Fw: Surfrider Foundation's letter to CCC re: PG&E Seismic Study

James Patterson to: cr_board_clerk Clerk Recorder 10/25/2012 02:12 PM
Sent by: Amy Gilman
Cc: Amber Wilson

Hi Clerks, please post...

----- Forwarded by Amy Gilman/BOS/COSLO on 10/25/2012 01:56 PM -----

From: Brad Snook <snookbw@yahoo.com>
To: dbuckshi@co.slo.ca.us, jpatterson@co.slo.ca.us, fmecham@co.slo.ca.us, Bruce Gibson <bgibson@co.slo.ca.us>, Supervisor Teixeira <pteixeira@co.slo.ca.us>, jwhite@co.slo.ca.us
Cc: Stefanie Sekich <ssekich@surfrider.org>, SLO Surfrider Chair <chair@slo.surfrider.org>
Date: 10/24/2012 08:27 PM
Subject: Surfrider Foundation's letter to CCC re: PG&E Seismic Study

Dear Chairman Patterson, Honorable Supervisors, and Chairman Guerena,

Please consider Surfrider Foundation's *Opposition to Pacific Gas and Electic Seismic Study* (attached) for your meeting on October 30th. This document was recently submitted to the California Coastal Commission in preparation for their November meeting and it more fully descibes Surfrider's concerns -- beyond recreational impacts, which were submitted to Mr. Buckshi last week.

Kind regards,
Brad Snook
Chair, Surfrider SLO
(805) 440-9489

CCC seismic ltrFINAL .pdf

Item # 22 Meeting Date: 10/30/2012
Presented by: Brad Snook
Received prior to meeting and posted to web on: October 25, 2012

SURFRIDER
FOUNDATION

October 24, 2012

Mary Shallenberger, Chair
California Coastal Commission
45 Fremont Street Suite 2000
San Francisco, CA 94105

RE: Opposition to Pacific Gas & Electric Seismic Survey: Consistency Certification and Coastal Development Permit (E-12-005 and CC-027-12).

Dear Chair Shallenberger and Honorable Commissioners,

On behalf of the Surfrider Foundation and the San Luis Obispo Chapter of the Surfrider Foundation (Surfrider), thank you for the opportunity to submit comments regarding Pacific Gas and Electric's (PG&E) proposal ("Project") to conduct seismic testing near the Diablo Canyon Power Plant (DCPP). Surfrider has identified significant impacts within PG&E's Final Environmental Impact Report (FEIR) and we have acquired outside information that leads us to highly question the value of the Project. While PG&E recently modified implementation of the Project (segmenting testing over the course of a few years) we are still bothered by the enormous impacts testing will have on marine life and ocean users. We urge you to carefully consider the below concerns and ***deny both the Consistency Certification and the Coastal Development Permit.***

Recreational Impacts:

Surfrider's concerns about impacts to ocean users began when we first read the Draft Environmental Impact Report (DEIR). In May 2012, we submitted comments to California State Lands Commission (CSLC) and PG&E highlighting our concerns about recreational impacts. We pointed out measures were only being taken to protect divers in the area, but the DEIR did not consider potential impacts to surfers, swimmers and other ocean users. In Volume I of the FEIR, PG&E responded *directly to Surfrider's* concerns, with the below statement:

> "In response to this and other related comments...MM LU-1 has been revised to include noticing beaches and local dive shops ***regarding offshore areas closed to diving, surfing, and swimming.***"[1]

Based on this statement, it seems clear that diving, surfing, and swimming will not be allowed within Project zone. However, in the FEIR, PG&E only addresses the prohibition of diving and is *clearly disregarding the safety of other ocean users* and is *obviously presenting contradictory information.*

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[1]http://www.slc.ca.gov/Division_Pages/DEPM/DEPM_Programs_and_Reports/CCCSIP/FEIR_Comments/FEIR_RTCs_NGOs_(13of14)_Surfrider.pdf

Surfrider would like to highlight statements from PG&E's FEIR that clearly **acknowledge impacts to ocean users:**

> "The proposed offshore activities *would* expose persons present in the water to harmful noise levels..."
>
> "Studies have shown that high levels of underwater noise can cause dizziness, hearing damage, or other sensitive organ damage to divers and swimmers, as well as indirect injury due to startle responses"
>
> "Noise levels in excess of 154 dB re 1 µPa could be considered potentially harmful to recreational divers *and swimmers* in the Project area".
>
> "The potential exists that noise levels in water due to Project activities could be harmful to humans who ignore the notices and enter water in close proximity to the air guns while being *deployed within the an active survey area" (emphasis added).* [2]

Yet within the same section of the FEIR, PG&E makes this contradictory declaration:

> "Therefore, potentially harmful noise levels from the air guns would not be expected to affect swimmers and surfers because there would be a substantial distance between them and the noise source. In addition, they would not be fully submerged. Based on the above, the potential impacts to swimmers and surfers from seismic survey noise are Less than Significant". [3]

Despite the contradictory statements, it's clear the Project will expose ocean users to harmful seismic testing impacts.

Determining Impacts to Ocean Users

From the beginning of Surfrider's investigation into the impacts of seismic testing on recreationalists, we have struggled to find detailed information contained within PG&E's FEIR. For example, Surfrider kept asking the following questions:

> 1.) How close will the vessel/air guns be to shore?
> 2.) What would be the instantaneous decibel (dB) exposure levels be to nearshore environments?

The below charts and maps (which *finally* answer the above questions) were <u>not</u> originally contained in the FEIR. Surfrider contacted Coastal Commission Staff asking for clarification; and in order to answer our questions, Coastal Commission Staff had to request additional information from PG&E.

It's important to reiterate the PG&E affirms 154 dB "could be harmful to swimmers and divers" [4].

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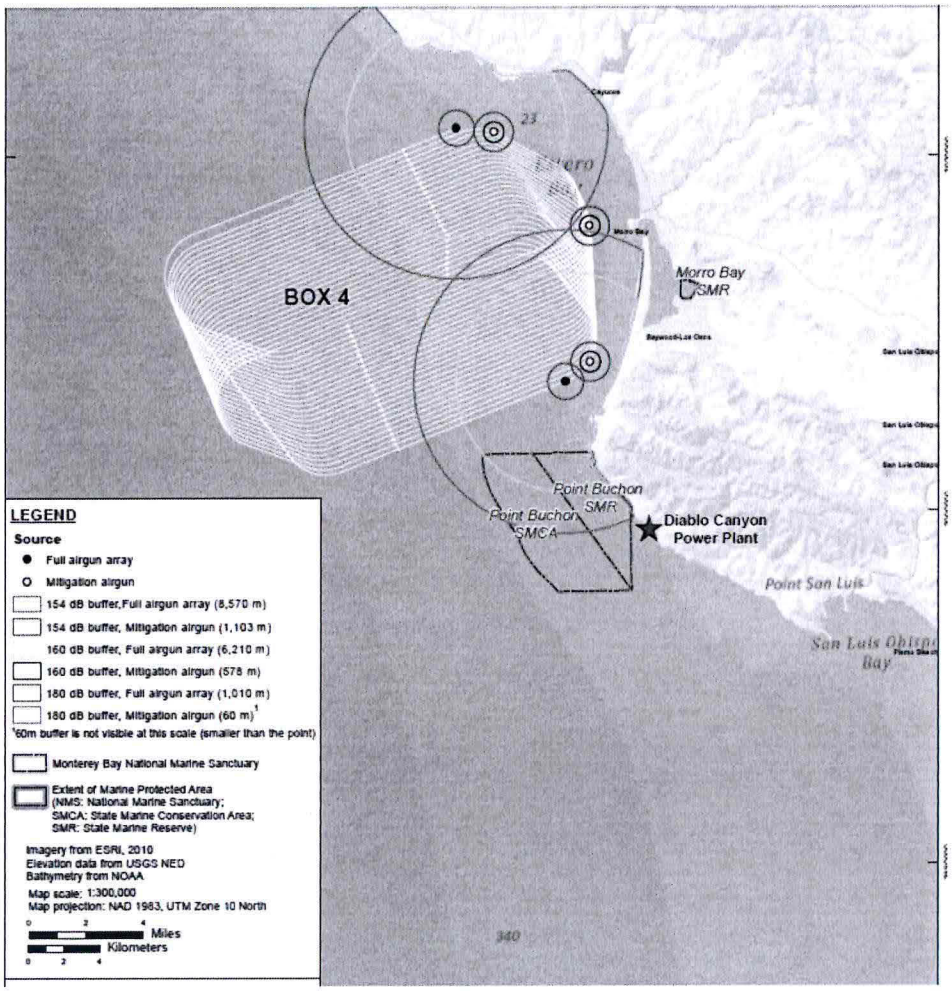
[2] PG&E FEIR: http://www.slc.ca.gov/Division_Pages/DEPM/DEPM_Programs_and_Reports/CCCSIP/PDF/FEIR_4.11_NOISE.pdf
[3] PG&E FEIR: http://www.slc.ca.gov/Division_Pages/DEPM/DEPM_Programs_and_Reports/CCCSIP/PDF/FEIR_4.11_NOISE.pdf
[4] PG&E FEIR: http://www.slc.ca.gov/Division_Pages/DEPM/DEPM_Programs_and_Reports/CCCSIP/PDF/FEIR_4.11_NOISE.pdf

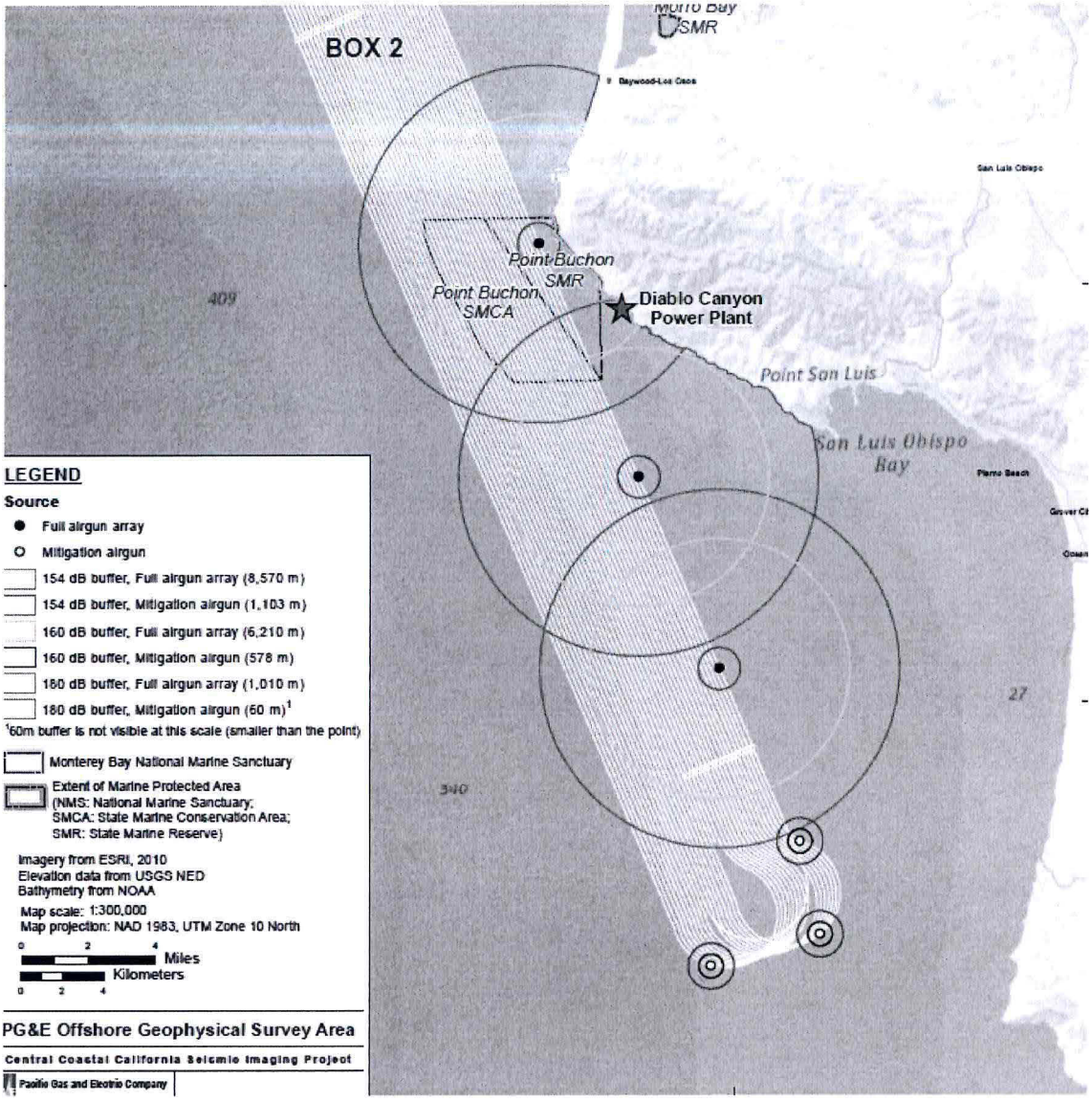
More importantly, the U.S. Navy conducted a study on divers and concluded that **145 dB is a safe level for humans**, stating:

> "In June 1999 NSMRL set interim guidance for the operation of low frequency underwater sound sources in the presence of recreational divers at 145 dB... Based on this guidance, the operation of the SURTASS LFA sonar will be restricted in the vicinity of known recreational and commercial diving so that sound levels will not exceed 145 dB".[5]

The below Project maps illustrate some beaches will receive 160 dB (yellow circles). Since dB ratios are logarithmic, 160 dB is **30 times above the safety threshold** the Navy identified at 145 dB.



[5] U.S. Navy Diver Study establishing safety threshold: http://www.surtass-lfa-eis.com/DiverStudies/index.htm



The below upslope sound propagation chart illustrates that dB levels could reach 190 at 0.13 nautical miles (which is approximately 789 feet <u>from</u> shore). That means that anyone who is recreating in the nearshore environment **would be exposed to decibel levels that are 1,000 times greater than the established safety threshold.**

Sound Pressure Level (SPL) (dB re 1 uPa)	Upslope Distance (In Shore)			Downslope Distance (Offshore)			Alongshore Distance		
	M[1]	SM[2]	NM[3]	M[1]	SM[2]	NM[3]	M[1]	SM[2]	NM[3]
190	250	0.16	0.13	280	0.17	0.15	320	0.20	0.17
187	390	0.24	0.21	370	0.23	0.20	410	0.25	0.22
180	1,010	0.63	0.55	700	0.43	0.38	750	0.47	0.40
170	2,990	1.86	1.61	1,760	1.09	0.95	1,760	1.09	0.95
160	6,210	3.86	335	4,450	2.77	2.40	4,100	2.55	2.21
154	8,570	5.33	4.63	7,820	4.86	4.22	6,780	4.21	3.66
120	24,650	15.32	13.31	251,320	156.16	135.70	94,870	58.95	51.23

M[1] = Meters; SM[2] = Statute miles; NM[3] = Nautical Miles

[6] Central Coastal California Seismic Imaging Project 1.0 Expanded Project Description. Originally obtained from CCC Staff.

Clearly, this Project will have significant impacts to ocean users. Surfrider is very troubled that PG&E is not applying the precautionary principle when analyzing seismic testing impacts to humans.

Documented Impacts to Ocean Users:

Dr. Marsha Green has been studying and documenting underwater acoustic impacts on humans and marine mammals for several decades. In 2004, she was appointed to the Federal Advisory Committee to make recommendations to the U.S. Congress regarding acoustic impacts on marine mammals. During the course of her research she has compiled the following impacts to humans from underwater acoustic noise.

- "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."[7]

Ecological Impacts:

Impacts to ocean ecosystems due to seismic testing can be potentially significant; including harm to sensitive habitats and marine mammals (i.e. fish, sea birds, invertebrates, turtles, porpoise, sea otters, etc); and four endangered species. PG&E's FEIR openly admits there will be "significant and unavoidable" impacts to marine life, and their "takings analysis" shows thousands of marine mammals will be harassed and/or possibly killed. [8] As mentioned above, Dr. Green has logged reports of impacts to marine mammals from underwater noise. She explains the following account of harm to marine mammals in her research compilation:

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[7] Compilation of Dr. Green's research regarding noise impacts to marine mammals and humans. http://www.oceanmammalinst.com/mgpaper.html#document

[8] PG&E's FEIR Marine Resources: http://www.slc.ca.gov/Division_Pages/DEPM/DEPM_Programs_and_Reports/CCCSIP/PDF/FEIR_4.04_BIOLOGICAL_RESOURCES-MARINE.pdf

"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". [9]

Another well-cited article from *Canadian Journal of Fisheries and Aquatic Sciences* documents that fish catches, after air gun use, decreased 40%-80% (depending catch method). [10] Finally a statement made the Marine Mammal Commission from former California Coastal Commissioner Sara Wan shows evidence of marine mammals stranding following anthropogenic noise activities saying:

"However, while the connection is more obvious in the case of beaked whales, other cetaceans have also been involved in strandings associated with anthropogenic noise. Minke whales, (Bahamas 2000), pygmy sperm whales (Canary Islands 1988), and bottlenose whales (Canary Islands 1988) have stranded concurrent with beaked whales. In other instances, melon-headed whales (Hawaii 2004), harbor porpoises (Haro Strait 200317), and humpback whales (Brazil 2002) have stranded in events that did not involve beaked whales. In addition to these, NMFS is still investigating whether the pilot whales, minke whales, and dwarf sperm whales that stranded in North Carolina (January 2005) had traumas consistent with acoustic impacts." [11]

In addition to these discrete ecological impacts, Surfrider is also concerned about broader impacts to the newly developed network of Marine Protected Areas (MPA). *The State spent the better half of a decade working on establishing MPA and this project would clearly interfere with MPA productivity.*

It's equally concerning that this project would completely halt biological monitoring of MPAs and impair effective management of the network. The MLPA requires scientific monitoring of protected areas in order to evaluate MPAs as a tool for conservation and fisheries management. The EIR openly admits significant impacts to biological monitoring of MPAs. This Project would therefore have statewide implications since the monitoring of MPAs at Morro Bay is tied to larger statewide efforts to collect data (currently conducted by Monitoring Enterprise).

Finally, we are concerned that the FEIR does a poor job of considering the project's cumulative impacts on marine resources when combined with the impacts from the operation of the DCPP, which include impacts from its seawater intake. We mentioned this in our DEIR comment letter in May and we believe both CSLC and PG&E are dismissing the cumulative impacts from once-through cooling of the DCNPP. As such we believe this dismissal is inconsistent with CEQA guidelines § 15130(a) and 14 CCR § 15130(b)(5).

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[9] Compilation of Dr. Green's research regarding noise impacts to marine mammals and humans. http://www.oceanmammalinst.com/mgpaper.html#document

[10] Engås, A., Løkkeborg, S., Ona, E., and Soldal, A.V. (1996). Effects of seismic shooting on local abundance and catch rates of cod (Gadus morhua) and haddock (Melanogrammus aeglefinus). *Canadian Journal of Fisheries and Aquatic Sciences 53(10), p.* 2238-2249.

[11] Commission Wan Statement: http://awionline.org/sites/default/files/uploads/legacy-uploads/documents/CCC_Comments_12-05-1238105852-10137.pdf

Project Not Required by State Legislation

There have been incorrect statements made in the media that seismic testing at DCPP is required by state legislation (AB 1632). AB 1632 merely requires the California Energy Commission (CEC) to compile and evaluate existing scientific studies in order to determine the potential vulnerability of the State's nuclear power plants due to aging or from a major seismic event—but it does not mandate seismic testing. [12] There has also been some confusion regarding recommendations/directives from the California Energy Commission (CEC) and California Public Utilities Commission (CPUC) to conduct testing at DCPP.

Cited case law states both the PUC and the CEC must collaborate with other state agencies in fulfilling agency roles; and neither the PUC nor the CEC can overstep the jurisdiction of any other state agency that originally comes from a federally approved program, such as the California Coastal Commission (CCC)[13]. Therefore in order for CPUC to direct PG&E to conduct testing, the CCC *must* also approve. Most notably, the Nuclear Regulatory Commission (NRC) has exclusive jurisdiction over nuclear safety and operations and the NRC has not mandated the use of this seismic testing.

Flawed Scope of Work:

After careful review of the existing documentation, analysis of expert testimony and discussions with expert geophysical researchers, Surfrider questions the overall value of the PG&E's Project and believes testing is unnecessary. Simply put, the Project is unlikely to provide the information necessary to improve seismic safety estimates for DCPP and will not advance worst-case scenario modeling or address the most serious risks.

Upon speaking with an expert research geophysicist at the USGS, Surfrider learned that PG&E's seismic surveying **would not answer the two most critical questions required to understand seismic risk.** The first parameters are the geometry of the faults (which may be addressed by seismic surveys) and the relationship of adjacent faults to each other (do they intersect), which is partly based on geometry and partly on other factors such as how a particular earthquake behaves (not addressed by seismic surveys). The second parameters are how the faults behave (slip rate, frequency, return interval). The proposed study will not address both set of parameters and will only potentially and marginally reduce uncertainties related to the first parameter - fault geometry. [14]

Our concerns about Project necessity were compounded when we learned the Project would duplicate pervious studies, and that existing data was not being synthesized to paint a full picture of fault lines near DCPP. A former PG&E geologist testified the following:

> "A good deal of their planned work includes offshore and onshore geophysical programs that duplicate existing investigations and analyses completed by the USGS and others.... Nothing in the planned

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[12] Legislation text: http://www.leginfo.ca.gov/cgi-bin/postquery?bill_number=ab_1632&sess=0506&house=B&author=blakeslee

[13] See case law: *Orange County Air Pollution Control Dist. v. Pub. Util. Com.*, 484 P.2d 1361, 1367 (Cal. 1971) and *Voices of the Wetlands v. SWRCB, 69 Cal Rptr 3d 487(2007)*

[14] Derived from personal communication with Dr. Jeanne Hardebeck Sept and Oct 2012;

additional surveys, both onshore and offshore, offers any prospect for any result beyond marginal improvement to what is already known...."[15]

Conclusion:

Surfrider questions the overall value of this Project because it will have devastating effects on ocean ecosystems and impact coastal and ocean recreation, tourism and the local economy. This Project jeopardizes marine life and ocean users while hoping to create a seismic profile that will not conclusively reduce uncertainties regarding earthquake hazards at DCPP. PG&E has not conducted due diligence to justify the need for this project. Instead, PG&E should synthesize existing data (collected over the decades by several entities), utilize recent data (collected by PG&E both terrestrially and through offshore low energy testing) to better understand seismic risks, seek further independent review of the need for additional study, and only then propose a project using state of the art techniques that minimize environmental harm to estimate earthquake hazards.

The proposed project violates several sections of the Coastal Act that address marine life protection and recreational resources (specifically Sections: 30220, 30224, 30234.5, 30223, 30230,30260, and 30210). The onus of stopping these precedent setting and harmful project resides squarely on the Coastal Commission and we respectfully urge you to deny this Project.

Thank you in advance for considering these comments.

Sincerely,

Stefanie Sekich-Quinn
Stefanie Sekich-Quinn

Surfrider Foundation, HQ
California Policy Manager

Brad Snook
Brad Snook

Surfrider Foundation, San Luis Obispo Chapter
Chair

[15] Dr Hamilton testimony at CPUC Feb 2012. http://a4nr.org/wp-content/uploads/2012/02/021012-Hamilton-testimony-014-Full.pdf

Fw: reposne to PG&E seismic testing proposal

Amber Wilson to: cr_board_clerk Clerk Recorder 10/25/2012 02:14 PM

Seismic testing....

Amber Wilson
Secretary/Board of Supervisors
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----- Forwarded by Amber Wilson/BOS/COSLO on 10/25/2012 02:14 PM -----

From: James Patterson/BOS/COSLO
To: Amber Wilson/BOS/COSLO@Wings
Date: 10/22/2012 02:58 PM
Subject: Fw: reposne to PG&E seismic testing proposal
Sent by: Amy Gilman

has anyone else been forwarding these to you? ....seems a good idea so we can keep everything compiled in one location. okay with you?

----- Forwarded by Amy Gilman/BOS/COSLO on 10/22/2012 02:58 PM -----

From: Ruth & Karl Kempton <nrview@thegrid.net>
To: ITP.Goldstein@noaa.gov
Cc: Cassidy.Teufel@coastal.ca.gov, fmecham@co.slo.ca.us, bgibson@co.slo.ca.us, adam hill <ahill@co.slo.ca.us>, pteixeira@co.slo.ca.us, jpatterson@co.slo.ca.us
Date: 10/14/2012 10:41 AM
Subject: reposne to PG&E seismic testing proposal

letter to Mr. Payne re pg&e seismic test.docletter to Mr. Payne re pg&e seismic test.pages

letter to Mr. Payne re pg&e seismic test.pdf

1-eir blast map.JPG

3-2 higherst levels of blasting impacts.jpg

Item # 22 Meeting Date: 10/30/2012
Presented by: Ruth & Karl Kempton
Received prior to meeting and posted to web on: October 25, 2012

*one blast impact.jpeg

*four blast impact.jpeg

*forty blast impact.jpeg

CCC_CommentsSeismicSurveys.pdf

P. Michael Payne
Chief Permits & Conservation
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1315 East-West Highway
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ITP.Goldstein@noaa.gov.

Karl Kempton
2740 Grell Lane
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October 13, 2012

Dear Mr. Payne,

I am currently the lead researcher for the California Central Coast Marine Sanctuary Alliance. I was the lead ocean protection individual for the Environmental Center of San Luis Obispo from 1991 through 2005. As a former energy planner for the County of San Luis Obispo, I was hired to write the documentation for and promote the proposed Central Coast Marine Sanctuary.

I and others have many concerns regarding understated and false assumptions in PG&E's Final Environmental Impact Report for the proposed Central Coast seismic imaging project that was certified by the California State Lands Commission on August 20, 2012. A major concern is that the document prepared by NSF and the EA prepared by Padre Associates, Inc. both contradict the high levels of 'take' forecasted by both the DEIR and EIR by stating that there will not be significant impact on the environment.

How do you reconcile the conflict between these documents regarding significant and insignificant impacts to mammals?

While the document prepared by NSF states in its conclusion, "NSF has reviewed and concurs with the conclusions of the Environmental Assessment report prepared by Padre Associates, Inc. that implementation of the proposed activity **will not** have a

significant impact on the environment.", I will be directing my comments to the PG&E DEIR and EIR that understate rates of 'take'. Of the many concerns, I will limit myself to 1) referenced sonic tests, 2) web of life, and 3) impact on federally protected marine designations: two national marine sanctuaries, a national estuary and a national monument. By discussing these concerns, it follows at the same time that the NSF document and the EA both extremely understate 'take' and the significant impact on the environment.

1) Reference Sonic Tests

Perhaps the most glaring false assumption, in my opinion as a former statistician, is the use of various sonic research papers and conclusions to forecast the numbers of 'take' for various mentioned and unmentioned marine life species, especially mammals. The sited studies, statistically speaking, are not in the same 'statistical universe' as the proposed seismic imaging project. The proposed intensities and durations of the sonic waves exponentially far exceed any sited study or studies; they are unprecedented in scope compared to any referenced study. Thus, the predictive model is useless other than a significantly understated guess.

How can your agency allow such a glaring statistical variance to go unnoticed and uncommented upon?

Moreover, the draft EIR and final EIR ignored in their approaches the conflict between the federal government's assumed lower standards or assumptions of sonic impacts to marine life, especially mammals and those of the California Coastal Commission that are significantly higher. The differences between these two standards are of statistical significance.

How is your agency addressing this conflict?

2) Web of Life

The EIR admits that it has no actual scientific knowledge about the impact of the sonic blast waves on planktonic life forms. These are part of the foundation of the web of life for our near and offshore waters. Further, the DEIR and EIR never mentioned nor addressed the concept of the web of life and thus how the sonic blast waves would alter the feeding patterns of all marine life within the immediate and adjacent impact zones. Mammals, both migrating and living in these coastal waters depend on marine web of life food.

How can your agency allow this testing with the EIR admitting it has no actual knowledge on the impacts of the sonic blast waves on planktonic life forms?

How can your agency allow this testing while the EIR omits discussion on the impacts of the sonic blast waves on the web of life?

It has been documented that the lower intensity sonic testing that began over three weeks ago has altered the population patterns of the sea birds. Apparently, the fish that the cormorants, Brown Pelicans (endangered specie) and others depend upon for food have removed themselves from as far south as Pt. Purisma to at least Shell Beach. The rocks along Shell Beach are essentially void of sea birds. Morro Rock is also void of Brown Pelicans (endangered specie). This is the time of year when the Brown Pelican (endangered specie) population is the most dense in our county. It is documented that the Brown Pelican (endangered specie) population is now greater than usual in Cambria (within the Monterey Bay National Marine Sanctuary) and the Morro Bay National Marine Estuary, both federal programs protecting marine life.

Since the low sonic testing began over three weeks ago, fishermen are reporting unusual patterns. They have reported lack of marine life around Pt Purisma and lack of seabirds in large numbers on

rocks. Their catch has been cut in half, but PG&E will not mitigate their losses. They are catching large bottom fish in shallow not deep waters.

Also, there is documentation concerning sea lions. Within the Morro Bay National Marine Estuary an unusual number of sea lions have taken refuge from the sonic waves.

If marine mammals are hiding from this low sonic testing, what will take place with exponentially far higher sonic blast waves?

What will happen to the marine mammal food sources that are scattered by the exponentially far higher sonic blast waves?

3) Impact on Federally Protected Marine Designations: Sanctuaries, an Estuary and a National Monument

The DEIR and EIR impact maps show a large enough radius that the Monterey Bay National Marine Sanctuary, the Channel Islands National Marine Sanctuary and the Morro Bay National Marine Estuary will be impacted. Neither the DEIR nor the EIR referenced the Monterey Bay National Marine Sanctuary and the Channel Islands National Marine Sanctuary study documents for sanctuary protection expansion into the nearshore and offshore waters between them off San Luis Obispo County and western Santa Barbara County. The waters north of Point Sal were part of a marine sanctuary nomination before Congress in 1991 and 1992. Thus, it is known, but unmentioned in the DEIR and EIR, that these nearshore and offshore waters are of national and international significance due to the diversities and densities of marine life.

Also the DEIR and EIR fail to mention the California Coastal National Monument. As you know, this protects sea life whose habitat includes the nearshore rocks along the entire coast of California. There are prohibitions against approaching these rocks

within 100 feet so as not to disturb sea life resting or living on these rocks. There are fines for those ignoring these rules.

How can your agency permit the 'taking' of marine life, especially mammals, in two national marine sanctuaries, a national estuary and a national monument?

Therefore, based on review of the project description and relevant literature, the project is not eligible for an Incidental Harassment Authorization pursuant to the Marine Mammal Protection Act (MMPA), because impacts will not be limited to Level B harassment of marine mammals, but will in fact result in significant *Level A* take of marine mammals.

For a full response to the proposed PG&E seismic imaging project, see

<http://www.slocoastjournal.com/docs/archives/2012/june/pages/marine_sanctuary.html>

<http://slocoastjournal.com/docs/archives/2012/sept/pages/marine_sanctuary.html>

<http://slocoastjournal.com/docs/marine_sanctuary.html>

Sincerely,

Karl Kempton

attachments
5 maps related to seismic testing proposal
California Coastal Commission Comments on Seismic Surveys

cc

Cassidy Teufel
California Coastal Commission
Energy, Ocean Resources and
Federal Consistency Division
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District 3 Adam Hill
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District 4 Paul Teixeira
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District 5 James Patterson
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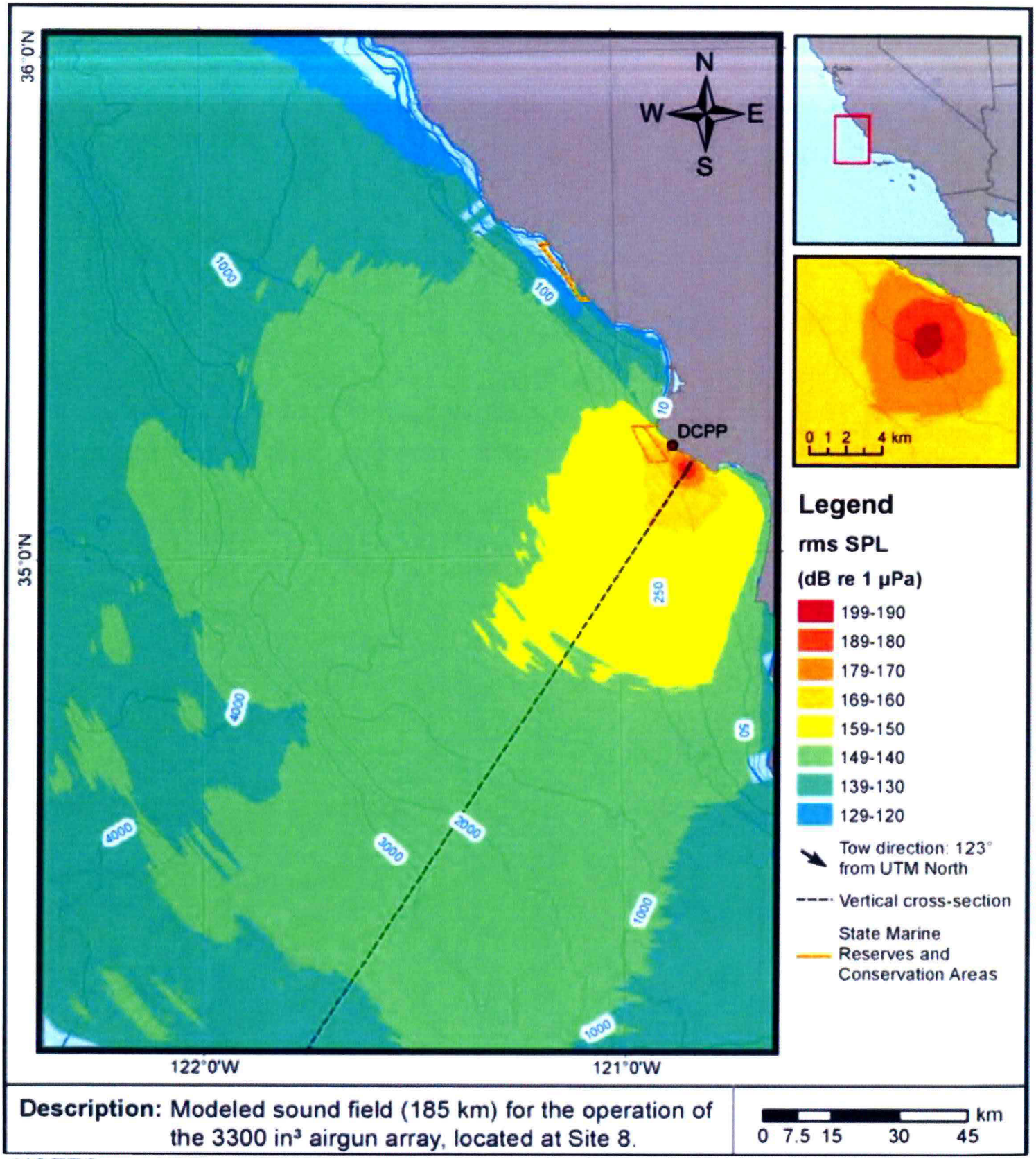
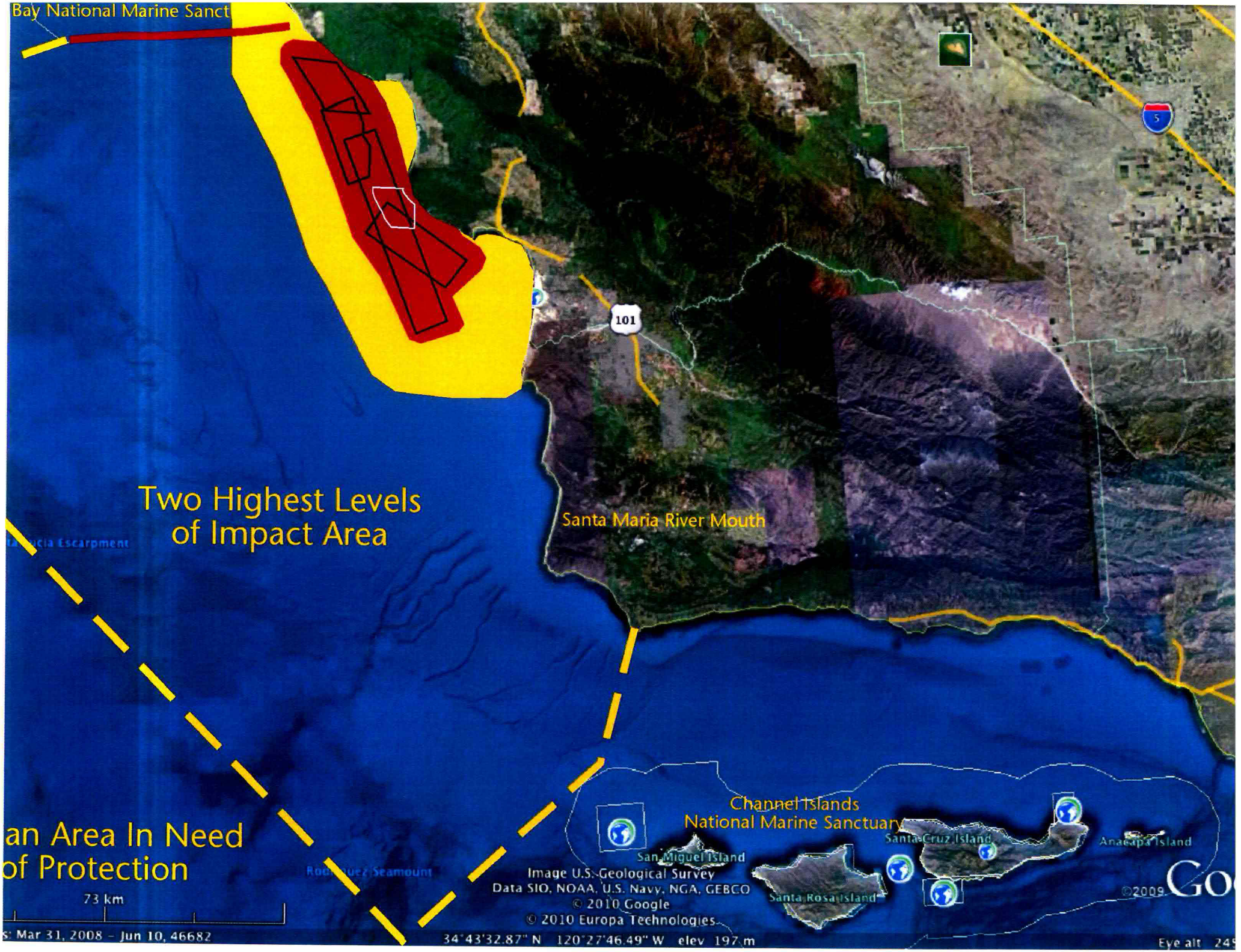
Figure 4.11-5 Example of Modeled Sound Pressure Levels from Air Gun Operations (Plan View)



Description: Modeled sound field (185 km) for the operation of the 3300 in³ airgun array, located at Site 8.

NOTES:
Model results shown in the figure are for Site 8, for maximum-over-depth broadband (10 Hz 2 kHz) sound pressure levels 185 km from the source, assuming 3,300 in^3 air gun levels.
Bathymetry contours (m) are shown in blue.
Source: Zykov et al. 2012.


Bay National Marine Sanct
101
5
Two Highest Levels
of Impact Area
Santa Maria River Mouth
Channel Islands
National Marine Sanctuary
San Miguel Island
Santa Cruz Island
Anacapa Island
Santa Rosa Island
an Area In Need
of Protection
73 km
Image U.S. Geological Survey
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 Google
© 2010 Europa Technologies
©2009
34°43'32.87" N 120°27'46.49" W elev 197 m
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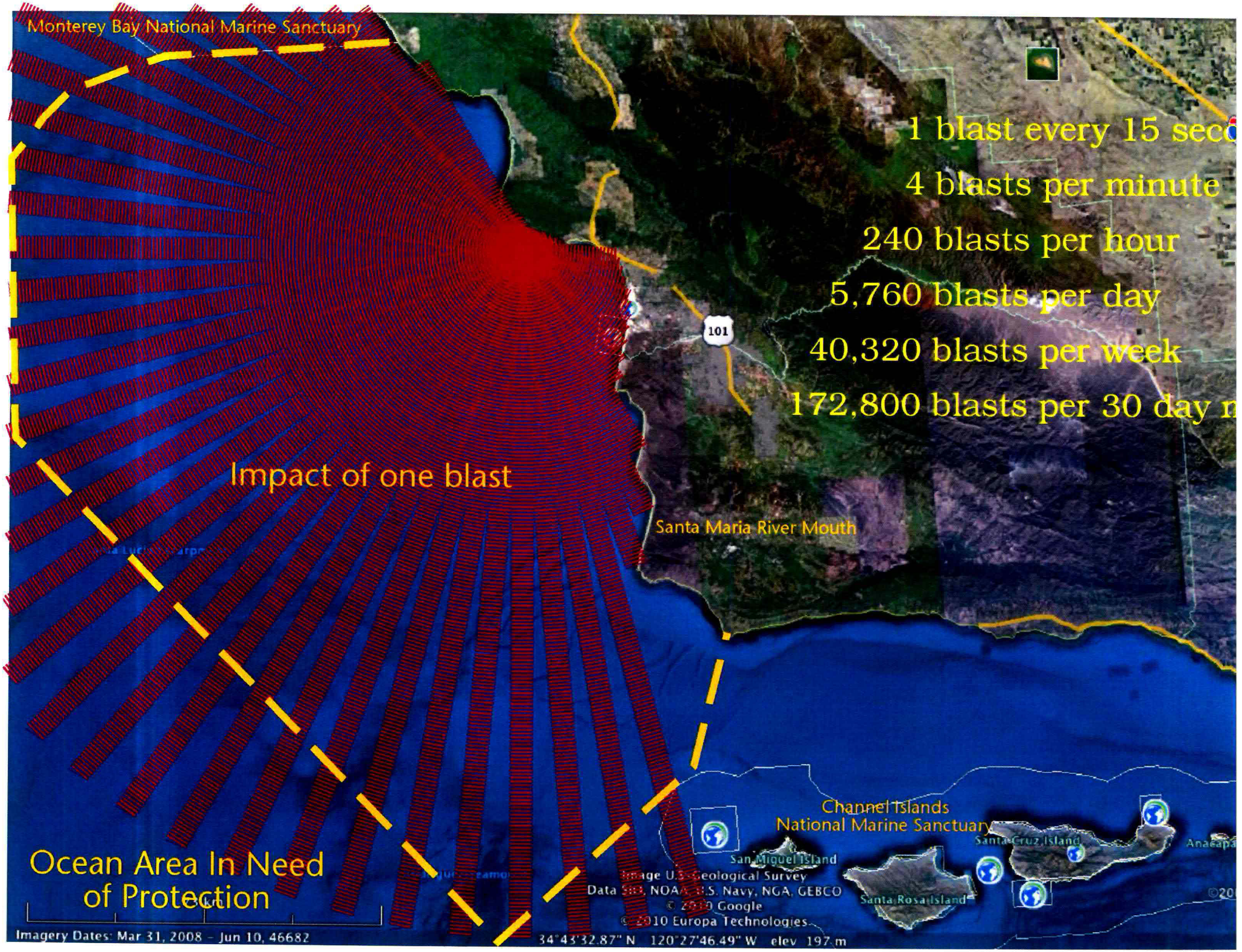
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Image U.S. Geological Survey
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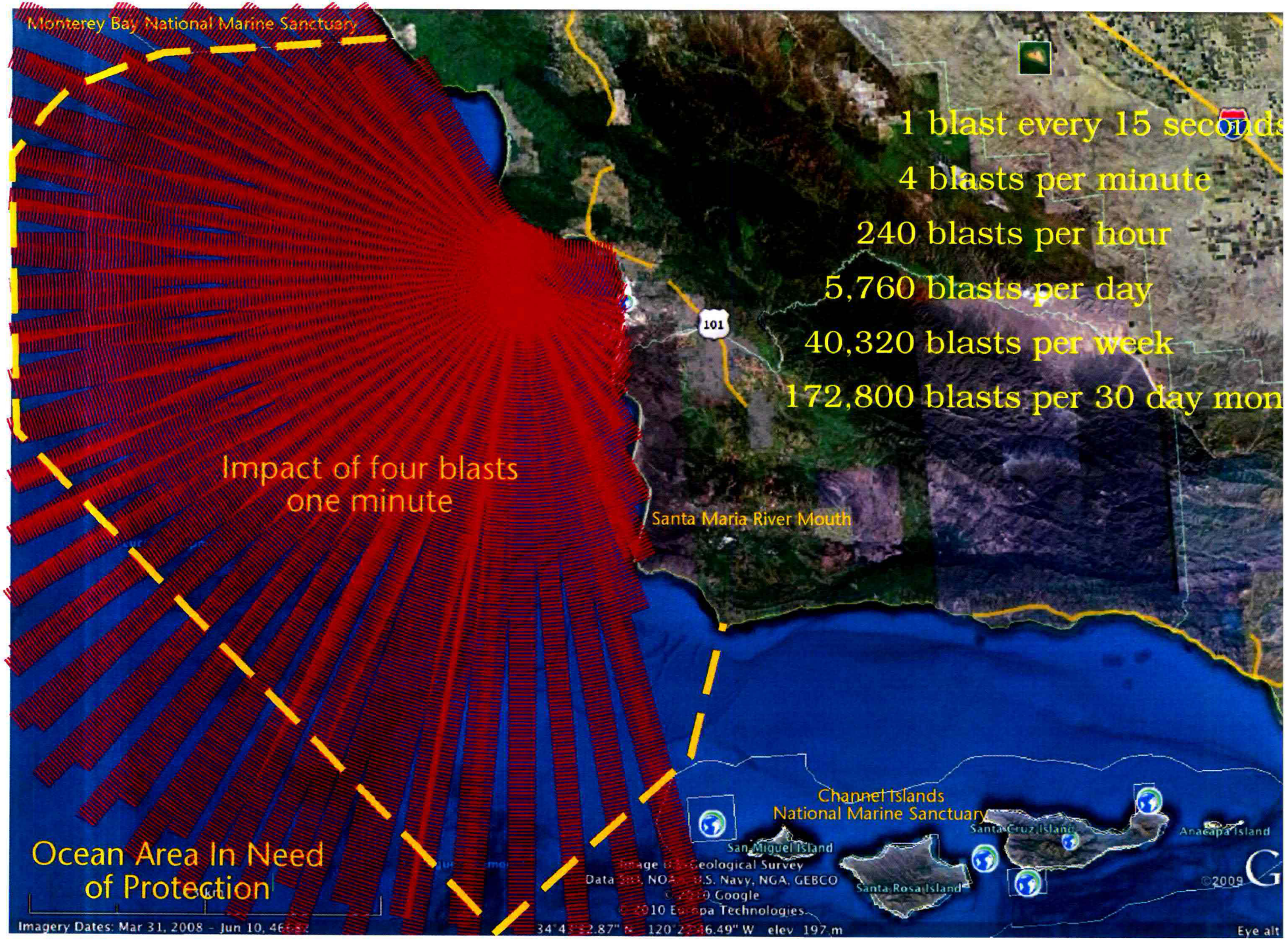
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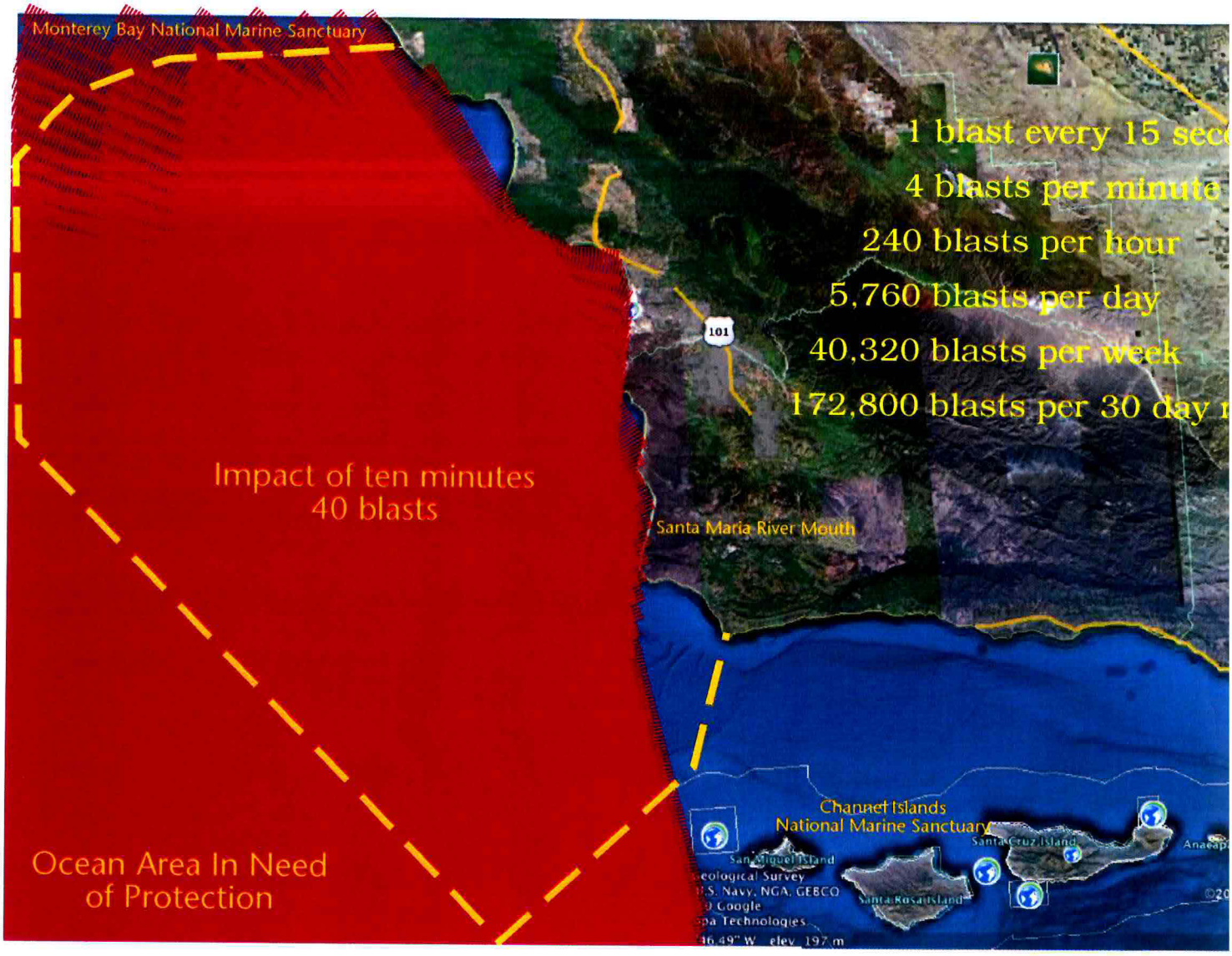
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Coastal Commission Comments on the Effects of Anthropogenic Sound on Marine Mammals

Statement for

The Report of the Advisory Committee on Acoustic Impacts on Marine Mammals

to the

Marine Mammal Commission

Submitted by:
Sara Wan, California Coastal Commission

on behalf of:
Meg Caldwell, Chair, California Coastal Commission

Submission Date: December 13, 2005

The following statement reflects only the views of the individuals and organizations listed as submitting authors. The inclusion of this statement does not indicate support or endorsement by other members of the Advisory Committee on Acoustic Impacts on Marine Mammals or by the Marine Mammal Commission.

Statement [__] submitted by Sara Wan, California Coastal Commision

Alternative Committee Member, Mark Delaplaine, California Coastal Commission

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The California Coastal Commission appreciates the opportunity to have had a representative on the Federal Advisory Committee on Acoustic Impacts on Marine Mammals. The California Coastal Commission is charged with overseeing the coastal zone of the State of California and protecting its valuable coastal resources, including marine mammals. The coastal and marine ecosystems of this State represent both an important economic interest and a vital spiritual one. The coastal and marine ecosystems and marine life within this State's sovereign waters and beyond support important commercial activities, including fishing and tourism. California residents and tourists alike enjoy the benefits and solace that comes from being able to see and appreciate the beauty and wonder of nature. Marine mammals represent a critically important part of this and play a special role in our society and as such deserve our protection.

The California Coastal Commission's regulatory authority over state waters and beyond into federal waters comes through both the California Coastal Act and the federal Coastal Zone Management Act (CZMA). It is within the coastal waters of the states that U.S. strandings occur. It is thus critically important that the states have a say in what happens relative to this issue.

It is with that in mind that the California Coastal Commission is submitting this statement to the Marine Mammal Commission. It is unfortunate that consensus was not reached among the Advisory Committee members so that one comprehensive document could be submitted to Congress and we have not attempted to craft one. Instead we have commented only on those issues that were listed as disagreements at the final Plenary session.

Introduction

Anthropogenic noise is a recognized, but largely unregulated, form of ocean pollution that can deafen, disturb, injure, and kill marine life.[1] Many species of marine mammals are known to be highly sensitive to sound and rely upon sound to navigate, find food, locate mates, avoid predators, and communicate with one another. A combination of noise sources, including shipping, oil and gas exploration and production, dredging, construction, and military activities, has resulted in dramatic increases in noise levels throughout the oceans. Over the last ten years, a growing body of evidence has shown that some forms of ocean noise can kill, injure, and deafen whales and other marine mammals.[2] In particular, a sequence of marine mammal strandings and mortalities has been linked to exposure to mid-frequency sonar.[3] There is also evidence that some affected animals do not strand but die at sea. This has increased public concern about the effects of anthropogenic noise on marine mammals, which has been acknowledged in a variety of domestic and international fora.

Marine mammals have evolved over millions of years and rely on sound for vital life functions and have specialized sensory capabilities to take advantage of the physics of sound in the ocean. Anthropogenic noise in the oceans has increased since the start of the industrial revolution and increases in ambient noise levels,[4] as well as individual sound sources, can cause adverse effects, the extent and type of which are not well understood. Military technology and scientific research using low frequency active acoustics attempting to cover large distances have specifically targeted the ecological sound niches that low frequency specialist whales have evolved to rely on, necessarily competing with those marine mammal species. Peer-reviewed scientific literature indicates that marine mammals are affected by exposure to anthropogenic noise in a variety of ways that can be harmful or even lethal. However, there are significant gaps in information available to understand

and manage these effects. This is particularly the case because marine mammals are extremely difficult to study and the marine environment is extraordinarily complex and dynamic. In addition, this is a relatively new field of concern and the amount of research undertaken to date has been limited in scope and duration.

Much of the information needed to understand the impacts of noise on populations and individuals will remain unknown for decades, if not longer. In the face of much uncertainty, the California Coastal Commission and other agencies must make decisions about proposed activities. Given the current data gaps and the uncertainties in information available about impacts of sound on the marine environment, and the potential for harm to occur before it is detected, it is appropriate for managers to apply precaution when allowing necessary activities to proceed. The current statutes presume that a precautionary approach should be taken and place the burden of proof on the applicant proposing the action. This is necessary because scientific certainty is difficult to obtain on most issues but will be particularly elusive in this field. Because many of these species reproduce very slowly, requiring scientific certainty before taking protective measures could very well result in their extinction.

While much remains to be learned about marine mammals and their responses to noise, one method of determining if there is a correlation between intense noise events (sonar and seismic) would be to be able to have more accurate information about strandings coincident with noise events. However, stranding teams are not necessarily available to cover all areas where strandings occur and funds for quick, accurate, and unbiased review of strandings are insufficient. In addition, knowledge of military activities is not always available. As a result, only publicized mass strandings are reviewed to see if they are coincident with naval or other sound-producing activities. Additionally, there has been no attempt to look at single strandings to see if there may have been sound-producing activities in the area. There also is no standardized form for reporting the results of necropsies and the public is frequently not allowed to observe necropsies or have access to the data for long periods of time (e.g., 2005 North Carolina stranding event). A more coordinated and complete analysis of all stranding data should be conducted.

While anthropogenic noise is only one of many serious threats facing marine mammals, such as fisheries by-catch, habitat degradation, ocean pollution, whaling, vessel strikes, global warming, and others, it is too early in our investigations to know where this issue sits in a relative sense. Most likely the answer will depend upon the species and a more complete knowledge of both cumulative and synergistic effects of noise. Long-term cumulative impacts to populations and synergistic effects that may heighten the impacts of other threats may turn out to be the greatest impact of noise on marine mammal populations. However, the indications are that this threat is significant enough to require efforts to reduce its potential impacts and should be taken seriously.

Extent of the Problem

How significant is the threat and what is the relative importance of sound?

There has been an attempt by some to downplay the significance of sound as a threat, particularly as it compares to other threats. However, it is impossible to say at this stage of our knowledge what the relative importance is. Underwater noise can prevent marine mammals from hearing their prey or predators, from avoiding dangers, from navigating or orienting toward important habitat, from finding mates, from contact with their young, and can cause them to leave important feeding and breeding habitat.[5] Those who state that anthropogenic noise only affects a few individuals or who

insist on an irrefutable burden of proof are looking at this from a very narrow perspective, i.e., considering only known atypical mass strandings where the existence of a sound source was known as a measure of the impact and requiring that there be physical evidence of trauma. This ignores that:

1) the majority of strandings likely go unreported, particularly in remote areas;
2) mortalities that occur away from the coast are very difficult to detect since most whale carcasses sink immediately;[6]
3) knowledge of whether or not a sound source may be present during known strandings may not be available;
4) strandings of single whales where there is no other known cause of the stranding are not reviewed for a possible connection to sound;[7]
5) there may be cumulative and synergistic effects on individuals and populations that are difficult, if not impossible, to determine;
6) there may be significant impacts to a variety of biologically necessary functions;
7) strandings are not the only possible impact of sound; and
8) limiting the inclusion of strandings to those where there is proof of a cause and effect is inaccurate and misleading.

The significance of the impacts may vary with the species. Some species are more threatened by ship strikes, other by by-catch, and still others, such as beaked whales, by noise. We also know that human impacts on marine ecosystems interact to produce a magnified effect of other threats. There is no reason to believe that it is different with noise. Thus noise could, for instance, affect the ability of marine mammals to sense fishing gear or create stress that magnifies the impacts of pollution.

In conclusion, the impact of anthropogenic noise on marine mammals cannot be looked at in a simplistic way by only comparing the known number of mass strandings proven to be connected to sound to the total number of strandings, including those for which there is no explanation. The body of scientific literature on noise impacts on marine mammals is growing, pointing almost uniformly to a cause for concern. While the relative significance of this threat is yet to be determined, it is clear, even at this stage, that this threat should not be taken lightly.

Impact on populations

Impacts of noise on populations, even non-lethal impacts, can severely affect species survival. However, population impacts are difficult to detect, particularly where there is insufficient information about the population size and structure. Where the impacts are the result of long-term cumulative exposure, scientific observation and conclusions are particularly elusive but noise is believed to have contributed to the decline of several species of whales or their failure to recover.[8] The NRC statement that "no scientific studies have conclusively demonstrated a link between exposure to sound and adverse effects on a marine mammal population" [i] is misleading at best, because there are also no scientific studies that conclusively demonstrate that there have been no effects on any marine mammal population. In other words, there is simply not sufficient information to make that conclusory statement. In addition, it ignores the information on noise-induced strandings of a well-studied local population of beaked whales that was either killed or did

i NRC 2005. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects. National Academy Press Washington, D.C. 96 pp.

not return even five years after the sonar event believed to have caused the stranding.[9] That local population impact, on a species about which we know little of the population numbers or structure, cannot be ignored as a possible population impact.

Additionally, the NRC conclusion ignores that:

1) in all but a few cetacean species our population estimates are too imprecise to be able to detect population declines;[10]
2) there have been no studies that have attempted to study population declines due to noise;
3) if we were able to detect a population decline, it would be difficult if not impossible to tie it to noise;
4) where we do know of population declines, most cannot be linked to one primary cause;[11] and
5) in instances where we have reason to believe there can be major impacts, such as in the case of known toxins, even those that accumulate in the tissues of marine mammals, it has not been possible to prove they are a cause of marine mammal decline.[12]

In conclusion, marine mammal population declines are difficult to document especially without accurate baseline population counts to start with. However, what we have learned in the very short time that attention has focused on these issues is that we have seriously underestimated the effects of noise on marine mammals. This indicates that the effects of anthropogenic noise could be far-ranging and severe and should not be discounted.

Degree of scientific uncertainty and the use of extrapolation

In the last few decades, knowledge of marine mammal biology has increased yet many aspects of marine mammal behavior, physiology, populations, and ecology remain unknown. An understanding of normal behavior and the biological significance of any resulting changes in behavior caused by sound exposure are critical to better answer questions regarding impacts. Unfortunately, much of the understanding of normal behavior required to answer these questions is unknown at this time.

At this time there is still a significant amount of uncertainty about how marine mammals hear, how they use sound, and the impacts of noise on them. In fact, the data gaps are so substantial that it is difficult to draw any definitive conclusions on this subject, other than to state that there is a high degree of probability that sound may impact marine mammals in significant ways necessitating the use of precaution.

Listed below are just some of the areas where it is generally agreed that there is uncertainty:

- Eighty-three different species of cetaceans are currently recognized, and audiograms have been developed for only 11 species, all of which are odontocetes.
- The hearing of mysticete whales remains unmeasured.
- Uncertainty regarding the specific uses of sound by marine mammals (e.g., extent, context) makes it difficult to detect or interpret changes in behaviors associated with sound.

- We know relatively little about the extent of marine mammals' use of sound from natural sources (for navigation, prey detection, predator avoidance, or other uses).
- There is uncertainty about how marine mammals use sound to communicate or carry out other functions.
- The ranges and circumstances of effective communication using sound are also unclear.
- There is limited information available on what constitutes normal behavior for many species.
- There is a lack of baseline behavioral data making it difficult to assess the impact of sound or determine what would constitute a biologically significant disturbance.
- There is uncertainty about whether an animal hears the same types of sounds that it produces, and therefore whether it is appropriate to estimate an animal's audiogram by examining its sound production.
- There is uncertainty about whether or not sounds to which animals are relatively insensitive are still important to their survival.
- There is uncertainty about the pathways by which sound travels to the inner ear and about other mechanisms for hearing in marine mammals.
- There is uncertainty about the onset of auditory trauma in marine mammals, including which types and levels of sound exposures will induce trauma in which species.
- There are limited experimental data on TTS (temporary threshold shift) in marine mammals, and no experimental data on PTS (permanent threshold shift, i.e., deafness).
- It is uncertain whether increased sound levels in the oceans could cause auditory developmental problems for young marine mammals.
- We do not know whether marine mammals have natural mechanisms to protect their hearing. If they do have protective mechanisms, they may not work in the same way as in the ears of terrestrial mammals. If marine mammals do have protective mechanisms, we do not know whether or how they might fatigue.
- There is uncertainty about whether the auditory systems of mysticetes may be more likely than those of odontocetes to be affected by low- to mid-frequency sounds because mysticetes' vocalizations consist of these same frequencies.
- While masking is known to be a common, naturally occurring phenomenon, there is uncertainty about the specific conditions under which, and the extent to which, it occurs in marine mammals, and when it is significant.
- The full range of options available to marine mammals to overcome masking is not known.
- There is uncertainty about the potential of general, non-directional ambient noise to cause masking, which results from a lack of information about ambient noise levels.
- Uncertainties exist about baseline feeding rates and hunting success, mate-searching behavior, and predator avoidance affecting scientists' understanding of whether masking is likely to adversely affect the survival or reproductive success of an individual or population.
- Direct effects of masking are difficult to demonstrate in the field.
- The prevalence of non-auditory physiological sound effects (e.g., stress, neurosensory effects, effects on balance, tissue damage from acoustic resonance, gas bubble growth in tissues and blood and blast-trauma injury) in marine mammals and the relative vulnerability of different species to such effects are uncertain.

- Little is known about how sound might induce stress in marine mammals.
- There have been no studies to date specifically investigating these stresses in marine mammals.
- There is uncertainty about the possible role of acoustic resonance in beaked whale strandings associated with sound exposure.
- The relationship of sound characteristics to gas bubble growth is unclear.
- Disagreement currently exists over the possible role of gas bubble growth in beaked whale strandings.
- It is unclear what, if any, specialized adaptations deep diving marine mammals may have evolved to avoid decompression-type effects during their routine diving behaviors.
- The biological significance (e.g., consequences for health, survival, reproduction) of behavioral responses to sound is largely unknown.
- The long-term, cumulative impacts of sound exposure on behavior are also unknown, making it more difficult to determine the significance of observed behavioral changes over time.
- Little is known about the extent to which marine mammals can or do adapt their behavior to changes in anthropogenic sound.
- It is also uncertain how most marine mammal species may respond behaviorally to long-term increases in background noise levels.
- The characteristics of sound that trigger a behavioral reaction are often unknown.
- There are few direct data concerning the behavioral effects of sound on marine mammals.

Uncertainties about the effects of sound on marine mammals are driven by several fundamental problems. First, the lack of baseline behavioral data for most marine mammals makes it difficult to measure and interpret behavioral responses to sound. Second, there are fundamental, practical challenges inherent to studying marine mammal behavior in the wild such that some types of responses (even acute responses) are difficult to detect with currently available monitoring capabilities. Third, even in cases where behavioral responses to sound have been documented, the mechanisms and implications of these changes are not always clear. Fourth, sample sizes in studies where behavioral changes are documented are often small, and the results are often specific to a particular location and scenario, making general conclusions difficult. In addition, even where behavioral changes are documented, interpreting the effects that are detected is extremely difficult, at best.

While the above is not meant to imply that we do not know anything about these issues, it highlights the significant gaps in our current understanding. We do not even know what the hearing range is for most cetaceans (only 11 out of the 83 known species), and we have no measurements on mysticetes at all. Most of what is known about the hearing range of these species comes from studies with one or a few individuals belonging to these 11 species. Extrapolation of these few data points is then used to determine the hearing range of the entire species. We know that there are great variations in the hearing ability and range of individuals within a species, and thus any extrapolation within the same species should include the probability of error and set possible bounds. To then use the extrapolated data to extrapolate again between species where there are no direct observations or experimental data is scientifically inaccurate and can only lead to erroneous conclusions. While extrapolation is a valid scientific tool, extrapolations must be used with great

care and underlying assumptions must be clearly stated. More confidence is placed in extrapolations where comparisons are made between more closely related species or where sample size is larger. Use of extrapolations in this field at this early stage of our knowledge is justifiably controversial. Extrapolation increases in validity as the body of knowledge and extent of data increase in robustness. Until such time as there are a greater number of data points, i.e., individuals measured, including those that are not captive, the risks of drawing the wrong conclusions that could lead to serious management decision errors is too great to justify.

The degree of uncertainty that exists in this newly emerging field of science should not be used as a justification for postponing action to prevent environmental degradation. The potential for harm to occur before it is detected necessitates the use of a precautionary approach to the review and permitting of activities that involve the intentional production of anthropogenic sound.

Relationship Between Stranding and Sound

Level of relationship: cause/effect, correlated, associated

Much has been made of the need to assess the relationship between strandings and sound by defining whether or not the relationship is a coincidence, association, or is correlated or related by cause and effect. Some stakeholders believe that to fully understand the nature of any relationship (e.g., coincidence or correlation) of an acoustic event with a stranding, scientists need, at a minimum, good information on:

- the sound sources involved and the propagation of energy from those sources;
- the animals' physiological and metabolic status and injuries;
- the animals' potential causes of death based on necropsy findings;
- the spatial and temporal correspondence between the sound sources and the animals; and
- the stranding pattern (e.g., atypical strandings having two or more animals stranded over several hours spread over kilometers of coast, rather than at the same time and location; or strandings involving more than one species).

In practice, it is rare to have such complete information and requiring this level of information sets the standard at an unachievable level. Information available to draw conclusions about the causes of stranding events is limited, making it difficult to assess the relationship between strandings and sound. Requiring the determination of whether a stranding is related to sound by cause/effect, correlation, association, or coincidence as a prerequisite to listing it in a table of strandings is inappropriate and artificially narrows the list of strandings that may involve noise. When events, particularly ones that are rare, occur together repeatedly, data from such events can be used to determine a relationship between the two and should not be overlooked, even if a particular individual event cannot be proven to be correlated.

Number of relevant stranding or mortality events

Current understanding of the connection between sound and strandings has not advanced to the point where the relationship between sound exposure and mortality can be understood in terms of physiological, behavioral, and population-level responses, making it difficult to assess the magnitude of impacts. Recent attention directed towards marine mammal strandings and sound, and

particularly the potential impacts of sound on beaked whales, argues for the need to highlight this topic.

The National Marine Fisheries Service (NMFS) maintains a database of marine mammal strandings in the U.S.[13] Some conclude the database indicates that the effects of noise are relatively insignificant when considering the number of strandings known to be caused by anthropogenic noise. However, it is extremely misleading to use the figures from this database. The vast majority of the strandings in the database involve pinnipeds (seals and sea lions) not cetaceans, and to date no strandings of pinnipeds have been linked to noise. In addition, most of these are strandings of one or two individuals where noise is not even considered a possible cause, and therefore no attempt was made to look at the relationship between the stranding and noise. Because 60% of the strandings cannot be explained by any known cause[14], it is also possible that a percentage of these could be sound-related and that for others sound was a contributing factor.

Anthropogenic sound has only recently emerged as a probable cause of some marine mammal strandings and, prior to the early 1990s, was not even looked at as a possible cause of strandings. In 1998, exposure to military sonar was postulated as the cause of a beaked whale stranding event in Greece in 1996.[15] Similar events have occurred in the Bahamas Islands in 2000, Madeira in 2002 and the Canary Islands in 2002.[16] Mass strandings of Cuvier's beaked whales are considered to be highly unusual. Since the early 1960s, when the Navy's mid-frequency tactical sonar was first deployed and the use of arrays began, more than 40 mass strandings of Cuvier's beaked whales have been reported worldwide, some together with naval maneuvers and the use of active sonar or other noise sources such as seismic surveys. Some of these strandings that occur together with a noise event are undisputed in their association with noise. In other cases stakeholders consider them to be coincidental events. These stakeholders require that the exact source and level of noise be determined and also require evidence of the physiological condition of the animals, potential causes of death based on necropsy findings, the presence of a qualified biologist to document both the stranding and the noise event and the spatial and temporal correspondence between the sound source and the animals. Such information may be useful in determining a cause and effect relationship but is seldom available and raises the bar of proof to a level usually unattainable. It should not be necessary to prove a cause and effect, e.g., through a known mechanism, to be convinced that some strandings are linked with sonar. This is the manner in which the relationship between smoking and cancer and other diseases was elucidated. It is therefore necessary to include a very complete list of strandings, particularly of mass strandings, and all known possible sound sources operating in the area at the time, to enable a more accurate analysis of the potential connection between noise and strandings whether or not a cause and effect can be conclusively proved.

It is interesting to note that that a double standard is being used. These same stakeholders reject the use of extrapolation to determine received levels in a stranding, even with relatively good propagation models that are available, yet they accept extrapolation relative to hearing from a single odontocete to a mysticete.

The magnitude of the problem of acoustically-induced strandings remains unknown, but there are concerns that the number of these strandings identified may underestimate the number of animals affected. In general, an analysis of stranding data may underestimate the number of strandings related to sound events because: a) a substantial number of strandings, and especially mortalities at sea, may go undetected or undocumented; and b) a substantial proportion of any associated sound

events may go undocumented (e.g., because of the absence of a standardized reporting system). Stranding detection is affected by factors such as their proximity to relatively populated areas (i.e., whether humans are likely to observe them). Animals that die at sea are seldom detected. The documentation of strandings depends on reporting efforts (e.g., by local stranding response networks) and the availability of qualified personnel to conduct necropsies or other analysis. In addition, the question of possible underestimation of acoustically-induced strandings is a particular concern for species other than beaked whales that may strand more regularly due to other causes. In these latter species, a connection to sound exposure may go undetected and their susceptibility to sound-related injury and mortality may be underestimated.

While much remains to be learned about marine mammals and their responses to noise, having more accurate information about strandings that occur coincident with noise events would help us determine if there is a correlation between the two. However, stranding teams are not necessarily available to cover all areas where strandings occur and funds for quick, accurate, and unbiased review of strandings are insufficient. In addition, knowledge of military activities is not always available and may be classified. As a result, only publicized mass strandings are reviewed to see if they are coincident with naval or other sound-producing activities and there has been no attempt to correlate single strandings of whales with noise events. There is also no standardized form for reporting the results of necropsies and the public is frequently not allowed to observe necropsies, or have access to the data for long periods of time (e.g., North Carolina stranding), making the conclusions subject to suspicion by members of the public, particularly when public members are barred from observing while Navy-sponsored scientists conduct the necropsies (e.g., Haro Strait[17]).

It has taken 40 years to notice the connection between naval sonar and mass strandings of beaked whales, even though this is one of the most obvious connections. This underscores how easy it is to miss the connections between noise and a variety of impacts on marine mammals. Some stakeholders have attempted to limit the listing of strandings to the four events where there is very good evidence of the connection between strandings and anthropogenic noise. This paints a very deceptive picture of what may be happening. It is of particular importance that we not limit the list of strandings that may have a connection to sound sources. A complete list is necessary to more fully understand the magnitude of the problem and allow for an analysis to determine whether a statistical correlation of the relationship between noise and strandings exists. We have therefore included a more complete list of strandings (Table 1).

Table 1. Mass Strandings of Beaked Whales[18] (Brownell et al. 2004; ICES 2005)

Year	Location	Species (numbers)	Associated activity, when available
1914	New York, U.S.	Zc (2)	
1960	Sagami Bay, Japan	Zc (2)	US Fleet
1963	Gulf of Genoa, Italy	Zc (15+)	Naval maneuvers
1963	Sagami Bay, Japan	Zc (8-10)	US Fleet
1964	Sagami Bay, Japan	Zc (2)	US Fleet
1965	Puerto Rico	Zc (5)	
1966	Ligurian Sea, Italy	Zc (3)	Naval maneuvers
1967	Sagami Bay, Japan	Zc (2)	US Fleet
1968	Bahamas	Zc (4)	
1974	Corsica	Zc (3), striped dolphin (1)	Naval patrol

Year	Location	Species (numbers)	Associated activity, when available
1974	Lesser Antilles	Zc (4)	Naval explosion
1975	Lesser Antilles	Zc (3)	
1978	Sagami Bay, Japan	Zc (9)	US Fleet
1978	Suruga Bay, Japan	Zc (4)	US Fleet
1979	Sagami Bay, Japan	Zc (13)	US Fleet
1980	Bahamas	Zc (3)	
1981	Bermuda	Zc (4)	
1981	Alaska, United States	Zc (2)	
1983	Galapagos	Zc (6)	
1985	Canary Islands	Zc (12+), Me (1)	Naval maneuvers
1986	Canary Islands	Zc (5), Me (1), *Ziphiid* sp. (1)	
1987	Canary Islands	Me (3)	
1987	Italy	Zc (2)	
1967	Suruga Bay, Japan	Zc (2)	
1987	Canary Islands	Zc (2)	
1988	Canary Islands	Zc (3), bottlenose whale (1), pygmy sperm whale (2)	Naval maneuvers
1989	Sagami Bay, Japan	Zc (3)	US Fleet
1989	Canary Islands	Zc (15+), Me (3), Md (2)	Naval maneuvers
1990	Suruga Bay, Japan	Zc (6)	US Fleet
1991	Canary Islands	Zc (2)	Naval maneuvers
1991	Lesser Antilles	Zc (4)	
1993	Taiwan	Zc (2)	
1994	Taiwan	Zc (2)	
1996	Greece	Zc (12)	Naval LFAS trials
1997	Greece	Zc (3)	
1997	Greece	Zc (9+)	Naval maneuvers
1998	Puerto Rico	Zc (5)	
1999	Virgin Islands	Zc (4)	Naval maneuvers
2000	Bahamas	Zc (9), Md (3), *Ziphiid* sp. (2), minke whale (2), *Balaenoptera* sp. (2), Atlantic spotted dolphin (1)	Naval mid-frequency sonar
2000	Galapagos	Zc (3)	Seismic research
2000	Madeira	Zc (3)	Naval mid-frequency sonar
2001	Solomon Islands	Zc (2)	
2002	Canary Islands	Zc (9), Me (1), Md (1), beaked whale spp. (3)	Naval mid-frequency sonar
2002	Mexico	Zc (2)	Seismic research
2004	Canary Islands	Zc (4)	Naval maneuvers

Zc=*Ziphius cavirostris* (Cuvier's beaked whale); Md=*Mesoplodon densirostris* (Blainville's beaked whale); Me=*Mesoplodon europaeus* (Gervais' beaked whale)

Range of species involved: beaked whales, other?

While marine mammal species other than beaked whales have been involved in mass strandings associated with anthropogenic sound, the connection is more readily apparent with beaked whales, in part because beaked whales are not known to regularly mass strand due to other causes (e.g., disease). In comparison with beaked whales, other species of cetaceans such as pilot whales mass strand more regularly, and these events are often attributed to causes other than anthropogenic sound exposure. Because beaked whale mass strandings are so rare, these strandings are likely to lead to questions about their possible causes. However, while the connection is more obvious in the case of beaked whales, other cetaceans have also been involved in strandings associated with anthropogenic noise. Minke whales, (Bahamas 2000), pygmy sperm whales (Canary Islands 1988), and bottlenose whales (Canary Islands 1988) have stranded concurrent with beaked whales. In other instances, melon-headed whales (Hawaii 2004), harbor porpoises (Haro Strait 2003[17]), and humpback whales (Brazil 2002) have stranded in events that did not involve beaked whales. In addition to these, NMFS is still investigating whether the pilot whales, minke whales, and dwarf sperm whales that stranded in North Carolina (January 2005) had traumas consistent with acoustic impacts. It should be noted that NMFS has not provided any report on the North Carolina incident, which occurred over ten months ago, and has not provided a final report on the Bahamas 2000 stranding almost five years after the event. This limits the ability to draw any conclusions about these events and the involvement of species other than beaked whales.

Table 2. Associated Mass Strandings Involving Species Other Than Beaked Whales[19]
(Engel et al. 2004; Martin et al. 2004; NOAA and U.S. Navy 2001; NMFS 2005; Tomaszeski 2004)

Year	Location	Species (numbers)	Associated activity (when available)
1988	Canary Islands	Pygmy sperm whale (2), Zc (3), bottlenose whale (1)	Naval maneuvers
2000	Bahamas	Minke whale (2), *Balaenoptera* sp. (2), Atlantic spotted dolphin (1), Zc. (9), Md. (3), Ziphiid sp. (2)	Naval mid-frequency sonar
2002	Brazil	Humpback whale (8)	Seismic exploration
2003	Washington, United States	Harbor porpoise (14), Dall's porpoise (1)	Naval mid-frequency sonar
2004	Hawaii, United States	Melon-headed whale (~200)	Naval mid-frequency sonar
2005	North Carolina, United States	Long-finned pilot whale (34), dwarf sperm whale (2), minke whale (1)	Naval maneuvers; investigation pending

Range of sound sources involved: sonar, airguns

Much has been made of the impact of Naval sonar, particularly mid-frequency sonar, and the connection to strandings, particularly of beaked whales. That there is a connection is clear.[20] Whether or not there is a connection to the strandings of other species is still a matter of disagreement, although for those non-beaked whale species stranding alongside beaked whales during a noise event, it would be hard to believe that there is no connection. It is unnecessary to dwell on this type of sound source as being the only one having impacts on marine mammals.

Other sources of sound, particularly seismic and shipping, should be of equal concern. Seismic surveys use sound that can travel across entire ocean basins. A single seismic survey in the northwest Atlantic was found to flood an area almost 100,000 square miles with one hundred fold greater than ambient noise levels, persisting so as to be nearly continuous for days.[21] This form of intense underwater sound has been used for many years but has only recently undergone any scrutiny as to its possible impacts on marine mammals. Scripps Institution of Oceanography

scientific research to study deep ocean temperatures to assist global climate change models (i.e., Acoustic Thermometry of Ocean Climate (ATOC) was specifically intended to be both transoceanic and operational over decades. The U.S. Navy's Low Frequency Active Sonar (LFA) is intended to ensonify an underwater area of several million km^2 at greater than ambient levels.[22]

In 2004, the International Whaling Commission's Scientific Committee concluded that increased sound from seismic surveys was "cause for serious concern."[23] Its conclusion was based on a substantial and growing body of evidence that shows that seismic pulses can kill, injure, and disturb a wide variety of marine animals, including whales, fish, and squid. Impacts range from strandings, to temporary or permanent hearing loss and abandonment of habitat and disruption of vital behaviors like mating and feeding. The IWC Scientific Committee expressed great concern about the effects of seismic surveys on blue, fin, and other endangered large whales,[24] particularly in their critical habitats, and some scientists have asserted that the persistent use of seismic surveys in areas known to contain large whales in significant numbers should be considered sufficient to cause population-level impacts.[25] The State of California (State Lands Commission) banned further high-energy seismic surveys within its waters until such time as a programmatic Environmental Impact Report is completed, due to concerns about the impact of seismic surveys on fish eggs and larvae.[26]

In 2002, in the Gulf of California, Mexico, two beaked whales (*Ziphius cavirostris*) were found to have stranded coincident with geophysical surveys that were being conducted in the area.[27] That same year, the stranding rate of adult humpback whales was unusually high compared with that of juvenile humpbacks along Brazil's Abrolhos Banks, where oil and gas surveys were conducted.[28] Studies suggest that substantial numbers of western Pacific gray whales, a population that is considered critically endangered, were displaced from important feeding grounds in response to seismic surveys off Russia's Sakhalin Island.[29] Other marine mammal species known to be affected by airgun arrays include sperm whales, whose distribution in the northern Gulf of Mexico has been observed to change in response to seismic operations;[30] bowhead whales, which have been shown to avoid survey vessels to a distance of more than twenty kilometers while migrating off the Alaskan coast;[31] harbor porpoises, which have been seen to engage in dramatic avoidance responses at significant distances from an array[32], and all small odontocetes in U.K. waters where sighting rates (combined) are significantly higher when air gun arrays are not shooting.[33]

Until sufficient stranding teams are in place to report, monitor and correlate possible strandings that might be associated with the use of seismic surveys and until there is a long-term study on the possible cumulative and synergistic effects on populations it will not be possible to have an accurate picture of the extent of the problem, and it will remain a major concern.

While Navy sonar and seismic surveys are the most obvious and easily recognizable as causing direct adverse impacts to marine mammals, the effects of shipping also rise to the level of significance. Shipping, however, unlike sonar and seismic noise, is not a single source of noise that can be as easily studied. Shipping is diffuse and spread throughout the world's oceans, raising the ambient levels of sound. Shipping noise creates the same frequencies used by many marine species, including baleen whales.[34] The most probable impacts of shipping relate to the masking of biologically meaningful sounds, and to chronic and sublethal effects including disruptions to breeding, migration

patterns, and communication. In addition, shipping noise may create stress that could contribute to a variety of synergistic impacts that affect the longevity of individuals and have possible long-term population impacts.

Other sources of anthropogenic sound in the oceans that are of significant concern include underwater explosives, anti-predator devices (e.g., acoustic harassment devices (or AHDs)) and whale watching boats. Whale watching boats have been linked to possible population-level impacts and are of particular concern because they are specifically directed at whales.[35]

Mechanisms of injury: auditory, behavioral, non-auditory

There is currently considerable scientific debate about the mechanisms of injuries sustained by marine mammals that lead to strandings. While this is of obvious scientific interest and importance, it should not be considered important relative to the regulatory agencies' decisions regarding the management of sound-producing activities. Knowledge of the mechanisms of injury could result in a better understanding of how to mitigate for these lethal impacts. Until this knowledge gap is filled, agencies must make decisions about allowing these activities to proceed. Regardless of how the injuries take place, the fact that sound sources cause them, affecting not only individuals but possibly populations, must be factored into agencies' decisions about permitting and management.

Recommendations:

1) Provide funding to have sufficient stranding teams available to review and obtain information on strandings in a timely manner.
2) Increase the level of monitoring to detect strandings or mortalities at sea associated with noise events.
3) Develop a standardized form for the reporting of data from strandings, including consistent necropsy examinations to detect acoustically-related injuries.
4) Allow for a limited number of members of the public to be present during necropsies to increase the transparency of the process.
5) Require reporting of any activities involving sound in areas where there was a stranding, including date, time, and location of the activity.

Effectiveness of Current Management/Mitigation

What are the best practices?

Many sound-producing activities serve important social, economic, or other purposes, and effective management of their effects is therefore essential, particularly when prevention of adverse effects is not practicable. Addressing human-caused acoustic impacts on marine mammals through a comprehensive and transparent management system should be a high priority, and potential and known adverse effects associated with anthropogenic sound should be minimized in the marine environment. Scientists have not conclusively identified all situations in which anthropogenic sound will have adverse effects, but a range of mitigation and management techniques or approaches currently exist, that, if implemented, may reduce potential adverse effects.

The components of systems for managing the effects of sound on marine mammals include knowledge and research, risk assessment, permit and authorization processes, mitigation tools and monitoring, evaluation, enforcement, and compliance activities. Mitigation consists of a suite of tools designed to prevent, reduce, eliminate, or rectify the impacts of sound introduced into the

environment. When considering the application of mitigation strategies, managers begin with the ultimate goal of preventing adverse effects (e.g., through source removal or exclusion zones). If that prevention is not practicable, they modify their strategies to minimize impacts on marine mammals (e.g., through source or exposure reduction) consistent with existing statutes. It is important to note that sound-producing activities may not be allowed to proceed in cases where mitigation is inadequate or impossible and the potential adverse effects warrant such action.

The application of fully integrated mitigation systems that bring together an appropriate combination of the tools at managers' disposal is likely to be the best way to maximize effective mitigation efforts. There is not, and probably never will be, a single "silver bullet" solution to designing and carrying out effective mitigation. The effectiveness of source removal is obvious but the effectiveness of other commonly used mitigation measures (e.g., ramp-up and safety zones) has generally not been systematically assessed, and may vary greatly form one case to another. Certain mitigation tools, such as exclusion zones, are inherently effective. However, under certain circumstances, some of these may be impractical for the sound-producers. Mitigation tools currently available include:

- Operational procedures (such as ramp-ups and speed limits);
- Temporal, seasonal, and geographic restrictions; and
- Removal or modification of the sound sources (such as ship-quieting technologies and reductions in sound-producing activities).

Fundamentally, the primary goal of any management system must be to reduce or eliminate the intensity, and thus the potential for negative impacts, of noise sources by either not undertaking these activities to begin with, or through modifications to those activities (including the use of alternative, quieter technologies), and geographic and seasonal restrictions or exclusions.

Mitigation strategies that have the greatest potential for reducing risks to marine mammals include, as a matter of priority, reduction of source levels or source removal. Moreover, reducing overall sound levels is a general premise of mitigation, and should be a goal of any management system attempting to prevent adverse effects on marine mammals, and in so doing, pursuing targeted mitigation of discrete noise-producing activities. To this end, we highlight several proactive mitigation tools that we believe are the most effective and should be improved upon and employed expeditiously for managing the impacts of human-generated noise on marine mammals and their habitats.

Seasonal and geographic exclusions: Geographic areas or regions that are biologically important for marine mammals (i.e. breeding, feeding, calving and migratory habitats) should be off-limits to noise-producing activities on a seasonal or permanent basis. This tool is the most effective in preventing harmful effects of noise on marine mammals by excluding noise-producing activities from critical habitats during important biological activity.

Marine reserves. Designating and enforcing marine reserves can be an extremely effective tool for protecting marine mammals and other marine life from noise-producing activities. Commercial activity, such as oil and gas exploration and extraction and other habitat-altering activities, should be off limits in marine reserves.

Source removal, reduction and modification. Where forms of marine habitat protection such as marine reserves and seasonal restrictions are not possible, lowering noise levels or removing them altogether are possible options through the use of alternative technologies.

The above tools are inherently the most effective at reducing or eliminating the impacts to marine mammals, but there are also practical limitations on their use and they may not always be "practicable" under current statutes. The use of safety zones with adequate monitoring is the next best level of protection that can and should be used.

Safety zones. Safety zones are centered around a sound source, rather than an animal. A safety zone is a specified distance from the source (generally based on an estimated received sound pressure level) that must be free of marine mammals before an activity can commence and/or must remain free of marine mammals during an activity.

The sizes of safety zones are typically determined using a variety of information, including prior observations of marine mammal impacts, sound propagation models, sound source information, real-time acoustic measurements, and consideration of other mitigation measures employed.

There are several limitations on the effectiveness of safety zones, including our lack of scientific knowledge about what levels of sound may be safe for a particular marine mammals species and thus the appropriate "received level" that is required to be set. In addition there are significant limitations on the ability to detect marine mammals prior to their entering the safety zone.

Safety zones are generally used in conjunction with marine mammal observers. These observers are individuals ranging from marine mammal biologists and trained observers to crew members who conduct visual surveys of marine mammals (i.e., watching for their presence or behavior) for various reasons including maintenance of marine mammal–free safety zones.

The limitations inherent in visual observations are well known. A variety of factors affect sighting rates. Effective visual observations are also generally limited to hours of daylight. Visual detection is also limited because it can only be achieved at or very near the water's surface. Sighting rates in good conditions are much higher for species that spend more time at the surface, or for those which are more visible when they breathe. However, many cryptic species that spend very little time at the surface (e.g., deep diving beaked whales) are difficult to detect even under ideal conditions.

The limitations of using marine mammal observers to enforce a safety zone can be offset through the use of Passive Acoustic Monitoring (PAM), especially for some deep diving species, if they vocalize. There are some technical limitations to PAM; for example, stationary hydrophones or Acoustic Recording Devices (ARDs) are not particularly useful for monitoring a highly mobile sound source unless there is a bottom array covering the area. Using these methods together, it is still unlikely that 100% of all marine mammals will be detected.

While there are no known mitigation techniques that guarantee elimination of potential and known impacts — other than denying an activity or creating seasonal and geographic exclusion zones — management and regulatory agencies must deal with the need for requests for permits for sound-producing activities. They must therefore, consistent with current statutes, look to all possible mitigation tools to reduce the impact to the level of least practicable adverse impact.

Recommendations for Management and Mitigation:

1) The management agencies should identify, and implement immediately, mitigation measures that are effective for noise-producing activities (e.g., source reduction and removal; geographic and seasonal restrictions) while a sustained national research program that includes systematic study of the effectiveness of mitigation tools is being developed.
2) The agencies should work with the U.S. Navy, air gun users (including scientists, geophysical contractors, and oil and gas companies), and the shipping industry to prioritize and ensure the development and use of quieter technologies, and other source reduction tools or methods. In addition, management should be extended to unaddressed sources and activities that have the potential to produce adverse effects (including, but not limited to, commercial shipping, recreational watercraft use, whale watching, and the development and use of AHD (Acoustic Harassment Devices, e.g., sounds to keep mammals away from fishing areas), and ADD (Acoustic Deterrent Devices, e.g., use of sound to keep mammals from entangling in fishing nets).
3) The National Marine Fisheries Service and the U.S. Fish and Wildlife Service (the Services) should examine novel applications of conservation tools such as designation of critical habitats, marine protected areas and ocean zoning to protect populations from chronic or episodic anthropogenic noise.
4) The Services should develop standardized and transparent systems and formats for the collection of monitoring data to be able to systematically take advantage of appropriate opportunities to collect data that can be used for statistical analysis, and facilitate the review, aggregation, and publication of data and results of those analyses.
5) The Services should establish training and certification programs to ensure that observers are qualified to conduct effective monitoring, enabling data to be utilized effectively.

Cost-effectiveness and practicality/practicability

Current statutes authorize the Services to issue permits for taking marine mammals that meet specific requirements, and to authorize small incidental takings of small numbers of marine mammals for activities "within a certain geographical region… during periods of not more than five consecutive years…" provided (1) that "the total of such taking… will have a negligible impact on such species or stock" and (2) that the agency "prescribes regulations setting forth… permissible methods of taking… effecting the least practicable adverse impact" on marine mammals. The MMPA has been working relatively well and there is no reason to believe it needs changing. The current statutes do not include cost or cost-effectiveness as a consideration in the application of mitigation to reduce the impact to the least practicable adverse impact. NMFS must provide meaningful protections for species regardless of the resulting economic costs. In addition, while some military exemptions may be warranted, broad-scale and unneeded military exemptions from the MMPA are not appropriate. This is critically important because the purpose of these statutes is to protect and preserve these species. To include cost and cost-effectiveness as considerations in the protection of species would undermine those protections and complicate the statutes to the point where requiring mitigations would become almost impossible. Protections provided for under the MMPA, NEPA, and ESA would become meaningless. There is no definition of what is meant by "cost-effective" and, as has been stated under the Mitigation Best Practices Section above, no mitigations to date have been studied for their effectiveness. To determine if a mitigation is "cost effective" would first require a determination of the mitigation's effectiveness relative to potential

and known impacts to the species. It is clear that at this point there are huge data gaps and high uncertainty in all aspects of this field. It would first require a series of long-term studies to better understand marine mammals and to look at the impacts of noise along with a determination of the mitigation's ability to reduce that impact. While we highly recommend that such studies be conducted, the results and ability to interpret them are decades away. In the meantime, decision-makers cannot be stripped of the only mechanisms they have at their disposal to reduce the potential and known impacts of anthropogenic sound on marine mammals.

Assignment of burden of proof: sound producers vs. regulators

The current regulatory system, NEPA (National Environmental Policy Act), MMPA (Marine Mammal Protection Act), ESA (Endangered Species Act), and CZMA (Coastal Zone Management Act), requires that the impacts of activities affecting marine mammals be reduced to the least practicable adverse impact and sets the burden of proof for determining what those impacts are with the sound producer.[ii] This is essential to retain. Given the scientific uncertainty surrounding this issue, the difficulty in studying marine mammals, our expectation that the data gaps will not be filled perhaps for decades, and the likelihood that scientific certainty can be achieved in the near future, or ever, is very remote, the need to have those proposing an activity show that their activity can be mitigated to reduce the potential for impact is essential. If agencies are required to prove that a sound-producing activity causes harm before requiring reasonable protection through mitigation, no mitigations will be able to be required and serious and/or irreparable harm to these important species could occur.

Precautionary approach—addressing the uncertainty

Given the level of uncertainty, the data gaps, and the serious – even lethal – potential effects of sound on marine mammals, precaution is necessary to protect and conserve these species that have a special place and role in nature and in our culture. While there is no clear-cut, agreed upon definition of precaution or the precautionary approach, some level of precaution is appropriate, given the difficulty of studying marine mammals in the wild, our lack of knowledge of marine mammal populations, and the potential for harm to occur before it is detected. The current regulatory system, through provisions in NEPA, MMPA, and ESA, incorporates precaution. Scientific uncertainty should not be used as a justification for postponing action to protect these species. Failure to take a precautionary approach until scientific certainty is achieved, which may never be possible, and attempting to shift the current burden of proof from the applicant to the agencies, could result in direct population effects, leading to the extinction of some species.

The California Coastal Commission believes that protecting marine mammals, which it considers to be coastal resources, is important to this State. As such the Coastal Commission applies precaution in its decision-making process in two ways. Under the CZMA, precaution is applied to mean that given uncertainties that might impact coastal resources the applicant is required to

[ii] Under the ESA, the take (harm/harassment) of listed species is strictly prohibited and consultation is required under the regulations whenever a federal activity/permit "may affect" a listed species. Following consultation, "take" may be authorized only where the agency/applicant can "insure" that the authorized action "is not likely to jeopardize" the survival of the species or adversely modify its critical habitat. "Any person who wants to be shielded from Section 9 liability for a take by an exemption or take permit "shall have the burden of proving that the exemption or permit is applicable has been granted". Taken together this puts the burden on anyone who wants to undertake an activity that could affect a listed species. The MMPA has language that similarly applies.

mitigate possible impacts to the maximum extent practicable and to monitor for impacts. Under the Coastal Act, if there is uncertainty the Coastal Commission takes the position that the applicant must avoid or mitigate the impacts to a negligible level. If avoidance is not possible, or if mitigation is not possible, or if it is unknown whether mitigation will work, then the Coastal Commission may deny the project. In each case, the Coastal Commission applies the generally accepted legal principal that the applicant bears the burden of proof that the proposed project/action will *not* impact coastal resources.

The California Coastal Commission believes that the current regulatory system should be retained and even strengthened to enable regulatory decision-makers the ability to factor in the current and evolving field of science that indicates that the impact of anthropogenic noise on marine mammals may be significant.

International or multi-lateral approach

Few marine mammals are restricted to the waters of any one country. While the problem of anthropogenic sound is international in scope, the California Coastal Commission's jurisdiction extends only to this State's waters, federal waters off its coast, and impacts on this State's coastal resources, i.e., marine mammals that pass through or live in or on California's coast. It is therefore beyond the scope of our jurisdiction to deal with marine mammals on an international level and we will not comment on this aspect of the problem.

Priorities and Conduct of Research

Diversification and distribution of research funding/Safeguards against bias in research

Bias in scientific research is recognized as a significant problem in all fields of research. The issue of bias in science is not a new one and is not specific to this field of inquiry. Many articles have been written on this subject and scientists and those who work with the scientific community have struggled over ways to deal with this issue. This issue becomes of even greater concern when there are limited sources of funding and the major sources are tied to those who have a vested interest in the outcome of the research. In addition, the very manner in which research funds are typically allocated may frustrate consideration of less damaging alternatives.

There is not now, nor has there ever been, such a thing as pure science. Science does not have absolutes and scientific certainty is relative. However, scientists strive to achieve as much independence and integrity in their work as possible, but they are human. Bias can affect the questions that are asked, the hypotheses posed, the method of research and analysis, which projects are funded, and the interpretations of the results and how they are presented. Bias can be unwittingly introduced or intentional. It is based on personal, social, political, and religious viewpoints. To attempt to deny that it is possible within this field of science, when it occurs in EVERY field of science, is to prevent taking steps to deal with and minimize it. An attempt to ignore it and fail to put into place mechanisms to reduce it can only lead to greater suspicion on the part of the public. This causes a heightened perception of bias and serves no purpose. In addition, because we are aware that one of the principal issues regarding bias and the perception of bias comes from a direct connection between the source of funding and the user, it is necessary to distance the funding from the noise producer and diversify and distribute as much as possible the funding sources for research.[36]

Some believe that peer review and ethical guidelines remove the possibility of bias, but this is not the case. While peer review helps, it does not solve the problem. Peer review does not remove many of the aspects of research that bias can affect as outlined above. It can be prone to bias itself (depending upon the reviewers), poor at detecting gross defects, almost useless for detecting fraud, and does not address the issue of which projects are funded.[37] In addition, the pre-publication "vetting" of manuscripts by the funder, actual interference by the sponsor into the research, or withholding of complete data by the researcher preventing independent analysis, are problems not solved by peer review. Other mechanisms must also be put in place to help reduce the problem.

One of the first questions always asked when reviewing any research is, who funded it? If the only source of funding is from those with an interest in seeing one point of view and that is the only research that has been published on that subject, then the research will too easily be dismissed as biased, even if it may be valid.[iii] As decision-makers involved in determining approval and mitigations we believe it is counterproductive to only have research that could be considered biased. If only sound producers and the agencies that regulate them fund all research, that research is subject to question and therefore could be of reduced use to decision-makers. Although we support the creation and funding of a national program to understand the impacts of sound on marine mammals, we do not support funding unless the issue of bias is dealt with explicitly.

There are numerous models for increasing funding diversity, independence, and public transparency. For instance, the National Oceanographic Partnership Program (NOPP) is a collaboration of fifteen federal agencies. NOPP brings the public and private sectors together to support larger, more comprehensive projects. Another model for achieving funding diversification is the National Whale Conservation Fund administered by the National Fish & Wildlife Foundation (NFWF). Legislation could establish a targeted fund at NFWF for research into the effects of undersea sound on marine mammals and other species. Still other models would be the establishment of jointly funded, independent non-profit organizations or expanded funding for federal research through NSF, NMFS, Fish & Wildlife Service, and the MMC.

The research programs should be well coordinated across the government and examine a range of issues relating to noise generated by scientific, commercial, and operational activities. Diversification can produce more comprehensive programs, improve opportunities for researchers, and reduce the perception that bias may occur. Also important in achieving these aims is the use of procedural mechanisms such as stakeholder and public participation, and alternative funding structures, such as quasi-independent agencies, that can further insulate decisions about research funding from dominant, sound-producing funders of research.

It is important to set up transparent safeguards and guidelines that aim to minimize the potential for bias or conflict of interest to occur and to expand study into important areas of research that are not as directly relevant to mission agencies' specific objectives and mandates. Transparency and credibility in research should be supported by mechanisms to create full post-publication access to research data. However, any such mechanisms would need to address concerns about the ownership of the data. Full disclosure of data is necessary to allow others to confirm that any

iii ** NRC (2000), "sponsors of research need to be aware that studies funded and led by one special interest are vulnerable to concerns about conflict of interest. For example, research on the effects of smoking funded by U.S. National Institute of Health is likely to be perceived to be more objective than research conducted by the tobacco industry," *Marine Mammals and Low Frequency Sound*, National Academy Press, Wash D.C. pg 84.

unpublished data do not contradict the conclusions of a published study. Data issues already have been addressed for many subdisciplines in ocean sciences and there is no reason to believe why similar data issues cannot be addressed in this discipline.

We strongly urge that sufficient funding be put into place to study this form of pollution and its impacts, which we believe represents a substantial threat to marine mammal populations. Funding for this critically needed research should not be taken from other existing research programs. Any commitment must be a real one, which means that it is in addition to other programs.

What are priority research areas?

Baseline studies on marine population size, population structure, location of critical habitats, and highest concentrations of marine mammals and their behavior are the most pressing priorities. When projects come for permitting it is essential to know precise information about the species and their population size and structure to do an accurate risk assessment. There is a big difference in considering allowing a possible impact to a species that is threatened or endangered or one whose population is essentially unknown or may be structured in such a way as to have small, localized sub-populations, and species whose populations are relatively healthy. Without adequate knowledge of the population, regulatory agencies cannot determine whether the activity can be reduced to the least practicable impact and projects may be denied unnecessarily. Because managers are faced with making these decisions routinely and these decisions cannot wait for long-term studies to determine more precisely the nature of the impacts, this baseline research must proceed immediately. Having better information about the location of critical habitats, where the highest concentrations of marine mammals are located and at what times of year will make it easier for managers and regulatory bodies to determine whether or not exclusion zones and/or seasonal closures are appropriate.

Studies that should also be given high priority are those that will allow for a valid interpretation of what a biologically significant reaction to anthropogenic sound is. To conduct other research, i.e., to use Controlled Exposure Experiments (CEEs) to determine impacts, without knowing more fully what normal behavior is and what it means will not answer the questions we need answered (see additional discussion below). Current efforts to focus on understanding the effects of noise on marine mammals have not resulted in greater protection to them. More importantly, without a more complete understanding of the baseline behavior of un-impacted animals, it will be extremely difficult to ever gain even a moderately complete insight into the impacts and we believe that funds expended will not be efficiently used.

One avenue that is readily available to obtain baseline information through systematic and observational research, and that does not involve the introduction of additional sound into the environment, is to utilize ongoing permitted sound-producing activities. Many of these currently permitted sound-producing activities carry with them the requirement for monitoring and reporting of the monitoring. Unfortunately, there is no standardized form for obtaining the data required in a way that would make these data available for statistical analysis or for research purposes. Additionally, although required as part of the mitigation for the impacts of the activity, sound producers may, and frequently do, keep the actual data obtained as proprietary. This is inappropriate, given that these are mitigation requirements. If all data were required to be made public and if these data were collected in a systematic way, funds expended for the purpose of mitigation could have a dual benefit of providing answers to many questions and result in a significant saving on research funding.

Other areas of priority for research include:

1) Conduct more complete analysis of past and present stranding data, including obtaining more information on whether or not there were sound activities in the area at the time of the stranding, for both naval sonars and seismic surveys.
2) Develop more effective ways to do monitoring before, during and after noise activity as part of current mitigation required of sound producers so that such monitoring data can be analyzed for impacts. This also requires that pre-activity baseline information be available.

Relative importance of research and mitigation efforts

Research on the effectiveness of current mitigations, the improvement of current tools, and the development of additional tools needs to be given the highest priority. While much of what scientists are attempting to learn about marine mammals is of importance to science and our understanding of these species, managers and regulatory bodies such as the Coastal Commission need information immediately to be able to meet the mandates of current statutes and concerns about protection of these species. Basic research and understanding of animal physiology and behavior requires long-term studies. Answers do not come easily, quickly, or cheaply. In the interim, sound producers need to have some degree of certainty about their ability to get permits and regulators need to have information about the value and advisability of requiring mitigations. Given the high degree of probability that noise does cause adverse impact to marine mammals, regulators cannot wait for long-term answers and must have more information on mitigation as soon as possible.

Permitting and authorization for research

The Coastal Commission agrees that researchers who undertake research on or who incidentally take marine mammals in the course of sound-producing research are in need of timely, predictable, and cost-effective permitting and authorization processes that maintain or enhance current levels of protection for marine mammals under the statutory regimes of the Marine Mammal Protection Act (MMPA) and other federal and state laws. The challenge is implementing an effective process that protects marine mammals while allowing much-needed research to be undertaken.

There are many issues of concern facing researchers and federal and state agencies. These include:

1) inadequate resources available to conduct permitting and authorization processes in a timely and efficient manner;
2) the funds, time, and regulatory and scientific expertise needed by a researcher seeking to obtain a permit or authorization to conduct acoustic research that could impact marine mammals;
3) lack of clarity regarding the applicability of other statutes like the National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA) that may require documentation in addition to that required by the MMPA (Marine Mammal Protection Act);
4) lack of clarity regarding when programmatic authorizations or permits are appropriate for repetitive activities that do not change significantly over time; and
5) the underlying circular situation in which the lack of information needed, in part, to make permitting and regulatory decisions is perpetuated by the challenges in permitting research activities that could help address those information needs.

To address this situation, there are several steps that could be taken by the Services, researchers, and funding entities to improve the permitting and authorization processes. The California Coastal Commission does not believe that there is any need for statutory changes for the permitting and authorization processes. In 1996 the California Coastal Commission was instrumental in convening the HESS (High Energy Seismic Survey) Team, one of whose primary purposes was to find ways to streamline the permit process for review of seismic surveys in federal OCS off the coast of California. Based on that experience the California Coastal Commission believes that the needs of the researchers for an improved and streamlined process could be accomplished within the current regulatory framework and existing statutes.

The following suggestions to improve the current process include:

- The Services should receive increased funding for their permitting and authorization divisions and that increased funding should be made available to all relevant federal and state agencies for their permitting and authorization divisions to meet compliance needs.

- The Services should adopt a more coordinated approach to:

    i. provide research funding entities and researchers with clear guidelines to use in determining whether or not a particular research activity requires an application under federal or state law;
    ii. provide standard background documents, application information, and references to reduce the cost and time of preparing applications; and
    iii. develop mechanisms, where appropriate, to collectively process and issue permits and authorizations that are similar based on species, region, or activity.

- The Services, research funding entities, and researchers should work together when appropriate:

    i. to develop programmatic environmental impact statements and assessments and to identify mechanisms to collectively process and issue permits and authorizations especially for repetitive activities that do not change over time;
    ii. to achieve better timing linkages between the process for authorization and permitting, securing funding, and scheduling research operations to minimize potential issues;
    iii. to achieve a more comprehensive and coordinated approach to implementation of both the MMPA and the ESA among the Services; and
    iv. to identify innovative ways to meet regulatory requirements through reductions in potential impacts on marine mammals.

Animal welfare aspects of research—ABR, CEE

There are two experimental techniques that raise significant controversy as to their effectiveness and their implications relative to the welfare of animals: ABRs (Auditory Brainstem Response) and CEEs (Controlled Exposure Experiments). While the Coastal Commission is concerned about the welfare of marine mammals and would not like to see anything done that could harm or kill any individual, its primary concern is to obtain information that will enable it to regulate activities that produce

sound in such a way as to eliminate or minimize the effects of that sound. ABRs raise very serious issues regarding the ethical treatment of animals, particularly those that are stranded and in highly stressful situations. This technique provides for the determination of hearing abilities of animals and may also expand the knowledge base to include the hearing values of a variety of species that may likely not be kept in captive situations, but the use of this technique calls for ethical guidelines. The Coastal Commission does not have a position relative to the use of ABR as a technique except to express its concern about making certain that the welfare of an animal is carefully weighed against the possible benefits of using ABR. When using ABR the primary priority when dealing with stranded animals must be their welfare and not the research objective. Nothing should be allowed that will compromise an animal's ability to survive the stranding. With that in mind, the ultimate decision to use ABR or not must be left to those at the scene charged with the rescue and care of these animals.

CEEs, on the other hand, raise an entirely different set of both ethical and research questions. CEEs are experiments in which animals in the wild are exposed to controlled doses of sound for purposes of assessing their behavior or physiological responses.

CEEs are problematic because they introduce additional sound into the ocean and expose not only the target species and/or individuals to be studied, but many additional ones. By doing so, they place animals at risk. In addition, CEEs may tell us whether or not there is an effect, but a better understanding of the behavior and physiology of marine mammals is required to understand the significance of that effect. Thus even a well-designed experiment may not eliminate controversy over a particular activity or project, but may only shift the nature of the debate. Unfortunately, our ignorance regarding the biology and physiology of many marine mammal species is so great that the potential effects of noise and the sound exposures causing these effects is poorly understood. A top priority for understanding what kinds of reactions may be most important for marine mammals exposed to noise must involve studies of baseline behavior of undisturbed animals prior to conducting other research. Until we have a greater understanding of what is a biologically significant response, CEEs may not give us the answers to our questions and thus should be used judiciously and then probably only in concert with other research or as part of a larger research program.

Given the controversial nature of CEEs and the ethical questions they raise, and because they are not a benign form of research, it is particularly important that when CEEs are used, they be carefully designed and their limitations acknowledged. If CEEs are to be used, it is important to have accurate information about the population status of both the target animals and any others that may be exposed. When endangered species or small local populations are involved, the use of CEEs could result in population effects and therefore should be avoided. In some cases, where the species is highly endangered or where there is little or no information about that population, CEEs should not be used, since the risk associated with the experiment may be too great.

For long-term effects, long-term research is required. It is not practical to use CEEs over long time periods or large spatial scales, i.e., the larger the area the more non-target species will be impacted. CEEs should use, as much as possible, sound exposures that are realistic and with the same characteristics of sound that the mammals are likely to be exposed to by ongoing sound operations. Further, for CEEs to be effective they must be preceded, as stated above, by baseline studies of behavior and physiology that enable the results of the experiments to be interpreted as to their

significance. To eliminate possible bias and arguments that will make the research valueless for regulatory purposes, if CEEs are conducted, there should be agreement, in advance, as to what constitutes a biologically significant effect.

Lastly, research that can yield conclusive results with less risk of harm to the animals should be preferred. Systematic observations using ongoing sound-producing activities should be used in place of CEEs if they can provide similar information. Systematic studies of ongoing sound-producing activities can strengthen monitoring efforts required as mitigation, while retaining the benefit that such studies do not introduce additional sound directed at the mammals. The advantages of observational studies are increased as more attention is given to optimizing measurement methods and study designs with the greatest power to detect real effects and provide convincing results.

No single research approach solves all of our data needs. Monitoring will always be required for regulated activities, and if monitoring data are collected systematically, gathered, and analyzed, they can provide important information on effects. Long-term correlational studies can provide added detail on effects of ongoing activities, and are especially useful for long-term exposures or difficult to reproduce sounds, and CEEs can constitute one component of a larger research and management program, designed to give us additional information where controlled exposures are necessary.

Recommendations:

1) Anthropogenic sound with the potential to harm marine life should be eliminated where possible or otherwise minimized (e.g., through source reduction and removal; geographic and seasonal restrictions).
2) Given the likelihood that anthropogenic sound may have significant impacts on marine mammals, the degree of uncertainty regarding the nature and extent of those impacts, and the need to consider cumulative and synergistic effects, a precautionary approach should be taken with respect to management of marine mammals.
3) Anthropogenically caused acoustic impacts on marine mammals need to be addressed through a comprehensive and transparent management system. The management system should address chronic and acute anthropogenic noise, long-term and short-term effects, cumulative and synergistic effects, and impacts on individuals and populations.
4) The Services should receive increased funding for their permitting and authorization divisions and that increased funding should be made available to all relevant federal and state agencies for their permitting and authorization divisions to meet compliance needs.
5) Congress should provide funding to have sufficient stranding teams available to review and obtain information on strandings in a timely manner and to increase the level of monitoring to detect strandings or mortalities at sea associated with noise events.
6) The Services should develop a standardized form for the reporting of data from strandings, including consistent necropsy examinations to detect acoustically related injuries. The Services should allow for a limited number of members of the public to be present during necropsies to increase the transparency of the process.
7) Congress should require reporting of any activities involving sound in areas where there was a documented stranding, including date, time, and location of the activity.

8) The management agencies should identify and immediately implement mitigation measures that are effective for noise-producing activities (e.g., source reduction and removal; geographic and seasonal restrictions) as a part of a sustained national research program that includes systematic study of the effectiveness of various mitigation tools.
9) There should be a commitment to fund a national research program, with emphasis on baseline behavior, physiology, and population size, location, and structure. That program should have procedures in place to minimize bias and the perception of bias and should include diversification of funding, a prohibition on the pre-publication vetting by funders, and a requirement that all data obtained with public funds be publicly available.
10) The agencies should work with the U.S. Navy, air gun users (including scientists, geophysical contractors, and oil and gas companies), and the shipping industry to prioritize and ensure the development and use of quieter technologies, and other source reduction tools or methods. In addition, management should be extended to unaddressed sources and activities that have the potential to produce adverse effects (including, but not limited to, commercial shipping, recreational watercraft use, whale watching, and the development and use of AHD and ADDs).
11) The Services should examine novel applications of conservation tools such as designation of critical habitats, marine protected areas, and ocean zoning to protect populations from chronic or episodic anthropogenic noise.
12) The Services should develop standardized and transparent systems and formats for the collection of monitoring data to be able to systematically take advantage of appropriate opportunities to collect data that can be used for statistical analysis, and facilitate the review, aggregation, and publication of data and results of those analyses.
13) All data obtained as a result of mitigation monitoring requirements should be public.
14) The Services should establish training and certification programs to ensure that marine mammal observers are qualified to conduct effective monitoring, enabling data to be utilized for observational research.

Conclusion

Although we know that anthropogenic sound in the ocean is a serious threat, we do not have sufficient information at this time to understand the full extent of the problem. One of the biggest challenges faced in regulating the effects of noise is our ignorance of the characteristics and levels of sound exposures that may pose risks to marine mammals. Given the current state of our knowledge we must therefore take a precautionary approach in the regulation of noise. We must also expand our efforts to protect and preserve marine mammals by instituting and using effective mitigation measures – such as geographic exclusion zones – now, to keep marine mammals at a distance from noise sources that have the potential to harm or kill them. In addition, we must commit to understanding this problem better by funding a national research program. Only through a combined approach – precaution, mitigation, and research – can we assure that these very special resources will be here for the enjoyment of future generations.

Notes

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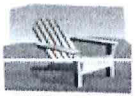

Fw: DCPP Seismic Update
Amber Wilson to: cr_board_clerk Clerk Recorder 10/25/2012 02:14 PM

Seismic testing...

Amber Wilson
Secretary/Board of Supervisors
San Luis Obispo County
805.781.4335
abwilson@co.slo.ca.us

----- Forwarded by Amber Wilson/BOS/COSLO on 10/25/2012 02:14 PM -----

From: James Patterson/BOS/COSLO
To: Amber Wilson/BOS/COSLO@Wings
Date: 10/22/2012 03:06 PM
Subject: Fw: DCPP Seismic Update
Sent by: Amy Gilman

----- Forwarded by Amy Gilman/BOS/COSLO on 10/22/2012 03:06 PM -----

From: "Jones, Thomas G&PR" <TPJ2@pge.com>
To: "Adam Hill (County of SLO)" <ahill@co.slo.ca.us>, "bgibson@co.slo.ca.us" <bgibson@co.slo.ca.us>, "Frank Mecham (County of SLO)" <fmecham@co.slo.ca.us>, "pteixeira@co.slo.ca.us" <pteixeira@co.slo.ca.us>, "jpatterson@co.slo.ca.us" <jpatterson@co.slo.ca.us>, "dbuckshi@co.slo.ca.us" <dbuckshi@co.slo.ca.us>, "ralsop@co.slo.ca.us" <ralsop@co.slo.ca.us>
Cc: "Parker, Suzanne" <SBP9@pge.com>, "Shoals, John" <JTSU@pge.com>
Date: 10/12/2012 04:46 PM
Subject: DCPP Seismic Update

Greetings All:

Please find attached three documents related to our ongoing seismic research and evaluation efforts from the Nuclear Regulatory Commission (NRC) and the California Public Utilities Commission (CPUC).

The first two are from the NRC confirming its analysis that the potential ground motions generated by the Shoreline fault fall within the design basis of Diablo Canyon Power Plant (DCPP). The NRC states it will determine if further regulatory actions for DCPP are needed as it looks at seismic related issues for all nuclear plants. Furthermore, the NRC will continue to evaluate DCPP as additional data comes in from our current on and offshore seismic research efforts .

The final letter is from CPUC President Michael Peevey to the California Coastal Commission requesting that it expedite the issuance of the Coastal Development Permit for off-shore studies.

As always, please feel free to contact me should you have any questions regarding this or any other PG&E matter.

Regards,
Tom Jones,

Item # 22 Meeting Date: 10/30/2012
Presented by: Tom Jone
Received prior to meeting and posted to web on: October 25 , 2012

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PG&E is committed to protecting our customers' privacy.
To learn more, please visit http://www.pge.com/about/company/privacy/customer/

ML120730106.pdf

12-112.pdf

10-12-2012 Letter from President Peevey to Mary Shallenberger and CCC Commissioners Re_ CPUC support for CCC to issue pern

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 12, 2012

Mr. Edward D. Halpin
Senior Vice President and
Chief Nuclear Officer
Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 56, Mail Code 104/6
Avila Beach, CA 93424

SUBJECT: DIABLO CANYON POWER PLANT, UNIT NOS. 1 AND 2 – NRC REVIEW OF SHORELINE FAULT (TAC NOS. ME5306 AND ME5307)

Dear Mr. Halpin:

On January 7, 2011, Pacific Gas and Electric (PG&E, the licensee) provided the U.S. Nuclear Regulatory Commission (NRC) with a report on the analysis of the Shoreline fault. This report can be found in Agencywide Documents Access and Management System (ADAMS) Accession No. ML110140431. This report provided new geological, geophysical, and seismological data to assess the potential seismic hazard of the Shoreline fault.

Based on our review, the NRC has confirmed our preliminary conclusion that the Diablo Canyon Power Plant's (DCPP's) ground motions from the Shoreline fault are at or below those for which the plant was evaluated previously and demonstrated to have reasonable assurance of safety. This letter provides a summary of the results of the NRC's independent assessment of the information found in the January 7, 2011, report. The staff's more complete assessment is documented in Research Information Letter (RIL) 12-01 "Confirmatory Analysis of Seismic Hazard at the Diablo Canyon Power Plant from the Shoreline Fault Zone" (ADAMS Accession No. ML121230035). In addition, this letter places the NRC's review of the Shoreline fault into context with a recent NRC action to have all of its nuclear power reactor licensees conduct seismic reevaluations. This action is documented in the March 12, 2012, request for information that was sent pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) (ADAMS Accession No. ML12053A340).

Shoreline Fault Report

On November 14, 2008, PG&E informed the NRC that it had identified a zone of seismicity that may indicate a previously unknown fault located offshore of the DCPP. The potential fault was identified as a result of a collaborative research program between PG&E and the U.S. Geological Survey (USGS). This research program, called the PG&E-USGS Cooperative Research and Development Agreement (CRADA), focuses on increasing the understanding of tectonics in the region around the DCPP.

Shortly after PG&E reported the potential for a new fault, the licensee's representatives provided the NRC with sets of initial scientific data and information related to the hypothesized fault in e-mails dated November 20 and 21, 2008 (ADAMS Accession Nos. ML090690193 and

ML090690218, respectively). PG&E named the hypothesized fault the "Shoreline fault." Based on the information provided by PG&E and the USGS, the NRC performed an independent assessment of this information and documented its review in Research Information Letter 09-001 (RIL 09-001) entitled "Preliminary Deterministic Analysis of the Seismic Hazard at Diablo Canyon Nuclear Power Plant from Newly Discovered 'Shoreline Fault'" (ADAMS Accession No. ML090330523). PG&E was informed of the publication of RIL 09-001 by the NRC staff by letter dated April 8, 2009 (ADAMS Accession No. ML090930459). The NRC's letter stated that the preliminary assessment was that the seismic loading levels for the Shoreline fault were below those for which the plant was previously analyzed. The NRC reviewed information on an ongoing basis as the USGS and PG&E continued to obtain new data as a result of ongoing fieldwork.

In the Shoreline Report dated January 7, 2011, PG&E updated the information that it had provided previously to the NRC staff. In reviewing the complete set of seismological, geological, and geophysical data, the NRC staff worked with independent external experts in the areas of paleoseismology, tectonics, and geology to assess the quality and reliability of the data, to address the broader questions related to regional tectonics, and to develop the five principal interpretations described in RIL 12-01. In addition, NRC staff members and their team of experts visited the site in October 2011 to view the geologic and tectonic features first hand. Based on a review of the report dated January 7, 2011, and the site visit, the NRC Review Team developed an independent assessment of the seismic source characteristics of the Shoreline fault[1] and performed an independent Deterministic Seismic Hazard Assessment as documented in RIL 12-01.

As documented in RIL 12-01, the NRC staff's assessment is that deterministic seismic-loading levels predicted for all the Shoreline fault earthquake scenarios developed and analyzed by the NRC are at, or below, those levels for the Hosgri earthquake (HE) ground motion and the long-term seismic program (LTSP) ground motion. The HE ground motion and the LTSP ground motion are those for which the plant was evaluated previously and demonstrated to have reasonable assurance of safety. Therefore, the staff has concluded that the Shoreline scenario should be considered as a lesser included case under the Hosgri evaluation and the licensee should update the final safety analysis report (FSAR), as necessary, to include the Shoreline scenario in accordance with the requirements of 10 CFR 50.71(e).

Diablo Canyon Seismic Design and Licensing Bases

Three design basis earthquakes were used to develop the seismic qualification basis for plant structures, systems, and components at DCPP:

- *Design Earthquake (DE)* (0.2g) - The amount of vibratory ground motion for which those plant features necessary for continued operation remain functional without undue risk to the health and safety of the public. This is considered to be the equivalent of the operating basis earthquake (OBE) in the licensing basis of the plant.

[1] Based on the data and analysis that the licensee provided, and a determination by the USGS, the "potential" Shoreline fault is treated as a fault for the deterministic analysis documented in RIL 12-01.

- *Double Design Earthquake (DDE)* (0.4g) - The evaluation of the maximum earthquake potential (producing the maximum vibratory ground motion) for which structures, systems, and components needed to prevent or mitigate an accident will remain functional. This evaluation includes all earthquake epicenters within 200 miles and faults within 75 miles of the plant and is considered to be the equivalent to the safe shutdown earthquake (SSE) as described in 10 CFR Part 100, Appendix A.

- *Hosgri Earthquake (HE)* (0.75g) - A postulated 7.5 M earthquake (unique to DCPP) assumed to occur on the Hosgri Fault line. Equipment credited in the HE shutdown path is required to remain functional following a Hosgri design basis earthquake.

Consistent with the DCPP Final Safety Analysis Report Update, Revision 20, the DDE is the equivalent of the SSE at DCPP. When the DCPP Unit 1 license was issued, it included a license condition for PG&E to implement a program to reevaluate the seismic design bases used for DCPP. This license condition led to the development of the LTSP.

Long Term Seismic Program

In compliance with the seismic license condition, PG&E performed a full seismic reevaluation of the DCPP between 1985 and 1988. The licensee performed a seismic margins assessment (SMA) and a seismic probabilistic risk assessment (SPRA) as detailed in the Final Report of the Diablo Canyon Long-Term Seismic Program. The NRC staff's evaluation of this material is documented in NUREG-0675, "Safety Evaluation Report Related to the Operation of Diablo Canyon Nuclear Power Plant, Units 1 and 2," Supplement 34, June 1991. During that reevaluation, the licensee continued to conclude that the Hosgri fault was capable of producing the largest ground motion at DCPP, and, therefore, remained the controlling fault for the seismic design.

The DCPP Final Safety Analysis Report Update states in Section 2.5, "The LTSP contains extensive databases and analyses that update the basic geologic and seismic information in this FSAR Update. However, the LTSP material does not alter the design bases for DCPP." In SSER 34, the NRC states, "The Staff notes that the seismic qualification basis for Diablo Canyon will continue to be the original design basis plus the Hosgri evaluation basis, along with associated analytical methods, initial conditions, etc." The NRC staff concluded in SSER 34 that the DCPP seismic margins are adequate to accommodate the LTSP spectrum.

Information Requested in Accordance with 10 CFR 50.54(f)

In the March 12, 2012, request for information, the NRC staff detailed a two-phase approach related to reevaluating seismic hazards at all power reactor licensees in response to recommendations of the Near-Term Task Force review of the accident at Fukishima Dai-ichi nuclear facility. PG&E is required to take the actions described and respond to this letter. The first phase is to perform a reevaluation of the seismic hazards at the DCPP site using updated seismic information and present-day regulatory guidance and methodologies and then compare

the results to the current seismic design basis. The second phase is based on the results of the first phase and consists of the NRC staff determining whether additional regulatory actions are necessary (e.g., update the design basis and structures, systems, and components important to safety) to provide additional protection against the updated hazards.

Because DCPP is unique in having three earthquake scenarios (DE, DDE, and HE) in its design and licensing basis rather than the normal two (OBE and SSE), the NRC staff expects that the PG&E's response to the March 12, 2012, request for information will compare the updated probabilistic ground motion (i.e., the ground motion response spectrum (GMRS)) with the ground motion in the plant's current licensing basis that is stated as the equivalent of the SSE ground motion. Consistent with the DCPP Final Safety Analysis Report Update, Revision 20, the DDE is the equivalent of the SSE at DCPP. Therefore, for purposes of the response to the March 12, 2012, request for information, the NRC staff expects PG&E to use the DDE for comparison with the reevaluated seismic hazard GMRS.

NRC Staff's Shoreline Fault Assessment in the Context of the March 12, 2012, Request for Information

The NRC recognizes that using the DDE as the basis of comparison will most likely result in the Shoreline fault and the Hosgri earthquake being reported as having greater ground motion than the SSE. The staff has concluded that it is appropriate to include these scenarios, along with any new seismic information that may be developed, in the risk-informed, performance-based GMRS and then follow the process set forth in the March 12, 2012, request for information, to determine whether any additional regulatory action is needed. Changes to the licensing basis may be appropriate to capture the information developed in response to the March 12, 2012, request for information.

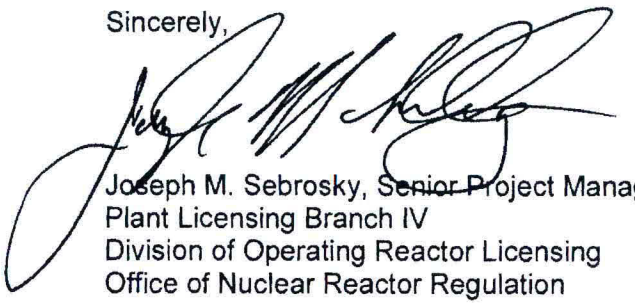
It should be reiterated that the NRC staff has concluded that deterministic seismic-loading levels predicted for all the Shoreline fault earthquake scenarios developed and analyzed by the NRC are at, or below, those levels for the HE ground motion and the LTSP ground motion. The HE ground motion and the LTSP ground motion are those for which the plant was evaluated previously and demonstrated to have reasonable assurance of safety. Therefore, the existing design basis for the plant already is sufficient to withstand those ground motions.

The NRC staff understands that the seismic evaluations described in the March 12, 2012, request for information are currently in progress at DCPP, and PG&E plans to acquire new offshore and onshore two- and three-dimensional seismic reflection data to identify and characterize faults in the vicinity of DCPP. If during the collection of the data, new faults are discovered or information is uncovered that would suggest the Shoreline fault is more capable than currently believed, the staff expects that the licensee will provide the NRC with an interim evaluation that describes actions taken or planned to address the higher seismic hazard relative to the design basis, as appropriate, prior to completion of the evaluations requested in the NRC staff's March 12, 2012, request for information. The staff will use this information to independently assess whether the new fault or new information related to the Shoreline fault challenges or changes the staff's current position that the motions associated with the Shoreline fault are at or below those levels of the HE and LTSP ground motions.

For the longer term, consistent with the March 12, 2012, request for information, based on the information from the first phase, the NRC staff will determine whether additional regulatory actions are necessary.

The NRC plans to inform stakeholders of its review of the Shoreline fault and on its continuing review of this matter as additional information becomes available. If you have any questions regarding these evaluations, please contact me at 301-415-1132 or via e-mail at joseph.sebrosky@nrc.gov.

Sincerely,



Joseph M. Sebrosky, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

cc: Distribution via Listserv

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Sincerely,

/RA/

Joseph M. Sebrosky, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

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NAME	JSebrosky	JBurkhardt	MMurphy*	CMunson*	KManoly*	MMitchell*
DATE	10/11/12	4/17/12	9/25/12	9/20/12	4/17/12	9/20/12
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DATE	9/24/12	9/20/12	9/27/12	10/12/12	10/12/12	

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U.S. NUCLEAR REGULATORY COMMISSION

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No. 12-112 October 12, 2012

ADDITIONAL NRC ANALYSIS CONFIRMS EARTHQUAKE SAFETY AT DIABLO CANYON NUCLEAR POWER PLANT

The Nuclear Regulatory Commission's latest analysis of faults near the Diablo Canyon nuclear power plant in California continues to conclude the plant's design would withstand earthquakes near the site.

The NRC's work is laid out in Research Information Letter (RIL) 12-01, "Confirmatory Analysis Of Seismic Hazard At The Diablo Canyon Power Plant From The Shoreline Fault Zone." The RIL, part of the ongoing effort to better understand earthquake sources near Diablo Canyon, focuses on the latest identified source, the "Shoreline fault" about a kilometer offshore from the plant. The letter will be available in the NRC's electronic document database, ADAMS, by entering "ML121230035" in the ADAMS search engine.

Pacific Gas & Electric (PG&E), which operates the plant 12 miles southwest of San Luis Obispo, Calif., first notified the NRC in November 2008 about the Shoreline fault. PG&E updated that information in early 2011, and a team of NRC staff visited the site in October 2011. Based on the available information and the site visit, the NRC team analyzed ground motion from earthquakes the Shoreline fault could potentially generate. All of those ground motions fell within Diablo Canyon's existing design limits, which are based on ground motion associated with an earthquake from the larger Hosgri fault near the plant.

Diablo Canyon must still carry out additional earthquake evaluations, as well as a "walkdown" to identify any near-term actions for enhancing earthquake resistance. These measures are included in the NRC's recent information request to all U.S. nuclear power plants as the agency implements lessons learned from the Fukushima Dai-ichi nuclear accident.

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PUBLIC UTILITIES COMMISSION

STATE OF CALIFORNIA
505 VAN NESS AVENUE
SAN FRANCISCO, CALIFORNIA 94102

MICHAEL R. PEEVEY
PRESIDENT

TEL: (415) 703-3703
FAX: (415) 703-5091

October 12, 2012

Mary Shallenberger, Chair
California Coastal Commission
45 Fremont Street
San Francisco, CA 94105

Re: CPUC support for CCC to issue permit to PG&E for DCPP seismic studies

Dear Ms Shallenberger and CCC Commissioners:

I am writing to you today to request the California Coastal Commission (CCC) to expeditiously issue the permit to enable Pacific Gas and Electric Company (PG&E) to perform high energy three-dimensional off-shore seismic surveys for its Diablo Canyon Power Plant (DCPP) as proposed to the CCC. It is important that these surveys be completed on schedule and within the authorized budget. Delaying the schedule proposed by PG&E would result in substantial additional costs. In addition, the fall is the only time of the year where the work can be done with minimum impact to marine mammals and the marine environment.

In accordance with PG&E's application to you for a permit, these seismic surveys are scheduled for November – December 2012. PG&E will be using the R/V Langseth, which is owned by the National Science Foundation and operated by Columbia University, to perform these seismic surveys.

As you know, the CPUC created an Independent Peer Review Panel (IPRP) to provide guidance and review the results of these enhanced seismic studies. The IPRP has reviewed PG&E's survey plans on several occasions. It is very important to the CPUC that PG&E remain on schedule and within budget for performing these off-shore seismic surveys. CPUC Decision D.12-09-008, increasing the authorized spending on enhanced seismic studies to $64 million, was approved by the CPUC on September 13, 2012.

Immediately following PG&E's scheduled off-shore seismic survey, Southern California Edison is scheduling the same boat R/V Langseth to also perform off-shore surveys during December 2012 for its San Onofre Nuclear Generating Station. The R/V Langseth might not be available to PG&E if the permit from the CCC is delayed until 2013 or later.

In its revised application to the CCC, PG&E proposed the survey to cover one zone, identified as Box 4 in Figure 1-2 of PG&E's application, in off-shore areas north of DCPP in Estero Bay. Seismic surveys of Zones 1 and 2 would be performed by PG&E in 2013, subject to a later application to the

CCC. Performing surveys only in Zone 4 in 2012 would minimize any effects to the marine environment, and is acceptable to our IPRP.

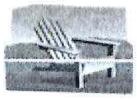
The CPUC strongly encourages and supports the CCC to issue a permit to PG&E now so that the off-shore high energy seismic surveys as proposed by PG&E in Zone 4 can be performed in a timely fashion.

Sincerely,

Michael R. Peevey
President

cc: Steve Blank, CCC
Dayna Bocho, CCC
William Burke, CCC
Wendy Mitchell, CCC
Jana Zimmer, CCC
Martha McClure, CCC
Steve Kinsey, CCC
Mark Stone, CCC
Brian Brennan, CCC
Richard Bloom, CCC
Esther Sanchez, CCC

Catherine Sandoval, CPUC
Mark Ferron, CPUC
Michel Florio, CPUC
Timothy Simon, CPUC
Paul Clanon, CPUC
Service List A.10-01-014



Fw: Seismic Testing
Amber Wilson to: cr_board_clerk Clerk Recorder 10/25/2012 02:14 PM

Seismic testing...

Amber Wilson
Secretary/Board of Supervisors
San Luis Obispo County
805.781.4335
abwilson@co.slo.ca.us

----- Forwarded by Amber Wilson/BOS/COSLO on 10/25/2012 02:14 PM -----

From: James Patterson/BOS/COSLO
To: Amber Wilson/BOS/COSLO@Wings
Date: 10/22/2012 03:15 PM
Subject: Fw: Seismic Testing
Sent by: Amy Gilman

----- Forwarded by Amy Gilman/BOS/COSLO on 10/22/2012 03:15 PM -----

From: Marty Brown <brookdiego@gmail.com>
To: jpatterson@co.slo.ca.us
Date: 10/07/2012 11:14 AM
Subject: Seismic Testing

Good morning, this message is from Marty Brown, Atascadero:

I, along with thousands of other concerned citizens, implore you as our representatives to write to the permitting agencies involved in this seismic testing project for PG&E telling them that you will not allow this to disturb, disrupt and damage our marine life, fishing industry, sporting, and tourism businesses here on the Central Coast.

As sworn upholders of the public trust you must convey this message. As far as trust is concerned, the migration of whales, dolphins and elephant seals is a matter of trust. These mammals feel their ancient pathways are safe or they would not have established this route to reach the places to give birth to their progeny. We must protect our fellow mammals.

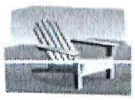
While the operation of Diablo Canyon Nuclear Plant poses significant, undeniable risk, it is unconscionable to use this method of testing that cannot be mitigated. These tests that are NOT mandated in AB1632 should be postponed unless and until a less harmful method of surveying the many seismic faults that are near and under the nuclear plant can be ascertained. The decades of seismic data that

Item # 22 Meeting Date: 10/30/2012
Presented by: Marty Brown
Received prior to meeting and posted to web on: October 25, 2012

have
not been used and analyzed should be thoroughly peer reviewed.

Sincerely,

Marty Brown
5385 Palma Avenue
Atascadero, Ca. 93422
805-423-8500



Fw: PG&E seismic testing comments
Amber Wilson to: cr_board_clerk Clerk Recorder 10/25/2012 02:15 PM

Seismic testing,,,

Amber Wilson
Secretary/Board of Supervisors
San Luis Obispo County
805.781.4335
abwilson@co.slo.ca.us

----- Forwarded by Amber Wilson/BOS/COSLO on 10/25/2012 02:15 PM -----

From: James Patterson/BOS/COSLO
To: Amber Wilson/BOS/COSLO@Wings
Date: 10/22/2012 02:35 PM
Subject: Fw: PG&E seismic testing comments
Sent by: Amy Gilman

Amber - please add to your collection....

----- Forwarded by Amy Gilman/BOS/COSLO on 10/22/2012 02:35 PM -----

From: Christine Heinrichs <christine.heinrichs@gmail.com>
To: bgibson@co.slo.ca.us, jpatterson@co.slo.ca.us, ahill@co.slo.ca.us
Date: 10/17/2012 09:03 AM
Subject: Fwd: PG&E seismic testing comments

Please add my comments to the materials for the October 30 discussion. Thank you.

---------- Forwarded message ----------
From: "Christine Heinrichs" <christine.heinrichs@gmail.com>
Date: Sep 20, 2012 5:11 PM
Subject: PG&E seismic testing comments
To: "Teufel, Cassidy@Coastal" <Cassidy.Teufel@coastal.ca.gov>, <
Alison.Dettmer@coastal.ca.gov>

20 September 2012

Cassidy Teufel

California Coastal Commission

Energy, Ocean Resources and

Federal Consistency Division

Item # 22 Meeting Date: 10/30/2012
Presented by: Christine Heinrichs
Received prior to meeting and posted to web on: October 25, 2012

45 Fremont St., Suite 2000

San Francisco, Ca 94105

Cassidy.Teufel@coastal.ca.gov

Alison Dettmer, Deputy Director

45 Fremont Street 2000

San Francisco, CA 94105- 2219

Alison.Dettmer@coastal.ca.gov

To the Commission:

The justification for this project is mapping seismic geology around Diablo Canyon Nuclear Power Plant. Mapping the geologic faults may help predict the "potential seismic hazard" and assess the risk of having a nuclear plant sitting on a geologic fault. Other experts who have studied the geologic site have concluded that the high-impact tests proposed would add little to knowledge of the faults. However, the tests would cause great harm to the marine and coastal environment.

The 250-decibel blasts will damage most of the ocean life that makes our coast so precious. This is no solution to the problem of a risky nuclear facility. At the end of the testing, Diablo Canyon is no safer than it is now. Nothing will have changed for the nuclear plant or PG&E. A lot will have changed for the coastline and its marine inhabitants.

The Coastal Commission is charged with protecting the coast. Sec. 30001.5 (a) – (e) goals are the opposite of PG&E's project. The major federal and state laws that this project proposes to violate

are listed on pages 4-5 - 4-18 of the California State Lands Commission FEIR, 12 of which, including the Marine Mammal Protection Act, apply specifically to the marine environment (pp. 4.4-43-48). PG&E has requested an Incidental Harassment Authorization, among others, to allow them to violate the letter and spirit of this law.

Sec. 30001, Legislative findings and declaration: ecological balance will be contravened by the tests. The tests will make all four of the findings empty promises.

The State Lands Commission Final EIR concedes serious effects are expected on fin, humpback and blue whales (Appendix H, p 94 summary, see following pages for specifics): "The Investigation area is located between two notable marine mammal hotspots, the Santa Barbara Basin and the Monterey Canyon system. During the time period of the Project, it is a known migration route for blue, humpback and gray whales..."

"Three species of endangered cetacean (fin, humpback and blue whale) are considered seasonally present with fluctuating temporal abundance, with large concentrations of humpback and blue whales sometimes reported within the Investigation area."

These magnificent -- and legally protected – animals are concentrated in this area because it is their breeding migration. Blasting the area with air guns could not be better designed if the goal were to disrupt their breeding and chase them away from their home.

Effects on Morro Bay Stock of Harbor Porpoises will be dire. "The Investigation area co-occurs

with the core habitat of the increasing Morro Bay Stock of harbor porpoises. Considered resident with limited opportunity for emigration and very sensitive to anthropogenic noise effects, there is a high likelihood of potential for substantial interference in movement and reduction in habitat. Mitigation for Level B harassment to porpoises is unlikely to [be] effective." Good-bye, Harbor Porpoises.

Effects of chasing all the marine mammals' prey, the fish they feed on, is considered an "indirect impact." If there isn't anything for them to eat, they'll have to go elsewhere: "It is expected that adult fish exposed to seismic sound sources will elicit a behavioral response that will result in either movement away from the approaching sound source, or by hiding within benthic cover."

The report makes the most benign and optimistic analysis of this destructive process. Even that is horrifying in its devastation.

Seismic testing and its effects are unacceptable for the Central Coast. These damages are illegal on the coast, which is protected by a variety of state and federal laws, including the Marine Life Protection Act. On June 6, the state Fish & Game Commission united Marine Protected Areas (http://www.caloceans.org/) along the entire California Coast. If these myriad legal protections do not protect the coast and its inhabitants against this kind of attack, what do they mean?

I ask that you follow the laws protecting the coast, the ocean and its inhabitants and the economy by denying this project. Data analysis using other, non-destructive methods must be required instead of seismic testing.

Christine Heinrichs

1800 Downing Ave.

Cambria, CA 93428