al. (1999) argue that the threshold shifts obtained by the Ridgway lab may underestimate the true threshold shifts (in absolute thresholds) because these were masked threshold shifts obtained in noisy San Diego Bay.

Kastak et al. (1999) found that their pinniped subjects sometimes became more aggressive after noise exposure experiments in the tank, and avoided locations they associated with the noise experiments even though these were often also where they received food prior to the experiments. They comment that these observations could have bearing on marine mammals in the wild if they avoid critical breeding or feeding grounds after being exposed to loud sounds, regardless of whether a temporary loss in hearing has occurred. Such avoidance behavior (only as a result of an **association** with previous unpleasant noise) could have dramatically negative effects on reproductive output, etc., which could even affect the well-being of the population.

c) There is no behavioral basis for the Single Ping Equivalent (SPE) approach which the Navy uses. We don't know how animals react--if to one event or to the total time or pings exposed to rather than total energy, especially for behavioral effects.

d) To consider a level at which "95% of marine mammals could incur non-injurious harassment" i.e. 180 dB, as "conservative" defies comprehension. Usually, when we wish to determine a safety level, we are generally aiming to **protect** 95-99% of the population, rather than the opposite!!

e) The Navy consistently downplays behavioral effects ("non-injurious harassment"), yet these could be as or more harmful than physiological ones. At the NMFS Acoustic Criteria Workshop (Silver Spring, MD, 9-11 Sept., 1998), it was clear that the panel of experts felt that the distinction between behavioral and physiological effects was somewhat arbitrary, as behavioral effects can cause physiological ones (fear causes increased heart rate, stress hormone release, etc.) and physiological effects can cause behavioral ones (vestibular effects causing panic

reactions as may have been the case with the stranded beaked whales in Greece).

f) Clearly, it would be simpler for regulators if we could agree on a single noise level which we all considered safe. This is what the NMFS Acoustic Criteria Workshop seemed determined to do, yet there was considerable disagreement among the panel at that time. If one figure needs to be arrived at as a safety standard, however, there is actually far more basis for the 120 dB level. Numerous studies, on two or three species of whales (on feeding and breeding grounds and migrations) and several fish species (e.g. Myberg 1990), have arrived at the 120 dB figure as the average received level at which avoidance reactions occur. This is the **average** level, the level at which 50% of the animals reacted. The most sensitive individuals (<50% of the population) reacted at less than 120 dB, however, showing avoidance at 110 dB or so. Yet, incredibly, the Navy maintains that below 120 dB (received levels) the risk is ZERO!! It is truly astounding (or rather embarrassing?) that the Navy feels comfortable in determining that risk is non-existent at certain levels of noise.

g) The Navy's own technical report prepared for the EIS (Croll et al. 1999) suggests keeping intensities below 150 dB where fish concentrations are located (p. 32). In addition, Croll et al. (1999) note that it is possible that baleen whales could suffer temporary auditory damage (TTS) at noise levels as low as 120 dB (p. VIII). This report also states that "...no work has been performed that tests the effects of low frequency noise on ecological processes" (p. XIII). And: "It is possible that low frequency noise masks the approach of predators and shifts the importance of various demographic processes in the dynamics of fish populations." (p. XIII).

h) Why shouldn't noise standards for marine mammals take into account research done on the best-studied species, humans? Humans can most clearly verbalize the level at which discomfort occurs. The safety level the Navy uses for human divers for short-term exposure is 145 dB RL. As marine mammals, unlike humans, depend on sound for their very survival and are thus more vulnerable, lower decibel safety levels, if anything, should apply to them. Incidentally, when human divers were tested underwater for TTS, levels of TTS were much higher (i.e. temporary hearing damage was worse) than first predicted.

i) It is likely that the whales which stranded in Greece and in the Bahamas received levels less than 180 dB, and yet this was certainly not just "non-injurious harassment".

j) In determining a decibel level for use as a **safety standard**, it is unconscionable to use a figure which has almost no scientific basis simply "for want of a more reliable standard". If the determined level has practically no basis in fact, it should not be used, period.

Further comments:

2) To say that naval sonars have been used for many years (such as the NATO LFA), yet no strandings have been observed is meaningless. Probably the vast majority of strandings go

undetected, especially if they occur on remote shores. Even less detectable are deaths which occur in the open ocean, yet such impacts are also quite possible.

Moreover, it should be noted that all 7 mixed species strandings involving beaked whales which have ever been recorded occurred between 1974 and the present, and all 7 were associated with naval maneuvers conducted nearby. No mixed species strandings involving beaked whales occurred from 1838 until 1974 (as reported by Teri Rowles in the latest IWC minutes). This cannot be considered as anything but very compelling evidence.

3) The Navy claims that the "minor, short-term responses" seen in its Scientific Research Program are not biologically significant, yet there is no possible basis for this statement. Unless long-term effects of LFA sonar on population parameters such as birth rates, growth rates, and death rates are measured and compared with baseline ones (which are non-existent and unknowable for most cetacean species), biological significance cannot be determined. It is simply impossible to link short-term responses with long-term impacts. One can observe short-term responses (e.g. change in respiration rates), yet these may have no long-term impacts. Conversely, one can fail to observe any short-term responses (e.g. increase in miscarriages), yet there may still be serious long-term impacts (e.g. decline in the population and eventual extinction).

4) The fact that the offshore migrating gray whales showed no deviation in their paths with LFA sonar broadcasts does not necessarily mean that LFA sonar can be safely broadcast offshore. The offshore migrating gray whales could be less hearing sensitive, for instance, or even hearing impaired, compared with the inshore ones. In other words, we cannot assume that the whales' response is the result of characteristics of the inshore environment.

5) The Navy claims that "...any potential for non-serious injury to marine mammals..is negligible...[because]...the host ship would always be moving during operations." A moving ship doesn't necessarily lower the risk. It may be better to subject a small section of a population more intensely to LFAS than broadcast very few transmissions to many animals. Also, it may be harder for whales to escape the noise because of changing sound fields. Ships were moving during both the Greek and Bahamas strandings, after all.

In conclusion, a full 99% of the possible biological effects of this noise, especially the most meaningful ones relating to the welfare of populations, have not been measured or studied. Our ignorance is profound. What we DO know, however, is that LFA sonar has a potentially far-ranging effect, with the 120 dB sound field reaching an area of 800,000 sq. km during every broadcast. This is an area larger than Texas. Additionally, LFA sonar is meant to be used over many years. It is extremely risky to subject such large areas of ocean over such long time periods in the face of such ignorance of its possible impacts.

We also have as conclusive evidence as is possible to obtain in a natural setting, that noise can be fatal to whales. Both the Greek and Bahamanian strandings were unpredictable, and we still cannot determine which aspects of the naval sonars made them so dangerous or what

exact reaction caused the whales to strand. We are groping in the dark. Given the depths of our lack of knowledge, the only prudent course is to err on the side of caution. If we are to have learned anything from our sorry legacy of DDT, acid rain, global warming, ozone depletion, PCB's, overfishing, BSE, etc. etc., it is that we pay long and heavily for blundering recklessly and arrogantly onward and asking questions later. We have been given at least two strong warnings in the form of these strandings. We ignore them at our peril.

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COASTAL COMMISSION

Dec. 4, 2000

Sara Wan, Chair
California Coastal Commission
45 Fremont St., Ste. 2000
San Francisco, CA 94105

Subject: Don't let the Navy deploy LFA in the Pacific

Dear Chair Wan,

The Coastwalk Board of Directors asked me to write to express our concern about the Navy's plan to expose marine animals living in California's coastal waters to loud, low frequency noise. The Navy's proposed deployment of its Low-Frequency Active (LFA) sonar system poses a serious threat to marine mammals, and other ocean life, in California waters.

The Navy's most recent studies have not adequately addressed the short-term and long-term impacts of the LFA system on whales, dolphins, porpoises, sea turtles, and a host of other marine animals.

We urge you and the rest of the Commission to deny the Navy's request to deploy LFA in the Pacific.

Please forward a copy of my letter to each Commissioner.

Sincerely,

Richard Nichols

Richard Nichols
Executive Director

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