Department of the Navy

ENVIRONMENTAL ASSESSMENT

Advanced Deployable System Ocean Tests Program Definition and Risk Reduction Phase

October 1998

ENVIRONMENTAL ASSESSMENT

ADVANCED DEPLOYABLE SYSTEM OCEAN TESTS
PROGRAM DEFINITION AND RISK REDUCTION PHASE

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ABSTRACT

This Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) addresses potential impacts associated with four ocean tests of the Advanced Deployable System (ADS), a passive acoustic undersea surveillance system program sponsored by the Chief of Naval Operations (CNO) and managed by the Space and Naval Warfare Systems Command (SPAWAR). ADS basically consists of cables placed on the ocean floor and is designed to "listen" to sounds produced by vessels operating within shallow waters. The four ocean tests evaluated in this EA/OEA are proposed to evaluate the capability and performance of ADS in an ocean environment. The potential impacts of the proposed tests are evaluated for the following environmental resources: geology, topography, and soils; air quality; marine environment; marine biology; marine mammals; terrestrial biology; land use, transportation, and recreation; socioeconomics; noise; cultural resources; and safety and environmental health. No significant unmitigable environmental impacts of the proposed action were identified. Alternatives to the proposed action include alternative test sites and the No-Action Alternative.

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ACRONYM AND ABRREVATION LIST

ACOE	U. S. Army Corps of Engineers
ADS	Advanced Deployable System
ANSI	American National Standards Institute
ARLUT	Applied Research Laboratory, University of Texas
ASBS	Areas of Special Biological Significance
BP	before present
C	Celsius
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CCC	California Coastal Commission
CCD	Coastal Consistency Determination
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeter
CNHP	California Natural Heritage Program
CNO	Chief of Naval Operations
CO	carbon monoxide
CONUS	Continental United States
CRWQCB	California Regional Water Quality Control Board
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
dB/km	decibels per kilometer
DEQ	Department of Environmental Quality
DoN	U.S. Department of the Navy
DOT	Department of Transportation
EA	Environmental Assessment
EMF	electromagnetic field
EPA	Environmental Protection Agency
EO	Executive Order
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
F	Fahrenheit
ft	feet
ft^2	square feet
g	gram
ha	hectare
HCl	hydrochloric acid
Hz	hertz
I-5	Interstate 5
ISO	International Standards Organization
kg	kilogram
kHz	kilohertz
km	kilometer
km^2	square kilometer
kts	knots
LCAC	Landing Craft Air Cushion
m	meter
m^2	square meter
m^3	cubic meter
MCB	Marine Corps Base
MCTSSA	Marine Corps Tactical Systems Support Activity
MMPA	Marine Mammal Protection Act
mph	miles per hour
ms	millisecond
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAWQC	National Ambient Water Quality Criteria
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical mile
nm^2	square nautical mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTMAR	Notice to Mariners
NO_X	oxides of nitrogen
NO_2	nitrogen dioxide
NRC	National Research Council
NRHP	National Register of Historic Places
NSR	New Source Review
NWR	National Wildlife Refuge
OAPCA	Olympic Air Pollution Control Agency
ODFW	Oregon Department of Fish and Wildlife
ODGMI	Oregon State Department of Geology and Mineral Industries
OEA	Overseas Environmental Assessment
ONHP	Oregon Natural Heritage Program
ONR	Office of Naval Research
OSHA	Occupational Safety and Health Administration
O_3	ozone
Pb	lead
PD&RR	Program Definition and Risk Reduction
PM_{10}	particulate matter less than 10 microns in diameter
ppm	parts per million

ppt	parts per thousand
PSD	Prevention of Significant Deterioration
PTS	Permanent Threshold Shift
re 1µPa	reference 1 micro-Pascal
re 1µPa-m	reference 1 micro-Pascal meter
rms	root-mean-square
ROC	reactive organic compounds
RONA	Record of Non-Applicability
ROV	Remotely Operated Vehicle
SAIC	Science Applications International Corporation
SBCAPCD	Santa Barbara County Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SCB	Southern California Bight
SDAPCD	San Diego Air Pollution Control District
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
S/N	signal-to-noise
SO_X	oxides of sulfur
SO_2	sulfur dioxide
SOSUS	Sound Surveillance System
SPAWAR	Space and Naval Warfare Systems Command
SWRCB	State Water Resources Control Board
TDV	Towed Deployment Vehicle
TL	transmission loss
TSS	Traffic Separation Scheme
TTS	Temporary Threshold Shift
USC	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VCAPCD	Ventura County Air Pollution Control District
VOC	volatile organic compound
WAC	Washington Administrative Code
WIRE	wet-end inspection and repair equipment
yd^2	square yard
yd^3	cubic yard

EXECUTIVE SUMMARY

This Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) (herein referred to as EA) has been prepared by the U.S. Department of the Navy (DoN) to evaluate potential environmental impacts of the Program Definition and Risk Reduction Phase for the Advanced Deployable System (ADS), a passive acoustic undersea surveillance system. Specifically, this EA evaluates four ocean tests proposed for locations within and beyond territorial seas associated with acquisition approval of ADS.

ADS consists of sensors connected by cables placed on the ocean floor designed to "listen" to sounds produced by vessels operating in shallow waters. The Navy proposes to use ADS to help detect underwater and surface marine vessel activity. To the greatest extent possible, ADS components have been and will continue to be tested in the laboratory. However, to obtain realistic testing conditions and to deploy full-scale hardware, certain tests must be performed in the ocean environment. Four tests over a 3-year period are proposed to evaluate the capability and performance of ADS. A summary of each of the four tests and the parameters of each test is provided in Table ES-1.

Table ES-1. Summary of ADS Ocean Tests

Key Test Parameters	Test 1 Multinode Test (MNT)	Test 2 Development Test-ID	Test 3 Integrated Deployment Test (IDT)	Test 4 All Optical Deployable System (AODS)
TEST CHARACTERISTICS				
Maximum Test Period	70 days	150 days	15 days	30 days
Number of Test Vessels	2	2	2	2
Nodes/Fingers	4/1	20/5	1/1	3/1
Total Length of Cable	130 km	550 km	50 km	150 km
Remotely Operated Vehicle	Yes	Yes	Yes	Yes
Battery Type	Lithium	Lithium	Alkaline	Alkaline
Maximum Number of Batteries	4	20	1	3
Shore Station	Yes	Yes	Yes	Yes
Wet-end Inspection and Repair[1]	Yes	Yes	Yes	Yes
Component Retrieval[2]	Yes	Yes	Yes	Yes
ACOUSTIC PARAMETERS				
Maximum Active Acoustic Testing	480 hours	720 hours	48 hours	96 hours
Pulsed Sound Source				
Total Number of Hours of Operation[3]	32 hours	48 hours	8 hours	16 hours
Source Level	120-175 dB	120-175 dB	120-175 dB	120-175 dB
Frequency Range	20-1000 Hz	20-1000 Hz	20-1000 Hz	20-1000 Hz
Signal Duration	0.25 to 10 seconds	0.25 to 10 seconds	0.25 to 10 seconds	0.25 to 10 seconds
Range of Time between Pulses	1.75 seconds to days	1.75 seconds to days	1.75 seconds to days	1.75 seconds to days
Continuous Sound Source				
Total Number of Hours of Operation[3]	448 hours	672 hours	40 hours	80 hours
Continuous Source Level Range	130-170 dB	130-170 dB	130-170 dB	130-170 dB
No. of hours less than 140 dB	335 hours	426 hours	17 hours	50 hours
No. of hours between 140 and 170 dB	113 hours	246 hours	23 hours	30 hours
Frequency Range	20-1000 Hz	20-1000 Hz	20-1000 Hz	20-1000 Hz
Light Bulb Acoustic Tests				
Number of Lightbulb Tests	32	96	16	48
Duration of Pulse for Lightbulb Tests	1.8 ms	1.8 ms	1.8 ms	1.8 ms
Time between Implosions	20-30 minutes	20-30 minutes	20-30 minutes	20-30 minutes

[1] Wet-end inspection and repair would occur only as required.

[2] Plastic clips used to hold shells together in canister would not be retrieved (5 for Test 1, 30 for Test 2). No clips are used for Tests 3 and 4.
[3] The total hours for continuous sound source do not represent constant transmission since some time would elapse between sound source operations.

Activities associated with the four proposed ocean tests would primarily include the following: establishment of a temporary shore station, deployment of the system, inspection and operation of the system, and retrieval of the system.

Establishment of a Temporary Shore Station. A temporary land-based shore station would be constructed and used for receiving, processing, displaying, and storing data.

Deployment of the System. A full scale deployment of the ADS system in the ocean would include: testing of handling and deployment systems; lowering and towing a Towed Deployment Vehicle (TDV) through the water column; releasing shells and associated hardware from the TDV; deploying cable and associated hydrophones to the sea floor; deploying a junction box on the sea floor; and deploying a shore landing cable from the junction box to the shore station (which would require some onshore trenching activities).

Inspection and Operation of the System. Although ADS is a passive acoustic system, it is necessary to produce pulsed and continuous sound during the ocean tests. Two different active acoustic methods are proposed: a towed sound source and a simple system involving the implosion of lightbulbs. Inspection and repair of the ADS system would be performed only as required.

Retrieval of the System. Retrieval of all components except for the shore landing cable would occur after completion of Tests 1 and 2. The system components would then be re-deployed for Test 3, retrieved after Test 3, re-deployed for Test 4, and retrieved following Test 4. Retrieval of the components would occur within 6 months of the completion of each test; however, the shore landing cable would be installed prior to Test 1 and remain in place during all four tests and be retrieved upon completion of Test 4.

As part of the ADS ocean tests, two surface vessels would be used to support deployment, inspection and operation (active acoustic testing), and retrieval of the system. Although ADS would not use active acoustics, it would be necessary to use an active acoustic test source to produce pulsed and continuous sounds during the proposed tests to evaluate ADS listening capabilities on the sea floor. The tests would occur over a 3-year period. Once the system has been deployed, the maximum days of operation for all four tests would be approximately 265 days; however, all tests would not occur continually. A maximum of 1,344 hours of active acoustic testing (104 hours of pulsed sound source and 1,240 hours of continuous sound source) is proposed over the 3-year period. As shown in Table ES-1, maximum test periods would consist of 70 days for Test 1, 150 days for Test 2, 15 days for Test 3, and 30 days for Test 4, including installation, data collection, and retrieval.

Personnel required for the ocean tests (approximately 24 shipboard personnel [16 scientists and 8 crew members] and 30 shore station personnel) consist of those required to prepare test plans and procedures, assemble and inspect equipment prior to the start of at-sea testing, deploy in-water components, conduct various tests, collect data, retrieve equipment, analyze test results, and prepare reports. In many cases, several of these tasks would be performed by the same person.

The DoN proposes to conduct these tests within the marine environment of southern California, between Point Conception and the U.S.-Mexican border. The proposed footprint area encompasses the California Channel Islands. The laydown of the system would occur within a portion of the footprint area; however, the specific laydown of the system is classified (Appendix A).

A shore station is proposed within the southwestern portion of Marine Corps Base (MCB) Camp Pendleton adjacent to the Marine Corps Tactical Systems Support Activity (MCTSSA) facility. The shore station would be a land-based, portable, temporary facility used for receiving, processing, displaying, and storing data. The proposed shore station site has ample room to park up to eight support International Standards Organization-vans (ISO-vans). Implementation of the proposed shore station would require some improvements, including upgrades to an existing access road, installation of security fencing, and construction of concrete slabs to support the ISO-vans.

To use the shore station for receiving and processing the data associated with the ADS ocean tests, a shore landing cable must be connected from a junction box located offshore to the shore station site. Installation of the cable would require trenching and backfilling across the beach and into the surf zone to bury the cable. The cable would be laid at low tide and buried about 6 feet (ft) (2 meters [m]) deep from low-water depth through the tidal zone. The trench across the beach would be a maximum of 250 ft (76 m) in length, 2 ft (0.6 m) wide, and 6 ft (2 m) deep.

Alternatives to the proposed ADS ocean tests include alternative test sites and the No-Action Alternative. Systematic operational parameters were analyzed to determine reasonable site locations for conducting the ADS ocean tests. The siting process involved the development of specific operational siting criteria based on test objectives, which included the following:

- operational realism (adequate laydown area/depth);
- survivability (weather conditions/level of fishing/terrain);
- scheduling (low potential for schedule change);
- availability (accessibility); and
- supportability (necessary amenities).

Once operational criteria were identified, various regions were considered in a tiered analysis to identify potential siting locations for conducting ADS ocean tests. Operational criteria were first used to eliminate general areas from further consideration and to compare advantages and disadvantages of potential alternative sites. Sites considered included the following:

- foreign sites;
- sites within U.S. coastal waters; and
- sites along the west coast of the continental U.S. (CONUS).

Foreign sites for ADS ocean tests were eliminated from further consideration due to the following reasons:

- high potential for schedule changes, or equipment damage due to weather, political atmosphere, or unknown variables;
- sites outside the U.S. are not easily accessible by Fleet assets;
- support functions (e.g., electricity, lodging, etc.) are highly variable;
- excessive costs;
- security of the system; and
- classified nature of the project could not be disclosed to foreign government.

Therefore, U.S. coastal waters were identified as the only viable siting option (Alaska was eliminated due to extreme weather conditions).

In the next tier of analysis, based on the alternatives analysis, the east coast, Hawaii, and the Gulf Region were eliminated from further consideration because they did not meet all operational siting criteria. Based on this tiered analysis, the west coast was identified as the only area that met all operational siting criteria for implementation of the ADS ocean tests.

Once the west coast was identified as the only region which met all operational siting criteria, specific west coast ocean test site locations were evaluated. More detailed operational criteria were used to further determine the characteristics of four proposed ocean test locations (shore station sites to support the ADS ocean tests were identified for each potential ocean site location). Of the four ocean test site locations, two locations did not meet all operational criteria; therefore, these locations were eliminated from further consideration. The two locations that satisfied all required operational criteria and could support a shore station site are analyzed in the EA. These two locations consist of the proposed ADS ocean test site, located within Southern California, and the alternative ADS ocean test site, located within the Pacific Northwest.

In support of the ADS ocean tests, a temporary shore station site would be used. The EA evaluates impacts associated with the proposed shore station, located adjacent to MCTSSA at MCB Camp Pendleton. In addition, two alternative shore station sites are evaluated: the Pacific City Alternative, located at an existing telecommunications facility in Pacific City, Oregon, and the MCB Camp Pendleton Alternative, located adjacent to the Landing Craft Air Cushion (LCAC) facility just north of the proposed shore station.

The only alternative to performing the proposed ocean tests would be to simulate the ocean environment through laboratory testing. This alternative does not meet the purpose and need of the ADS ocean tests since real-world conditions are necessary to verify and validate ADS capabilities; therefore, this alternative was not analyzed in the EA.

Under the No-Action Alternative, the proposed action would not be implemented and the purpose and need for ADS acquisition approval would not be met. ADS was created in direct response to an identified, documented, and validated mission and need; if these tests are not conducted, the Navy's objective of developing ADS could not be met.

The EA describes current baseline conditions and evaluates potential impacts from implementation of ADS ocean testing at the proposed ADS ocean test location, the alternative ADS ocean test location, and the proposed and alternative shore station sites, as well as identifying potential impacts resulting from selection of No-Action Alternative. A portion of the proposed project would be located outside territorial waters; therefore, to comply with Executive Order (EO) 12114, *Environmental Effects Abroad of Major Federal Actions*, the EA includes descriptions of baseline conditions and environmental consequences within and outside territorial waters. The following environmental resources are addressed in the EA: geology, topography, and soils; air quality; marine environment; marine biology; marine mammals; terrestrial biology; land use, transportation and recreation; socioeconomics; noise; cultural resources; and safety and environmental health. The key issue identified during preparation of this EA was the potential for acoustic impacts on fish and marine mammals. However, the analysis of potential acoustic impacts demonstrated that significant impacts on fish and marine mammals would not occur as a result of implementation of the proposed ADS ocean tests.

National Research Council (NRC) reported that National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NOAA/NMFS) recommended (on an interim basis) the use of sound source levels 80 to 100 dB above absolute hearing threshold as harassment levels based on annoyance or TTS (See NRC 1996). Absolute hearing thresholds for odontocetes and pinnipeds in the band of sensitive hearing tend to fall in the range 40 to 80 dB (re 1 µPa), consistent with the lowest observed ambient noise levels in those bands. There are no measurements of hearing sensitivities for mysticetes, but for the low band (below 500 Hz), noise band levels in the quietest locations generally exceed 80 dB. Based upon the NOAA/NMFS recommendation, the harassment thresholds for mysticetes would then fall in the range from about 160 dB to 180 dB (re 1 µPa), depending on species, frequency, duration, waveform, etc. NMFS is re-examining sound pressure level thresholds in the context of the definition of harassment. For this EA, the Navy will take the conservative approach of mitigating to the range at which the level is estimated to be 120 dB or less for continuous sound and 160 dB or less for pulsed sound. In this case, the ADS program can meet the testing requirements while mitigating to these very conservative sound levels.

<u>Mitigation Measures</u>

In the resource-specific analysis as described in Sections 4.1 through 4.11 of this EA, no significant impacts have been identified. The proposed ADS tests and establishment of the proposed shore station are not intrusive and have been designed to minimize environmental impacts. Mitigation measures for marine mammals were established based on predicted received sound levels relative to distance from the sound sources as shown in Table ES-2.

Table ES-2. Predicted Received Sound Levels Relative to Distance from Sound Source

Source Level	Received Sound Levels 120 dB	140 dB	160 dB
175 dB (pulsed)	1,800 ft (560 m)	184 ft (56 m)	20 ft (6 m)
170 dB (continuous)	1,050 ft (320 m)	105 ft (32 m)	10 ft (3 m)

The following mitigation measures have been recommended and incorporated into the ADS ocean test program to minimize any potential for acoustic impacts on marine mammals (Table ES-3).

Table ES-3. Mitigation Measures for Marine Mammals during ADS Ocean Tests Acoustic Transmissions

Acoustic Source		Watch Type[1]		
Continuous	Pulsed	Ship's	Dedicated	Operations Curtailed[2]
< 140 dB		√		Any marine mammal within 33 ft (10 m)
140-170 dB[3]			√	Mysticetes within: 1,050 ft (320 m) @ 170 dB 330 ft (100 m) @ 160 dB 105 ft (32 m) @ 150 dB 33 ft (10 m) @ 140 dB
140-170 dB[3]		√		Pinnipeds or odontocetes within 1,050 ft (320 m) for more than 0.5 hour
	160-175 dB	√		Any marine mammal within 33 ft (10 m)

[1]A ship's or dedicated watch will begin 20 minutes before the start of any acoustic transmission and will continue for the duration of the transmission.
[2]Operations would also be curtailed if sea turtles are observed.
[3]Acoustic transmission during daylight hours only.

For the proposed ADS ocean tests, two types of visual searches for marine mammals would be conducted: (1) a *ship's watch* by the operations personnel, and (2) a *dedicated watch* by at least two personnel specifically trained in marine mammal identification. A ship's watch of surrounding waters would be conducted at least 20 minutes before and continuing during any pulse or continuous sound source transmission.

For continuous sound source transmissions, a ship's watch by operations personnel would be conducted at all times during transmissions less than 140 dB re 1μPa-m. Operations would be curtailed only if marine mammals approach within 33 ft (10 m) of the towed sound source projector during continuous sound transmission at less than 140 dB re 1μPa-m.

When active acoustics involve continuous sound source transmission greater than 140 dB, a dedicated watch would be conducted. Continuous sound source transmission between

140 and 170 dB re 1μPa-m would be conducted only during daylight hours and when visibility is not limited by weather conditions (e.g., fog, adverse sea state). Transmissions would be curtailed in accordance with Table 4-5.

Because pinnipeds (seals and sea lions) and odontocetes (toothed whales: dolphins, porpoises, etc.) do not have good hearing below 1 kHz, continuous sound source, transmissions between 140 and 170 dB re 1μPa-m would continue unless pinnipeds and/or odontocetes remain within 1,050 ft (320 m) of the sound source for periods greater than one-half hour. If pinnipeds or odontocetes remain during continuous sound source transmissions over one-half hour, transmissions would be stopped.

At the start of sound source transmission, the transmission level would be increased gradually or ramped-up from an overall level less than or equal to 140 dB re 1μPa-m to the desired operating level, at a rate not exceeding 6 dB re 1μPa-m per minute. Although there was some discussion as to the utility of ramp-up procedures at a recent Office of Naval Research (ONR) Workshop (ONR 1998), it is thought that such procedures may allow any marine mammals near the sound source projector during the onset of test operations the opportunity to move away before being exposed to maximum levels. To ensure implementation, this action would be a test requirement and would be added to the test plan for all ADS ocean tests.

If any marine mammals are attracted to sounds associated with the ADS ocean test operations, they may actually approach or remain in the test area. Such long-term exposure should be avoided to mitigate potential hearing damage to marine mammals. Although such behavior is not anticipated for any species, active acoustic transmissions would be delayed in accordance with the proposed mitigation measures outlined in Table 4-5 (refer to Section 4.5.2.5).

The following mitigation measures for threatened and endangered terrestrial species have been proposed to ensure that trenching activities associated with placement of the shore landing cable would not adversely impact the western snowy plover. All activities associated with trenching would occur outside the plover breeding season (1 March - 15 September). In addition, if any repairs are needed to the buried shore landing cable during the plover breeding season, all activities would be coordinated with MCB Camp Pendleton Environmental Security personnel and U.S. Fish and Wildlife Service (USFWS) prior to any beach or dune disturbance.

Summary of Impacts

In defining significant impacts, the National Environmental Policy Act (NEPA) requires the consideration of context and intensity. The significance of an action must be analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality. Intensity refers to the magnitude of the potential effect (i.e., the degree of reach in terms of strength, force, or energy per unit [e.g., time]). The analysis carried forth in the EA addresses the impacts of the proposed ADS tests within the spatial and temporal boundaries of test implementation. The proposed activity of laying cable and self-contained electronics, the use of typical seagoing vessels, and the short-term use of artificial underwater sound sources (the projector and implosion of lightbulbs) have all been found to have highly localized influences (i.e., small regions of potential impact) that preclude the need to look at larger areas of influence. Thus, the context of potential impact for the ADS activities is limited to localized site-specific regions surrounding the laydown areas.

Changes in the environment would be limited to a total of 265 days over a period of three years for all four proposed tests. Upon completion of the tests, the marine environment within the proposed footprint area would remain essentially unchanged from its condition prior to the proposed action.

Intensity of impacts are measured against specific evaluative factors including public health; unique characteristics (e.g., wetlands and sensitive ecological features); degree of controversy; degree of unknown or uncertain risk; precedent-setting impact; cumulative impact; archaeological and historic resources; special status species; and the potential to violate federal, state, and local laws. Based upon the detailed analysis presented in this EA, the intensity of effects associated with implementation of the proposed action is not significant since the proposed ADS tests consist of highly localized, discrete actions that do not add in a cumulative manner to other activities in the general region. The ADS ocean tests would have no significant impact on federally protected threatened and endangered marine or terrestrial species. Air emissions associated with the proposed project would be consistent with the relevant State Implementation Plans (SIPs). The proposed action complies with considerations regarding environmental justice and protection of children because it would not disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations (including children). There are no known archaeological resources that would be affected with implementation of the proposed action; therefore, there would be no significant impacts on cultural resources. The review for consistency with applicable environmental requirements at the federal, state, and local level found no threat of violation associated with the proposed action. This document satisfies the requirement for Executive Order (EO) 12114. As discussed in the joint EA/OEA, no significant harm would occur to the global commons as a result of implementation of the proposed action.

Therefore, the intensity of impacts caused by implementation of the proposed action would be less than significant. No significant impacts would result from implementation of the proposed action, use of the alternative Pacific Northwest site, use of the proposed or alternative shore station sites, or the No-Action Alternative. Summaries of the proposed ADS ocean test location, the alternative test location, and the No-Action Alternative's potential effects on each of the resource areas are provided in Table ES-4.

Table ES-4. Impact Summary Matrix (Page 1 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
Geology, Topography, and Soils	**<u>Proposed ADS Ocean Test Location</u>** N/A **<u>Proposed Shore Station Location</u>** Construction of the proposed shore station would involve minor grading (approximately 23,250 square feet [ft^2] [2,160 square meters (m^2)] of previously disturbed areas for access road widening and site preparation. Installation of the cable to connect the offshore junction box with the shore station would involve burying the cable from the tidal zone to the beach bluff. The total volume of unconsolidate beach sand that would be trenched and back-filled would be approximately 111 cubic yards (yd^3) (85 cubic meters [m^3]): 89 yd^3 (68 m^3) along the beach and 22 yd^3 (17 m^3) in the tidal zone. Due to the flat topography of the shore station site, presence of soils that are not construction limiting, and the dynamic nature of coastal beaches, impacts to geology, topography, and soils would not be significant. **<u>MCB Camp Pendleton Alternative Shore Station Location</u>** Impacts to geology, topography, and soils from construction (i.e., site preparation and cable trenching along the beach) of the MCB Camp Pendleton alternative shore station would be similar to those of the proposed shore station due to the close proximities of the sites; however, an additional 3,200 ft^2 (297 m^2) would need to be graded for the installation of a utility corridor from the shore station to the LCAC facility. Impacts to geology, topography, and soils would not be significant.	**<u>Alternative ADS Ocean Test Location</u>** N/A **<u>Pacific City Alternative Shore Station Location</u>** Use of the Pacific City alternative shore station would not require any facility improvements with the exception of the installation of the shore landing cable. Trenching along the beach associated with burying the cable would be similar to that of the proposed shore station site and would involve the temporary excavation of approximately 111 yd^3 (85 m^3) of unconsolidated beach sand. Impacts to geology, topography, and soils would be similar to those of the proposed shore station location and would not be significant.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 2 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
Air Quality	**<u>Proposed ADS Ocean Test Location</u>** Air quality analysis concluded that emissions associated with the proposed ocean tests would be below *de minimis* levels for all nonattainment criteria pollutants. Impacts to air quality would not be significant as a result of implementation of the proposed action. **<u>Proposed Shore Station Location</u>** Emissions from construction activities (e.g., minor grading and trenching) would be short-term and would not significantly degrade air quality. In addition, emissions would be below *de minimis* levels for all nonattainment criteria pollutants. Therefore, impacts to air quality would not be significant. **<u>MCB Camp Pendleton Alternative Shore Station Location</u>** Emissions from construction activities (e.g., minor grading and trenching) would be short-term and would not significantly degrade air quality. In addition, emissions would be below *de minimis* levels for all nonattainment criteria pollutants. Therefore, impacts to air quality would not be significant.	**<u>Alternative ADS Ocean Test Location</u>** Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. Provisions of the General Conformity Rule would not apply since the alternative test location is located in an area considered in attainment for all criteria pollutants. **<u>Pacific City Alternative Shore Station Location</u>** Construction-related activities for the Pacific City alternate shore station would be limited to minor trenching activities associated with placement of the shore landing cable. Emissions from trenching activities would be short-term and impacts to air quality would not be significant.	No effect/No change from baseline condition.
Marine Environment	**<u>Proposed ADS Ocean Test Location</u>** <u>Water Quality</u>: The system's lithium and alkaline batteries are self-contained and closed systems; therefore, there would be no discharges to the surrounding marine environment. Implosion of lightbulbs and corrosion of drogue chute clips would result in negligible contribution of argon gas and iron/magnesium, respectively, to the naturally occurring levels found in seawater. Therefore, impacts on water quality would not be significant.	**<u>Alternative ADS Ocean Test Location</u>** <u>Water Quality</u>: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 3 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
	Marine Sediments: Since the average diameter of the cable to be used during the tests is 0.22 inches (0.56 cm), the total surface area of ocean bottom that would be momentarily disturbed during deployment of the cable would be a maximum of 32,504 ft^2 (3,020m^2) for Test 2. For Tests 1, 3, and 4, much shorter lengths of cable would be deployed and the average surface area of ocean bottom that would be disturbed as a result of deployment would be approximately 6,494 ft^2 (603 m^2). Any sediment disturbance that would occur would be short-term and not significant.	Marine Sediments: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different.	
Marine Biology	**Proposed ADS Ocean Test Location** Chemical Contamination: (refer to *Marine Environment*, water quality, above) Benthic Organisms: ADS components have been designed to minimize drag, limiting sediment disturbance. Therefore, increases in turbidity would be minimal and not significant. Portions of the marine environment where impacts on marine biota may occur are therefore limited to the benthic organisms (e.g., clams, snails, sea urchins) directly in contact with the ADS ocean test components. Impacts on benthic communities would be limited to the placement of ADS components on the sea floor and subsequent removal. Even if an ADS component were to be placed directly on a benthic organism, survival is likely due to the hard outer covering of most benthic species and the ability of many benthos to live buried in the sand. No significant impacts on benthic organisms would result. Fish: *Sound Source* - Given the moderate sound source level and short duration of exposure to maximum received levels, projected sounds would not affect catchability or the hearing abilities of fish. *Lightbulbs* - Given the extremely limited exposure time to instantaneous peak pulse levels (1.8 ms per lightbulb test or 0.35 seconds cumulative for all four tests), no negative effects on fish or catchability would occur. Impacts would be insignificant.	**Alternative ADS Ocean Test Location** Chemical contamination: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. Benthic Organisms: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. Fish: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different.	No effect/No change from baseline condition.

Table ES-4. Impact Summary Matrix (Page 4 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
Marine Mammals	**Proposed ADS Ocean Test Location** All pinniped (seals and sea lions) haul-out grounds are located within exclusion areas for the proposed ADS ocean tests. Acoustic Impacts: Potential acoustic impacts of ADS ocean test operations on marine mammals vary with hearing capabilities of each major group. For example, mysticetes (baleen whales) may hear noise from both the project vessels and the towed sound source projector. However, maximum source levels for the pulsed sources (175 dB re 1µPa-m) and continuous sources (170 dB re 1µPa-m) are such that the area ensonified to levels above 160 dB and 120 dB, respectively, is comparatively small. Lightbulb implosions are too brief to pose a problem. It is unlikely that odontocetes (toothed whales) or pinnipeds would be affected by either vessel or towed source noise due to comparatively poor hearing at frequencies less than or equal to 1 kHz. It is unlikely that any noise associated with ADS ocean test operations would be heard by sea otters due to their low numbers and exclusive occupation of coastal waters within 3 nm of shore. Mitigation measures have been incorporated to minimize any potential for acoustic impacts to marine mammals (refer to pages ES-5 and ES-6). Attraction/Collision: The risk of attraction and collision would be no greater than the risk associated with other vessels operating in the area and would not be significant.	**Alternative ADS Ocean Test Location** All pinniped haul-out grounds are located within exclusion areas for the Alternative ADS ocean test location. Acoustic Impacts: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. Attraction/Collision: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 5 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
Marine Mammals (cont'd)	<u>Entanglement</u>: Test components would be retrieved within 6 months of Tests 1 and 2, Test 3, and Test 4. During operations, the potential for entanglement or ingestion would be remote based on the size and shape of cables and test components. The cables have been designed to lay straight; at any one location, the cable would consist of a single line extending more-or-less linearly along the bottom. It is highly unlikely that any marine mammals would become entangled with this cable arrangement. Although most species do not contact the bottom, any marine mammals that do contact the bottom near a cable would not become entangled in a single cable. Impacts resulting from potential entanglement would not be significant. No significant impacts on marine mammals would result. <u>Chemical Contamination</u>: Since there would only be minor chemical discharges associated with the ADS tests, there would be no risk of metal bioaccumulation in marine mammals (refer to *Marine Environment*). No significant impacts on marine mammals would result.	<u>Entanglement</u>: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. <u>Chemical Contamination</u>: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different.	
Terrestrial Biology	**<u>Proposed ADS Ocean Test Location</u>** Boating activities are common in the area and are not known to adversely affect sight-feeding bird species. Therefore, impacts to terrestrial species, including federally or state listed sensitive species, would not be significant. **<u>Proposed Shore Station Location</u>** Minor construction activities would occur in previously disturbed areas. Shore landing cable installation would involve trenching along the beach. Although the beach area supports a small breeding colony of threatened western snowy plovers, all activities associated with trenching for the shore landing cable would be conducted outside of the snowy plover breeding season. Therefore, impacts to terrestrial species would not be significant.	**<u>Alternative ADS Ocean Test Location</u>** Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. **<u>Pacific City Alternative Shore Station Location</u>** The only construction associated with this alternative shore station location would involve trenching a section of beach for installation of the shore landing cable. The section of beach proposed for trenching currently supports no sensitive plant or animal species or habitat. Therefore, impacts to terrestrial species would not be significant.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 6 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
Terrestrial Biology (cont'd)	**<u>MCB Camp Pendleton Alternative Shore Station Location</u>** Minor construction activities would occur in previously disturbed areas that currently support no sensitive plant or animal species or habitats. Shore landing cable installation would involve trenching along a section of beach that currently supports no sensitive plant or animal species or habitats. Therefore, impacts to terrestrial species would not be significant.		
Land Use, Transportation, and Recreation	**<u>Proposed ADS Ocean Test Location</u>** The operation of two marine vessels would be consistent with offshore land use in the Southern California Bight. In addition, exclusion areas have been established to avoid potential impacts to existing land use and recreational resources. To minimize potential impacts to transportation, the ocean tests would be sited to avoid major shipping lanes and heavily utilized military operation areas. In addition, since the test vessel would be towing a device, a Notice to Mariners (NOTMAR) would be issued 48 hours prior to commencement of tests. For these reasons and due to the short-term nature of the tests, impacts to marine traffic would not be significant. It has been determined that the proposed action is consistent to the maximum extent practicable with the policies of the California Coastal Commission. A Coastal Consistency Determination has been submitted in accordance with CZMA. **<u>Proposed Shore Station Location</u>** Access to the site would be provided by an existing road. Since no traffic problems currently exist and use of the shore station would be temporary, impacts to transportation would not be significant.	**<u>Alternative ADS Ocean Test Location</u>** Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. Overall, implementation of the ADS ocean tests at the alternative ocean test location would be consistent to the maximum extent practicable with the provisions of CZMA and coastal management programs adopted by the states of Oregon and Washington.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 7 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
	<u>MCB Camp Pendleton Alternative Shore Station Location</u> The alternative shore station site is presently used and zoned for military operations. No sensitive recreational or visual resources are located in the vicinity of the proposed shore station or within the section of beach proposed for trenching. Therefore, impacts to land use or recreational resources would not be significant.	**<u>Pacific City Alternative Shore Station Location</u>** This alternative shore station site would be located within an existing telecommunications facility on private property zoned for commercial uses. Since no sensitive recreational or visual resources are located in the vicinity, use of this site would not result in significant impacts to land use or recreational resources.	
Land Use, Transportation, and Recreation (cont'd)	Access to the site would be provided by an existing road. Since no traffic problems currently exist and use of the shore station would be temporary, impacts to transportation would not be significant.	Since the area of beach proposed for trenching under this alternative is currently subjected to vehicular and pedestrian traffic, and trenching activities would last less than 8 hours, impacts to land use or recreational resources would not be significant. Access to the site would be provided by an existing road. Since no traffic problems currently exist and use of the shore station would be temporary, impacts to transportation would not be significant.	
Socioeconomics	**<u>Proposed ADS Ocean Test Location</u>** Commercial shipping traffic would not be significantly affected by the proposed action. Vessels could continue to operate within a 0.5 mile (0.8 km) radius of the test location without interfering with the integrity of the tests. Given the large area in which the tests would occur and the short duration of the tests, and since no permanent residents (low-income, minority, disadvantaged, or other) reside in the project area, the potential to disproportionately affect human health or the environment in low-income, minority, or disadvantaged (including children) populations would not be significant.	**<u>Alternative ADS Ocean Test Location</u>** Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. **<u>Pacific City Alternative Shore Station Location</u>** The Pacific City alternative shore station would be located within an existing telecommunications facility. The potential for this alternative to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations (including children) would not be significant.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 8 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
	<u>Proposed Shore Station Location</u> The proposed shore station would be located on MCB Camp Pendleton within a previously disturbed area. Because the proposed site is within military base boundaries, the potential for the proposed shore station location to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations (including children) would not be significant. **<u>MCB Camp Pendleton Alternative Shore Station Location</u>** The MCB Camp Pendleton shore station alternative would be located within a previously disturbed area. Because the proposed site is within military base boundaries, the potential for the alternative shore station location to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations (including children) would not be significant.		
Noise	**<u>Proposed ADS Ocean Test Location</u>** <u>Air environment</u>: Project-related noise associated with the operation of two marine vessels would not significantly change ambient noise conditions in the area. <u>Underwater</u>: Underwater noise produced by the surface vessels, TDV, and ROV would be similar to noise produced by other vessels and similar acoustic devices (e.g., depth sounders, fish finders) employed on other ships and boats operating in the area and would not significantly change underwater ambient noise conditions of the area.	**<u>Alternative ADS Ocean Test Location</u>** <u>Air environment</u>: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different. <u>Underwater</u>: Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different..	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 9 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
Cultural Resources	**Proposed ADS Ocean Test Location** No known underwater archaeological resources would be impacted as a result of the ADS ocean tests within the proposed ocean test location. **Proposed Shore Station Location** Based on the site reconnaissance and record search, no archaeological resources were found within the area of potential effect; therefore, impacts to cultural resources would not be significant. **MCB Camp Pendleton Alternative Shore Station Location** Based on the site reconnaissance and record search, no archaeological resources were found within the area of potential effect; therefore, impacts to cultural resources would not be significant.	**Alternative ADS Ocean Test Location** No known underwater archaeological resources would be impacted as a result of the ADS ocean tests within the alternative ocean test location. **Pacific City Alternative Shore Station Location** Based on the site reconnaissance and record search, no archaeological resources were found within the area of potential effect; therefore, impacts to cultural resources would not be significant.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 10 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
Safety and Environmental Health	**Proposed ADS Ocean Test Location** To reduce potential hazards associated with the use of lithium batteries, safety measures have been proposed. These include precautions taken during receiving, storage, assembly, shipping, recovery, and disposal. All batteries will be retrieved after completion of each test. Therefore, public safety impacts associated with lithium batteries would not be significant. During vessel operations, TDV towing, deployment activities, and retrieval operations, standard vessel operating safety procedures would be implemented to protect public nonparticipants and military personnel. In addition, retrieval of all test components would be achieved upon conclusion of the tests. Therefore, given standard component retrieval procedures, impacts to public safety would not be significant. Exclusion areas for sound source levels associated with active acoustic testing of ADS have been established as part of the proposed ocean tests. These include no sound source levels in waters 200 ft (61 m) or less and a maximum sound source level of 175 dB in waters deeper than 200 ft (61 m). In addition, all active acoustic transmission would cease if divers or dive flags are observed within 0.5 mile (1 km) of the test vessel. With the implementation of these avoidance measures, impacts to recreational SCUBA divers would not be significant. **Proposed Shore Station Location** The proposed shore station would be located within the boundaries of MCB Camp Pendleton and security fencing would be constructed around the facility. Since public access would be prohibited, use of the shore station site would not result in a public safety hazard. Therefore, impacts would not be significant.	**Alternative ADS Ocean Test Location** Since the size and characteristics of the alternative ADS ocean test location are similar to the proposed location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different.	No effect/No change from baseline conditions.

Table ES-4. Impact Summary Matrix (Page 11 of 9)

Resource	ADS Ocean Test/Southern California	ADS Ocean Test/Pacific Northwest Site	No-Action Alternative
	MCB Camp Pendleton Alternative Shore Station Location The MCB Camp Pendleton would be located within base boundaries and security fencing would be constructed around the facility. Since public access would be prohibited, use of the shore station site would not result in a public safety hazard. Therefore, impacts would not be significant.	**Pacific City Alternative Shore Station Location** The Pacific City alternative shore station would be located within a existing telecommunications facility that does allow public access. Therefore, use of this shore station alternative would not create a public safety hazard and public safety impacts would not be significant.	

CHAPTER 1
PURPOSE AND NEED

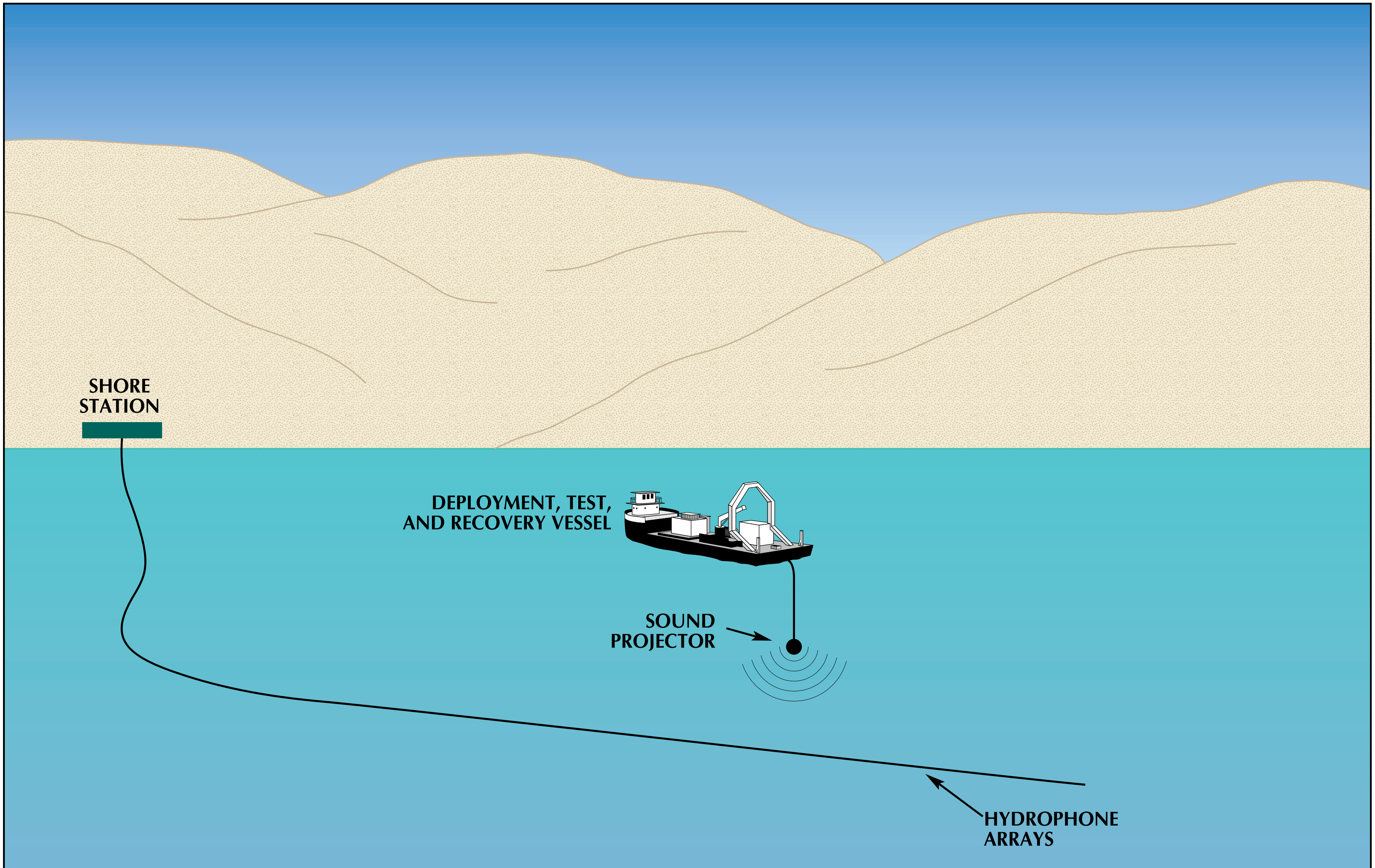
1.1 INTRODUCTION

This combined Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) (herein referred to as EA) has been prepared by the U.S. Department of the Navy (DoN) to evaluate potential environmental impacts of four proposed ocean tests for the Advanced Deployable System (ADS), a passive acoustic undersea surveillance system. Specifically, this EA evaluates four proposed ocean tests located within and beyond territorial seas and associated shore support within the continental United States (CONUS). The proposed tests are associated with acquisition approval of ADS. This EA has been prepared in compliance with the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] 4321 *et seq.*), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508), the DoN Procedures for Implementing NEPA (32 CFR 775), and Executive Order (EO) 12114, *Environmental Effects Abroad of Major Federal Actions.*

ADS is sponsored by the Chief of Naval Operations (CNO) and managed by the Space and Naval Warfare Systems Command (SPAWAR). ADS consists of passive sensors connected by cables placed on the ocean floor designed to "listen" to sounds produced by vessels operating within littoral (i.e., nearshore) waters. If determined to meet Navy performance criteria, ADS would be used to help detect underwater and surface marine vessel activity.

The Navy conducts research, test, and evaluation on its defense programs when acquiring new systems. Testing and evaluation is designed to provide necessary information regarding risk and risk mitigation; to furnish empirical data to validate models and simulations; to assess technical performance specifications and system maturity; and to determine whether systems are effective, suitable, and survivable for their intended use. Most of the design, development, and testing of Naval systems is conducted in the laboratory and with computer simulations. However, these data must be verified and validated against real-world conditions, resulting in the need for system testing in the ocean environment.

The Program Definition and Risk Reduction (PD&RR) Phase comprises four ocean tests that are associated with acquisition approval of ADS: the Multinode Test (Test 1), Development Test-ID (Test 2), Integrated Deployment Test (Test 3), and All Optical Deployable System Test (Test 4). These tests are designed to evaluate the system's operational effectiveness in an ocean environment. A general depiction of the ADS system is presented in Figure 1-1.



NOTE: Drawing not to scale.

Advanced Deployable System Ocean Test

FIGURE 1-1

1.2 PURPOSE AND NEED

1.2.1 Purpose and Need for ADS

ADS was created in response to the Navy's *Mission Needs Statement for Undersea Surveillance in Littoral Waters*. The mission statement identifies the need to provide undersea surveillance capability, cites shortfalls of current systems to furnish this capability, and identifies additional possible capabilities being explored by the ADS Program Office. Surveillance requirements include the ability to:

- detect, locate, and report submarines and surface shipping;
- provide a worldwide, flexible, and tailored response;
- bring tactical forces into contact with threat submarines; and
- gather operational and technical intelligence.

The overall purpose of these tests is to demonstrate to the Fleet that the ADS system could be used to locate the position of submarines and other craft within the littoral zone. Data derived from other systems would be used together with ADS data to confirm detections, classify contacts, and process contact reports.

The overall need for the four proposed ocean tests is to demonstrate and validate the operational realism, survivability, scheduling, availability, and supportability of all the segments of the ADS system working as a whole. The ocean tests are needed to verify that design goals and performance requirements of the ADS system could be achieved. These tests are described in further detail in Chapter 2.

1.3 REGULATORY COMPLIANCE

Various federal and state laws, ordinances, rules, regulations, and policies are pertinent to the proposed action. A description of the proposed action's consistency with these policies and regulations as well as the regulatory agencies responsible for their implementation is presented in Chapter 6.

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CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This chapter of the EA presents a detailed description of the proposed action and alternatives to that action. Section 2.1 describes ADS and the four proposed ADS ocean tests. Section 2.2 discusses alternatives to the ADS ocean tests, ocean test locations, and shore station locations, including no action.

2.1 DESCRIPTION OF THE PROPOSED ACTION

2.1.1 ADS Description

2.1.1.1 Overview

The ADS passive acoustic undersea surveillance system is designed to detect, locate, and report ocean vessel and submarine activities. ADS is complex and can best be described by its general components; a depiction of a typical ADS is shown in Figure 2-1 (Figure 2-1 is for illustration purposes only; configurations can vary). Basically, once the system is deployed, underwater sounds are received by listening devices (hydrophones). These sound signals are converted to electronic signals (and ultimately optical signals) that are amplified in a pressure vessel and transmitted via internode cable to the next series of hydrophones. These data are combined and transmitted via internode cable to a connecting shore landing cable until they reach a land-based shore station. Optical data are then recorded, processed, and analyzed at the shore station.

2.1.1.2 General Background of ADS

To the greatest extent possible, ADS hardware and associated components have been and will continue to be tested in laboratories, environmental simulation chambers, high-pressure test tanks, and mock ocean beach facilities. However, to attain realistic testing conditions and deploy full-scale hardware, certain tests must be performed in the ocean environment.

As part of the proposed action, four ocean tests would be conducted as part of the PD&RR phase to evaluate the capability and performance of ADS. The DoN proposes to conduct these tests at a location within the shallow water ocean environment. These tests are proposed to demonstrate and validate operational realism, survivability, scheduling, availability, and supportability of all segments of the ADS system working as a whole. By implementing these tests in the marine environment and establishing a shore station, more realistic conditions can be achieved. The various types of hardware and components associated with operation and deployment of the ADS system are discussed below.

2.1.1.3 In-Water Hardware and Components

As part of the four ocean tests, various types of in-water hardware are used for operation of the system. Specific ADS hardware and components are described in Table 2-1.

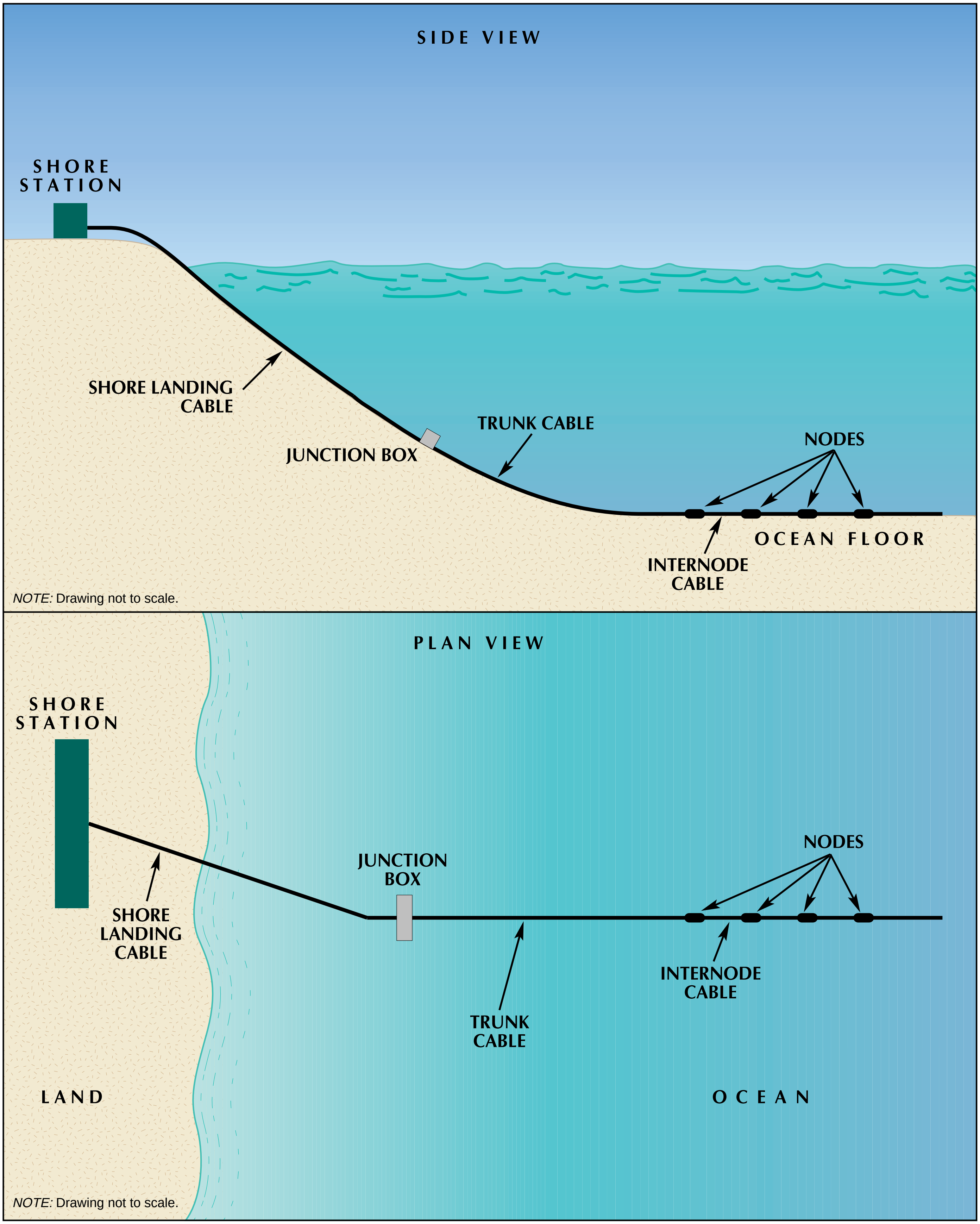


FIGURE 2-1

Advanced Deployable System Concept

2.1.1.4 Installation and Repair Hardware

To install ADS, various installation and repair hardware and components are needed and are described in Table 2-2.

Table 2-1. In-Water Components

Component	Composition	Description
Canisters	Aluminum	Packing containers for the shell.
Shell	Aluminum 50 inches (127 cm) length, 19 inches (47 cm) diameter	Contains hydrophone arrays, pressure vessel, drogue, and internode/trunk cable. Acts as a dispenser for all components during deployment. Once the system is deployed, it houses only the pressure vessel.
Drogue Chute	Nylon	Used to reduce the speed of the shell during installation/deployment.
Drogue Chute Clip	Magnesium and iron (total mass for each clip is approximately 1.1 oz [32.2 g])	A corrodible clip attached to the shell as part of the system to slow the descent of the shell. A total of 28 clips would be used for all four tests.
Pressure Vessel	Pressure resistant, watertight housing	Contains electronic circuit assemblies, fiber optics, and a battery pack. Amplifies sound/electrical signals then transmits along internode and trunk cable.
Hydrophone	Ceramic elements or optical fiber encapsulated in a polyurethane	Series of underwater sound sensors that convert sound signals to electronic signals and transmits them to the pressure vessel.
Battery	Lithium (Tests 1 & 2) Alkaline (Tests 3 & 4)	Powers electronics in pressure vessel and hydrophone arrays.
Array Cable	0.22 inch (0.56 cm) diameter, fiber-optic, copper electrical wires, steel strength members, surlyn jacket	Connects hydrophone arrays to pressure vessel.
Internode/Trunk Cable	0.06 inch (0.15 cm) diameter, fiber-optic (glass), steel strength members, nylon jacket	Transmits optical data from the nodes to the junction box at a point near shore.
Junction Box	Steel (10 ft x 8 ft x 4 ft [3 m x 2 m x 1 m])	Trawl-resistant frame positioned on the ocean floor that connects multiple trunk cables to a shore landing cable.
Shore Landing Cable	0.625 inch (1.6 cm) diameter, 6-fiber armored cable, fiber-optic (glass), steel strength members, polyethylene jacket	Connects junction box to shore station.

Table 2-2. Installation and Repair Hardware

Component	Composition	Description
Towed Deployment Vehicle (TDV)	Steel	Tethered towed device that holds and deploys the major underwater system components.
Remotely Operated Vehicle (ROV)	Aluminum	Tethered and electrically powered, used for inspection and cable retrieval.
Lights	150 and 200 watts	Used on both the TDV and ROV for better visibility for video cameras.
Acoustic Positioning System	N/A	Used on TDV and ROV to monitor position.
Canisters	Aluminum	Packing containers for the shell.

2.1.2 ADS Ocean Tests Description

The DoN is proposing to conduct four ADS ocean tests: Multinode Test (Test 1), Development Test-ID (Test 2), Integrated Deployment Test (Test 3), and All Optical Deployable System Test (Test 4). Each proposed underwater ocean test would utilize the hardware and components previously described for installation and operation of the system. The purpose of the tests would be to evaluate the capability and performance of the entire ADS system. Since certain parameters of these tests are classified, a classified appendix (Appendix A) is provided in order to evaluate potential site-specific impacts associated with the laydown of the system.

2.1.2.1 ADS Ocean Test Activities

ADS ocean test activities would require a maximum of 24 shipboard personnel (16 scientists and 8 crew) and 30 shore station personnel for installation, operation, and retrieval of the system. The proposed tests would occur over a 3-year period. Once the system has been deployed, the maximum number of days of operation for all four tests would be approximately 265 days; however, tests would not occur continually. ADS ocean test activities would incorporate both active and passive acoustic testing. Although ADS is an inherently passive system, artificial low frequency active acoustics must be introduced into the ocean environment to enable testing the system over its full range. A maximum of 1,344 hours (56 days) of active acoustic testing is proposed over the 3-year period. The capability of the system and the hydrophone sensors would also be tested by listening passively to ship traffic in the area. During active acoustic testing of the system, a sound projector would be deployed from the side of a test vessel and would be towed 26-89 ft (8-27 m) behind the vessel. Data processing would take place at the shore station. Table 2-3 provides a summary of each of the four proposed ADS ocean tests.

Activities associated with the four proposed ocean tests would primarily include the following: establishment of the shore station, deployment of the system, operation and inspection of the system, and retrieval of the system.

Table 2-3. Summary of ADS Ocean Tests

Key Test Parameters	Test 1 Multinode Test (MNT)	Test 2 Development Test-ID	Test 3 Integrated Deployment Test (IDT)	Test 4 All Optical Deployable System (AODS)
TEST CHARACTERISTICS				
Maximum Test Period	70 days	150 days	15 days	30 days
Number of Test Vessels	2	2	2	2
Nodes/Fingers	4/1	20/5	1/1	3/1
Total Length of Cable	130 km	550 km	50 km	150 km
Remotely Operated Vehicle	Yes	Yes	Yes	Yes
Battery Type	Lithium	Lithium	Alkaline	Alkaline
Maximum Number of Batteries	4	20	1	3
Shore Station	Yes	Yes	Yes	Yes
Wet-end Inspection and Repair[1]	Yes	Yes	Yes	Yes
Component Retrieval[2]	Yes	Yes	Yes	Yes
ACOUSTIC PARAMETERS				
Maximum Active Acoustic Testing	480 hours	720 hours	48 hours	96 hours
Pulsed Sound Source				
Total Number of Hours of Operation	32 hours	48 hours	8 hours	16 hours
Source Level	120-175 dB	120-175 dB	120-175 dB	120-175 dB
Frequency Range	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz
Signal Duration	0.25 to 10 seconds	0.25 to 10 seconds	0.25 to 10 seconds	0.25 to 10 seconds
Range of Time between Pulses	1.75 seconds to days	1.75 seconds to days	1.75 seconds to days	1.75 seconds to days
Continuous Sound Source				
Total Number of Hours of Operation[3]	448 hours	672 hours	40 hours	80 hours
Continuous Source Level Range	130-170 dB	130-170 dB	130-170 dB	130-170 dB
No. of hours less than 140 dB	335 hours	426 hours	17 hours	50 hours
No. of hours between 140 and 170 dB	113 hours	246 hours	23 hours	30 hours
Frequency Range	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz
Light Bulb Acoustic Tests				
Number of Lightbulb Tests	32	96	16	48
Duration of Pulse for Lightbulb Tests	1.8 ms	1.8 ms	1.8 ms	1.8 ms
Time between Implosions	20-30 minutes	20-30 minutes	20-30 minutes	20-30 minutes

[1] Wet-end inspection and repair would occur only as required.

[2] Plastic clips used to hold shells together in canister would not be retrieved (5 for Test 1, 30 for Test 2). No clips are used for Tests 3 and 4.

[3] The total hours for continuous sound source do not represent constant transmission since some time would elapse between sound source operations.

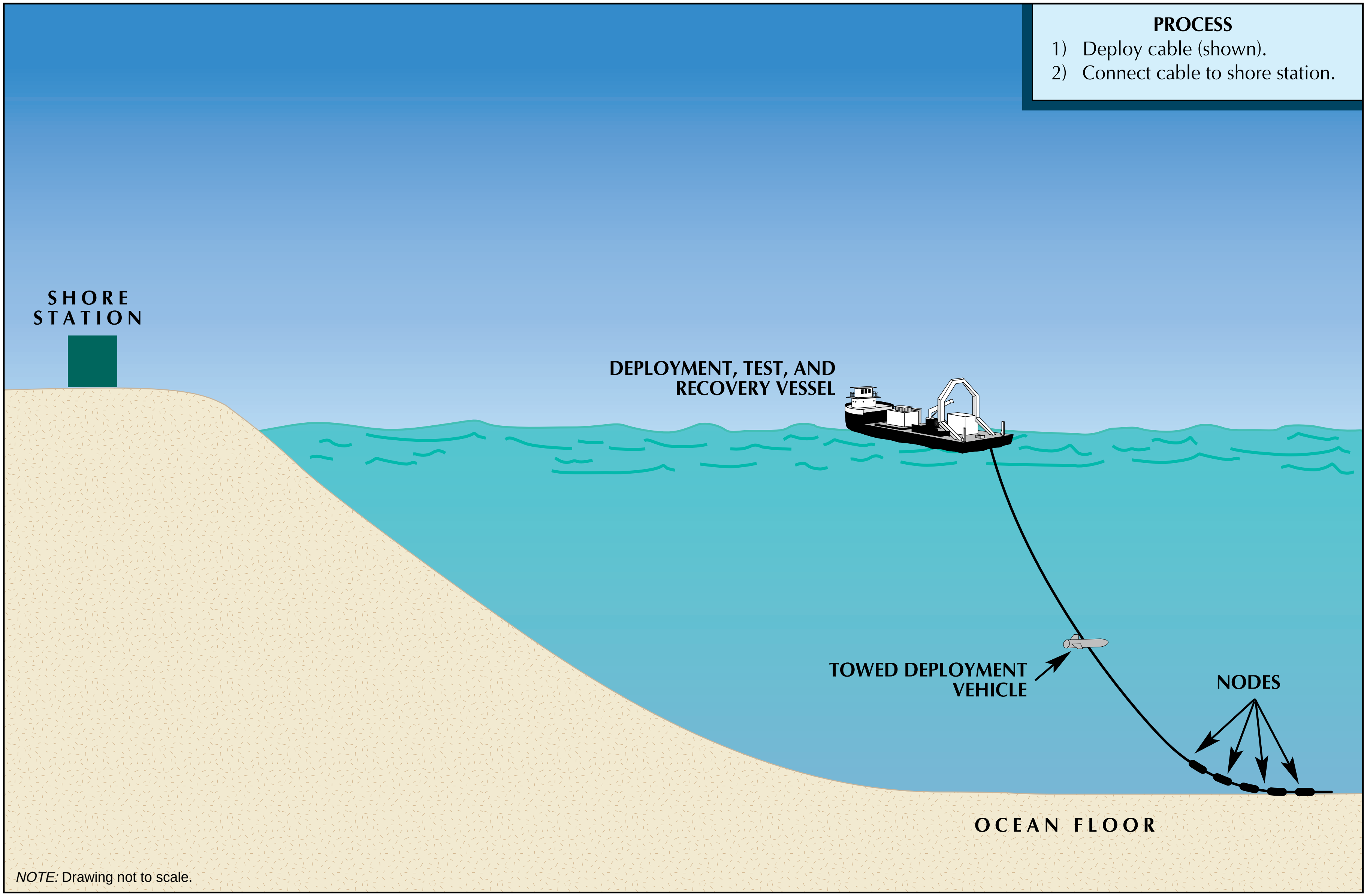
Establishment of the Shore Station

As part of the ocean tests, a temporary land-based shore station would be established and used for receiving, processing, displaying, and storing data. A suitable shore station site would consist of a flat, relatively open area and would have electric power available in its vicinity. Specifically, the shore station site must meet the following requirements:

- It must be close to a Navy/contractor facility;
- An access road for equipment and personnel must be available;
- An area near the shore that could accommodate up to eight support International Standards Organization (ISO)-vans must be available;
- Docking facilities must be nearby;
- It must be a secured, fenced area with limited/controlled access;
- Utilities, such as water, electricity, sewage, and phone lines, must be available; and
- Access to the shore must not be in an area used extensively by the public.

Deployment of the System

Deployment procedures would consist of placing a Towed Deployment Vehicle (TDV) in the water and unreeling an attached cable from the deployment vessel. Typical deployment for ADS is illustrated in Figure 2-2. As the TDV nears the bottom and stable towing conditions are reached, components would be mechanically ejected from the



Typical Deployment for ADS Ocean Test

FIGURE **2-2**

canisters in a pre-loaded sequence. A maximum of 12 canisters would be used for all four tests. As each node sinks to the bottom, its associated array would be stretched out on the ocean floor and would be followed by an internode cable and connected to the next node.

Once the desired test components are deployed on the ocean floor, the internode/trunk cable would be connected to a junction box. The junction box is approximately 10 feet (ft) x 8 ft x 4 ft (3 meters [m] x 2 m x 1 m) and would be set on the ocean floor within 3 miles (5 kilometers [km]) of shore. For deployment of all four tests, a maximum of 547 miles (880 km) of cable would be laid on the ocean floor. A shore landing cable would then be connected from the junction box to the shore station. The cable would be laid at low tide and buried 6 ft (2 m) deep through the intertidal zone. The shore landing cable and junction box would be deployed using the deployment vessel and smaller boats (most likely inflatable Zodiacs) near shore.

As part of the system, a maximum of 4 lithium batteries would be deployed for Test 1 and 20 for Test 2. The batteries would be used to power the pressure vessel and hydrophone array electronics. The main lithium battery assembly would consist of 32 parallel strings of cells with four cells per string. An auxiliary battery would consist of two parallel cells. Both main and auxiliary batteries would share a common housing. Lithium batteries are discussed in detail in Appendix B. Alkaline batteries would be used for Tests 3 and 4.

Operation of the System

Although ADS is a passive acoustic system, active (or not naturally occurring) acoustics would be used during the system's proposed testing. Operation of the system would consist of the following four principal sound sources used during the proposed ADS ocean tests:

- ADS marine test vessels;
- a standard commercial acoustic positioning system;
- lightbulbs; and
- a towed sound source projector.

Test Vessels. Two surface test vessels would be used as part of the proposed activities; however, only one vessel would be deployed at any given time. The test vessels would have deck lights which would provide visibility from between 150-300 ft (46-91 m) at night.

Acoustic Positioning System. The acoustic positioning system is a commercially available projector/hydrophone and standard vessel component used frequently by the oil industry and oceanographic community for bathymetric surveying, ROV operations, and manned submersible operations. It is considered a standard tracking system for locating equipment in water. The acoustic positioning system would be used during deployment and repair of ADS.

The positioning system would consist of two hydrophones, one of which would operate at 186 dB reference 1 micro Pascal meter (re 1 µPa-m) and the other at 192 dB re 1 µPa-m (refer to Section 3.9.1 for an explanation of noise terminology). The interrogation frequency (or how often you transmit to the beacon on the TDV or ROV) is dependent on the activities of the project. This system has similar characteristics to fathometers commonly used on commercial and Navy ships.

Generally, the positioning system would produce brief, high-frequency repetitive pulsed chirp sounds with a maximum sound source level of 192 dB re 1 µPa-m at a repetition rate up to once per second. The frequency would be between 15-18 kHz, and the pulse duration would be about 80 microseconds (ms). The 80 ms "pulse" actually consists of eight 1.2 ms chirps separated by 10 ms gaps, so the actual transmission time is 9.6 ms per "pulse."

Since the acoustic positioning system is a standard commercially available system, no further analysis is required for use of this product.

Lightbulbs. A simple system consisting of imploding lightbulbs to generate acoustic signals would be used during the acoustic testing portion of all ADS ocean tests. The operation would consist of lowering standard, off-the-shelf lightbulbs (for example, a 2.5-inch diameter General Electric 40625/W 40-watt globe) to a specified depth and breaking the lightbulbs, thus creating a short duration impulse on the order of 2 ms. For the ADS ocean tests, a mousetrap would be used to implode the lightbulb. The system would consist of a cable and a set of mousetraps connected to its end. Each mousetrap would have an actuator that releases the trap's spring mechanism and is triggered at the surface using a battery. Each lightbulb would be encased in nylon to facilitate retrieval and to ensure that no glass chards are released into the water. This system is often used as a cost-efficient means to provide a sound source.

The acoustic signature of the imploding lightbulb is shown graphically in Figure 2-3. The underwater pressure signature for this event is characterized by an initial shock pulse followed by a succession of oscillating bubble pulses. The first pressure rise represents the shock wave, followed by a drop in pressure (negative phase), followed by a series of bubble pulses of progressively reduced pressure. In the case of lightbulb implosion, 1.8 ms represents the time interval between positive peaks in the waveform. The energy spectrum would peak broadly at about 550 Hz, consistent with the measured 1.8 ms interval between positive peaks. The bandwidth would be approximately 300-700 Hz, which includes energy densities within about 7 dB re 1 µPa of the peak. Thus, the implosion of one lightbulb would produce a single 1.8 ms pulse at peak pressure. In this case, the peak source level would be 215 dB re 1 µPa-m. The peak pressure in reflected ray paths would not arrive coincidentally with the direct path, preventing any coherent addition. For the ADS ocean tests, there would be a minimum of 20-30 minutes between each lightbulb implosion under all four test scenarios. Therefore, each implosion would be considered an independent acoustic event, given the instantaneous nature of the generated pulse.

A pulsed sound measure, widely used in assessing pulse levels, is the root-mean-square (rms) pressure level over the duration of the pulse. Most studies of marine mammal reactions to pulse sounds have used this rms measure as well as the "average peak pressure." Pulse rms levels are always less than peak pressures but wave shape influences the difference. For simple sinusoidal waves, the difference between the peak and the rms pressure levels is always 3 dB re 1 μPa. For airgun sounds during marine seismic surveys, the difference is typically 10 dB re 1 μPa. Since the lightbulb sound has more rapid rise and fall times, there would probably be a greater difference between the peak and rms pressure levels. Assuming a 15 dB re 1 μPa difference, the rms pulse levels versus distance can be estimated from the following equation where r (distance) is in meters:

$$\text{Received Level (dB re 1 } \mu Pa_{rms}) = 200 - 20 \log(r)$$

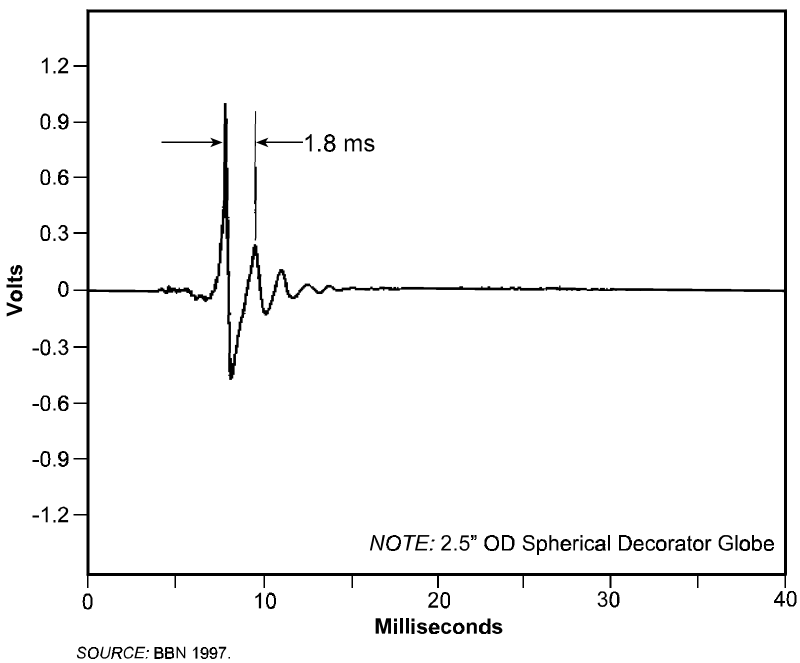


Figure 2-3. Acoustic Signature of Spherical Globe Implosion at 300-Foot (90-m) Depth

At greater distances, the spreading loss rate probably approaches 10 log(r) (i.e., approaching cylindrical spreading) but scattering and absorption effects will dramatically increase the losses. According to this equation, the level at a distance of 66 ft (20 m) is expected to be 174 dB re 1 μPa_{rms} and at a distance of 328 ft (100 m) it would be 160 dB re 1 μPa_{rms}. These levels are conservative since shockwaves are dispersive (the signal changes shape, increasing in duration as it travels out from the source, and thus decreasing the peak levels rapidly). Pressure measurements are not directly comparable to energy-based measures because energy is proportional to duration. Thus, a small pressure over a long time can have the same energy as a high pressure over a short time.

A maximum of 192 lightbulbs would be imploded under all four tests (refer to Table 2-3). To test the ADS array, lightbulbs would be placed past the end of the array, so that the signal could be tracked as it moved down the array from sensor to sensor. This also would provide a means for checking the location of the hydrophones.

Towed Sound Source. A U.S. Navy Underwater Sound Reference Detachment sound projector (model J15-1) is proposed for use during the proposed ADS ocean tests. According to its specifications, this projector is capable of transmitting tonals at sound source levels shown in Table 2-4.

Table 2-4. Underwater Sound Source Levels for Sound Projector

	J15-1 Sound Source Levels at 3 amps			
Frequency	**100 Hz**	**400 Hz**	**700 Hz**	**1,000 Hz**
dB re 1 µPa at 1 meter from sound source	175	171	169	163

The towed source would have two modes of operation: a pulsed mode and a continuous mode. The maximum amount of time proposed for all four tests for pulsed sound source (maximum of 175 dB re 1 µPa-m) testing is 104 hours. Maximum proposed continuous sound source testing in 1,240 hours (828 hours at less than 140 dB re 1 µPa-m and 412 hours at no greater than 170 dB re 1 µPa-m). A support vessel would be used to tow a sound source at various depths and distances from the hydrophone array to test its listening capabilities. The sound source would be towed at speeds up to 2-7 mph (2-6 knots). The maximum sound source level would be 175 dB re 1 µPa-m in waters deeper than 200 ft (61 m). The towed sound source projector would not be used in waters 200 ft (61 m) or less in depth. In addition, all active acoustic transmission would cease if divers or dive flags are observed within 0.5 mile (1 km) of the test vessel.

For purposes of analysis in the EA, the proposed frequency range for the ADS ocean tests is 20-1,000 Hz (refer to Table 2-3). However, the majority of testing specifically for low frequency occurs above 50 Hz. When the frequency is below 50 Hz, the maximum sound source level would be limited to 130 dB re 1 µPa-m.

As shown in Table 2-5, using 20 log r (which is an accepted approximation of source level measured at a given distance), received sound levels at a maximum 170 dB re 1 µPa-m continuous transmission would diminish to 160 dB re 1 µPa at about 10 ft (3 m), to 140 dB re 1 µPa at 105 ft (32 m), and 120 dB re 1 µPa at 1,050 ft (320 m). When the source level is at a maximum 175 dB re 1 µPa-m for pulsed transmission, received sound levels would diminish to 160 dB re 1 µPa at 20 ft (6 m), to 140 dB re 1 µPa at 184 ft (56 m), and to 120 dB re 1 µPa at 1,800 ft (560 m).

Table 2-5. Predicted Received Sound Levels Relative to Distance from Sound Source

	Received Sound Levels		
Source Level	**120 dB**	**140 dB**	**160 dB**

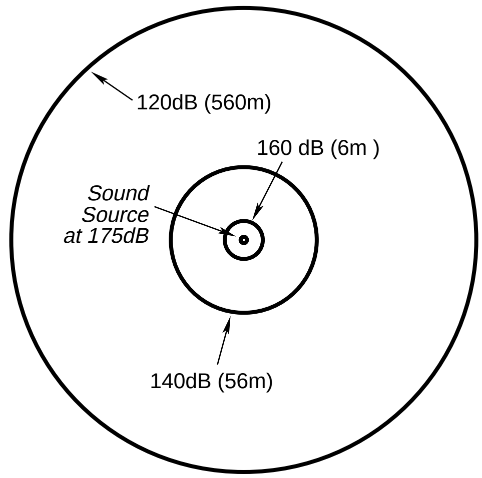
175 dB (pulsed)	1,800 ft (560 m)	184 ft (56 m)	20 ft (6 m)
170 dB (continuous)	1,050 ft (320 m)	105 ft (32 m)	10 ft (3 m)

During ADS ocean tests, a sound source would be towed along predetermined paths. Potential impacts of sound on marine life depends partly on whether sounds are pulsed or continuous. An animal's response to a pulsed sound with a particular peak level can be quite different than its response to a continuous sound at the same level (Richardson et al. 1995). Corresponding zones of ensonification for maximum pulsed and continuous sound source levels for day and night operations that would affect fish and marine mammals are depicted on Figure 2-4. Potential acoustic impacts on fisheries and marine mammals are discussed in Sections 4.4 and 4.5, respectively.

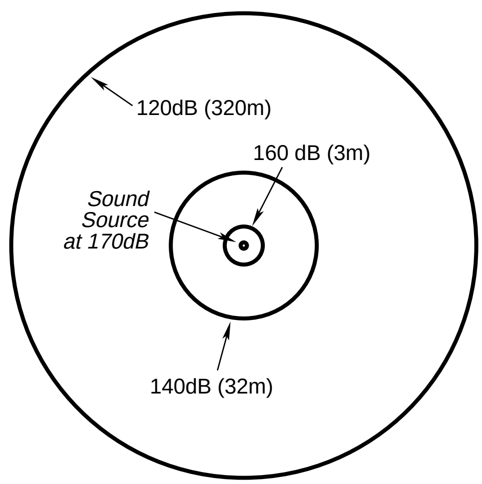
Inspection of the System

To inspect and repair the system, wet-end inspection and repair equipment (WIRE) would be utilized during the ocean tests. The WIRE would include deck handling equipment, internode splicing equipment, and a ROV that would be used for underwater inspections and cable retrieval. Specifically, the ROV would be used to locate a node (which would serve as a reference point) and inspect the cable for a repair; the internode cable would be cut at that point. A buoy, attached to the end of the cable, would be used so the cable could be brought to the surface and subsequently brought aboard the deployment vessel. Repairs would be made by splicing the cable using the WIRE's splicing system. The "repaired" cable would then be re-placed on the ocean floor. The ROV would be equipped with an acoustic positioning system as well as a camera and lights.

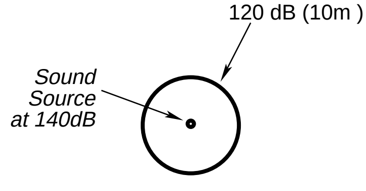
Estimated Zones of Ensonification at 175dB Pulsed Sound Source (Day/Night Operations)



Estimated Zones of Ensonification at 170dB Continuous Sound Source (Day-Only Operations)



Estimated Zones of Ensonification at 140dB Continuous Sound Source (Night Operations)



Note: All radial distances based on 20 log r.

NOT TO SCALE

FIGURE 2-4

Estimated Zones of Ensonification for ADS Ocean Tests at Maximum Levels

Retrieval of the System

The ROV would be used to cut the cables and attach retrieval lines to the nodes. The lines would be used to haul sections of the cable and nodes aboard. A hydraulic winch on the deployment vessel would be used to raise cables and other in-water hardware components. Retrieval of all components would occur after completion of Tests 1 and 2. The system components would then be re-deployed for Test 3, retrieved after Test 3, re-deployed for Test 4, and retrieved following Test 4. Retrieval of the components would occur within 6 months of completion of each test; however, the shore landing cable would be installed prior to Test 1 and remain in place during all four tests and be retrieved only upon completion of Test 4.

2.2 ALTERNATIVES ANALYSIS

The types of alternatives considered in this EA include alternatives that meet the testing need, alternative ocean test sites that meet testing objectives, alternative shore station locations, and no action

2.2.1 Alternatives to the ADS Ocean Tests

The only alternative to acquiring data through the four proposed ADS ocean tests is to obtain the needed information through laboratory testing. However, this alternative does not meet the objectives of the tests since real-world conditions are necessary to validate ADS capabilities. Several test and performance parameters in the ADS design cannot be simulated in the laboratory. For example, the TDV must be towed underwater at a combination of depths and speeds. Shells need to be deployed from the TDV and arrays and cables must be released under real-world oceanic conditions (e.g., variable currents, pressure gradients, bottom topography, etc.). The system's underwater listening capabilities must also be tested at full-scale in an ocean environment. In addition, it is impossible to demonstrate ADS's potential U.S. Navy Fleet use in a laboratory. Since laboratory testing does not meet the purpose and need of the ADS system acquisition, this alternative is not carried forward for analysis in this EA.

2.2.1.1 ADS Ocean Tests Operational Criteria and Siting Process

Systematic operational criteria were analyzed to determine reasonable site locations for conducting the ocean tests that would meet the purpose and need of ADS. The siting process involved the development of specific operational siting criteria based on test objectives, which included the following:

- operational realism (adequate laydown area and operational depth)/ performance measurability;
- survivability (weather conditions/level of fishing/terrain);
- scheduling (low potential for schedule change);
- availability (accessibility); and
- supportability.

Once these operational siting criteria were identified, various regions were considered in a tiered analysis to evaluate potential locations for conducting ADS ocean tests. Operational siting criteria were first used to eliminate general areas from further consideration and to compare the advantages and disadvantages of potential site alternatives. Sites considered included the following:

- foreign sites;
- sites within U.S. coastal waters; and
- sites along the west coast of the CONUS.

Initially, foreign sites were considered; however, these sites did not meet all the operational criteria. Due to the high potential for schedule changes, equipment damage associated with weather, uncertain political atmosphere, unknown environmental variables, excessive costs, and security concerns associated with the classified nature of the project, foreign sites were deemed unreasonable for implementation of the ADS system. Since effective testing requires relatively stable conditions, foreign sites were not carried forward for further analysis in this EA.

In the next tier of analysis, U.S. coastal waters were identified as the only viable siting option; however, coastal waters off Alaska were eliminated due to extreme weather conditions. The east coast, Hawaii, and the Gulf Region did not meet all of the operational siting criteria and therefore were not carried forward for further analysis in this EA. Based on the tiered analysis, the west coast was identified as the only area that met all operational criteria for implementation of the ADS ocean tests (Table 2-6).

Once the west coast of CONUS was identified as the most reasonable area within which to conduct the ADS ocean tests, specific site locations that could meet the objectives were evaluated based on the more detailed operational and environmental siting criteria presented below. These criteria were first used to determine the characteristics of proposed test locations and whether these locations could meet specific test objectives:

- adequate laydown area and operational depth;
- ambient acoustics;
- shipping traffic;
- moderate fishing threat;
- ocean bottom (roughness/slope);
- weather conditions; and
- proximity to Navy/contractor assets.

Using the more detailed siting criteria, three candidate ADS ocean test sites along the west coast of CONUS were identified: northern site (Puget Sound), Pacific Northwest, and southern California. Only the Pacific Northwest and southern California sites satisfied all required operational criteria (Table 2-7).

Table 2-6. Proposed ADS Ocean Tests Operational Criteria

Criteria	Alternative Locations			
	West Coast	**East Coast**	**Hawaii**	**Gulf Region**
Operational Realism/ Performance Measurability	Adequate laydown area and operational depth	Too shallow to meet performance criteria	Nearshore too deep to meet performance criteria	Adequate laydown area and operational depth
Survivability	Predictable weather conditions, moderate fishing threat	Subject to severe weather, heavy fishing, and rugged coastline-more than moderate risk	Predictable weather conditions, moderate fishing threat	Subject to severe weather, heavy fishing-more than moderate risk
Scheduling	Low potential for schedule change	Potential schedule changes due to weather	Potential schedule changes	Potential schedule changes due to weather
Availability	Location physically accessible to Fleet	Location physically accessible to Fleet	Accessible to Fleet, but long transit time of the test assets	Accessible to Fleet, but long transit time of the test assets
Supportability	All necessary amenities available on site	All necessary amenities available on site	All necessary amenities available on site	All necessary amenities available on site

Table 2-7. Comparison of West Coast Ocean Test Sites/Operational Criteria

Operational Criteria	Northern Site (Puget Sound)	Pacific Northwest Site	Southern California Site
Laydown Area	Inadequate	Adequate	Adequate
Operational Depth	Medium variability	High variability	High variability
Ambient Acoustics	Represents operational environment	Represents operational environment	Represents operational environment
Shipping Traffic	Heavy	Medium to light	Medium
Moderate Fishing Threat	Heavy fishing	Medium to heavy fishing	Medium fishing
Ocean Bottom (Roughness/Slope)	Variable, real-world conditions	Variable, real-world conditions	Variable, real-world conditions
Weather Conditions	Periods of heavy weather	Generally predictable, but periods of heavy weather	Predictable
Proximity to Navy/ Contractor Assets	Adequate	Adequate	Adequate

2.2.2 ADS Ocean Test Locations

Southern California is the preferred location due to the lower threat from fishing industry and less potential for periods of heavy weather. In addition, the shore station would be located on a military installation in a secured area, whereas portions of the Pacific Northwest alternative would be located on a public beach and in a private facility. Although the Pacific Northwest is a reasonable alternative, it is not the preferred alternative for reasons discussed above.

2.2.2.1 Proposed Location

The area proposed for conducting the ADS ocean tests would be located within the marine environment of southern California, between Point Conception and the U.S.-Mexican border. The proposed footprint area encompasses the California Channel Islands (Figure 2-5). The laydown of the system would occur within a portion of the footprint area; however, the specific laydown location of the system is classified and details are contained in a separate submittal, Appendix A.

<u>Exclusion Areas</u>

To avoid potential environmental and operational conflicts, laydown and operation of the ADS system would not occur within exclusion areas discussed below and shown in Figure 2-5.

Marine Sanctuaries. Currently, a 6 nautical mile (nm) (11 km) boundary exists around the Channel Island National Marine Sanctuary (San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara islands). As part of the proposed project, the existing 6 nm sanctuary boundary plus a 1 nm buffer area around the sanctuary has been established as an exclusion area. This is due to the area's high percentage of recreational activities and sensitive land use, cultural, and biological resources in the area.

Islands. A 3 nm (6 km) buffer area around San Nicolas, Santa Catalina, and San Clemente islands was identified as an exclusion area due to existing recreational activities and sensitive land use, cultural, and commercial fishing resources.

Sea Banks. Areas containing sea banks were identified as exclusion areas due to commercial fishing resources, cultural resources, and potential operational constraints associated with the laydown of the system.

Known Dump Sites. Exclusion areas were established around known dump sites due to potential operational constraints associated with the laydown of the system.

To eliminate potential risk of acoustic exposure to SCUBA divers, no active acoustics would be projected in waters less than 200 ft (61 m) in depth (refer to Figure 2-5). In addition, all active acoustic transmission would cease if divers or dive flags are observed within 0.5 mile (1 km) of the test vessel.

2.2.2.2 Alternative ADS Ocean Test Location

The alternative ADS ocean test site would be located within the marine environment of the Pacific Northwest, between Grays Harbor, Washington, and just south of Heceta Head, Oregon (Figure 2-6). The laydown of the ADS system would occur within a portion of the footprint area; however, the specific laydown of the system is classified and details are contained in a separate submittal, Appendix A.

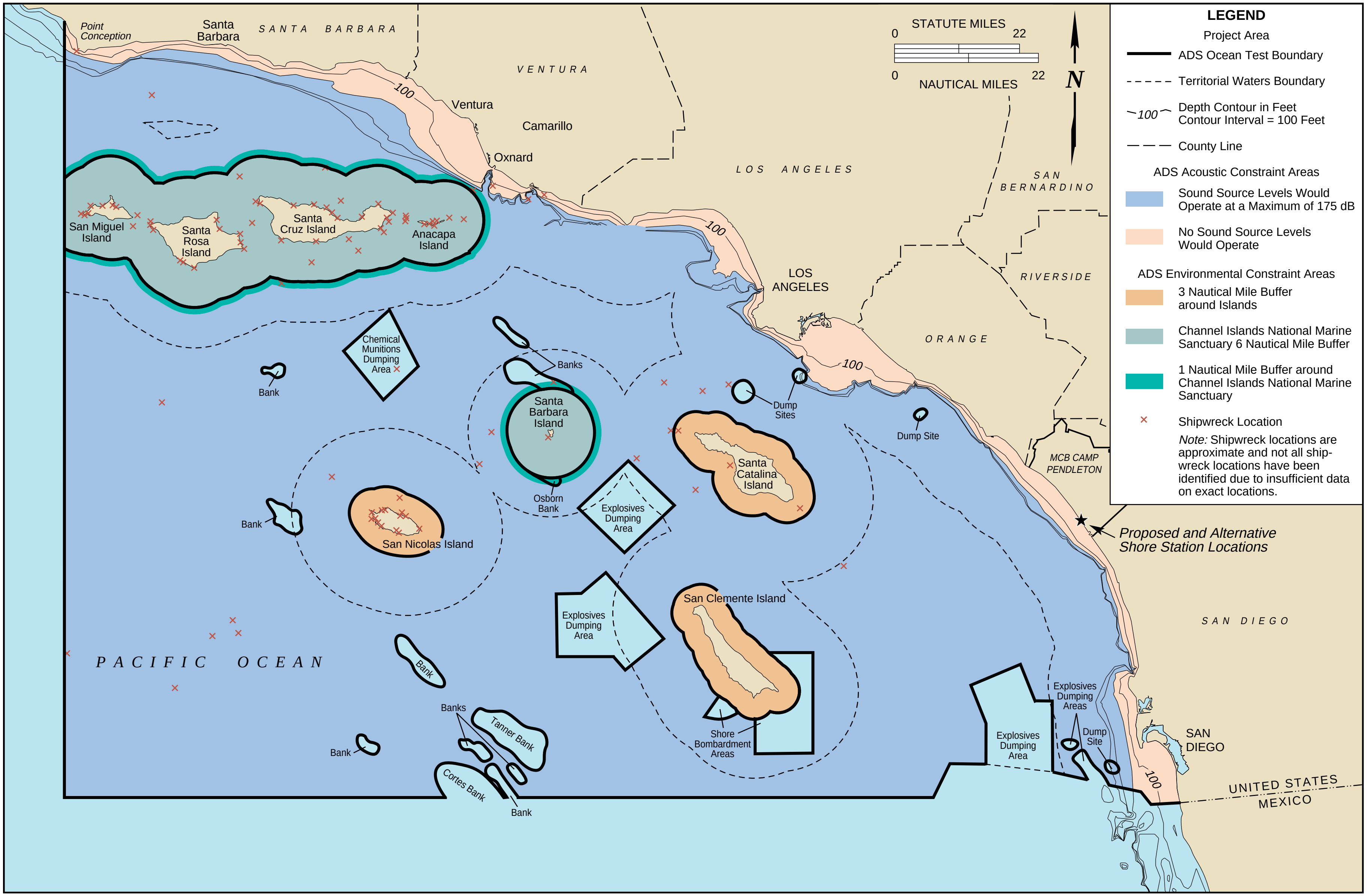
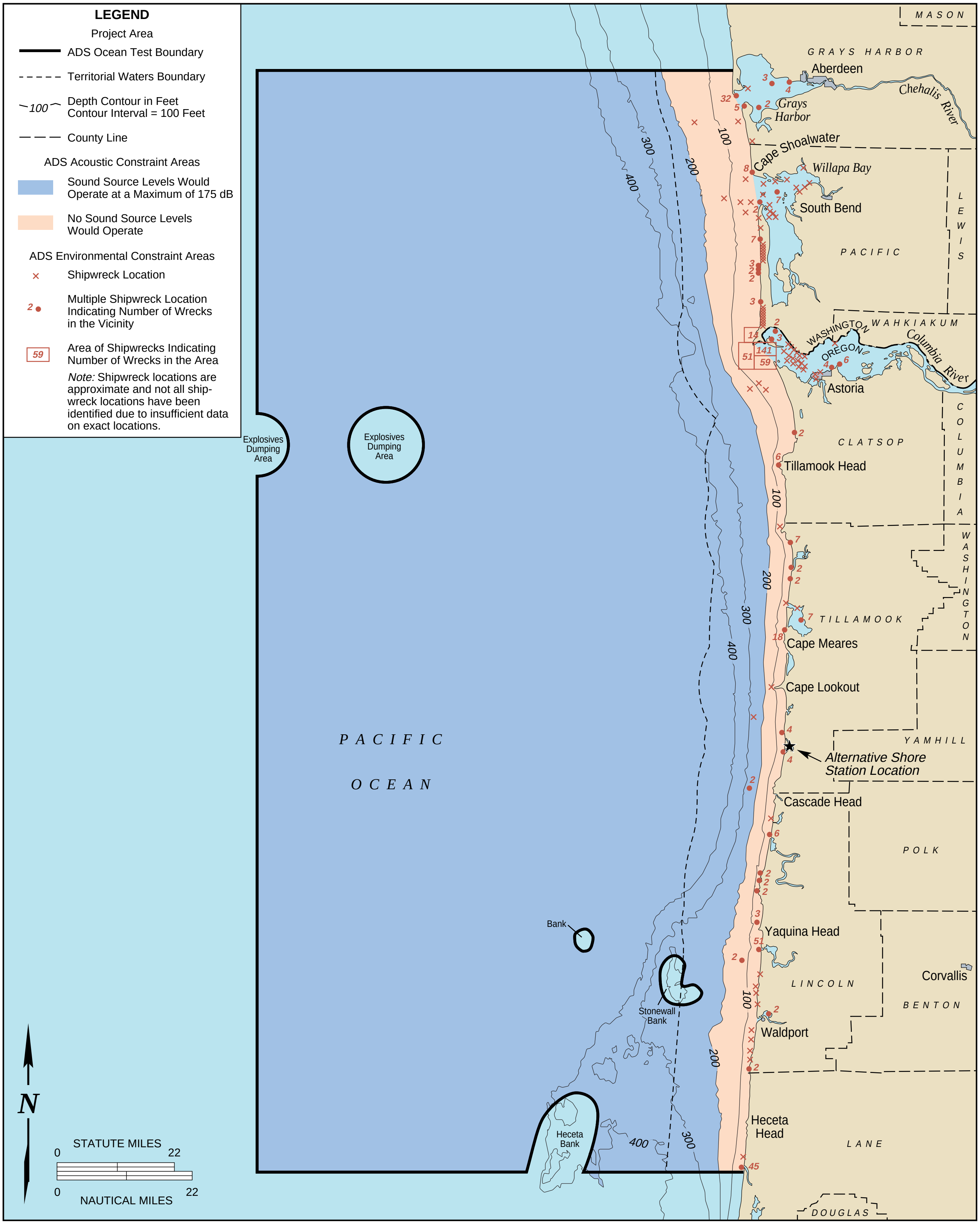


FIGURE 2-5

Proposed ADS Ocean Test Location



F I G U R E

2-6

Alternative ADS Ocean Test Location

Exclusion Areas

Various environmental and operational constraints, similar to those identified for the proposed action, exist within the alternative ADS ocean test site area and have been identified as exclusion areas (refer to Figure 2-6). ADS installation and operation would not occur within these designated exclusion areas.

2.2.3 ADS Shore Station Locations

In support of the ADS ocean tests, a temporary shore station site would be used for processing and analysis of data. A suitable shore station site would be a flat, relatively open area capable of handling up to eight ISO-vans, and would have electric power available in its vicinity.

Shore station sites were identified at each potential ADS ocean test site location (two sites at Marine Corps Base [MCB] Camp Pendleton, California, and one site at Pacific City, Oregon). The following discussion provides a detailed description of the proposed and alternative shore station sites.

2.2.3.1 Proposed Shore Station Location

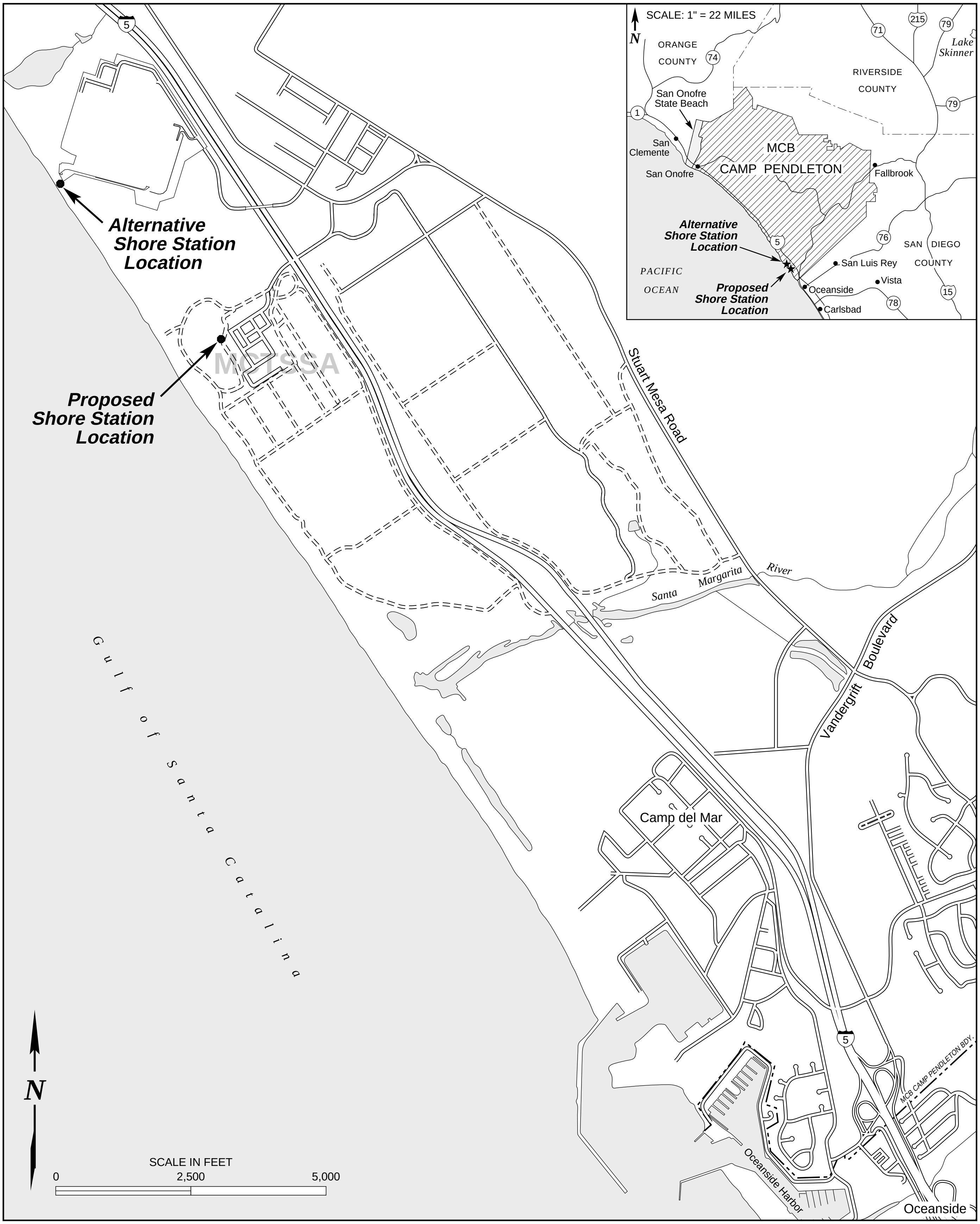
As part of implementation of the ADS ocean tests, a temporary shore station is proposed and would be used for receiving, processing, displaying, and storing data from the in-water hardware. The proposed shore station would be located within MCB Camp Pendleton property boundaries (Figure 2-7).

The proposed shore station site would be located on approximately 0.5 acres (0.2 hectare) within a previously disturbed area adjacent to the Marine Corps Tactical Systems Support Activity (MCTSSA) facility (Figure 2-8). An existing road would be used to provide access to the site. The site currently has ample space to park up to eight support ISO-vans. However, in order to utilize the site, an area of approximately 23,250 square feet (ft^2) (2,160 square meters [m^2]) would require grading to accommodate access and parking for the ISO-vans. Proposed improvements and grading activities would occur over a period of one week. In addition, the proposed shore station site would require the following improvements:

- upgrade existing access road (Grade 2 gravel);
- redirect and widen existing access road by 5 ft (1.5 m), (15 ft [4.5 m] at the curve);
- install security fencing around the proposed site;
- place gravel within the proposed fenced area; and
- construct a concrete slab to accommodate the support ISO-vans.

To use the shore station for receiving and processing the data associated with the ADS ocean tests, a cable must be connected from an offshore junction box to the shore station site. Installation of the cable would require trenching and backfilling across the beach and into the surf zone to bury the cable. Approximately 111 yd^3 (85 cubic meters [m^3])

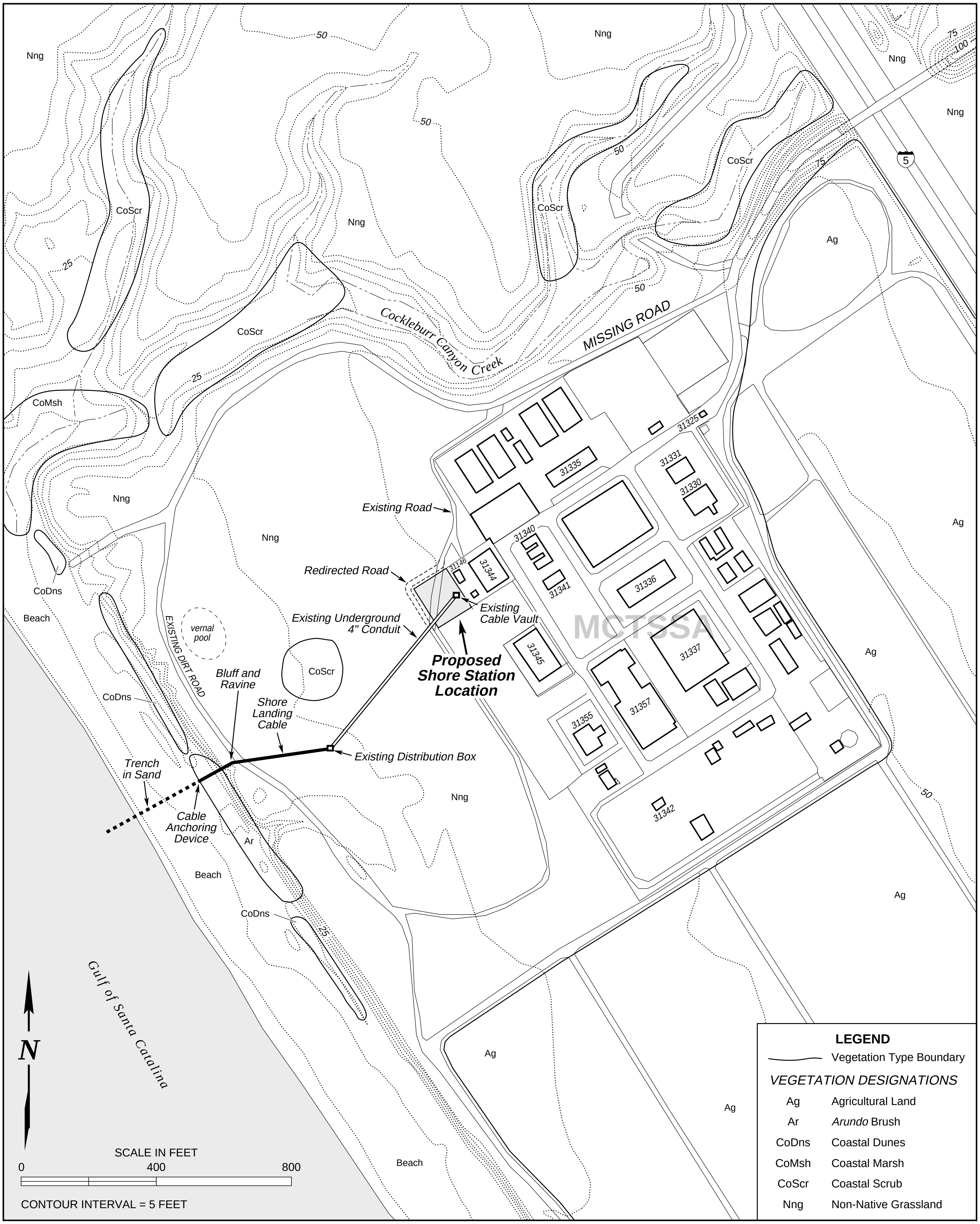
of sand would be trenched (89 yd^3 [68 m^3] along the beach and 22 yd^3 [17 m^3] in the tidal area) and then be used to bury the cable. The cable would be laid and buried at low tide about 6 ft (2 m) deep through the intertidal zone. The trench across the beach would be a maximum of 250 ft (76 m) in length and 2 ft (0.6 m) wide. From the beach, the cable



FIGURE

2-7

Proposed and Alternative Shore Station Locations
MCB Camp Pendleton, California



Proposed Shore Station Location
MCB Camp Pendleton, California

FIGURE **2-8**

would then be laid on the ground (uncovered) until it reached an existing distribution box and conduit. Prior to reaching the existing distribution box, the cable would be trenched under the existing dirt road. At that point, the cable would be placed in the 4-inch (10-cm) conduit and run through to the proposed shore station (refer to Figure 2-8).

2.2.3.2 Alternative Shore Station Locations

Pacific City Alternative

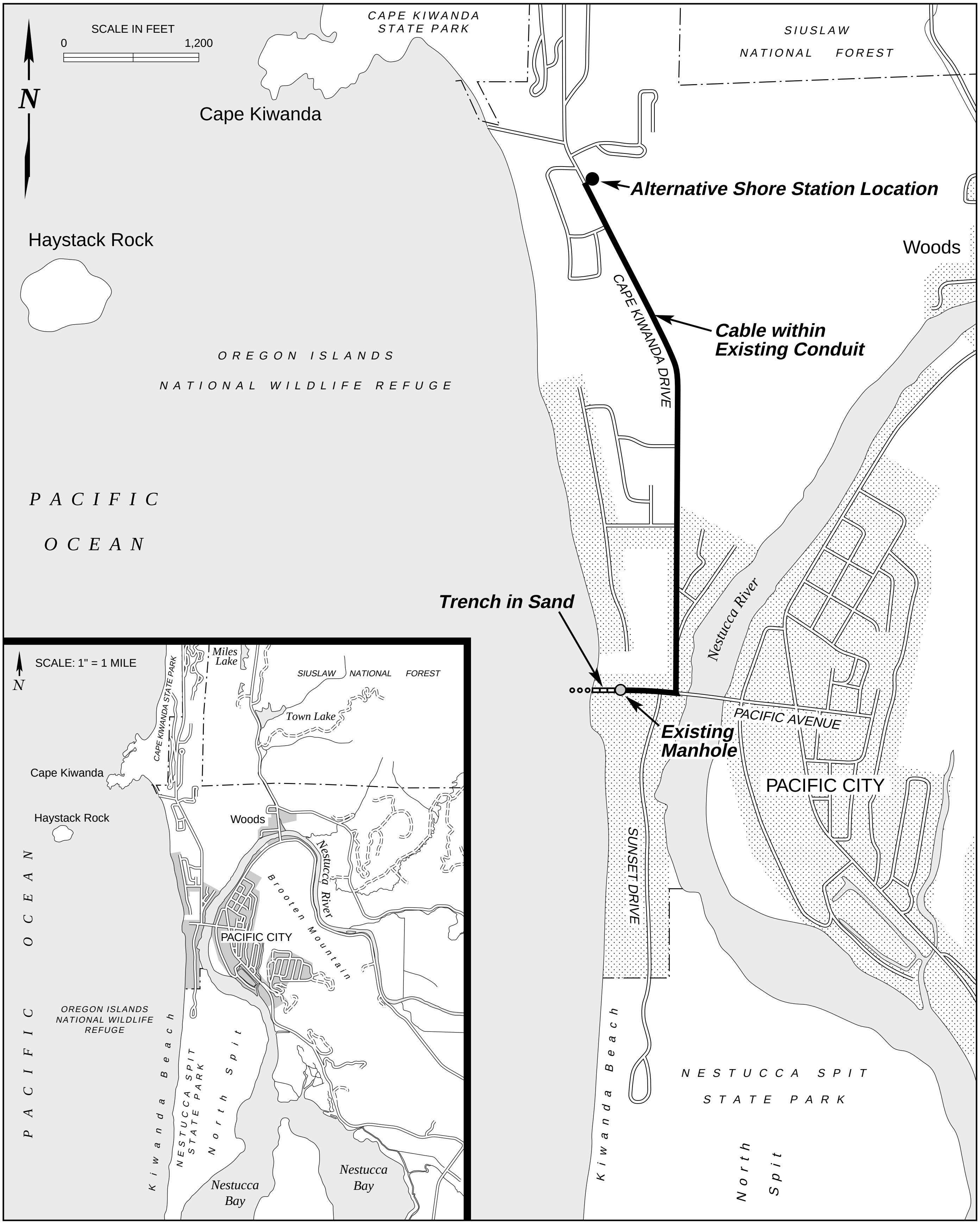
The alternative shore station would be located within the unincorporated boundaries of Pacific City, Oregon (Figure 2-9). This alternative shore station site would be used to support data receiving and processing for the Pacific Northwest ADS ocean tests alternative site. Under this alternative, the shore station would be located within a fenced facility compound with limited access to the public. The site is presently used as a telecommunications facility and has ample space to park up to eight support ISO-vans. Implementation of this alternative would require placement of the cable from the junction box to the shore station. Placement of the cable would require trenching and backfilling from the tidal zone and across the beach to an existing manhole and conduit located at the entrance to a public beach. The cable would be laid in the trench at low tide and buried about 6 ft (2 m) deep from low-water depth to the tidal zone. Approximately 111 yd^3 (85 m^3) of sand would be trenched (89 yd^3 [68 m^3] along the beach and 22 yd^3 [17 m^3] in the tidal area) and then used to bury the cable. The trench across the beach would be a maximum of 250 ft (76 m) in length and 2 ft (0.6 m) wide. From the beach, the cable would be placed in the existing conduit (at the manhole) and run through the conduit along the Cape Kiwanda Drive right-of-way to the facility compound. No improvements to the facility would be required with implementation of the alternative shore station site.

MCB Camp Pendleton Alternative

Under this alternative, a temporary shore station would be located within MCB Camp Pendleton property boundaries near the existing Assault Craft Unit-5 control tower at the Landing Craft Air Cushion (LCAC) facility (refer to Figure 2-7). An existing road currently provides access to the site, and ample room exists to park up to eight support ISO-vans. Implementation of this alternative would require placement of a utility line along the existing access road to the site. This would require trenching of an area approximately 3,200 ft^2 (297 m^2) along the existing access road for placement of the utility corridor. Additional improvements would consist of the following:

- surface grading (approximately 0.5 acres [0.2 hectares]);
- installation of security fencing around the proposed site;
- placement of gravel within the fenced area; and
- construction of a concrete slab to accommodate the support ISO-vans.

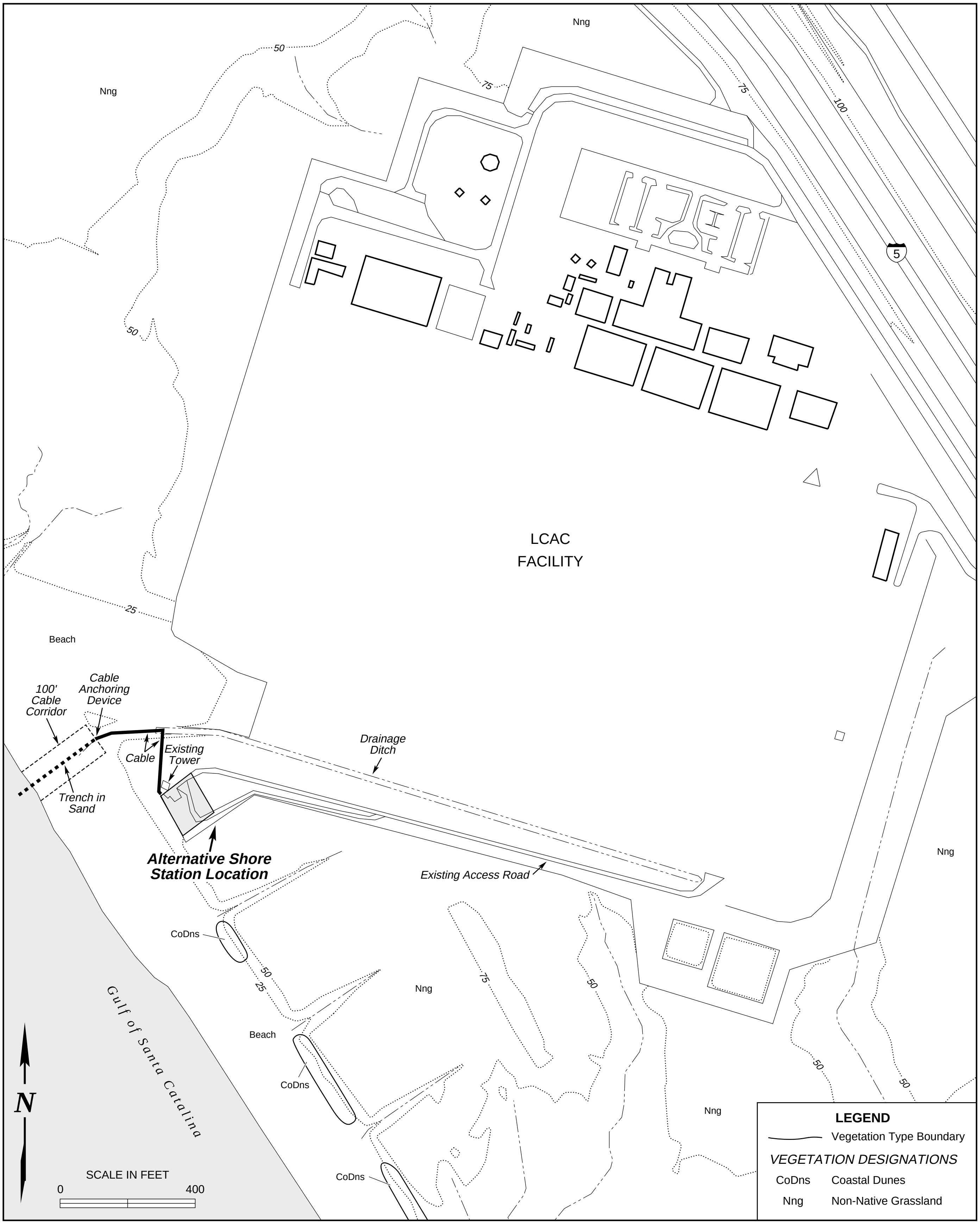
The shore station would be located adjacent to the existing tower in a relatively disturbed area (Figure 2-10). Placement of the shore landing cable from the junction box to the shore station under implementation of this alternative would require trenching through the intertidal zone and across the beach to bury the cable. Trenching activities and quantities would be the same as those described for the proposed shore station. From the beach, the cable would be laid on the ground (uncovered) and along an existing drainage ditch. At the top of the slope, the cable would be laid along an existing fence line until it reached the shore station site.



Alternative Shore Station Location
Pacific City, Oregon

FIGURE

2-9



Alternative Shore Station Location
MCB Camp Pendleton, California

FIGURE **2-10**

2.2.4 No-Action Alternative

Under this alternative, the proposed action would not be implemented and the purpose and need would not be met. The result of not conducting these tests would impact the DoN's ability to meet mission objectives. ADS acquisition would be interrupted or possibly eliminated because design verification/validation tests would not occur. In addition, since ADS was created in direct response to an identified, documented, and validated mission need, the DoN's objective of developing a proven littoral undersea surveillance system would not be met. Nevertheless, in compliance with NEPA, the No-Action Alternative is carried forward for analysis in this EA.

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CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes relevant existing environmental conditions for resources potentially affected by the proposed action and alternative ocean test sites and shore station sites. In compliance with guidelines contained in NEPA, CEQ regulations, and the DoN procedures for implementing NEPA, the description of the affected environment focuses only on those aspects potentially subject to impacts.

3.1 GEOLOGY, TOPOGRAPHY, AND SOILS

3.1.1 Background

Geological resources of an area typically consist of surface and subsurface materials and their inherent properties. Principal geological factors influencing the ability to support structural development are seismic properties (i.e., potential for subsurface shifting, faulting, or crustal disturbance), soil stability, and topography.

The term soil generally refers to unconsolidated materials overlying bedrock or parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support man-made structures. Soils are typically described in terms of their complex type, slope, physical characteristics, and relative compatibility or constraining properties with regard to construction activities and types of land use.

3.1.2 ADS Shore Station Locations

3.1.2.1 Proposed Shore Station Location

Geology

The proposed shore station site, located at MCB Camp Pendleton, California (refer to Figure 2-8), is underlain by Pleistocene marine terrace deposits. These deposits consist of alluvial material within sedimentary formations, which are common along the coast of northern San Diego County. Marine terrace deposits are typically undercut by wave action along the shoreline, causing the formation of coastal bluffs (California Division of Mines and Geology [CDMG] 1975).

There are no known active or potentially active faults crossing the proposed shore station site. Regional fault systems that would potentially affect the site in the event of a major earthquake include the Elsinore, San Jacinto, and San Andreas faults, all of which extend in a northwest to southeast direction east of the site.

Topography

The proposed shore station site is located atop a predominantly flat marine terrace, with about a 2 percent slope. The site is located approximately 40 ft (12 m) above mean sea level (MSL). No steep slopes (i.e., slopes greater than 25 percent) or other significant topographic features are located on the site.

The marine terrace transitions to the beach in a steep bluff, approximately 1,000 ft (305 m) west of the proposed shore station site. The bluff extends from 15 ft (5 m) to 35 ft (11 m) above MSL, with a 50 percent slope. The beach below the bluff extends approximately 250 ft (76 m) into the ocean.

Soils

Soils at the proposed shore station site are classified under the Marina Series and are characterized as marina loamy coarse sand. This soil type is typically used for agricultural purposes; however, due to proximity to the coast and the soil characteristics, the majority of the Marina Series soils have been developed for residential uses. Prior to its incorporation into the military reservation, the proposed site was historically used for agricultural purposes (U.S. Department of Agriculture [USDA] 1973).

3.1.3 Alternative Shore Station Locations

Pacific City Alternative

Geology

The alternative shore station site, located within the unincorporated boundaries of Pacific City, Oregon (refer to Figure 2-9), is underlain by unconsolidated surficial geologic units dominated by beach sands. Extensive sand dunes are located directly north of the site, also a result of alluvial deposits from the river.

There are no known active or potentially active faults crossing the alternative shore station site. In addition, no significant fault systems are known to occur in the region and no landslides or other geologic hazards occur on the property (Oregon State Department of Geology and Mineral Industries [ODGMI] 1972).

Topography

The alternative shore station site is located on a predominantly flat alluvial terrace, with about a 1 to 2 percent slope. The site is located approximately 20 ft (6 m) above MSL. No steep slopes (i.e., slopes greater than 25 percent) or other significant topographic features are located on the site.

Soils

Soils at the alternative site are characterized as active dune land. Dune land consists of sand in ridges and intervening troughs that shift with the wind. This soil type is not suitable for most plant species and is essentially barren. Soil characteristics include severe seepage, minimal slope, and high erosion potential. Fill soils have replaced most naturally occurring soils at the site in order to enable existing development (USDA 1964).

MCB Camp Pendleton Alternative

The alternative shore station site at MCB Camp Pendleton is located approximately 1 mile (1.6 km) north of the proposed shore station site (refer to Figure 2-7). The site is developed and soils in the area consist of unknown fill materials. Geologic features, topography, and soils are similar to those described under the proposed shore station site.

3.2 AIR QUALITY

3.2.1 Background

Air quality is defined by ambient air concentrations of specific pollutants as determined by the U.S. Environmental Protection Agency (USEPA) to be of concern with respect to the health and welfare of the general public. Air quality standards have been established on the federal, state, and local level.

The USEPA is the agency responsible for enforcing the federal Clean Air Act (CAA) of 1970 and its 1977 and 1990 Amendments. The purpose of the CAA is to establish National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), particulate matter less than 10 microns (PM_{10}), and lead (Pb). Furthermore, its purpose is to classify areas as to their attainment status relative to the NAAQS, to develop schedules and strategies to meet the NAAQS, and to regulate emissions of criteria pollutants and air toxics to protect the public health and welfare. Ozone is not typically the result of direct emissions, but the result of complex chemical reactions between O_3 precursors and promoted by sunlight. Therefore, pollutants that are regulated in O_3 nonattainment areas are the O_3 precursors for reactive organic compounds (ROC) and oxides of nitrogen (NO_x). The 1990 CAA established new deadlines for achievement of the NAAQS, dependent upon the severity of nonattainment. Under the CAA, individual states are allowed to adopt ambient air quality standards and other regulations, provided they are at least as stringent as federal standards. The State of California has developed the California Ambient Air Quality Standards (CAAQS). Both Washington and Oregon adhere to the federal standards. NAAQS and CAAQS are shown in Figure 3-1.

The USEPA requires each state to prepare a State Implementation Plan (SIP), which describes how that state will achieve compliance with the NAAQS. A SIP is a compilation of goals, strategies, schedules, and enforcement actions that will lead the state into compliance with all federal air quality standards. Each change to a compliance schedule or plan must be incorporated into the SIP. Unlike other states, California's SIP consists of separate elements for each air basin, depending on the attainment status of that air basin.

Clean Air Act Conformity Determination

In 1993, the USEPA instituted final rules for determining general conformity of federal actions with state and federal air quality implementation plans. Section 176(c) of the

CAA, the General Conformity Rule, requires federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the applicable implementation plan. To demonstrate conformity with the CAA, a project must clearly demonstrate that it does not (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard, any required interim emission reductions, or other milestones in any area. A conformity applicability analysis is required for each of the nonattainment pollutants or its precursor emissions.

Compliance with the General Conformity Rule is presumed if emissions associated with the federal action are below the relevant *de minimis* emissions levels for the region in which the action is proposed. If the conformity applicability analysis demonstrates that the federal action is subject to the General Conformity Rule, a conformity determination would be conducted to demonstrate that the action is in conformity with the applicable implementation plan.

POLLUTANT	AVERAGING TIME	CALIFORNIA STANDARDS (1)		NATIONAL STANDARDS (2)		
		Concentration	Method	Primary	Secondary	Method
Ozone (3)	1 Hour	0.09 ppm (180 $\mu g/m^3$)	Ultraviolet Photometry	0.12 ppm (235 $\mu g/m^3$)	Same as Primary Standards	Ethylene Chemiluminescence
Carbon Monoxide	8 Hour	9.0 ppm (10 mg/m^3)	Nondispersive Infrared Spectroscopy	9.0 ppm (10 mg/m^3)	Same as Primary Standards	Nondispersive Infrared Spectroscopy
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
Nitrogen Dioxide	Annual Average	•	Gas Phase Chemilum- inescence	0.053 ppm (100 $\mu g/m^3$)	Same as Primary Standards	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 $\mu g/m^3$)		•		
Sulfur Dioxide	Annual Arithmetic Mean	•	Ultraviolet Fluorescence	0.03 ppm (80 $\mu g/m^3$)	•	Pararosaniline
	24 Hour	0.04 ppm (105 $\mu g/m^3$)		0.14 ppm (365 $\mu g/m^3$)	•	
	3 Hour	•		•	0.50 ppm (1300 $\mu g/m^3$)	
	1 Hour	0.25 ppm (655 $\mu g/m^3$)		•	•	
Suspended Particulate Matter (PM-10)	Annual Arithmetic Mean	30 $\mu g/m^3$	Size Selective Inlet High Volume Sampler and Gravimetric Analysis	50 $\mu g/m^3$	Same as Primary Standards	Inertial Separation and Gravimetric Analysis
	24 Hour	50 $\mu g/m^3$		150 $\mu g/m^3$		
Sulfates	24 Hour	25 $\mu g/m^3$	Turbidimetric Barium Sulfate	•	•	•
Lead	30 Day Average	1.5 $\mu g/m^3$	Atomic Absorption	•	•	Atomic Absorption
	Calendar Quarter	•		1.5 $\mu g/m^3$	Same as Primary Standards	
Hydrogen Sulfide	1 Hour	0.03 ppm (42 $\mu g/m^3$)	Cadmium Hydroxide Stractan	•	•	•
Vinyl Chloride (chloroethene)	24 Hour	0.010 ppm (26 $\mu g/m^3$)	Tedlar Bag Collection, Gas Chromatography	•	•	•
Visibility Reducing Particles	8 Hour (10:00 a.m. to 6:00 p.m. PST)	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent. Measurement in accordance with ARB Method V.		•	•	•

ppm – parts per million
$\mu g/m^3$ – micrograms per cubic meter
mg/m^3 – milligrams per cubic meter

(1) CO, SO_2 (1 Hour), NO_2, O_3, PM-10, and Visibility Reducing Particulates Standards are not to be exceeded. All other California Standards are not to be equaled or exceeded.

(2) Not to be exceeded more than once a year except for annual standards; new ozone standard can be exceeded three times per year.

(3) USEPA has recently revised the ozone standard. The new averaging time is 8 hours and the Primary Standard is 0.08 ppm. Attainment status will be determined in year 2000.

Sources: California Air Resources Board 1998; USEPA 1998.

California and National Ambient Air Quality Standards

FIGURE **3-1**

For the proposed ADS ocean tests, air quality emissions would be limited to the operation of two surface marine vessels as well as short-term, construction-related impacts from construction of a shore station site.

3.2.2 ADS Ocean Test Locations

3.2.2.1 Proposed ADS Ocean Test Location

Regional Air Quality

Area within Territorial Waters

The proposed ocean test site is located within four separate air districts: Santa Barbara County Air Pollution Control District (SBCAPCD), Ventura County Air Pollution Control District (VCAPCD), South Coast Air Quality Management District (SCAQMD), and San Diego Air Pollution Control District (SDAPCD). The federal and state attainment status of each affected air district is identified in Table 3-1.

Table 3-1. Federal and State Attainment Status for Affected Air Districts

	NAAQS	CAAQS
SBAPCD		
O_3	Moderate nonattainment	Nonattainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
CO	Attainment	Attainment
PM_{10}	Attainment	Nonattainment
Pb	Attainment	Attainment
VCAPCD		
O_3	Severe nonattainment	Nonattainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
CO	Attainment	Attainment
PM_{10}	Attainment	Nonattainment
Pb	Attainment	Attainment
SCAQMD		
O_3	Extreme nonattainment	Nonattainment
NO_2	Nonattainment*	Attainment
SO_2	Attainment	Attainment
CO	Serious nonattainment	Nonattainment
PM_{10}	Nonattainment	Nonattainment
Pb	Attainment	Attainment
SDAPCD		
O_3	Serious nonattainment	Nonattainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
CO	Maintenance	Attainment
PM_{10}	Attainment	Nonattainment
Pb	Attainment	Attainment

* Applying for redesignation as a maintenance area.

Area outside Territorial Waters

The Channel Islands lie within the regulatory jurisdiction of SBCAPCD, VCAPCD, and SCAQMD. All are considered in attainment/unclassifiable for air quality by the USEPA except for Santa Catalina and San Clemente islands. Santa Catalina and San Clemente islands lie within SCAQMD and are classified as a federal nonattainment area for O_3 and NO_2, and a California nonattainment area for O_3 and PM_{10} (SBCAPCD 1998; SCAQMD 1998; VCAPCD 1998).

3.2.2.2 Alternative ADS Ocean Test Location

Regional Air Quality

Area within Territorial Waters

The alternative ocean test location lies within two states and is regulated by two separate air districts. The portion of the site that lies in the state of Washington is regulated by the Olympic Air Pollution Control Agency (OAPCA) and is considered to be in attainment for all criteria pollutants (OAPCA 1998). The portion of the site that lies within the state of Oregon is regulated by the Oregon Department of Environmental Quality (DEQ). The area is considered to be in attainment for all criteria pollutants (Oregon DEQ 1998).

Area outside Territorial Waters

Conformity under the CAA does not apply to emissions outside of 3 nm (5.6 km).

3.2.3 ADS Shore Station Locations

3.2.3.1 Proposed Shore Station Location

MCB Camp Pendleton is located within the San Diego Air Basin, and is regulated by SDAPCD. San Diego County and MCB Camp Pendleton currently meet federal standards for all pollutants except O_3 and state standards for all pollutants except O_3 and PM_{10}. Therefore, the San Diego Air Basin is currently classified as a federal and state serious O_3 nonattainment area and a state nonattainment area for PM_{10}. San Diego is also classified as a maintenance area for CO (SDAPCD 1998).

3.2.3.2 Alternative Shore Station Locations

Pacific City Alternative

Pacific City is located in Tillamook County, Oregon. The area is considered to be in attainment for all criteria pollutants (Oregon DEQ 1998).

MCB Camp Pendleton Alternative

The MCB Camp Pendleton alternative shore station site is located within the San Diego Air Basin and is regulated by SDAPCD. San Diego County and MCB Camp Pendleton currently meet federal standards for all pollutants except O_3 and state standards for all pollutants except O_3 and PM_{10}. Therefore, the San Diego Air Basin is currently classified as a federal and state serious O_3 nonattainment area and a state nonattainment area for PM_{10}. San Diego County is also classified as a maintenance area for CO (SDAPCD 1998).

3.3 MARINE ENVIRONMENT

3.3.1 Background

The marine environment can be described in terms of physical and chemical marine water characteristics, including physical oceanography and marine sediments and bathymetry. A general description of the marine environment along the west coast of the CONUS and site-specific information for the ocean test sites is provided in this section. The proposed ocean test location is between Point Conception, California, and the U.S.-Mexican border, offshore of the Channel Islands in an area referred to as the Southern California Bight (SCB) (refer to Figure 2-5). The alternative ocean test site is located from Grays Harbor in Aberdeen, Washington, to a point south of Heceta Head, Oregon, and offshore to 126ºW longitude (refer to Figure 2-6).

3.3.2 ADS Ocean Test Locations

3.3.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Physical Oceanography

The dominant hydrographic feature along the California coast is the California current, which controls the general water characteristics and circulation of the area. The California current originates in colder northern waters and flows southward along the west coast of North America. The California current within the SCB is part of a large semipermanent eddy called the southern California eddy. Beneath the California current (at a depth of approximately 1,640 ft [500 m]), the California undercurrent flows in a northerly direction. This current system manifests three seasonal current patterns:

- From December to February, the California undercurrent becomes stronger and partially displaces the California current westward. The southern California eddy is weak.

- From March to June, along-shore winds strengthen and drive surface waters offshore. At deeper layers, cold nutrient-rich water flows toward the shore and rises to compensate for the displaced surface water. This is a coastal event that may be more intense in certain locations depending on bottom topography and current strength.

- From July to November, the southward flowing California current dominates the nearshore current patterns, and the southern California eddy is well developed (Hickey 1993).

Water Quality

The State Water Resources Control Board (SWRCB) adopted the Water Quality Control Plan for ocean waters of California in 1974; amendments were made to the plan in 1988, 1990, and 1997 (SWRCB and California EPA 1997). Ocean water quality is generally high, and meets criteria set forth by the Ocean Plan and/or National Ambient Water Quality Criteria (NAWQC) (USEPA 1986). The amended plan (The Ocean Plan) establishes beneficial uses and water quality objectives for waters of the Pacific Ocean adjacent to the California coast outside of enclosed bays, estuaries, and coastal lagoons. The Ocean Plan identifies effluent quality requirements and management principles for waste dischargers and specific waste discharge prohibitions. It also contains a prohibition against discharge of specific hazardous substances and sludge, bypass of untreated waste, and discharges that impact Areas of Special Biological Significance (ASBS). However, the SWRCB may grant exceptions to allow a discharge into an ASBS provided the exception will not compromise protection of ocean waters for beneficial uses and the public interest will be served (California Regional Water Quality Control Board [CRWQCB] 1994).

Marine Water Characteristics

Surface water temperatures along the coast of southern California can show seasonal variation in association with upwelling, climatic conditions, and latitude. Surface water temperatures in the SCB normally range between 54°F (12°C) in the winter to 66°F (19°C) in the summer, with maximum variations between 50°F (10°C) and 73°F (23°C) (USEPA 1988a,b).

Salinity levels in the SCB are relatively constant with slight seasonal variations. Variations in salinity measurements are generally small, ranging between 32.9 and 34.5 parts per thousand (ppt). Minimum and maximum salinities typically occur in December and May, respectively (Allan Hancock Foundation 1965).

Marine Sediments and Bathymetry

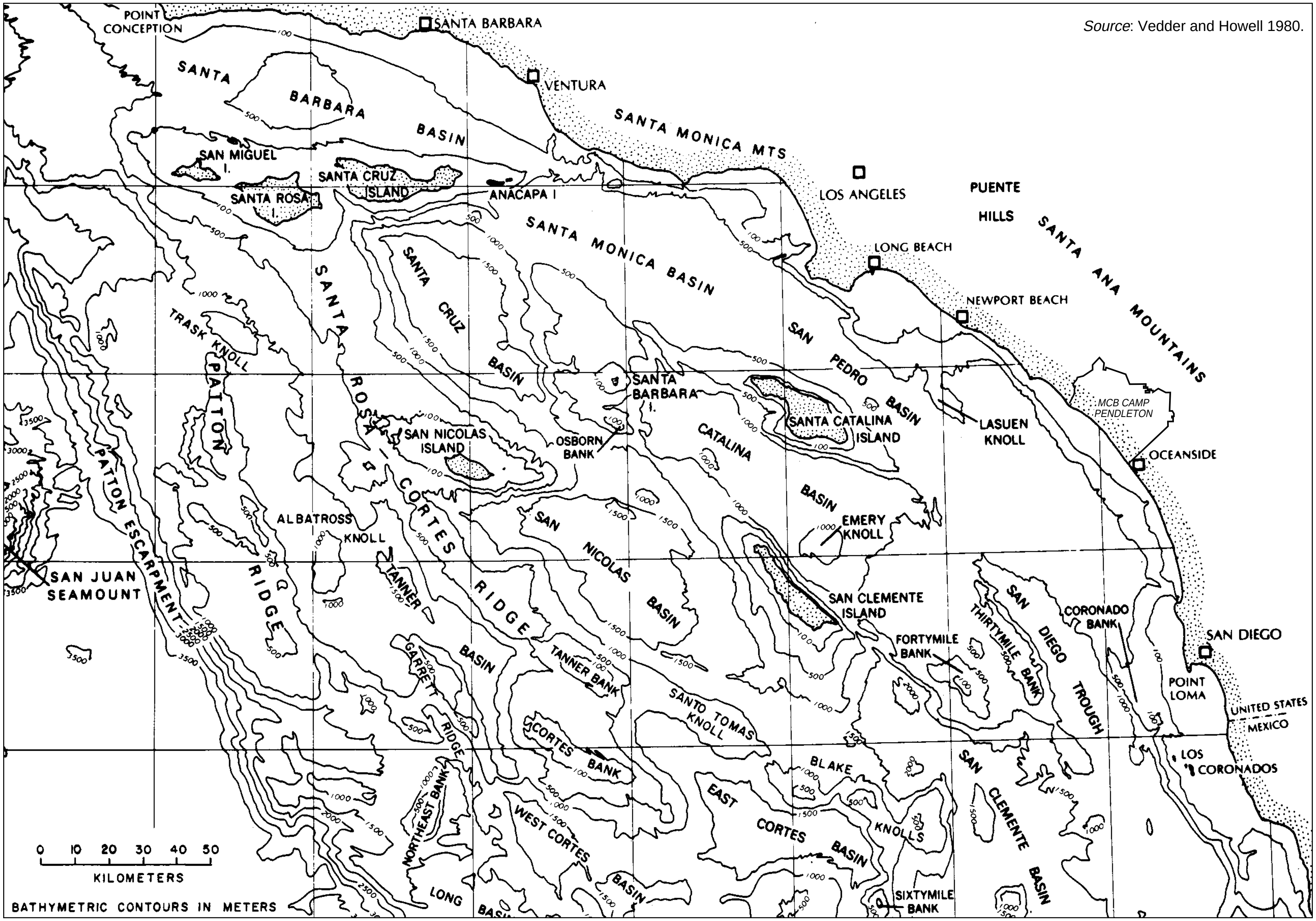
An important feature of the SCB is the accentuated bottom relief and varied bottom substrate. The Northern Channel Islands are actually peaks of extensive offshore ridges. A relatively shallow island shelf, extending to a depth of about 328 ft (100 m), surrounds the islands, usually extending from 3-6 nm (6-11 km) from the island coast. At this depth, the bathymetry either plunges steeply to a deep coastal basin 1,640-2,300 ft (500-700 m) in depth or slopes more gradually to the peak of submerged ridges 590-1,148 ft (180-350 m) in depth.

The majority of the ocean floor in the northern portion of the SCB consists of the Santa Barbara, Santa Cruz, and Santa Monica basins (Figure 3-2). The Santa Barbara Basin has a relatively gradual slope that reaches depths of 1,970 ft (600 m). The relatively wide Santa Monica shelf has an irregular shape, complicated by the presence of two submarine canyons, which have depths that exceed 2,300 ft (700 m). The Santa Cruz Basin also has a submarine canyon that reaches depths greater than 4,920 ft (1,500 m). The ocean floor off San Diego has a complex topography and does not have a continuously deepening slope from shore to the deep basin of the San Diego trough (3,600 ft [1,100 m]). Instead, a portion of the intervening ocean floor rises 390 ft (120 m) to form the Coronado bank. On the western side of the Coronado bank, the Coronado escarpment descends steeply into the San Diego trough. On the southern side of the Coronado bank is a steep submarine canyon, the Coronado Canyon (U.S. Department of Commerce 1980).

Characteristics of bottom sediments in the SCB are influenced by local submarine features and oceanographic conditions. The finer sediment fractions of silt and clay are common in the deeper portions of the bight, while at intermediate depths roughly equal proportions of sand and fine sediment are typically found. In shallower waters, coarser sand fractions increase (USEPA 1988a,b).

Area outside Territorial Waters

The marine environment outside territorial waters is similar to that described for the area within territorial waters.



Source: Vedder and Howell 1980.

FIGURE 3-2

Bathymetry of the Southern California Bight

3.3.2.2 Alternative ADS Ocean Test Location

<u>Area within Territorial Waters</u>

Physical Oceanography

Circulation patterns within the Pacific Northwest ocean test area are not as complex as those in southern California. Major oceanic currents affecting the natural processes and resources in the summer include the southward-flowing California surface current and northward-flowing California undercurrent. These summer currents result in an offshore flow of nearshore waters, with a corresponding upwelling of cold, nutrient-rich waters from the deep. In the winter, south and southwest winds dominate, resulting in the northward-flowing Davidson current and downwelling of surface waters (Good 1993).

Water Quality

Water quality in Oregon is regulated by the Oregon DEQ and in Washington by the Washington State Department of Ecology. Marine and fresh water quality is managed by watershed to link scientific, permitting, and prevention activities as a means of maintaining water quality standards. Oregon and Washington regulations for marine quality and sediment quality are nearly identical to the NAWQC established by the USEPA (1986). Ocean water quality is generally high and meets criteria set forth by the state and/or USEPA NAWQC (USEPA 1986).

Marine Water Characteristics

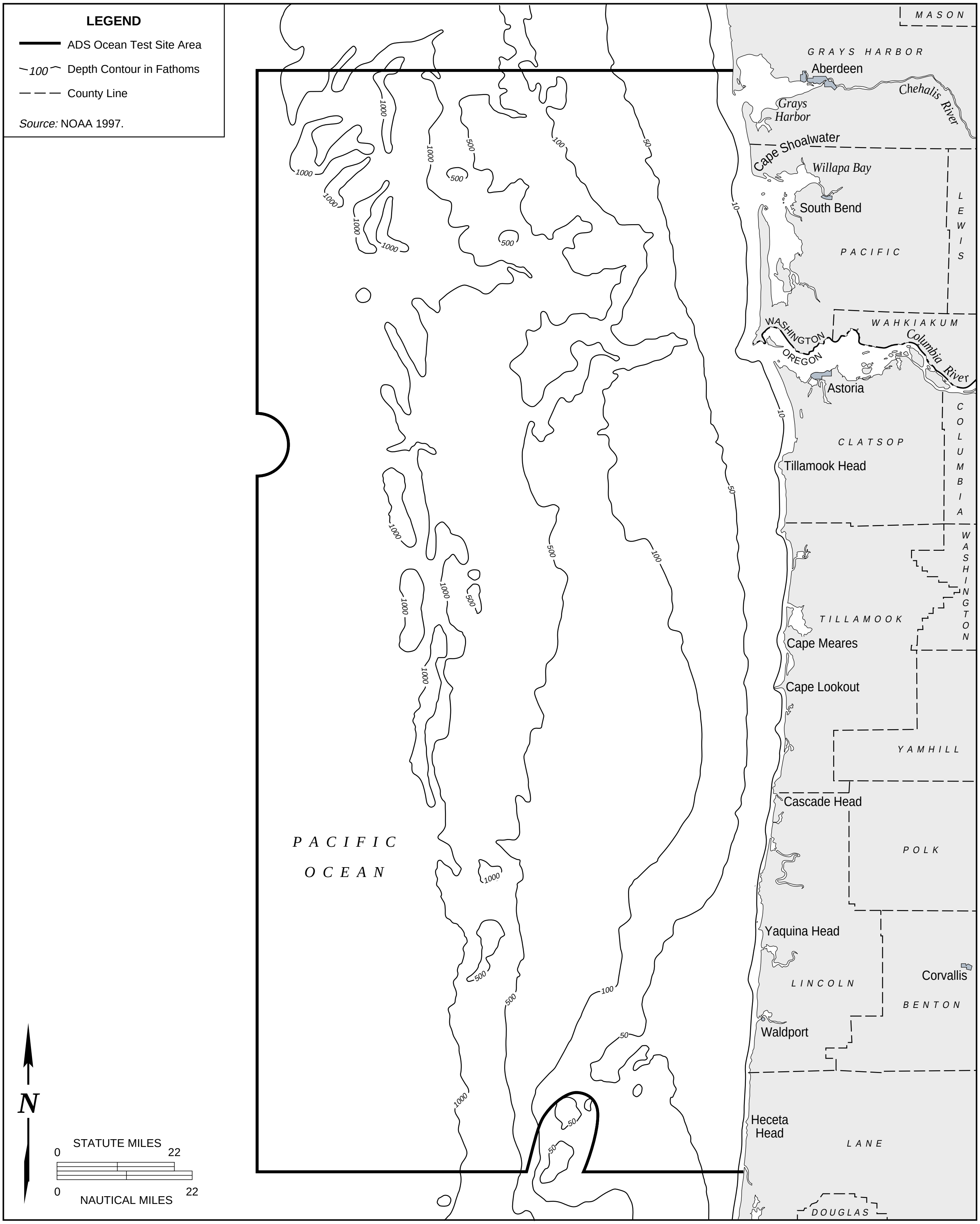
Surface water temperatures along the coast of the Pacific Northwest can show seasonal variation in association with upwelling, climatic conditions, and latitude. Surface water temperatures normally range from 48°F (9°C) in the winter to 52°F (11°C) in the summer. Surface salinity in the Pacific Northwest ranges from approximately 32 to 34 ppt (Lerman 1986).

Marine Sediments and Bathymetry

The continental margin of the northern Pacific coast is relatively narrow and adjacent to a mountainous coast, which is typical of a convergent plate margin. It is composed of sedimentary and volcanic rocks, and although most is covered with mud and sand, there are significant rock outcroppings. Movement of these sediments is greatest close to shore where they are transported by nearshore littoral currents. Offshore currents also move sediments although transport is relatively slower.

The continental shelf underlies shallow coastal waters out to about 650 ft (200 m) in depth and ranges in width from about 12 nm (22 km) at Cape Blanco to nearly 50 nm (93 km) off Grays Harbor (Good 1993). The bathymetry of the shelf is generally smooth; however, subduction has caused the formation of a series of ridges with intervening basins. A series of submarine canyons cuts the shelf at approximately 430 ft (130 m) (Figure 3-3). Sediments off the continental shelf are derived from two principal sources:

rivers and erosion of coastal terrace deposits. The Columbia River provides the single largest source of sediment for the Washington and Oregon coasts. The majority of the sediments on the shelf are medium to fine grained sand with rock and mud being less common (Pickard and Emery 1990).



Bathymetry of the Pacific Northwest

FIGURE

3-3

At the edge of the shelf, the continental slope plunges more than 1 mile (1.6 km) to the seafloor. The slope is dissected by steep submarine canyons, such as the Astoria Canyon at the mouth of the Columbia River. These canyons serve as channels for movement of sediments across the slope into the deep ocean basins.

Area outside Territorial Waters

The marine environment outside territorial waters is similar to that described for the area within territorial waters.

3.4 MARINE BIOLOGY

3.4.1 Background

The following section describes marine biology for the proposed and alternative ocean test sites. This includes a general description of the habitat types and associated marine biology along the west coast of CONUS as well as site-specific information for the ocean test locations. Marine mammals and terrestrial biology are discussed separately in Sections 3.5 and 3.6, respectively.

3.4.2 ADS Ocean Test Locations

3.4.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Marine Flora

The diverse assemblage of marine plants within the proposed ocean test area ranges in size from microscopic one-celled organisms living in bottom sediments or drifting with currents, to large, canopy-forming kelps. The majority of marine plants exist in the photic zone of the ocean (the area where light penetrates the water). In general, proportionally fewer creatures are found at greater depths or distances from land.

Approximately 280 species of phytoplankton and 669 species of macroalgae are known to occur in California waters (Abbott and Hollenberg 1976). The mixing of waters from northern and southern currents influences the species diversity and abundance of small planktonic organisms in the SCB. Plankton productivity is generally highest during the summer (July to September) and lowest during the winter months (October to December) (USEPA 1988a,b).

Larger marine plants fall into two main groups: grasses and algae. Seagrasses include eelgrass (*Zostera marina*), which inhabits muddy substrates in bays, and surfgrass (*Phyllospadix* spp.), which is found on exposed rocky shores. Algae can range in size from microscopic, one-celled organisms to kelp forests more than 100 ft (30 m) in length. Several species of kelp occur throughout the SCB, generally in nearshore areas at water depths between 3 and 100 ft (1-30 m). All require hard substrate (e.g., standstone or rock) for attachment and growth. The most visible kelp is the giant kelp (*Macrocystis pyrifera*), which can form large beds or canopies at the surface. Giant kelp can experience tremendous growth during the spring and summer months (up to 1.5 ft [0.5 m] per day), but can experience high mortality from wave action during winter storms (Foster and Schiel 1985). Other kelps include *Egregia menziesii, Eisenia arborea, Cystoseira osmundacea, Pterygophora californica, Pelagophycus porra*, and *Laminaria* spp., which are generally found in the understory of giant kelp forests or in similar habitats. Physical (e.g., temperature, light, sedimentation) and biological factors (e.g., grazing, competition with other species) can affect the distribution and abundance of kelp.

Offshore of the proposed site, kelp beds have historically been present in the central and northern portions of the area (Figure 3-4). The area directly offshore of the proposed site is generally dominated by a sandy bottom separated by numerous and extensive sandstone/cobble reefs that do not support kelp but support commercially important invertebrates and fishes. Also present are three California Department of Fish and Game (CDFG) artificial reefs. The northernmost reef was constructed in 1980 and covers approximately 3.5 acres (1.4 hectares [ha]). Two other artificial reefs are located offshore of Oceanside Harbor (Figure 3-4). The southernmost reef was constructed in 1964 and covers an area of approximately 4 acres (1.6 ha), while the last reef was constructed in 1987 and covers approximately 256 acres (104 ha). These reefs are composed of modules that are piles of quarry rock, stacked approximately 6-13 ft (2-4 m) high. The modules vary in size, but can be as long as 56 ft (17 m). Although the artificial reefs do not support kelp, they do provide habitat for lobster and commercially and recreationally important fish.

Marine Fauna

Marine animals can be grouped into three general categories based on where they live and their form of movement: planktonic, nectonic, and benthic. Planktonic animals (zooplankton) drift with the ocean currents and are unable to determine their horizontal position within the ocean. Zooplankton are present in the water column from the air-sea interface to the ocean bottom (Tait 1980).

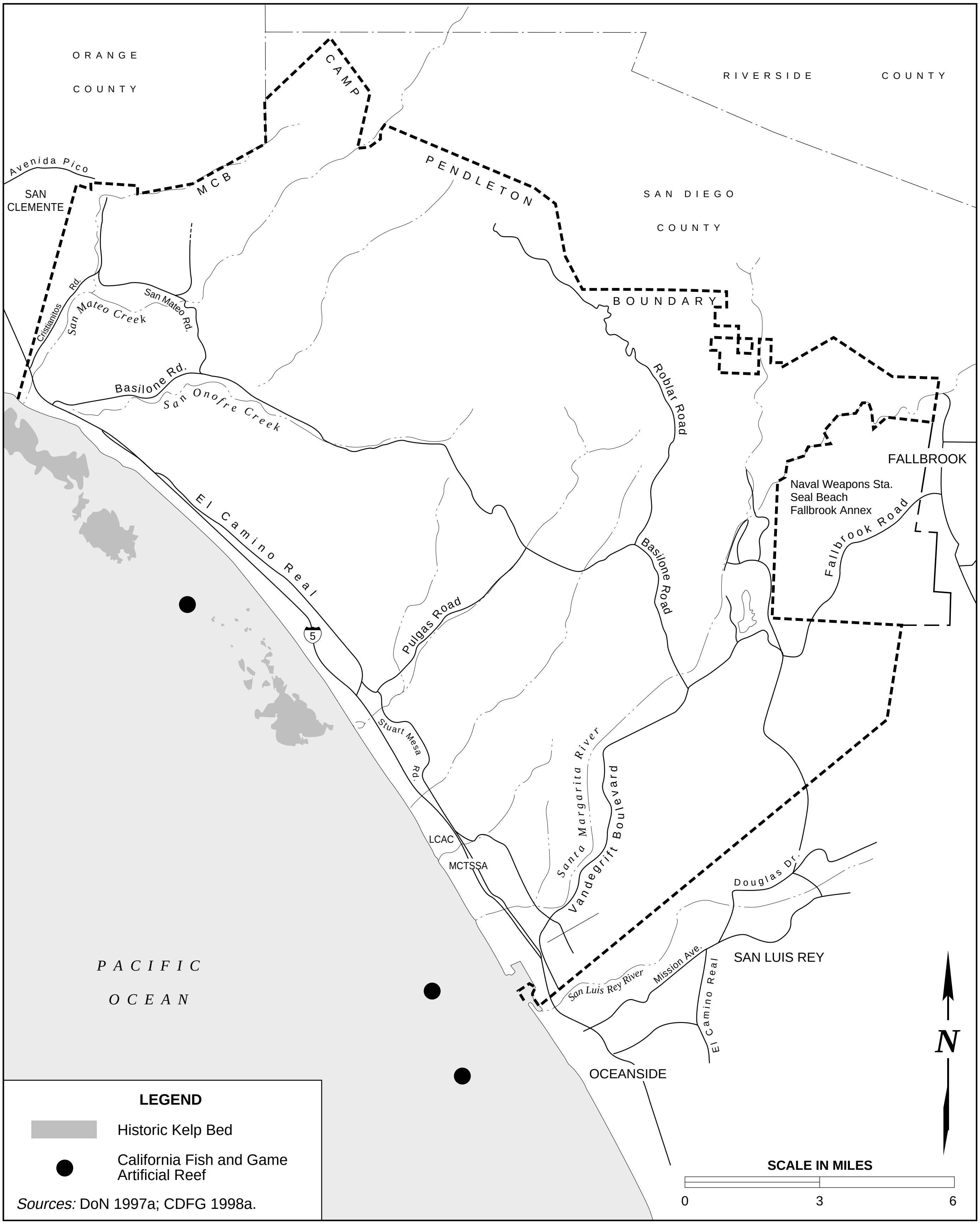
Nectonic organisms have the ability to swim and move independent of ocean currents. This group includes animals such as fish, squid, marine reptiles, and marine mammals (refer to Section 3.5 for a detailed discussion of marine mammals). About 481 species of fish inhabit the SCB (Cross and Allen 1993). The great diversity of species in the area occurs for several reasons: (1) the ranges of many temperate and tropical species extend into and terminate in the SCB; (2) the complex bottom topography and complex physical oceanographic regime includes several water masses and a changeable marine climate (Horn and Allen 1978; Cross and Allen 1993); and (3) the islands and nearshore areas provide a diversity of habitats that include soft bottom; rock reefs; extensive kelp beds; and estuaries, bays, and lagoons.

Point Conception is recognized as a boundary for certain fish species. South of Point Conception, northern species tend to move into deep, colder water or upwelling areas.

There are also seasonal migrations of temperate and subtropical species into the SCB and invasions of tropical species during warm-water years and northern species during cold-water years (Cross and Allen 1993).

The most abundant commercially fished species in the SCB are Pacific sardine (*Sardinops sagax caeraleus*), Pacific mackerel (*Scomber japonicus*), jackmackerel (*Trachurus symmetricus*), skipjack tuna (*Katsuwonus pelamis*), northern anchovy (*Engraulis mordax*), Pacific bonito (*Sardo chiliensis*), thresher shark (*Alopias volpinus*), Dover sole (*Microstomus pacificus*), California halibut (*Paralichthys californicus*), and rockfish (*Sebastes* spp.).

Benthic organisms are separated into two groups based on where they reside. Infauna are organisms such as worms, molluscs, and crustaceans that live buried in ocean sediments. Epifauna are organisms that live and move over the surface of the ocean bottom. Many



FIGURE

3-4

MCB Camp Pendleton Historic Kelp Beds and Location of California Department of Fish and Game Artificial Reefs

species occupy the bottom sediments of the Pacific coast; however, polychaete worms and bivalve molluscs are the most common benthic species in sandy sediments. Common epifauna include echinoderms, crustaceans, and demersal fish.

Several clam species are common or abundant throughout the SCB on the nearshore continental shelf. Abundant clams include species of the genera *Tellina*, *Macoma*, and *Spisula*. Assemblages on the shallower portions of the shelf are frequently dominated by sand dollars and tubicolous polychaetes of the genera *Diopatra*, *Nothria*, *Onuphis*, *Owenia*, and *Pista*. In mid-depth portions of the shelf, patches of the geoduck (*Panopea generosa*) are common. In deeper portions of the shelf, deposit feeders are more common. These include tubicolous polychaetes such as maldanids, the burrowing echiuroid (*Listriolobus pelodes*), sea cucumbers, and several species of small deposit-feeding bivalves. The small clam (*Cardita ventricosa*) is one of the more common clams in deeper portions of the shelf (Jones 1969). In addition, numerous predatory and opportunistic invertebrates (i.e., scavengers) are common in these assemblages (e.g., various crabs, hermit crabs, starfish, and snails).

Nearshore Habitats

When compared with other nearshore habitats, the diversity of organisms found on sandy bottom habitats in the SCB is relatively low. Some of the more common organisms include sand crabs (*Emerita*, *Blepharipoda*), polychaete worms (*Nephtys*), clams (*Macoma*, *Tivela*), surf perch (*Amphistichus*), and halibut (*Paralichthys*). The subtidal zone of sandy bottom habitats is more stable than the intertidal zone; common organisms include sand dollars (*Dendraster*), various polychaete worms (*Pista*, *Diopatra*), and snails (*Natica*, *Polinices*, *Olivella*).

Estuaries and lagoons are partially enclosed coastal embayments where fresh and sea water meet and mix. The dynamic fluctuations of the physical and chemical regimes often create a stressful environment for organisms. Most estuaries are dominated by muddy substrates. Some common estuarine flora include *Ulva*, *Enteromorpha*, and *Salicornia*, while common fauna include clams (*Tresus*), crabs, polychaete worms, fishes (perch, flatfish), sharks (*Triakis*), and rays (*Myliobatus*). Estuaries can also serve as a transitional habitat. This includes those organisms that pass through the estuary on their way to breeding grounds (e.g., migratory fish such as salmon).

Threatened and Endangered Species

The southern California Evolutionary Significant Unit (ESU) of westcoast steelhead (*Oncorhynchus mykiss*) was recently listed by the U.S. Fish and Wildlife Service (USFWS) as endangered (USFWS 1996a). An ESU is a population of a species that is reproductively isolated from other populations of the same species and is an important component in the evolutionary history of the species. Although steelhead are a migratory species that return to their natal stream, they typically spend 2-3 years in marine waters.

Four species of sea turtles found in southern California waters are currently listed as either endangered or threatened under the Endangered Species Act (ESA) of 1973 as amended (National Marine Fisheries Service [NMFS] and USFWS 1995). These include loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), eastern Pacific green (*Chelonia mydas*), and olive ridley (*Lepidochelys olivacea*). However, none of these four species is known to nest on beaches in southern California. Threatened and endangered marine mammals are addressed separately in Section 3.5.

Few specific data are available on the use of the SCB by sea turtles, and no data are available on actual numbers of turtles occurring there. Sea turtles may be encountered year-round in the SCB with the highest concentrations during the warmer summer months (July-September) and during abnormally warm water years (e.g., El Niño years). Only three species are likely to be encountered in the SCB: juvenile loggerhead, leatherback, and green. Olive ridley turtles are present but rarely encountered north of Baja California, Mexico (NMFS and USFWS 1998a).

Although the green sea turtle is the most commonly sighted hard-shelled sea turtle along the U.S. Pacific coast, it is still uncommon and sightings are probably vagrants from, or migrants to, breeding areas in Baja California, Mexico (NMFS and USFWS 1998b). Most sightings of loggerheads are of juveniles which have moved into southern California waters while visiting important foraging areas off the coast of Baja California; adults are rarely seen (NMFS and USFWS 1998c). The leatherback is commonly sighted along the west coast of the U.S. as it disperses from its breeding grounds along the coast of Mexico (NMFS and USFWS 1998d). In general, green and olive ridley turtles occupy shallow, nearshore zones and leatherbacks and juvenile loggerheads may be found over all water depths.

<u>Area outside Territorial Waters</u>

Marine Flora

Because most of the area outside territorial waters is deep and virtually absent of substrate in the euphotic zone, few to no macroflora exist. Phytoplankton comprises most of the marine flora outside territorial waters.

Marine Fauna

In contrast to patterns observed on the continental shelf within territorial waters, species abundance and numbers of individuals decline with increasing depth beyond territorial waters. Outside territorial waters, infaunal assemblages are generally impoverished as a consequence of sediment type, the absence of hard-bottom reefs, and sediment transport caused by cross-shelf movement of material seaward from shallower to deeper regions (Science Applications International Corporation [SAIC] and MEC 1995). Deposit feeders such as maldanid worms and heart urchins are more common, although some suspension feeding species also occur.

A series of submarine canyons, ridges, basins, banks, and seamounts are located along the Pacific coast outside territorial waters. Banks and seamounts possess unique physical characteristics that affect local biological processes. They are the focus of upwelling, which results in increased primary and secondary productivity, attracting pelagic fishes and their predators (e.g., seabirds and marine mammals).

Threatened and Endangered Species

All rare, threatened, or endangered marine species found within territorial waters could potentially occur outside territorial waters. In general, green and olive ridley turtles occupy shallow nearshore zones, while westcoast steelhead, and pelagic leatherbacks and juvenile loggerhead sea turtles may be found in waters of all depths. However, their occurrence in waters outside territorial waters is less common. Threatened and endangered marine mammals are addressed separately in Section 3.5.

3.4.2.2 Alternative ADS Ocean Test Location

<u>Area within Territorial Waters</u>

Marine Flora

The distribution and ecology of marine phytoplankton off the coast of Oregon and Washington is influenced by two major physical phenomena: nutrient upwelling in the nearshore region and nutrient-laden freshwater entering the coastal water from rivers and coastal estuaries. The most important freshwater source in the alternative ADS ocean test area is the Columbia River, which forms the border between the two states.

A diverse group of algae inhabit rocky substrate in the intertidal zone. This is in large part due to the cooler, moister climate for which stress is lower than that of more southerly areas. Algaes include *Laminaria*, *Egregia*, *Fucus*, *Ulva*, *Postelsia*, and *Iridaea*. The seagrass *Phyllospadix* is also found in the intertidal zone. *Laminaria*, *Desmarestia*, and *Agarum* are other macroalgae found in the subtidal nearshore.

In the Pacific Northwest, giant kelp is not present although beds of bull kelp (*Nereocystis luetkeana*) can form surface canopies in areas where hard substrate is available. It is generally found in water depths of 10-40 ft (3-12 m). Unlike giant kelp, bull kelp is an annual plant (i.e., lives for only 1 year) (Abbott and Hollenberg 1976). Beds of perennial kelp (*Macrocystis* spp.) can be found in the same area; however, it occurs primarily in the intertidal and shallow subtidal zones. Factors that affect the distribution and abundance of kelp in the SCB also affect kelp in the Pacific Northwest.

Marine Fauna

Marine fauna in the Pacific Northwest is abundant and varied; however, many species that are found along the southern Pacific coast can also be found along the Pacific Northwest coast. Organisms found in the water column include zooplankton, jellyfish, and pelagic (i.e., midwater column) fish (University of Washington 1953). Benthic organisms vary with sediment size throughout the Pacific Northwest. Typically, soft sediment infauna include polychaete worms, bivalve mollusks, and crustaceans. Epifauna include echinoderms, crustaceans, and demersal fish such as flounder and halibut. As mentioned previously, proportionally fewer organisms are found at greater depths or distances from land.

Shellfish in the Pacific Northwest include several species of clams, mussels, oysters, scallops, and snails. Edible crabs such as Dungeness crab (*Cancer magister*) and red crab (*Cancer productus*) are also found in Pacific Northwest waters. Shrimp (*Pandalus* spp.) and sea urchins (*Strongylocentrotus* spp.) are also abundant.

Nearshore Habitats

Of all the habitat types, the rocky intertidal shores are the most densely inhabited and have the greatest diversity of plant and animal species. Common organisms that can be found in the rocky intertidal zone along the Pacific Northwest coast include algae (*Pelvetia, Fucus, Endocladia*), seagrass (*Phyllospadix*), mussels (*Mytilus*), snails (*Tegula*, *Lottia*, *Acanthina*), sea stars (*Pisaster*), urchins (*Strongylocentrotus*), barnacles (*Balanus*, *Chthamalus*), crabs (*Cancer*), and fishes (*Cottidae*) (Morris et al. 1980).

The subtidal zone along the Pacific Northwest coast is also a very diverse habitat, especially if rocky substrate is present. On the Pacific coast, seaweed forests of giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis luetkeana*) provide food and shelter for many organisms ranging from other algal species and invertebrates to large game fishes. Other important macroalgae off the Pacific coast include *Pterygophora, Sargassum,* and *Laminaria.*

Pelagic fish are highly mobile and are found throughout the Pacific Northwest. Common pelagic fish include salmon, steelhead, herring, and surfperch. The most common of these is salmon (*Oncorhynchus* spp.), which is an anadromous species (i.e., migrates up rivers from the sea to breed in fresh water). In addition to salmon, steelhead (*Oncorhynchus mykis*) (an anadromous trout), is found in the rivers year-round. A species of non-anadromous trout, the cutthroat (*Oncorhynchus clarkii*), is found in bays year-round.

Other prominent marine fishes that occur in or pass through the Pacific Northwest include dogfish (*Squalus acanthias*); Pacific cod (*Gadus macrocephalus*); rockfish; lingcod (*Ophidon elongatus*); herring (*Clupea pallasi*); greenling (*Hexagrammidae*); dolly varden (*Salvinus malm*a); sole, halibut, flounder (*Pleuronectidae*); smelt (*Osmeridae*); sanddab (*Citharichthys* spp); skate (*Raja* spp); and varieties of surfperch (*Embiotocidae*) and sculpin (*Cottidae*) (Washington State Department of Community Development 1987).

Threatened and Endangered Species

The same four species of sea turtles addressed in section 3.4.2.1 have the potential to occur within the alternative ADS ocean test location. In addition, several anadromous ESUs of westcoast steelhead have been listed by the USFWS within drainages in Washington and Oregon. Although these fish are migratory species that return to their natal stream, they typically spend 2-3 years in marine waters.

Fish and Acoustic Considerations

Fish often react to sounds, especially strong or intermittent sounds of low frequency. Fish are not necessarily driven from an area by strong sounds, but they may sometimes change their behavior and activity patterns. Vessel sounds with received levels of 120 dB re 1 μPa at frequencies of 100-500 Hz sometimes cause avoidance responses. Avoidance responses to the relatively low sound levels produced by vessels apparently cease quickly. Low-frequency pulsed sounds do not seem to cause noticeable impacts on fish behavior unless the received levels are at least 160 dB re 1 μPa. Pulses at received levels of 180 dB may cause noticeable changes in behavior, such as an alarm response and lowered catchability. High frequency sounds (greater than 1 kHz) can be heard by some species of fish if intensities are strong. Fish may also sense very high frequency sounds by nonauditory mechanisms if the intensity is strong. Different species of fish can have very different hearing capabilities, and behavioral response data derived for one species often do not apply to another species (Enger 1967; Fay 1988). It also appears that fish often rapidly habituate to repeated strong sound. However, habituation is only temporary, and resumption of the disturbing activity may again elicit disturbance responses from the same fish.

Area outside Territorial Waters

Marine biology in the area outside territorial waters is similar to that discussed in Section 3.4.2.1.

3.5 MARINE MAMMALS

3.5.1 Background

Marine mammals include a diverse assemblage of animals uniquely adapted for life in the sea. Cetaceans (whales, dolphins, and porpoises) are commonly divided into two groups: those with teeth for grasping prey (odontocetes), and those that use baleen to filter prey from sea water (mysticetes). Pinnipeds (seals, sea lions, and walruses) are somewhat less marine adapted in that they routinely haul-out on land to breed and molt. Mustelids (sea otters), sirenians (manatees and dugongs), and ursids (polar bears) complete the list of mammalian orders that have adapted to the marine environment.

Marine mammals are abundant in waters offshore of the U.S. west coast, with a strong seasonal occurrence for some species (Barlow 1995; Forney et al. 1995). Continental slope and shelf waters are modified by upwelling each winter and spring, followed by a period of relatively warm stratified conditions during summer and autumn. While the occurrence and migrations of some mysticete species relative to this seasonal occurrence is comparatively well documented (e.g., blue and gray whales), it is less well described for most odontocete species.

The NMFS provides a comprehensive assessment of all marine mammal populations offshore the U.S. west coast and furnish descriptions of geographic range and estimates of abundance for each stock (Barlow et al. 1997). In addition, Barlow (1997) updated abundance estimates for waters to 300 nm (556 km) offshore of California, Oregon, and Washington, based upon a large-scale ship survey conducted during the summer-autumn of 1996. The following description of marine mammal abundance and distribution for the proposed and alternative ADS ocean test locations relies on information contained in these documents, augmented by additional references as required.

3.5.2 ADS Ocean Test Locations

3.5.2.1 Proposed ADS Ocean Test Location

The proposed location for the ADS ocean tests is the SCB, the ocean area that extends south from Point Conception to the U.S.-Mexican border (refer to Figure 2-5). At least 29 species of marine mammals occur in this area, with seasonal shifts in dominant fauna described for some (Table 3-2). For example, gray whales are the most common mysticete in southern California waters during winter and spring, while blue, fin, humpback, and minke whales are far more common in summer and autumn. Although Bryde's, sei, and northern right whales are uncommon in both seasons, individuals have been reported within the boundaries of the proposed test location throughout the year. Of particular note, only four northern right whales have been seen in southern California waters since 1981 (Figure 3-5); however, one sighting was located just south of the proposed ADS ocean test boundary. Five additional sightings were reported elsewhere in the eastern North Pacific since 1995. The significance of this is underscored when one considers there were only 10 reliable sightings reported for this species in California waters between 1900 to 1982 (Scarff 1986, 1991; Carretta et al. 1994; Evans 1998).

Short-beaked common dolphins are the most ubiquitous odontocete in southern California waters, with higher abundance reported for summer-fall than winter-spring. Other toothed whales that follow this seasonal pattern include long-beaked common dolphins, striped dolphins, and Baird's beaked whales. Conversely, Risso's dolphins, short-finned pilot whales, northern right whales, Pacific white-sided dolphins, and Dall's porpoise are more common in winter-spring than in summer-autumn. Toothed whales for

Table 3-2. Marine Mammals Common to Waters Offshore California

Common Name	Scientific Name	Stock	Status[1]	Pop. Estimate (CV)[2]	Winter/ Spring	Summer/ Fall
Mysticetes						
Gray whale	*Eschrichtius robustus*	East. N. Pacific	NL	22,263 (0.09)*	Common	Uncommon
Blue whale	*Balaenoptera musculus*	CA	E	2,146 (0.23)	Uncommon	Common
Fin whale	*Balaenoptera physalus*	CA	E	1,896 (0.59)	Uncommon	Common
Minke whale	*Balaenoptera acutorostrata*	CA	NL	446 (0.44)	Uncommon	Common
Humpback whale	*Megaptera novaeangliae*	CA	E	1,701 (0.33)	Uncommon	Common
Bryde's whale	*Balaenoptera edeni*	CA (1991/93)	NL	24 (2.0)	Uncommon	Uncommon
Sei (or Bryde's) whale	*Balaenoptera borealis*	CA (1991/93)	E	36 (0.71)	Uncommon	Uncommon
Northern right whale	*Eubalaena glacialis*	N. Pacific	E	16 (1.11)**	Uncommon	Uncommon
Odontocetes						
Sperm whale	*Physeter macrocephalus*	CA	E	503 (0.42)	Common	Common
Pygmy (or dwarf) sperm whale	*Kogia breviceps*	CA (1991/93)	NL	3,145 (0.54)	Uncommon	Uncommon
Killer whale	*Orcinus orca*	CA	NL	323 (0.60)	Uncommon	Uncommon
Baird's beaked whale	*Berardius bairdii*	CA	NL	157 (0.53)	Uncommon	Common
Cuvier's beaked whale	*Ziphius cavirostris*	CA	NL	2,162 (0.55)	Uncommon	Uncommon
Beaked whales spp.	*Mesoplodon spp.*	CA(1991/93)	NL	1,378 (0.58)	Uncommon	Uncommon
Risso's dolphin	*Grampus griseus*	CA	NL	7,366 (0.52)	Common	Uncommon
Short-finned pilot whale	*Globicephala macrorhynchus*	CA(1991/93)	NL	1,004 (0.37)	Common	Uncommon
Northern right whale dolphin	*Lissodelphis borealis*	CA	NL	9,131 (0.77)	Common	Uncommon
Long-beaked common dolphin	*Delphinus capensis*	CA	NL	72,251 (0.83)	Uncommon	Common
Short-beaked common dolphin	*Delphinus delphis*	CA	NL	326,815 (0.42)	Common	Common
Striped dolphin	*Stenella coeruleoalba*	CA	NL	5,734 (0.55)	Uncommon	Common
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	CA	NL	60,026 (0.84)	Common	Uncommon
Bottlenose dolphin	*Tursiops truncatus*	CA	NL	320 (0.43)	Common	Common
Dall's porpoise	*Phocoenoides dalli*	CA	NL	60,756 (0.50)	Common	Uncommon
Pinnipeds						
California sea lion	*Zalophus c. californianus*	U.S.	NL	167,000-188,000	Common	Common
Harbor seal	*Phoca vitulina richardsi*	CA	NL	30,293-188,000	Common	Common
Northern elephant seal	*Mirounga angustirostris*	CA Breeding	NL	84,000-188,000	Common	Uncommon
Guadalupe fur seal	*Arctocephalus townsendi*	CA/Mexico	T	7,408-188,000	Uncommon	Uncommon
Northern fur seal	*Callorhinus ursinus*	San Miguel Is.	NL	10,036-188,000	Common	Uncommon
Mustelids						
Southern sea otter	*Enhydra lutris neresis*	Experimental population	T	< ~50	Uncommon	Uncommon

Sources: Population Estimates
Cetaceans - Barlow 1997 Pinnipeds - Barlow et al. 1997
*Hobbs et al. in press
**Forney et al. 1995

[1]Status: E = Endangered
T = Threatened
NL = Not Listed

[2]CV = Coefficient of variation

Right Whale Sightings within the Southern California Bight

FIGURE 3-5

which seasonal shifts in occurrence have not been described, include sperm whales, pygmy sperm whales, killer whales, beaked whales (including Cuvier's), and bottlenose dolphins. Some species seem to prefer specific bathymetric habitat. For example, sperm whales, pygmy sperm whales, and beaked whales are commonly associated with deep water seaward of the continental shelf/slope, while some stocks of bottlenose dolphin are clearly associated with very shallow coastal areas.

Pinnipeds inhabit the SCB year-round, although species presence and abundance vary significantly from season to season (Reeves et al. 1992). Four pinniped species establish seasonal rookeries in the Channel Islands for pupping, mating, and molting (Figure 3-6 and Table 3-3). One species, the Guadalupe fur seal, occasionally hauls out on some of the Channel Islands but does not currently breed there. Because pinniped time at sea varies significantly with each activity, a brief synopsis of pupping, mating, molting, and feeding is provided below.

Table 3-3. Pinniped Breeding, Molting, and Feeding Cycle in the SCB

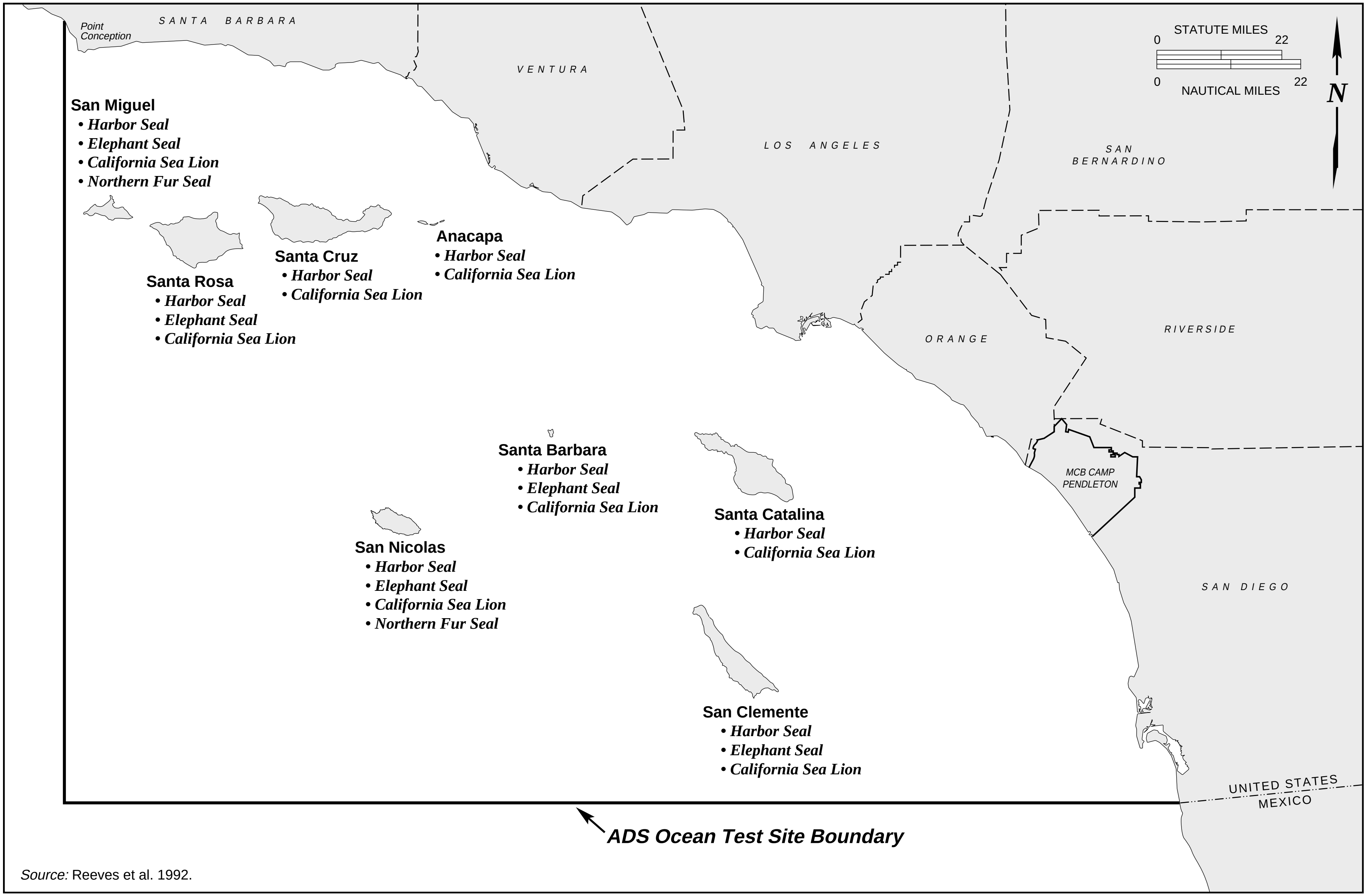
		Month											
Species		J	F	M	A	M	J	J	A	S	O	N	D
Harbor seal	Primary behavior Age Class	F ♂♀	F ♂♀	B ♂♀	B ♂♀	M ♂♀	M ♂♀	M ♂♀	M ♂♀	F ♂♀	F ♂♀	F ♂♀	F ♂♀
N. elephant seal	Primary behavior Age Class	B ♂♀	B ♂♀		M ♀*	M ♀*	M ♂	M ♂	M ♂				B ♂♀
California sea lion	Primary behavior Age Class	M ♂	M ♂			B ♂♀	B ♂♀	B ♂♀	F ♀*	M ♀*	M ♀	M ♂	M ♂
N. fur seal	Primary behavior Age Class	F ♀*	F ♀*	F ♀*		B ♂	B ♂♀	B ♀	B ♀	B ♀	B ♀	B ♀	

Notes:
F = feeding ♂ = adult males
M = molting ♀ = adult females
B = pupping/mating * = juveniles

Most phocids (i.e., hair or true seals, including harbor seals and elephant seals) fast as they nurse their pups with extremely rich milk for a relatively short period of time (4 days to a few weeks), then abandon the pups to return to the sea to replenish fat reserves (Reeves et al. 1992). Harbor seals are an exception to the normal phocid pattern in that they often feed while lactating, taking their pups along with them. Harbor seals in southern California give birth in March and April.

Otariids (eared seals and sea lions) do not have as rich of milk as phocids and must regularly return to the sea to feed during lactation. California sea lions give birth at rookeries on San Miguel, San Nicolas, Santa Barbara, and San Clemente islands in May and June and remain in the area alternating between feeding and nursing through August. There is also a small breeding colony of northern fur seals on San Miguel Island; females arrive in June to pup and remain in the local area until October or November when the pups are weaned.

Mating takes place usually within a few days to a few weeks after pupping (Reeves et al. 1992). Pinnipeds that pup on land (as opposed to ice) usually return to the same rookery every year. During the pupping/mating season, males of most species remain onshore defending territories. After the mating season, males leave the rookeries and often migrate great distances. For example, male California sea lions that mate at rookeries in



Source: Reeves et al. 1992.

Pinnipeds of the Channel Islands

FIGURE 3-6

the Channel Islands migrate to beaches in Washington and British Columbia to molt. Male California sea lions that molt in the Channel Islands have migrated there from Baja California. Male northern fur seals that mate in the Channel Islands probably spend the rest of year in Alaska near the Aleutian Islands.

Both phocids and otariids molt annually to replace skin and hair (Reeves et al. 1992). During the molt, pinnipeds generally do not eat and most do not enter the water at all. Different age and sex classes usually molt at different times or at different locations. Harbor seals and northern elephant seals molt at rookeries in the Channel Islands in spring and summer; California sea lions molt in fall and winter. Northern fur seals do not undergo molting in southern California.

When not involved in pupping, mating, or molting activities, pinnipeds spend the majority of time at sea, occasionally hauling out on rocks or beaches (Reeves et al. 1992). The SCB is a feeding ground for all four species of pinniped regularly found there. Harbor seals generally feed at depths averaging 55-285 ft (17-87 m), while elephant seals are deep divers 1,200-1,575 ft (370-480 m). California sea lions feed at depths from 85-240 ft (26-74 m), and gravitate towards areas of upwelling south of San Miguel Island.

Sea otters are not commonly seen in southern California waters. However, the USFWS translocated over 100 individuals to San Nicolas Island in the late 1980s. Most of those animals returned to their capture site off of central California or are otherwise missing. A few individuals remained, however, and have established a small breeding colony at San Nicolas Island.

Area within Territorial Waters

Mysticete and odontocete abundance within territorial waters of an island or coastal shoreline will generally be greater than waters farther offshore because, as a rule, continental shelf and slope waters are more productive than waters that overlie basins. The southern California test area represents a region of highly varied bathymetry and is often described as "topographically complex," with a narrow continental shelf, distinct basins interrupted by subsurface ridges and banks, and various islands (refer to Figure 3-2) (Winant 1990). Bathymetric complexity affects current patterns and influences upwelling, which in turn affects productivity over the test area. For example, blue and fin whales feed on euphausiid swarms in waters between Point Conception and the four northern Channel Islands from July through October (Fiedler et al. 1995). The dense prey swarms are associated with summer upwelling along the California coast, with prey often found in the waters of the Santa Barbara Channel. In addition to coastal feeding, gray whales commonly migrate close to the coast and island shorelines in winter and spring (Poole 1984; Sumich and Show in press). Specifically, gray whales migrating through the Channel Islands were primarily found within 3 nm (5.6 km) of the islands, with clustering reported in the channels between the northern islands (Jones and Swartz in press). Finally, the range of some subpopulations of bottlenose dolphins appears restricted to coastal waters, while other groups range far offshore (Hansen 1990).

Pinniped abundance within territorial waters of an island or coastal shoreline will generally be greater than outside of territorial waters, particularly just prior to or just after the pupping/mating season or molting. At any time of the year, at least one species of pinniped is just leaving or just returning to rookeries in the Channel Islands (refer to Table 3-3). Female California sea lions and northern fur seals will regularly leave the rookeries while nursing to forage both near the rookeries as well as several hundred kilometers distant. Furthermore, harbor seals will remain in nearshore areas year-round. Newborn pups and weaners will remain near the rookeries for several weeks, venturing only into shallow water as they learn to swim.

Although sea otter occurrence in the SCB is sparse, if encountered they would most likely be within territorial waters of one of the offshore islands. It would be extremely rare to encounter a sea otter outside territorial waters.

Area outside Territorial Waters

Mysticete and odontocete abundance outside territorial waters will generally be lower than waters closer to shore. Distribution patterns for various species, as depicted in Barlow (1995) and Forney et al. (1995), appear to show some clustering near the mainland coast and islands. As mentioned above, the complex topography of the SCB directly affects productivity, although specific zones of productivity have not been described for offshore areas. Hui (1985) analyzed the distribution of common dolphins and pilot whales relative to depth and contour index (i.e., relative abruptness of change in depth) and reported that both species seemed associated with undersea topography of high relief, with pilot whales showing a stronger affinity. Common dolphins were associated with waters overlying canyons and escarpments, where anchovies (a common prey item) often are concentrated. There have been no comprehensive bathymetric habitat analyses of marine mammals in the SCB. As mentioned previously, some species (e.g., sperm whales, pygmy sperm whales, and beaked whales) are generally associated with deep water seaward of the continental shelf/slope and so may be more common outside territorial waters.

Pinniped abundance will also generally be lower outside territorial waters. Pinniped distribution in the open ocean is not well known, as they are extremely difficult to census during shipboard or aerial surveys (Reeves et al. 1992). Pinnipeds, particularly males, tend to disperse after they leave rookeries and haul-out areas. Males (and sometimes females) of three of the species regularly found in the SCB (California sea lion, northern elephant seal, and northern fur seal) undergo long distance migrations to separate feeding areas and/or molting areas and therefore would have a higher probability of being encountered outside territorial waters albeit in low abundance. Detailed information on elephant seal migrations has shown that males migrate to the Gulf of Alaska and the Aleutian Islands, while females migrate to offshore Oregon and Washington (Stewart and Delong 1993). Male and female harbor seals and female California sea lions tend to remain relatively close to shore feeding at fairly shallow depths 65-260 ft (20-80 m), so they would be less likely to be encountered beyond territorial waters. Specifically, plots of California sea lion seasonal relative abundance offshore the Channel Islands indicate higher densities near the coasts of the northern islands in summer and autumn, with a shift to higher densities near the southern islands in winter and spring (Bonnell and Ford 1987). Throughout the year, lower sea lion densities correspond to waters beyond 12 nm from mainland or island coastal areas.

3.5.2.2 Alternative ADS Ocean Test Location

The alternative location for the ADS ocean tests is the Pacific Northwest (i.e., waters offshore Oregon and Washington) (refer to Figure 2-6). At least 24 species of marine mammals occur in this area, with seasonal differences described for some species (Table 3-4). Except for gray whales, mysticetes are common to Pacific Northwest waters only in summer and fall, with estimated abundance for fin and humpback whales lower than for waters offshore California. During aerial surveys flown to 100 nm (185 km) offshore, fin whales were seen most often roughly 50 nm (93 km) west of Newport, Oregon, with humpback whales concentrated about 30 nm (56 km) south of Heceta Bank

Table 3-4. Marine Mammals Common to Waters Offshore Oregon and Washington

Common Name	Scientific Name	Stock	Status[1]	Pop. Estimate (CV)[2]	Winter/ Spring	Summer/ Fall
Mysticetes						
Gray whale	*Eschrichtius robustus*	East. N. Pacific	NL	22,263 (0.09)*	Common	Common
Blue whale	*Balaenoptera musculus*	OR/WA	E	^ No estimate	^ Uncommon	^ Common
Fin whale	*Balaenoptera physalus*	OR/WA	E	136 (0.41)	Uncommon	Common
Minke whale	*Balaenoptera acutorostrata*	OR/WA	NL	262 (1.00)	Uncommon	Common
Humpback whale	*Megaptera novaeangliae*	OR/WA	E	39 (0.42)	Uncommon	Common
Northern right whale	*Eubalaena glacialis*	WA	E	^^1 seen/May '92	Rare	Rare
Odontocetes						
Sperm whale	*Physeter macrocephalus*	OR/WA	E	303 (0.57)	Common	Common
Pygmy (or dwarf) sperm whale	*Kogia breviceps*	OR/WA	NL	1,376 (2.0)	Uncommon	Common
Killer whale	*Orcinus orca*	OR/WA	NL	319 (0.80)	Common	Common
Baird's beaked whale	*Berardius bairdii*	OR/WA	NL	110 (0.41)	Uncommon	Common
Beaked whales spp.	*Mesoplodon spp.*	OR/WA	NL	2,438 (0.68)	Uncommon	Uncommon
Risso's dolphin	*Grampus griseus*	OR/WA	NL	7,065 (0.51)	Uncommon	Common
Northern right whale dolphin	*Lissodelphis borealis*	OR/WA	NL	4,683 (0.77)	Uncommon	Common
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	OR/WA	NL	7,180 (1.66)	Uncommon	Common
Short-beaked common dolphin	*Delphinus delphis*	OR/WA	NL	11,194 (1.00)	Uncommon	Common
Striped dolphin	*Stenella coeruleoalba*	OR/WA	NL	113 (2.00)	Uncommon	Common
Dall's porpoise	*Phocoenoides dalli*	OR/WA	NL	63,152 (0.78)	Common	Common
Harbor porpoise	*Phocoena phocoena*	OR/WA	NL	26,175 (0.21)**	Common	Common
Pinnipeds						
California sea lion	*Zalophus c. californianus*	U.S.	NL	167,000-188,00	Uncommon	Uncommon
Harbor seal	*Phoca vitulina richardsi*	OR/WA	NL	27,131 (0.07)	Common	Common
Northern elephant seal	*Mirounga angustirostris*	CA Breeding	NL	84,000	Uncommon	Common
Northern fur seal	*Callorhinus ursinus*	San Miguel Is.	NL	7,408	Common	Uncommon
Steller sea lion	*Eumetopias jubatus*	OR, WA, CA, E. AK	T	37,746	Uncommon	Common
Mustelids						
Southern sea otter	*Enhydra lutris neresis*	WA	T	200-300	Common	Common

Sources: Population Estimates
Cetaceans - ^ = acoustic detections
^^ Carretta et al. 1994
* Hobbs et al. in press
** Barlow et al. 1997
Stafford 1995
Barlow 1997
Stafford and Fox 1998

Pinnipeds - Barlow et al. 1997
Hill et al. 1997

[1]Status: E = Endangered
T = Threatened
NL = Not Listed

[2]CV = Coefficient of variation

and roughly 40 nm (74 km) west of Cape Flattery, Washington (Brueggeman 1992). A cryptic species, minke whales were seen infrequently and usually in coastal waters. In addition, one northern right whale was sighted off the central Washington shore in May of 1992 (Carretta et al. 1994). Although blue whales have not been seen offshore Oregon and Washington, since 1993 their calls have been routinely recorded via the Navy's Sound Surveillance System (SOSUS) from waters roughly 100-250 nm (185-463 km) west of the Oregon and Washington coast (Figure 3-7) (Stafford 1995).

Gray whales occur offshore of Oregon and Washington year-round, although the greatest numbers coincide with the southbound (December through January) and northbound (March through May) phases of the migration (Herzing and Mate 1984). In summer and early autumn, gray whales cluster near the coast, with most animals seen near Yaquina Head, Oregon (Sumich 1984; Brueggeman 1992). Sperm whales, killer whales, and harbor porpoises also occupy Pacific Northwest waters year-round, associated primarily with slope-basin, continental shelf, and coastal habitat, respectively. Dall's porpoise occurs across all seasons and depth zones (Brueggeman 1992). The suite of odontocete species that occupy Pacific Northwest waters in summer and fall include pygmy sperm and Pacific white-sided dolphins in shelf-slope, slope, and slope-basin waters, and short-beaked common and striped dolphins generally seaward of the continental slope. Though not well documented for any region, beaked whales are thought to be uncommon in Pacific Northwest waters in both seasons.

Pinnipeds inhabit the nearshore regions of Washington and Oregon year-round (Reeves et al. 1992), although species presence and abundance vary significantly from season to season (Table 3-5). Northern elephant seals, California sea lions, and northern fur seals feed in offshore areas and occasionally haul-out on beaches, but do not pup or mate locally. Harbor seals pup, mate, and molt at various locations along both the Oregon and Washington coasts. Steller sea lions establish small seasonal rookeries in Oregon for pupping, mating, and molting and also occasionally haul-out on a few beaches in Washington. Species-specific detail for each activity is summarized below.

Table 3-5. Pinniped Breeding, Molting, and Feeding Cycle in the Pacific Northwest

		Month											
Species		J	F	M	A	M	J	J	A	S	O	N	D
Harbor seal	Primary behavior	F	F	B	B	M	M	M	M	F	F	F	F
	Age Class	♂♀	♂♀	♂♀	♂♀	♂♀	♂♀	♂♀	♂♀	♂♀	♂♀	♂♀	♂♀
N. elephant seal	Primary behavior			F	F		F	F	F	F	F	F	F
	Age Class			♀	♀		♀	♀	♀	♀	♀	♀	♀
California sea lion	Primary behavior	M	M						M	M	M	M	M
	Age Class	♂	♂						♀	♀	♀	♂	♂
Steller sea lion	Primary behavior						B	B	M	M			
	Age Class						♂♀	♂♀	♀*	♀*			
N. fur seal	Primary behavior	F	F	F	F	F					F	F	F
	Age Class	♀*	♀*	♀*	♀*	♀*					♀*	♀*	♀*

Notes:

F = feeding	♂ = adult males
M = molting	♀ = adult females
B = pupping/mating	* = juveniles

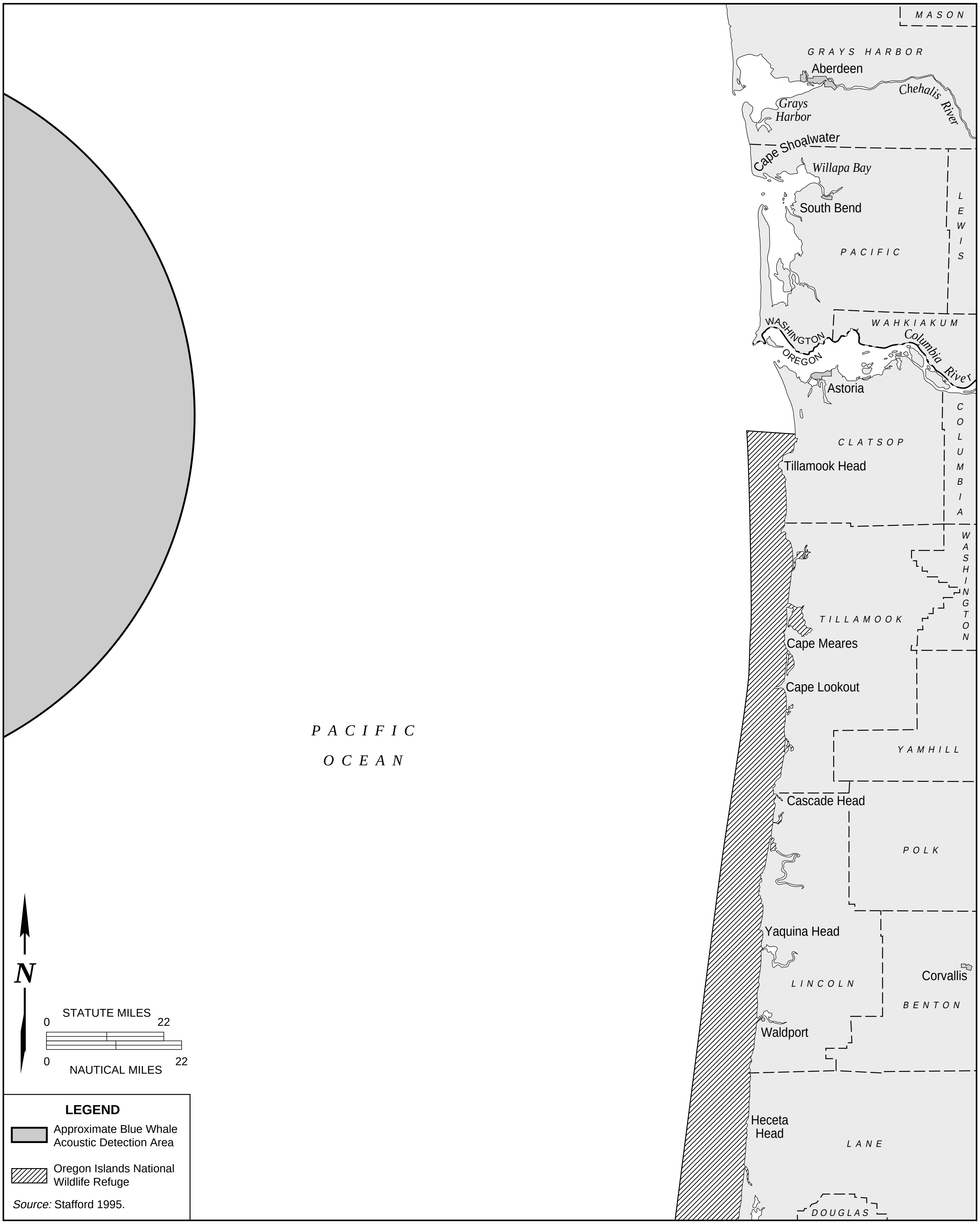


FIGURE 3-7

Boundary of Wildlife Refuges and Approximate Blue Whale Acoustic Detection Area in the Pacific Northwest

As described earlier, most phocids fast as they nurse their pups for a relatively short period of time, then abandon them to return to the sea to replenish fat reserves (Reeves et al. 1992). Elephant seals do not pup in the Pacific Northwest; however, harbor seals give birth in the Pacific Northwest in May and June. Harbor seals are an exception to the normal phocid pattern in that they often feed while lactating, taking their pups along with them. Otariids do not have as rich of milk and regularly return to the sea to feed during lactation. Steller sea lions pup at rookeries on Orford Reef and Rogue Reef, Oregon, in June and July (NMFS 1992).

Mating takes place usually within a few days to a few weeks after pupping (Reeves et al. 1992). Pinnipeds that pup on land (as opposed to ice) usually return to the same rookery every year. During the pupping/mating season, males of most species remain onshore defending territories. After the mating season, males leave the rookeries and often migrate great distances. For example, male Steller sea lions leave Oregon rookeries after mating and do not return to the area until the following breeding season. Male harbor seals that breed in Oregon and Washington apparently remain year-round.

As described above, all pinnipeds undergo annual molts to replace skin, and hair during which time they generally do not eat and most do not enter the water at all (Reeves et al. 1992). Different age and sex classes usually molt at different times and locations. Harbor seals molt in summer off Oregon and Washington. Female California sea lions haul-out at various Oregon and Washington beaches from August to October, followed by males from November to February. Small colonies of Steller sea lion females and juveniles molt at haul-outs on Oregon rookeries and occasionally at Jagged Island, Split Rock, and Cape Flattery, Washington, in August and September (NMFS 1992). Adult male Steller sea lions migrate north after the breeding season and do not molt locally.

When not involved in pupping, mating, or molting activities, pinnipeds spend the majority of time at sea feeding, occasionally hauling out on rocks or beaches (Reeves et al. 1992). The Pacific Northwest provides feeding habitat for at least four species of pinniped. Male and female harbor seals are present year-round and generally feed at depths averaging 55-285 ft (17-87 m). Female elephant seals feed offshore Oregon and Washington between pupping and molting (March and April) and post-molt (May to December). Northern fur seal females and juveniles from the Pribilof Islands, Alaska, migrate south to offshore Oregon between October and May, and generally remain on the continental shelf. Steller sea lion females feed during lactation and commonly occur at the mouths of rivers, including the Rogue River in southern Oregon. Steller sea lions occasionally haul-out in winter at Umatilla Reef, Washington (NMFS 1992).

Sea otters were translocated from Alaska to Washington in 1969 and 1970, and to Oregon in 1970 and 1971. Otters did not remain in Oregon, but by 1990 the Washington population had increased from an original release of 59 to 212 animals. Presently, sea otter distribution is confined to the northwesternmost coast of Washington state (i.e., from Cape Flattery south to Cape Elizabeth), with most animals concentrated near Cape Alava (Brueggeman 1992). Sea otters spend nearly all their time feeding or rafting in kelp beds close to shore.

Area within Territorial Waters

Cetacean abundance within territorial waters of the coast will generally be greater than farther offshore. As described previously, continental shelf and slope waters are quite productive compared to basin habitat and cetacean prey (and therefore cetaceans) can be expected to occur in higher abundance there. The continental shelf (to 655 ft [200 m] depth) extends only about 22 nm (41 km) offshore Oregon, broadening slightly to roughly 32 nm (59 km) offshore Washington. Gray whales and harbor porpoises are the two species most likely to occur within territorial waters and are there year-round. In addition, minke whales, killer whales, and Risso's dolphins occur near shore, though less frequently.

Pinniped abundance within territorial waters of a coastal shoreline will generally be greater than outside of 12 nm, particularly just prior to or just after the pupping/mating season or molting. At any time of the year, at least one species of pinniped is leaving or returning to a rookery or haul-out on Oregon or Washington beaches, or can be found near shore feeding (refer to Table 3-4). The largest aggregations of pinnipeds are always those found onshore during mating and/or molting periods. Female Steller sea lions will regularly leave the rookeries while nursing to forage both near the rookeries as well as several hundred kilometers distant. Harbor seals will remain in nearshore areas year-round. Newborn pups and weaners will remain near the rookeries for several weeks, venturing only into shallow water as they learn to swim.

As mentioned above, all sea otters are expected to be within territorial waters along the northwest coast of Washington.

Area outside Territorial Waters

Mysticete and odotocete abundance outside territorial waters will generally be lower than in waters closer to shore. This will vary somewhat by season and species, however. For example, blue, fin, and humpback whales occur in waters seaward of territorial waters during summer and fall, but in relatively low numbers. Sperm whales and Dall's porpoise can be expected in offshore waters year-round, but again are sparsely distributed. Odontocete that occur in Pacific Northwest waters in summer (i.e., Risso's dolphin, northern right whale, Pacific white-sided dolphin, etc.) are often associated with continental slope habitat, which lies outside territorial waters. Of particular note, Pacific white-sided dolphins have been reported in comparatively large groups in basin habitat when they arrive in late spring, then forming smaller groups and dispersing shoreward to slope and shelf habitat by late summer (Brueggeman 1992). Overall, lowest cetacean abundance seaward of territorial waters would likely occur in winter and early spring.

Pinniped abundance will generally be lower outside of territorial waters. Pinniped distribution in the open ocean is not well known and they are extremely difficult to census during shipboard or aerial surveys (Reeves et al. 1992). Pinnipeds tend to disperse after they leave rookeries and haul-out areas and generally are not gregarious at sea. The only pinniped that is a deep diver is the elephant seal, and only females and juveniles are regularly found offshore Oregon and Washington. Male and female harbor seals and female California sea lions tend to remain relatively close to shore feeding at fairly shallow depths 65-260 ft (20-80 m), so they would be less likely to be encountered beyond territorial waters. Northern fur seals generally remain on the continental shelf and their migration route between the Pribilof Islands, Alaska, and offshore Oregon and Washington is largely unknown.

3.5.3 Acoustic Issues

Marine mammals rely on the acoustic modality to sense their environment and to communicate with one another. As discussed earlier, marine mammals are a diverse assemblage and as such produce many kinds of sounds ranging from infrasonic to ultrasonic frequencies. Hearing capabilities are thought to vary widely between species. Because underwater sound is so important to marine mammals, analysis of potential acoustic impacts of the ADS ocean tests is emphasized in this EA. This section briefly summarizes the characteristics of marine mammal calls and hearing as a foundation for assessment. A comprehensive review of these topics is available in Richardson et al. (1995).

3.5.3.1 Call Characteristics and Hearing Abilities

In the absence of species specific data on auditory capabilities and injury thresholds, information regarding marine mammal calls provides some indirect clues about the risk posed by loud underwater noise at specific frequencies. Characteristics and functions of marine mammal calls are important to the analysis in this EA for several reasons:

- Call characteristics determine the likelihood of acoustic masking by specific types of anthropogenic noise;
- Call functions (if known) can determine the potential consequences of masking; and
- Call characteristics provide indirect evidence about the hearing abilities of marine mammal species for which no audiograms exist.

Hearing abilities vary greatly among the different groups of marine mammals (Schusterman 1981; Ketten 1992). Indeed, a given species hearing ability will determine whether an anthropogenic sound:

- will be inaudible, barely audible, or prominent (i.e., likely to disturb an animal);
- will mask natural sounds at similar frequencies; or
- will cause auditory or other injuries.

Concepts routinely used when discussing marine mammal hearing ability include audiograms, absolute threshold, critical bandwidth, and critical ratio. An *audiogram* is a graph of absolute threshold versus frequency. The *absolute threshold* represents the lowest sound level, at a given frequency, that can be detected by an animal in the absence of appreciable background noise. Background noise can interfere with, or mask, the ability of an animal to detect a signal. It is primarily the background noise within a frequency band near the signal frequency that affects the detectability of that signal. This bandwidth is called the *critical bandwidth*. Measurements of a closely related and more easily measured parameter, called the *critical ratio*, are commonly used in characterizing hearing abilities in the presence of background noise. The *critical ratio* is the signal-to-noise (S/N) ratio required to detect a pure tone sound signal in the presence of background noise. In this case, background noise (also called, ambient noise) is measured on a "per hertz" or "spectrum level" basis (in dB re 1 $\mu Pa^2/Hz$). A *critical ratio* of 20 dB at a particular frequency means that a tone at that frequency must be 20 dB or more above the spectrum level (Hz) of background noise in order to be detected. Except at very low frequencies, critical ratios and critical bandwidths tend to increase with increasing frequency (Richardson et al. 1995).

Odontocetes (Toothed Whales)

Calls

Most odontocetes produce sounds that fall into three general categories: (1) echolocation clicks (short-duration, high-frequency pulsed sounds); (2) tonal whistles, often used for communication; and (3) highly varied pulsed sounds, some used for communication and others of uncertain function.

Much of the research on odontocete whale calls has focused on the first type—the ultrasonic (above 20 kHz) echolocation clicks (Au 1993). Most odontocetes studied to date seem to use these sounds for navigation, orientation, and feeding. With the exception of the pinger source, the sounds to which marine mammals might be exposed during the proposed ADS tests are mostly at much lower frequencies. In dolphins, as well as in terrestrial mammals, anthropogenic sounds at low frequencies have very little if any masking effect on high frequency signals such as those used in echolocation (Au 1993; Richardson et al. 1995). Therefore, interference with echolocation signals is not considered an issue.

Most odontocetes produce narrowband whistles at frequencies from 1-20 kHz, below the frequency of the echolocation signals but, with the exception of the pinger source used for positioning the ROV and TDV devices, still above the frequency range of most vessel and test sounds that might be encountered during the proposed ADS ocean tests.

Whistles are quite varied within and among species, with at least one report of lower-frequency whistle-like sounds reported for bottlenose dolphins (Schultz et al. 1995). In general, whistles are thought to be communicative in function, used to coordinate activities among individuals. However, the specific biological functions of most whistle types are largely unknown.

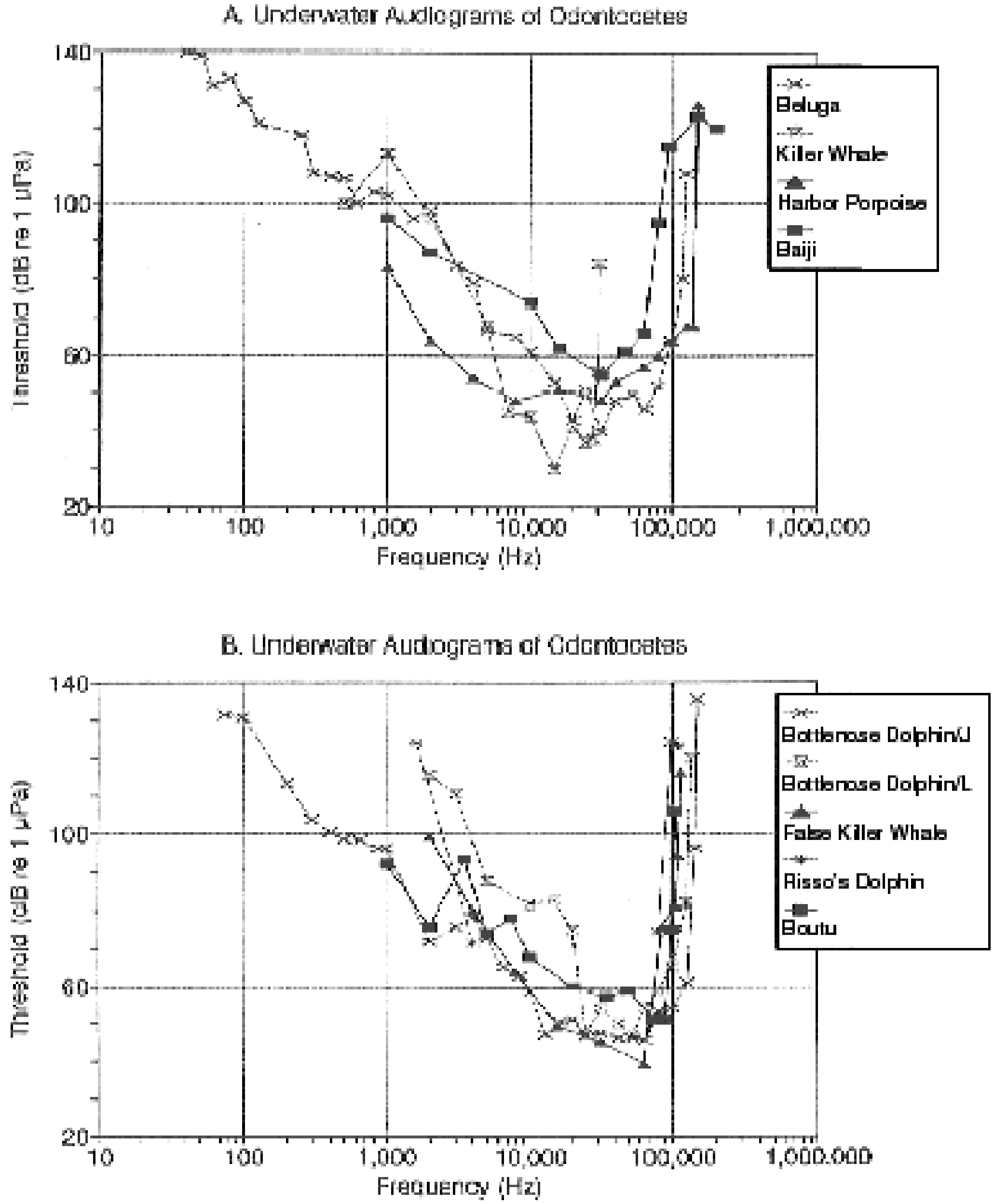
Some odontocetes also produce low- to moderate-frequency "pulsed calls" that appear to serve a communicative, rather than echolocative, function. These pulsed sounds are normally broadband in nature and often sound like a "rasp" or "Bronx cheer." Often pulsed sounds include significant energy below 1 kHz, but many of these same pulses include energy at higher frequencies as well. Some toothed whales (e.g., sperm whales and porpoises) are not known to whistle, and their acoustic communication may depend exclusively on pulsed sounds.

The ultrasonic echolocation pulses of medium-sized species can have a very high peak source level, up to 225-230 dB re 1 μPa-m. However, these signals are very brief and thus contain relatively little energy. Also, the smaller dolphins and porpoises do not emit such strong echolocation signals (Au 1993). Even the strongest echolocation signals are not detectable at long ranges because ultrasound is rapidly absorbed in seawater and because echolocation signals are highly directional.

Source levels of odontocete whistles and pulsed calls are extremely variable, and available data are often imprecise because of various measurement problems both in the field and in captivity. Source levels of communication calls may range from seemingly very weak signals (100-125 dB re 1 μPa-m) by some small species to rather strong pulses by sperm whales (160-180 dB re 1 μPa-m) and strong whistles by pilot whales (180 dB re 1 μPa-m) (Richardson et al. 1995). Many odontocete calls cannot be detected by simple hydrophones at distances beyond about 0.3-1.2 miles (0.5-2 km). However, sperm whale "clicks" are often detectable up to 3-6 miles (5-10 km) away.

Hearing

Underwater audiograms have been published for eight species of small- to moderate-sized odontocetes, including bottlenose dolphins, killer whales, harbor porpoises, and Risso's dolphins (Figure 3-8). In general, in the absence of significant background noise, toothed whales can hear sounds over a very wide range of frequencies, from as low as 40-75 Hz in bottlenose dolphins and white whales (beluga), to as high as 80-150 kHz for most other



SOURCE: Reproduced from Richardson et al. 1995.

FIGURE 3-8

Underwater Audiograms of Odontocetes

species (Richardson et al. 1995). Hearing in most small- and moderate-sized odontocetes is most sensitive at high frequencies, i.e., between about 10-90 kHz. At these frequencies, absolute thresholds are in the range of 40-60 dB re 1 μPa.

Standard threshold measurements, as summarized above, refer to detection of pure tones of relatively long duration (greater than 0.5 second). For pulses less than 0.2 seconds in duration, odontocete detection thresholds are higher (Johnson 1968, 1991). On the other hand, the threshold for detection of a sequence of pulses is lower than that for a single pulse. These results are relevant because the projected sounds to be used during the ADS ocean tests would be sequences of relatively short (roughly 0.25 second low-frequency pulses, and because the acoustic positioning system for the ROV and TDV would employ sequences of shorter, high-frequency pulses.

The effects of masking by background noise (the general principles of masking are discussed in Section 3.5.3.2) on the hearing abilities of odontocetes have been studied for bottlenose dolphins, false killer whales, and white whales (Au 1993; Richardson et al. 1995). For the bottlenose dolphin, a pure-tone signal at 6 kHz must exceed spectrum level ambient noise by 22-28 dB re 1 μPa to be detected, whereas a 70 kHz tone must exceed spectrum level ambient noise by about 40 dB re 1 μPa (Johnson 1968). Critical ratios for the bottlenose dolphin have not been measured below 5 kHz, but those of white whales have been measured from 40 Hz to 115 kHz. The critical ratios of a white whale remained nearly constant, near 17 dB re 1 μPa, from 40 Hz to 3 kHz, then rose gradually above 3 kHz (Johnson et al. 1989). At ultrasonic frequencies, susceptibility to masking depends strongly on the relative directions of arrival of the signal and the masking noise. At moderate and probably at low frequencies, these directional effects on masking are reduced or absent (Bain and Dahlheim 1994). Direct auditory measurements have not been obtained from any of the larger odontocetes, aside from some high-frequency data from a beached sperm whale calf (Carder and Ridgway 1990).

Mysticetes (Baleen Whales)

Calls

All mysticete whales emit underwater calls at low to moderate frequencies (Richardson et al. 1995). Frequencies range from roughly 12-14 Hz (i.e., infrasonic sound) for the lowest-frequency components of some blue and fin whale calls, up to 2-8 kHz for the highest-frequency components produced by some species (e.g., humpback whales). Higher-frequency clicks have occasionally been reported, but the accuracy of these reports is uncertain. Most mysticete calls have energy centered at frequencies below 1 kHz, and nearly all blue and fin whale calls have energy centered at 15-25 Hz. Mysticete calls are often brief (1-4 seconds), but are sometimes emitted in long sequences, as in the case of humpback whales songs. Blue whales produce long stereotypic calls that last 19 seconds or more and are often given in series.

Source levels of mysticete whale calls are highly variable. The strongest calls by several species of baleen whales (e.g., blue, fin, humpback, right, and bowhead whales) are in the range of 180-190 dB re 1 μPa-m. However, many calls are considerably weaker. In continental shelf waters, calls of humpback, fin, and bowhead whales are often detectable by simple hydrophones at distances ranging up to at least 6-12 miles (10-20 km); detection ranges are longer in deep offshore waters (Watkins et al. 1987; Clark and Ellison 1988; Helweg et al. 1992).

Functions of most mysticete calls are not well documented, but presumably involve intraspecific communication and coordination in most cases. However, there is increasing speculation that some species may obtain useful navigational information from the reverberations or echoes of their low-frequency calls from large underwater objects (Ellison et al. 1987).

Hearing

No direct audiometric studies have been conducted on baleen whales, but there is strong indirect evidence that they are well adapted for hearing low- and moderate-frequency sounds. The anatomy of baleen whale ears is adapted for detecting low frequencies, apparently including infrasonic (less than 20 Hz) sounds in some species (Ketten 1992, 1994). Various species have exhibited behavioral reactions to low-frequency (less than 1 kHz) sounds from other whales and from actual or simulated sources of anthropogenic noise (Richardson et al. 1995). Watkins (1986) noted that mysticetes often react to sounds with frequencies from 15-28 kHz, but not to pingers and sonars at 36 kHz and above. The fact that most sounds produced by baleen whales are at frequencies less than 1 kHz is a further indication of their sensitivity to lower-frequency sounds. Presumably, mysticetes are well adapted to hear the types of sounds made by members of their own species.

The actual hearing sensitivity of baleen whales at different frequencies is not known with certainty. However, at low frequencies, mysticete hearing is probably sensitive enough that detection of sound signals is limited by ambient noise rather than the absolute hearing thresholds of the whales. Baleen whales probably have some directional hearing ability, even at low frequencies, as they sometimes move toward calling conspecifics and either away from or toward sources of some low-frequency anthropogenic noise (Richardson et al. 1995). Directional hearing at low frequencies probably reduces masking effects at those frequencies.

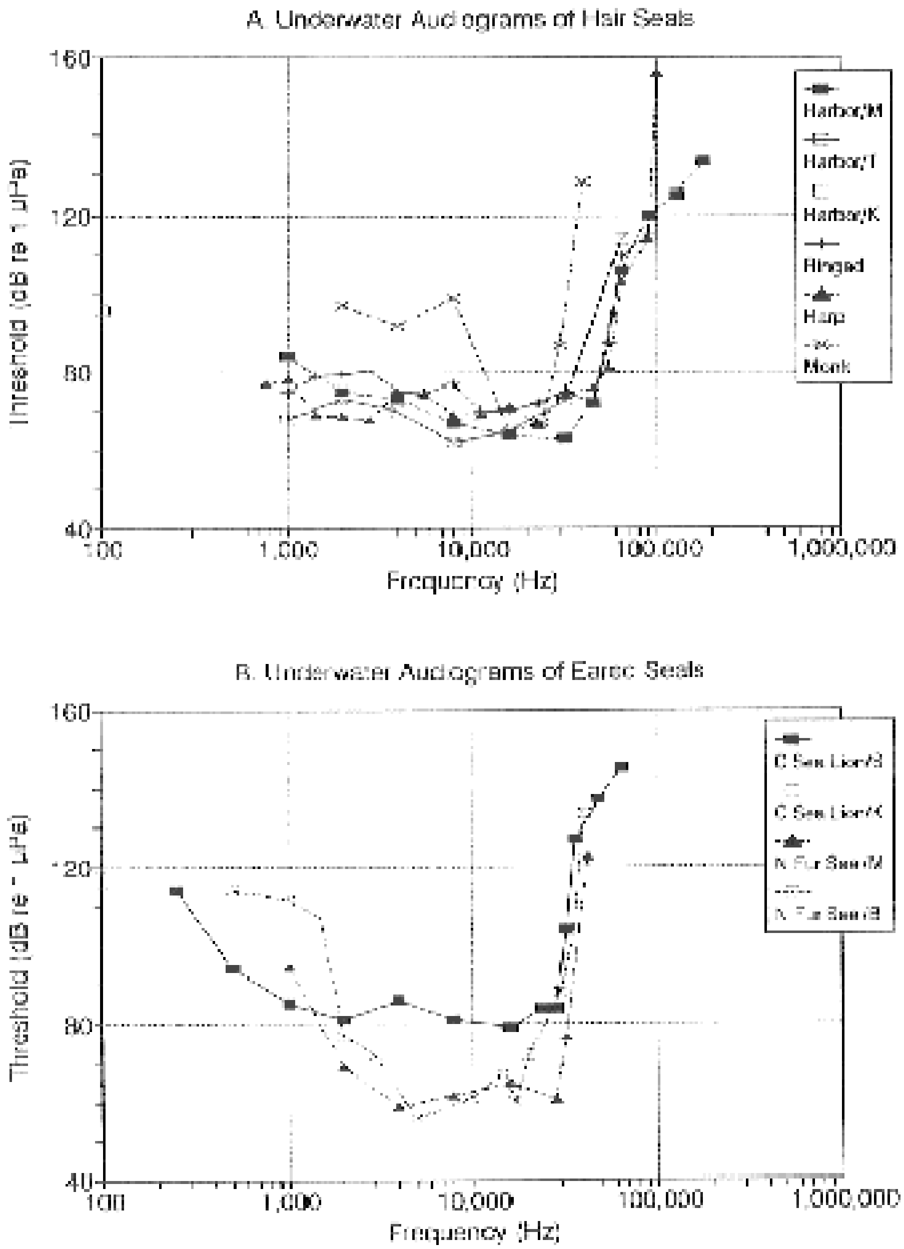
Pinnipeds (Seals and Sea Lions)

Calls

Pinnipeds produce calls both in the air and, for many species, underwater. Underwater calls are more common for species that mate in the water, like harbor seals; some of these species produce strong underwater calls that propagate for long distances. Harbor seals socialize and call both in air and in the water; the male's reproductive display includes repeated trains of 20 ms pulses at 4 kHz emitted underwater and accompanied by bubble blowing, roars, grunts, and creaks (Hanggi and Schusterman 1994). Elephant seals and eared seals mate on land and produce many airborne sounds; their underwater call repertoire is poorly known, but can include barks and sometimes clicks. Both underwater and in-air calls of pinnipeds are typically at frequencies ranging from a few hundred to a few thousand Hz. Pinnipeds do not appear to echolocate.

Hearing

Studies of pinniped hearing have been conducted on both phocids and otariids for underwater and in-air hearing (Richardson et al. 1995). In general, pinniped hearing abilities are less specialized than those of cetaceans. Highest sensitivity for phocids tested underwater usually occurs from 1 kHz to 30-50 kHz, with thresholds of 60-85 dB re 1 μPa (Figure 3-9). Sensitivity deteriorates below 1 kHz. However, phocids are more sensitive than odontocetes at lower frequencies: 96 dB re 1 μPa at 100 Hz in the harbor



SOURCE: Reproduced from Richardson et al. 1995.

Underwater Audiograms of Pinnipeds

FIGURE

3-9

seal, and lower in the northern elephant seal (Kastak and Schusterman 1995). Thresholds deteriorate (increase) when the sounds are pulses less than 0.05 second in duration (Terhune 1988), but improve (decrease) when sound pulses are in sequences rather than single (Turnbull and Terhune 1993).

Otariids listening underwater have similar or slightly better sensitivity than phocids within their frequency range of best hearing (Figure 3-9). However, this frequency range is apparently narrower than in phocids, with a high-frequency cutoff at about 36-40 kHz. Northern fur seal hearing is most sensitive at 4 to 17-28 kHz, where the absolute threshold is about 60 dB re 1 μPa (Moore and Schusterman 1987; Babushina et al. 1991). California sea lion hearing is most sensitive in the 2-16 kHz range, apparently with higher absolute thresholds than in the fur seal. The sea lion hearing threshold rises from about 85 dB at 1 kHz to 116-120 dB re 1 μPa at 100 Hz (Kastak and Schusterman 1995), indicating that they may be less sensitive to low-frequency sounds than are phocids.

Both otariids and phocids hear in-air as well as underwater sounds. Highest sensitivity to airborne sounds are in the 1-2 to 8-16 kHz range. Otariids may have slightly higher sensitivity and a higher high-frequency cutoff than do phocids. In-air hearing sensitivity deteriorates below 2 kHz, but strong sounds at frequencies as low as 100 Hz are detectable. Pinnipeds are less sensitive than humans to airborne sounds below 10 kHz (Richardson et al. 1995).

Auditory masking has been studied in a few pinnipeds and is similar to that in other mammals. In both harbor and northern fur seals, critical ratios for underwater hearing increased from 19 dB re 1 μPa at 2-4 kHz to 27 dB re 1 μPa at 32 kHz (Moore and Schusterman 1987). Critical ratios are similar for underwater and in-air listening.

3.5.3.2 Masking Effects

Background noise can interfere with, or mask, the ability of an animal to detect a sound. It is primarily the background noise within a band of frequencies near the signal frequency that affects the detectability of that signal. Auditory masking is, in part, a natural phenomenon to which marine mammals are adapted. Even in the absence of any human activities, there is natural ambient noise caused by wind, waves, surf, precipitation, and animals. This ambient noise limits the distances over which marine mammals can hear natural sounds relevant to them, including calls from conspecifics and predators. The longer the distance from any sound source, the lower the expected received level. At some distance, the received level of that sound diminishes below the ambient noise level at similar frequencies. At about that distance, the sound becomes undetectable. The distance at which a given sound will fall below the natural ambient noise level and become undetectable varies greatly from day to day and place to place, in large part because the level of natural ambient noise is highly variable depending on factors including wind speed, precipitation, vessel traffic, and the presence of call animals nearby.

Marine mammals are adapted to life in an environment where sounds from sources beyond some variable distance are inaudible because of propagation loss and masking by ambient noise. The need to detect specific sound signals in the presence of natural background noise is one of the primary selection pressures that have shaped the evolution of the auditory systems of marine mammals.

The maximum detection radius of a given sound signal is determined by the total background noise level, including both natural ambient noise and any anthropogenic noise. In recent history, anthropogenic noise is a frequent and sometimes dominant component of the total background noise in the ocean. When the level of anthropogenic noise equals or exceeds the natural ambient noise level, the total background noise level is increased appreciably, reducing the detection radius for any sound signal at similar frequency (Richardson et al. 1995).

In evaluating the potential for background noise (natural and/or anthropogenic) to mask a sound signal, the relevant frequencies are primarily those of the signal plus adjacent frequencies that are within the critical band(s) around the frequency(ies) of the sound signal. Thus, a sound signal may be masked by background noise at the same frequency or a nearby frequency. However, there will be little masking effect by background noise at a very different frequency.

Masking is a quantitative, not an "all-or-none," process. When masking does occur, the effect is to reduce the radius around the source of a sound within which that sound will be detectable. At closer distances, the sound signal will still be above the background noise level at corresponding frequencies and will remain detectable. At longer distances, the sound signal is too low relative to the then-prevailing background noise level (natural and/or anthropogenic). The process is further complicated by directional effects. At least at higher frequencies, background noise arriving from directions similar to the arrival direction of the sound signal has a strong masking effect, but background noise arriving from another direction may have less masking effect (Bain and Dahlheim 1994). The directional properties of both the signal and the background noise may affect the detectability of the signal. Another complication is that a rapid sequence of brief sounds is more detectable amidst background noise than is a single brief sound (e.g., Au 1993; Turnbull and Terhune 1993).

3.6 TERRESTRIAL BIOLOGY

3.6.1 Background

Biological resources include native or naturalized plants and animals and the habitats in which they occur. Sensitive biological resources are defined as those plant and animal species listed as threatened or endangered, or proposed as such, by the USFWS under the ESA, CDFG, or Oregon Department of Fish and Wildlife (ODFW). Federal Species of Concern, formerly known as Category 2 candidate species, are not protected by law; however, these species could become listed, and therefore protected, at any time. Additionally, the California National Heritage Program (CNHP) and Oregon Natural Heritage Program (ONHP) maintain databases of state species of concern, many of which are not afforded legal protection.

Jurisdictional wetlands are those subject to regulatory authority under Section 404 of the Clean Water Act (CWA) and EO 11990, *Protection of Wetlands*. Wetlands and Waters of the U.S. are defined by the U.S. Army Corps of Engineers (ACOE) and USEPA as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3 (b); 1984).

3.6.2 ADS Ocean Test Locations

3.6.2.1 Proposed ADS Ocean Test Location

<u>Area within Territorial Waters</u>

The proposed ADS ocean test site is located within the SCB (refer to Figure 2-5). Coastal or offshore aquatic habitats in the SCB are used by more than 195 species of birds. Although population numbers have not been accurately determined, breeding birds number in the thousands and migratory populations number in the millions. The SCB is the northern or southern limit of breeding ranges for many species and is the only California breeding location for black storm-petrels (*Oceanodroma melania*), Xantus' murrelets (*Synthliboramphus hypocleucus*), and brown pelicans (*Pelecanus occidentalis*) (Baird 1993).

Due to their high mobility, the majority of birds found in the SCB regularly move in and out of the SCB during foraging trips or migration through the area. Some species use only the coastal marshes and estuaries while others use both inshore and offshore marine waters.

The greatest biomass of birds that use the SCB include seabirds, scoters, loons, and western grebes (*Aechmophorus occidentalis*). The most numerous seabirds include shearwaters, storm-petrels, phalaropes, gulls, terns, and auklets. In addition to those species breeding in the SCB, numerous species overwinter or migrate through. The visitors are predominantly southern breeders in the spring, subtropical breeders in the fall, and mainly Alaskan breeders in the winter. Seabird diversity is highest in fall to early spring, reflecting the arrival of species that nest outside the SCB, and lowest from May to August. Except for terns and skimmers, all seabirds that breed in the SCB nest on the Channel Islands (Baird 1993).

Common birds that use the nearshore and offshore marine waters within territorial waters off MCB Camp Pendleton include Heermann's gulls (*Larus heermanni*), ring-billed gulls (*Larus delawarensis*), California gulls (*Larus californicus*), common terns (*Sterna hirundo*), elegant terns (*Sterna elegans*), Forster's terns (*Sterna forsteri*), Brandt's cormorants (*Phalacrocorax penicillatus*), western grebes, and surf scoters (*Melanitta perspicillata*).

Area outside Territorial Waters

Many of the same species that utilize the area inside territorial waters also use the area outside territorial waters (see Area within Territorial Waters). Other seabirds that may be encountered outside territorial waters from MCB Camp Pendleton include black storm-petrels, herring gulls (*Larus argentatus*), western gulls (*Larus occidentalis*), double-crested cormorants, Cassin's auklets, pigeon guillemots, sooty shearwaters (*Puffinus griseus*), red phalaropes (*Phalaropus fulicaria*), and red-necked phalaropes (*Phalaropus lobatus*) (Harrison 1983; Baird 1993).

3.6.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

The alternative ADS ocean test site is located off the northern half of the coast of Oregon and the southern portion of the Washington coast (refer to Figure 2-6). Oregon's and Washington's diverse coastal habitats of wave-washed rocks, sandy beaches, and protected estuaries are important not only for resident species of birds but also to millions of nesting, wintering, and migrating shorebirds, waterfowl, and marine seabirds.

Oregon Islands National Wildlife Refuge (NWR) and Three Arch Rocks NWR consist of isolated islands and rocks lying less than 2 miles (3 km) off the mainland coastline. Oregon Islands NWR is comprised of over 1,400 islands, rocks, and reefs scattered along the coastline from Tillamook Head to the California border. Some of the more important nesting islands/rocks within 20 miles (30 km) of Pacific City are Three Rocks, Two Arches Rocks, Proposal Rock, Pillar Rock, and Pyramid Rock. Located approximately 20 miles (30 km) north of Pacific City, Three Arch Rocks NWR is a group of nine offshore rocks and is the site of Oregon's largest seabird colonies. The rocks and islands of both these NWRs provide critical nesting habitat for more than one million nesting seabirds, including common murres (*Uria aalge*), tufted puffins (*Fratercula cirrhata*), Cassin's auklets (*Ptychoramphus aleuticus*), rhinoceros auklets (*Cerorhinca monocerata*), black oystercatchers (*Haematopus bachmani*), pigeon guillemots (*Cepphus columba*), fork-tailed storm-petrels (*Oceanodrama furcata*), Leach's storm-petrels (*Oceanodroma leucorhoa*), Brandt's cormorants, double-crested cormorants (*Phalacrocorax auritus*), pelagic cormorants (*Phalacrocorax pelagicus*), and western gulls (USFWS 1985, 1993). Other seabirds found in the nearshore waters include western grebes, surf scoters, black scoters (*Melanitta nigra*), and harlequin ducks (*Histrionicus histrionicus*).

Area outside Territorial Waters

In addition to many of the same seabirds that nest on the nearshore islands and rocks (see Section 3.6.2.1, Area within Territorial Waters), black-footed albatrosses (*Diomedea nigripes*), northern fulmars (*Fulmarus glacialis*), sooty shearwaters, pink-footed shearwaters (*Puffinus creatopus*), and Buller's shearwaters (*Puffinus bulleri*) are found feeding further offshore (Harrison 1983).

3.6.3 ADS Shore Station Locations

3.6.3.1 Proposed Shore Station Location

Vegetation

Vegetation in the area of the proposed MCB Camp Pendleton shore station site includes mostly nonnative grassland with areas of riparian and wetland vegetation occurring along drainages (refer to Figure 2-8). Large weedy areas occur throughout the site due to previous site disturbance (i.e., military facilities construction and training). Although the majority are nonnative, both nonnative annual grasslands and native perennial grasslands occur in the proposed project area. Dominant plant species include bromes (*Bromus* spp.), fescue (*Vulpia* sp.), mustards (*Brassica* spp.), wild oats (*Avena* spp.), yellow oxalis (*Oxalis incarnata*), numerous small forbs, and stands of fennel (*Foeniculum vulgare*). Scattered grasses with croton (*Croton californicus*) and storksbill (*Erodium* spp.) occur in the more sparse grassland associations.

The lower beaches are primarily unvegetated; however, small areas of sand verbena (*Abronia* spp.), beach bursage (*Ambrosia chamissonis*), and ice plant (*Carpobrotus* spp.) occur on the upper beach and coastal foredunes. Where larger ephemeral drainages meet the beach, large monotypical stands of giant reed (*Arundo donax*) occur that displace native vegetation.

Wetlands

The closest wetlands to the proposed shore station sites are located along Cockleburr Canyon, which lies between the proposed and alternate shore station sites. These are seasonally flooded riverine and palustrine wetlands. A small, ephemeral lagoon is at the mouth of Cockleburr Canyon Creek.

In parts of southern California, vernal pools are a unique, specialized form of seasonal wetlands. Critical to the formation of vernal pools is the presence of nearly impermeable surface or subsurface soil layers and flat or gently sloping topography (less than 10 percent slope). In southern California, these impervious layers are typically alluvial materials with clay or clay loam subsoils, and they often form a distinctive microrelief known as Gilgai or mima mound topography (USFWS 1997). MCB Camp Pendleton contains many of the remaining vernal pools and vernal pool complexes in northern San Diego County, with the largest number occurring along the coast from French Creek, near the LCAC facility, north to Horno Canyon (McMillan 1998a). The only known vernal pool in the vicinity of the proposed shore station is located approximately 300 ft (100 m) northwest of the proposed shore landing cable laydown area (DoN 1995) (refer to Figure 2-8).

Wildlife

Wildlife species commonly found in the proposed project area are those generally associated with native and nonnative grasslands, riparian and wetland vegetation along drainages, and beach and coastal dunes. Common birds include American kestrels (*Falco sparverius*), black phoebes (*Sayornis nigricans*), barn swallows (*Hirundo rustica*), western meadowlarks (*Sturnella neglecta*), European starlings (*Sturnus vulgaris*), red-winged blackbirds (*Agelaius phoeniceus*), song sparrows (*Melospiza melodia*), black-necked stilts (*Himantopus mexicanus*), and ruddy ducks (*Oxyura jamaicensis*). Reptiles found in the area include side-blotched lizards (*Uta stansburiana*) and western fence lizards (*Sceloporus occidentalis*). Mammals are predominantly rodents and include California ground squirrels (*Spermophilus beecheyi*), deer mice (*Peromyscus maniculatus*), and western harvest mice (*Reithrodontomys megalotis*). Coyotes (*Canis latrans*) and desert cottontail (*Sylvilagus audubonii*) are also present (Ingles 1965).

In addition to vertebrates, a number of invertebrate species are found along the sandy beaches of southern California and many provide an important source of food for resident and migrating shorebirds. Common animals of sandy beaches include Pacific mole crabs (*Emerita analoga*), razor clams (*Siliqua patula*), bloodworms (*Glycera* spp.), lugworms (*Arenicola* spp.), and clam worms (*Nereis* spp.). Found in deposits of decaying kelp and other detritus at the upper tide line are a number of scavenging organisms, including beach hoppers or California beach fleas (*Orchestoidea californica*), Harford's greedy isopod (*Cirolana harfordi*), and kelp flies (*Fucellia* spp., *Coelopa* spp., etc.) (Schoenherr 1992). Common shorebirds found feeding on these invertebrates include willets (*Catoptrophorus semipalmatus*), marbled godwits (*Limosa fedoa*), and sanderlings (*Calidris alba*).

Threatened and Endangered Species.

Eleven species that are federally or state listed as threatened, endangered, or otherwise of special concern, have the potential to occur in the vicinity of the project area. Six are federally listed as endangered and one is listed as threatened under the ESA (Table 3-6).

No federally listed plant species are known to occur on the proposed shore station site. Two species listed as sensitive by the California Native Plant Society have been found in the vicinity: red sand-verbena (*Abronia maritima*) and Blochman's dudleya (*Dudleya blochmaniae* ssp. *blochmaniae*) (McMillan 1998b). Red sand-verbena is found on coastal sand dunes; none were observed during recent biological surveys of the proposed site (Spaulding 1998). Blockman's dudleya inhabits coastal bluff scrub or coastal scrub habitats and has been found north of the LCAC facility.

Table 3-6. Sensitive Species Known to Occur at MCB Camp Pendleton and with Potential to Occur in the Vicinity of the Proposed and Alternative Shore Station Sites

Common Name	Scientific Name	Status[1]
Plants		
Red sand-verbena	*Abronia maritima*	CNPS: 4
Blochman's dudleya	*Dudleya blochmaniae* ssp. *blochmaniae*	CNPS: 1B
Reptiles and Amphibians		
Arroyo southwestern toad	*Bufo microscaphus californicus*	FE, DFG: Protected

Southwestern pond turtle	*Clemmys marmorata pallida*	FSC, DFG: SC
Mammals		
Pacific pocket mouse	*Perognathus longimembris pacificus*	FE, DFG: SC
Birds		
Brown pelican	*Pelecanus occidentalis*	FE, SE
California gnatcatcher	*Polioptila californica*	FT, DFG: SC
California least tern	*Sterna antillarum browni*	FE, SE
Least Bell's vireo	*Vireo bellii pusillus*	FE, SE
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE
Western snowy plover	*Charadrius alexandrinus nivosus*	FT, DFG: SC

Sources: Skinner & Pavlik 1994; Ogden 1997a; CDFG 1998; McMillan 1998a,b.

[1]Status: FE = federally listed as endangered
FT = federally listed as threatened
FSC = Federal Species of Concern, former Category 2 candidate species
SE = state listed as endangered
DFG: SC = California Department of Fish and Game Special Concern species - an administrative designation given to vertebrate species that appear to be vulnerable to extinction because of declining populations, limited ranges, and/or continuing threats
CNPS = California Native Plant Society:
1B - Plants rare, threatened, or endangered in California and elsewhere
4 - Plants of limited distribution, watch list

The federally endangered arroyo southwestern toad (*Bufo microscaphus californicus*) inhabits rivers with shallow, gravelly pools adjacent to sandy terraces. These areas have a nearly complete closure of cottonwoods, oaks, or willows and almost no grass and herbaceous cover at ground level. Suitable habitat for arroyo toads does not exist at the proposed site and the closest populations are 3-4 miles (5-6 km) south in the Santa Margarita River (U.S. Marine Corps [USMC] 1994). The southwestern pond turtle (*Clemmys marmorata pallida*), a federal and state species of concern, was observed in the pond at the mouth of Cockleburr Canyon Creek during recent biological surveys (Spaulding 1998).

The federally endangered Pacific pocket mouse (*Perognathus longimembris pacificus*) was historically found in the coastal areas of MCB Camp Pendleton. Before 1936 the species was reliably captured along the Santa Margarita Estuary in the southern portion of the base. However, between 1936 and 1995, no observations of Pacific pocket mice had been made on the base. Intensive surveys of potential and historical Pacific pocket mouse habitat on MCB Camp Pendleton were conducted in 1995 and three areas in the northern portions of the base were found to support the species. Although the vicinity of the proposed shore station site appears to contain habitat that is suitable to support Pacific pocket mice (e.g., open coastal sage scrub on fine sandy or sandy loam soils), no individuals were found during surveys by the USFWS (USFWS 1995b). Reasons for the species absence may include past and continuing disturbance by agriculture, habitat fragmentation by development and roads, poor dispersal and colonization abilities of the species, and competition from other, more common rodent species (Ogden 1997b).

A total of six federally and state listed threatened or endangered bird species have the potential to occur within the vicinity of the proposed shore station at Camp Pendleton.

Least Bell's vireos (*Vireo bellii pusillus*) and southwestern willow flycatchers (*Empidonax traillii extimus*) nest and forage generally along willow-dominated riparian habitats with lush understory vegetation. The closest suitable habitat and known populations of vireos and flycatchers are 3-4 miles (5-6 km) south of the MCTSSA facility along the Santa Margarita River (USMC 1994).

The California least tern (*Sterna antillarum browni*) and western snowy plover (*Charadrius alexandrinus nivosus*) are ground nesters and utilize undisturbed, sparsely vegetated, flat areas with loose, sandy or saltpan substrates. The breeding season for both species is March 1 - September 15. Least terns migrate south to Central and South America whereas snowy plovers disperse along the coast of southern California and are present throughout the winter. The nearest nesting colonies of least terns occur approximately 1.5 miles (2 km) north of the MCTSSA facility on the beaches and coastal dunes associated with Aliso/French Creek and 1 mile (1.6 km) south of the MCTSSA facility at the mouth of the Santa Margarita River (Foster 1996). Snowy plovers nest in similar habitats to least terns and are in proximity to least tern colonies at Aliso/French Creek and the Santa Margarita River mouth. In addition, snowy plovers were discovered in 1996 to be nesting in an area extending from the mouth of Cockleburr Canyon Creek (just north of the MCTSSA facility) south to North Beach at the mouth of the Santa Margarita River. The preferred nesting habitat is a narrow strip of lower dunes between the heavily used lower beach and the heavily vegetated upper sand dunes (Powell et al. 1997).

The California gnatcatcher (*Polioptila californica*) is an obligate resident of the coastal sage scrub plant community, which is dominated by California sagebrush (*Artemisia californica*). At MCB Camp Pendleton, California gnatcatchers are found predominantly in the upland areas. Very little coastal sage scrub habitat remains in the vicinity of the MCTSSA and LCAC facilities and is confined to small, island patches along the drainages to the north of the MCTSSA facility; suitable habitat does not exist for gnatcatchers in the immediate vicinity of either facility. The closest known gnatcatcher locality occurs over 1,000 ft (305 m) from the proposed site (USFWS 1998b). The remaining listed species, the brown pelican (*Pelecanus occidentalis*), has the potential to occur in the project area as a transient visitor (e.g., migrating or foraging) over nearshore waters.

3.6.3.2 Alternative Shore Station Locations

<u>Pacific City Alternative</u>

Vegetation

Oregon can be divided into a number of ecoregions, which are geographic areas with similar features, such as climate, vegetation, geology, geomorphology, soils, and ecosystem processes, together with characteristic natural communities of plant and animal life. The ONHP recognizes 10 ecoregions that are the same as those used by ODFW (Natural Heritage Advisory Council 1998). The Oregon coast is contained in the Oregon Coast Range Ecoregion and includes the entire Oregon coastline and the northern and central Oregon Coast Range Mountains. Elevations in the ecoregion range from sea level to 4,000 ft (1,200 m), and the marine climate creates the most moderate and wettest habitats in the state. Average annual precipitation is 60-180 inches (150-460 cm), which supports extensive stands of temperate rainforests. Vegetation is characterized by forests of Sitka spruce (*Picea sitchensis*), although in many places western hemlock (*Tsuga heterophylla*) and Douglas fir (*Pseudotsuga menziesii*) dominate. Red alder (*Alnus ruber*) often forms patches in disturbed areas and riparian situations, while western red cedar (*Thuja plicata*) characterizes swampy habitats (Frenkel 1993; Natural Heritage Advisory Council 1998).

Much of the native vegetation in Pacific City has been either reduced to small patches or replaced by nonnative trees, shrubs, and grasses. The alternative shore station area is a fenced, paved compound with no vegetation.

Wetlands

Due to Pacific City's proximity to Nestucca Bay at the mouth of the Little Nestucca River, wetlands are very prominent in the area. These are predominantly estuarine, intertidal wetlands with characteristic tidal flats and salt marsh. Sandy beaches, or marine intertidal wetlands, are dominant along the coast north and south of Pacific City (USFWS 1995a).

Wildlife

Coastal areas of Oregon hold a great diversity of terrestrial wildlife due to temperate climate and a wide variety of habitats ranging from beaches, rocky cliffs, intertidal areas, marshes, and sloughs along the coast to the temperate rainforests inland. Due to the generally year-round, moist temperate climate, amphibians are abundant, including northwestern salamander (*Ambystoma gracile*), Pacific giant salamander (*Dicamptodon tenebrosus*), ensatina (*Ensatina eschscholtzii*), roughskin newt (*Taricha granulosa*), Pacific treefrog (*Hyla regilla*), and red-legged frog (*Rana aurora*) (Corkran and Thoms 1996).

Common mammals found in the region include black bear (*Ursus americanus*), mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), creeping vole (*Microtus oregoni*), Pacific jumping mouse (*Zapus trinotatus*), red squirrel (*Tamiasciurus hudsonicus*), striped skunk (*Mephitis mephitis*), long-tailed weasel (*Mustela frenata*), and mink (*Mustela vison*) (Ingles 1965).

In the region around Pacific City, five NWRs (see Section 3.6.2.2, Area within Territorial Waters), have been established to provide wintering areas for shorebirds and waterfowl, and migratory stopovers and critical nesting habitat for over one million seabirds. Nestucca Bay NWR, located immediately south of Pacific City, and Siletz Bay NWR, 15 miles (24 km) south of Pacific City, protect high quality coastal wetlands and uplands for residents and serve as rest stops for migrating shorebirds and waterfowl, including sanderlings, mallards (*Anas platyrhynchos*), pintails (*Anas acuta*), northern shovelers (*Anas clypeata*), whimbrels (*Numenius phaeopus*), willets, and western sandpipers

(*Calidris mauri*). Cape Meares NWR, approximately 20 miles (30 km) north of Pacific City, was originally established to protect important nesting habitat along the coastal cliffs and offshore rocks for tufted puffins, pelagic cormorants, common murres, and pigeon guillemots. It also protects one of the few remaining stands of coastal old-growth forest in Oregon (USFWS 1985, 1993).

Other bird species found in the area include Stellar's jays (*Cyanocitta stelleri*), American crows (*Corvus brachyrhynchos*), common ravens (*Corvus corax*), belted kingfishers (*Ceryle alcyon*), black oystercatchers, snowy egrets (*Egretta thula*), western gulls, downy woodpeckers (*Picoides pubescens*), varied thrushes (*Ixoreus naevius*), Cooper's hawks (*Accipiter cooperii*), great-horned owls (*Bubo virginianus*), American robins (*Turdus migratorius*), and rufous-sided towhees (*Pipilo erythrophthalmus*).

Threatened and Endangered Species

A total of five federally and state-listed threatened or endangered species occur within the vicinity of Pacific City (Table 3-7). Nestucca Bay NWR and surrounding fields and farms of Nestucca Bay provide the principal wintering habitat in the area for Aleutian Canada geese (*Branta canadensis leucopareia*), a federally threatened and state endangered species. Occasionally, individuals and small flocks have also been observed in grazed pasture land along both sides of the Nestucca River, along the beach north of Cape Kiwanda, at Three Arch Rocks NWR, and offshore of Pacific City on Haystack Rock. Birds usually arrive at Nestucca Bay during fall migration in October and leave in March or April. As of 1995, peak numbers of geese were 16 in February; previously a peak winter count of 128 was observed in January 1991 (USFWS 1993; ONHP 1998).

The only other listed species known to occur in the immediate vicinity of Pacific City is the federally and state-listed threatened western snowy plover (*Charadrius alexandrinus nivosus*). The last nest sites were observed in 1974 in dried vernal pools between the ocean and bayside foredunes. Individuals were last observed at Nestucca Spit State Park, immediately south of Pacific City, in 1988 when two birds were seen (ONHP 1998).

Table 3-7. Sensitive Species Known to Occur or Potentially Occur in the Vicinity of Pacific City, Oregon

Common Name	Scientific Name	Status[1]
Birds		
Aleutian Canada goose	*Branta canadensis leucopareia*	FT, SE
Bald eagle	*Haliaeetus leucocephalus*	FT, ST
American peregrine falcon	*Falco peregrinus anatum*	FE, SE
Brown pelican	*Pelecanus occidentalis*	FE, SE
Western snowy plover	*Charadrius alexandrinus nivosus*	FT, ST

Sources: USFWS 1981, 1998; ONHP 1995, 1998.
[1]Status: FE = federally listed as endangered
FT = federally listed as threatened
SE = state-listed as endangered
ST = state-listed as threatened

The remaining three listed species, American peregrine falcon (*Falco peregrinus anatum*), brown pelican, and bald eagle (*Haliaeetus leucocephalus*), have the potential to occur in the project area as transient (e.g., migrating or foraging) visitors (USFWS 1993).

MCB Camp Pendleton Alternative

The MCB Camp Pendleton alternative shore station site is located less than 0.5 mile (1 km) northwest of the proposed site (refer to Figure 2-8). Due to the proximity of the alternative site to the proposed site and its similar coastal/beach location, the vegetation of the alternative site is very similar to that of the proposed site. Therefore, biological resources for the alternative site are similar to those previously discussed for the proposed site (Section 3.6.3.1).

Six vernal pool groups occur in the immediate vicinity of the LCAC facility; however, the closest group is approximately 7,000 ft (2,100 m) from the alternative shore station location (McMillan 1998a).

3.7 LAND USE, TRANSPORTATION, AND RECREATION

3.7.1 Background

Land use is the classification of either natural or human-modified activities occurring at a given location. Examples of land use in an ocean environment include shipping, tourism, military, commercial and recreational fishing, and other recreational activities. Types of offshore activities suitable for given areas are often addressed by state and local coastal management programs that have been established to comply with the Coastal Zone Management Act (CZMA) of 1972 *et seq*. For the proposed action, the CZMA is administered by the California Coastal Commission (CCC). For the alternative ADS ocean test location, the CZMA is administered by the Oregon Coastal Management Program and the Washington State Department of Ecology. To obtain approval from state and local agencies for offshore actions, it is typically necessary to obtain appropriate permits.

Traffic issues generally refer to transportation and circulation of ground vehicles in the relationship of the ability of a road system to accommodate varying levels of traffic burdens. Marine traffic issues address ocean vessel movement in port, nearshore, and in open ocean environments. Traffic issues related to the ADS ocean tests are associated with the addition of two offshore vessels, with only one being used at any given time. Transportation issues for ship traffic have similarities to onshore traffic systems; however, ship traffic has a greater flexibility than land routes for structuring courses and paths that a particular ship or boat may take. Routes used for commercial shipping (characterized by use of large cargo, container vessels, or tankers) are highly structured and controlled, even in open ocean areas. For smaller boats, the only limiting factor on a specific body of water is the availability of adequate depth.

3.7.2 ADS Ocean Test Locations

3.7.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Land Use/Recreation

The proposed ocean test location would be located off the coast of southern California (refer to Figure 2-5). Waters offshore of southern California are heavily utilized for commercial uses, recreational and military activities, and limited oil and gas production facilities.

Commercial uses primarily comprise commercial fishing, diving, and trapping. These activities occur at various locations off the coast of southern California. The Channel Islands are extremely productive commercial fishing areas. The nearshore waters along the coast and the waters just off the islands contain giant kelp beds, which provide habitats for a number of different species. Fishery seasons are established and regulated by the CDFG. A detailed discussion of the economic elements of commercial fishing is presented in Section 3.8, Socioeconomics.

The commercial harvest of kelp and other marine vegetation near the coastline is becoming a more established industry in southern California. Live fish trapping (e.g., rockfish, sheephead, and sea bass) occurs primarily in the shallower waters near the coastline of the Channel Islands. Lobsters are fished in coastal waters because they are typically most abundant in rocky areas with kelp in waters of 100 ft (30 m) or less in depth. Most of the waters off the islands are conducive to this habitat since the islands generally have an offshore shelf that extends out gradually into deeper waters. Commercial drift gill netting for pelagic shark and swordfish occurs in the open waters throughout portions of southern California. This fishery, however, is only a small portion of the total industry in southern California.

Recreational activities occur primarily in nearshore areas of southern California. Examples of common recreational activities include sport fishing, sailing, boating, and swimming. In addition, the coastal and offshore marine environments are popular locations for tourist activities including sightseeing, whale watching, sport fishing, pleasure boating, and diving.

Recreational fishing involves hook-and-line fishing from piers and docks, jetties and breakwaters, beaches and banks, private or rental boats, and commercial passenger fishing vessels. Hook and line fisheries are not allowed within the state waters of California (3 nm [5.6 km] offshore); the main species caught in hook and line fisheries is rockfish. Recreational fishing also includes activities such as spear and net fishing. Recreational fisheries in southern California access both nearshore and offshore areas, targeting both groundfish and mid-water fish species.

According to catch records, southern California is a leading recreational fishing area along the west coast (CDFG 1996). The weather and sea conditions allow for year-round fishing activity. Although the majority of kelp beds are within 1 nm (1.8 km) of shore, some fishing areas extend as far as 5 nm (9 km) from shore. Commercial passenger fishing vessels frequently take 1-day sport fishing excursions from the various ports within southern California. Types of fish landed on commercial passenger fishing vessels include kelp bass, mackerel, sheephead, halfmoon, and whitefish, which indicates that sport fishing generally takes place in relatively shallow waters (approximately 60 ft [18 m] or less).

Recreational activities in southern California other than rod and reel fishing include SCUBA diving for spiny lobster, scallop, and abalone as well as spear fishing for rockfish, sheephead, and swordfish. These activities also occur primarily in shallow waters near the coastline.

Federal leasing of offshore lands for oil and gas production began in 1963, following 10 years of state leasing of offshore areas. Numerous oil platforms and exploratory drilling rigs are located from Los Angeles to the Santa Barbara Channel, both in state waters (out to 3 nm [5.6 km]) and federal waters (beyond 3 nm [5.6 km]). Several of these rigs and platforms are in the process of being decommissioned.

Transportation

Maritime traffic routes are typically established by the U.S. Coast Guard (USCG). The major purpose of these routes (often referred to as shipping lanes) is to allow access to and from major ports for large commercial marine vessels, while also allowing an adequate separation scheme for other types of offshore activities. Commonly used commercial shipping routes include a major shipping lane that transits the Santa Barbara Channel; this route is the most heavily traveled traffic lane used by commercial cargo vessels in the waters of southern California. This Traffic Separation Scheme (TSS) established by the USCG runs just north of, and roughly parallel with, the northern Channel Islands. The TSS is used by commercial vessels traveling between northern Pacific ports (e.g., Seattle, San Francisco, and Vancouver) and those situated in southern California, as well as by traffic using the Panama Canal or heading to and from western Pacific ports. The majority of oil tankers passing through the area voluntarily travel 50 nm (93 km) offshore (USCG 1997). However, those tankers heading south to the Port of Los Angeles use a route closer to shore. The USCG issues a Notice to Mariners (NOTMAR) that notifies passing vessels of the presence of activities in the area.

Southern California waters are also used by Navy marine vessels for ocean-related activities. Common types of Navy vessels include range support boats, larger ships (cruisers, destroyers, and aircraft carriers), and surface targets. The Point Mugu Sea Range, a 36,000 square nautical mile (nm^2) (123,500 km^2) area located in the Pacific Ocean approximately 50 miles (80 km) northwest of Los Angeles, is a military operations and testing area operated by the Navy. The Sea Range parallels the California coast for approximately 200 nm (370 km) and extends seaward for more than 180 nm (333 km). Offshore commercial and recreational activities are allowed within the Sea Range;

however, restrictions are occasionally enacted to clear areas before military operations are conducted.

Area outside Territorial Waters

Certain activities, such as commercial shipping and commercial fishing, as well as oil and gas production platforms, occur in the open ocean environment outside territorial waters. However, the majority of vessels and activities typically operate in nearshore areas. Land use activities, as they would apply to areas outside of territorial waters, are described above.

3.7.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Land Use/Recreation

The alternative ocean tests would be located off the coast of the Pacific Northwest (refer to Figure 2-6). Waters offshore of the Pacific Northwest are heavily used for commercial uses and recreational activities.

Commercial uses are comprised primarily of commercial fishing and trapping. These activities occur at various locations off the coast of the Pacific Northwest. A detailed description of the economic elements of commercial fishing is discussed in Section 3.8, Socioeconomics.

Commercial fishing is important to the Pacific Northwest economy. The primary fisheries include bottom trawling, which targets flatfish, rockfish, roundfish, shrimp, and prawns; near-bottom and pelagic trawling, which targets whiting and rockfish; longlining, which targets halibut, sablefish, and rockfish to a lesser extent; pot vessels, which target Dungeness crab and sable fish; dredging, which targets scallops; and trolling, which targets salmon and albacore tuna.

Commercial fishing operations operate out of most ports along the Pacific Northwest coastline. Groundfish and shrimp trawlers operate out of larger coastal ports such as Newport, Tillamook, Garibaldi, and Astoria, Oregon, and Grays Harbor, Washington. Fishing grounds range from areas within the 3-mile state jurisdiction area up to 60 nm (111 km) offshore but are generally more than 20 nm (37 km) offshore in deeper pelagic waters. Inshore midwater trawl vessels operate out of Coos Bay, Newport, and Astoria, Oregon, and Grays Harbor, Washington. Nearly all of the groundfish longline/pot fishing effort takes place beyond the 3 nm (5.6 km) state jurisdiction area. Halibut fishing is spotted over sand and gravel bottom along the entire coast, with major grounds off the ports of Newport and Astoria, Oregon, and Grays Harbor, Washington. Major sablefish fishing grounds are located off the larger canyons, such as Astoria Canyon and Grays Canyon, Washington. The west coast Dungeness crab pot fishery is conducted near the major fishing ports along the coast, including Newport, Astoria, and Grays Harbor. The salmon season generally lasts from May to October each year. Although the effort is concentrated off the major fishing ports in the area, vessels from all Pacific coast states may range as far as 50 miles (80 km) offshore and follow the salmon migration north from California to Washington as the summer progresses. Tuna trollers may be based in Oregon and Washington ports or may follow the albacore tuna migration across the North Pacific from Hawaii. There are a number of other minor, usually localized, commercial fisheries that occur on the Oregon and Washington coasts (Alliant Techsystems, Inc. 1994).

Recreational activities occur primarily in nearshore areas of the Pacific Northwest. Examples of common offshore recreational activities include sport fishing, sailing, and boating. In addition, the coastal and offshore marine environments are popular locations for tourist activities. Tourist-related activities include sightseeing, sport fishing, pleasure boating, and diving.

Recreational fishing involves hook-and-line fishing from piers and docks, jetties and breakwaters, beaches and banks, private or rental boats, and commercial passenger fishing vessels. Recreational fishing also includes activities such as spear and net fishing. Recreational fisheries in the Pacific Northwest access both nearshore and offshore areas, targeting both groundfish and mid-water fish species.

The Pacific Northwest is a very popular recreational fishing area. Recreational fishing occurs throughout the year; however, fishing activity generally occurs from late spring through early fall. Although the majority of fishing grounds are located within 1 nm (2 km) of shore, some fishing areas extend as far as 12 nm (22 km) from shore. Commercial passenger fishing vessels frequently take 1-day sport fishing excursions from most ports along the coast. Types of fish landed included salmon, halibut, rockfish, lingcod, greenling, albacore tuna, and Dungeness crab. These activities occur primarily in shallow waters less than 3 hours transit time from the coast (Alliant Techsystems, Inc. 1994).

For the alternative ADS ocean test location, the CZMA is administered by the Oregon Coastal Management Program and the Washington State Department of Ecology. Project proposals are reviewed based on the state's coastal management program to determine consistency with standards of the program. Jurisdiction for review is based on projects which involve the use of coastal land and water use. The following provides a brief overview of the goals for Oregon and Washington coastal management programs.

Oregon Coastal Management Program - The Oregon Coastal Management Program is a state and local partnership whose purpose is to protect, conserve, and where appropriate develop natural and cultural resources within Oregon's Coastal Zone.

Comprehensive plans in the coastal zone contain special elements that address the use of coastal resources such as beaches and dunes, coastal shorelands, and estuaries. These local plan elements derive from Statewide Planning Goals that address coastal resources. Three of these goals are implemented in large part through the comprehensive plans of coastal jurisdictions. A fourth goal, ocean resources, is an element which is implemented predominantly through state agency programs, since the state, rather than local governments, has management responsibility for ocean resources. Project proposals must comply and be consistent with all applicable overall goals of the Oregon Coastal Management Program. These guidelines are summarized below:

Goal 17: Coastal Shorelands: "To conserve, protect, where appropriate, develop and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation and aesthetics. The management of these shoreland areas shall be compatible with the characteristics of the adjacent coastal waters; and

To reduce the hazard of human life and property, and the adverse effects upon water quality and fish and wildlife habitat, resulting from the use and enjoyment of Oregon's coastal shorelands".

Goal 18: Beaches and Dunes: "To conserve, protect, where appropriate develop, and where appropriate restore the resources and benefits of coastal beach and dune areas; and

To reduce the hazard to human life and property from natural or man-induced actions associated with these areas".

Goal 19: Ocean Resources: " To conserve the long-term values, benefits, and natural resources of the nearshore ocean and the continental shelf".

Washington State Department of Ecology - For the Washington State Department of Ecology, the CZMA-designated agency, project proposals must provide all necessary data in accordance with the requirements of 15 CFR § 930.58. The project proposal must comply and be consistent with all applicable overall goals of the State Guidelines for development of Master Programs (Washington Administrative Code [WAC] 173-16). These guidelines are summarized below.

Chapter 23.20.20 Economic Development Goals: "To create and maintain an economic environment which can coexist harmoniously with the natural and human environment."

Chapter 23.20.30 Public Access Goals: "Access of the public to all types of shorelines will be substantially increased, provided that private rights, the public safety, and natural shorelines will be preserved."

Chapter 23.20.40 Recreation Goals: "Additional opportunities and space for diverse forms of recreation will be provided by public and private organizations."

Chapter 23.20.50 Circulation Goals: "Circulation systems in shoreline areas will be shoreline dependent; and the physical and social environment will be protected from adverse effects of such circulation activities."

Chapter 23.20.60 Shoreline Use Goals: "The Shorelines will be preserved or developed for an orderly balance of shoreline dependent uses."

Chapter 23.20.70 Conservation Goals: "All natural and social resources in the shorelines will be conserved to the maximum reasonable extent."

Chapter 23.20.80 Historical-Cultural Goals: "Shoreline features of significant historic, cultural, archaeological, scientific, or educational value will be protected and made accessible by public or private organizations."

Chapter 23.20.90 Restoration Goals: "Restoration of severely blighted shorelines will be encouraged."

Transportation

Important maritime trade consists of both coastal and foreign shipping. Large and small ships and barges transport oil, containers, agricultural products, and logs to and from Pacific Northwest ports, linking the Northwest through trade with many nations on the Pacific rim and beyond. Ocean-going vessels utilize a number of areas along the Pacific Northwest coast, including major ports along the Columbia River, Strait of Juan de Fuca, and smaller coastal ports throughout the coastline of Oregon and Washington. The Port of Portland leads in total tonnage of foreign trade handled, mainly from the export of grains from the Columbia Basin, followed by Seattle and Tacoma. Seattle dominates in ocean-going barge traffic to Alaska, while Portland leads in barge and small ship construction and in ship repair (Northam 1993).

No established traffic routes are located in this area; however, the majority of large vessels generally travel at least 3-5 miles (5-8 km) offshore. At the Columbia River, however, larger vessels must contact a bar pilot and be escorted into the river (USCG 1998). The majority of oil tankers passing through voluntarily travel 50 nm (93 km) offshore (USCG 1997).

Area outside Territorial Waters

Certain activities, such as commercial shipping and commercial fishing, occur in the open ocean environment. However, the majority of vessels and activities typically operate in nearshore areas. Land use activities as they would apply to areas outside territorial waters are described above.

3.7.3 ADS Shore Station Locations

3.7.3.1 Proposed Shore Station Location

Land Use/Recreation

The proposed shore station would be located within the boundaries of MCB Camp Pendleton (refer to Figure 2-7). MCB Camp Pendleton is located in northwestern San Diego County, with a small portion of the base located in Orange County. The communities nearest to MCB Camp Pendleton are San Clemente to the north, Fallbrook to the east, and Vista and Oceanside to the south. The primary base entrance is located off Interstate 5 (I-5) north of the City of Oceanside.

Goals and policies to ensure land use consistency with MCB Camp Pendleton functions have been established in the MCB Master Plan (Southwest Division 1992). General onbase land use is described below.

The developed areas of MCB Camp Pendleton are isolated from one another by large undeveloped areas used for training, maneuvers, and ordnance impact areas. The perimeters of the impact areas function as safety buffer zones and contain most of the firing ranges at MCB Camp Pendleton.

The largest concentration of development is in the Headquarters Area, in the southeastern portion of the base. Major community support facilities, family housing areas, and gates to the Fallbrook and San Luis Rey communities are located adjacent to the Headquarters Area. The Santa Margarita Valley, located in the eastern portion of MCB Camp Pendleton, contains the Naval Hospital, military housing, the Chappo (22) Area, and the Marine Corps Air Station (Southwest Division 1992).

The proposed shore station site would be located in a disturbed area in the southern portion of the base on land presently designated as troop areas (USMC 1998). The site is located adjacent to the MCTSSA facility, which is a development testing and evaluation organization for data systems and telecommunications electronic equipment (refer to Figure 2-8). Land uses surrounding the site include the Pacific Ocean to the west, undeveloped land to the north, agricultural lease areas to the southeast, and MCTSSA to the east.

Transportation

MCB Camp Pendleton is located in the vicinity of several major roadways (refer to Figure 2-7). I-5, an eight-lane freeway running in a north-south direction through the western portion of the base, is the major highway link between metropolitan Los Angeles and San Diego. Onbase roadways in the vicinity of the proposed shore station site include Stuart Mesa Road, a north-south arterial, and Vandergrift Boulevard, a major north-south arterial that provides primary access into the main gate. Access to the proposed shore station site would be provided from Cockleburr Road, which is a two-lane (one lane in each direction) bridge that crosses over I-5 and connects MCTSSA to Stuart Mesa Road. There is an unpaved road outside and adjacent to the existing eastern and southern fence lines of the MCTSSA compound that is used for access to the agricultural areas. This road would also be used to access the proposed shore station site.

3.7.3.2 Alternative Shore Station Locations

Pacific City Alternative

Land Use/Recreation

The Pacific City alternative shore station would be located in Tillamook County, within the unincorporated boundaries of Pacific City (refer to Figure 2-9). Under this alternative, the shore station site would be located within a fenced facility compound with limited access to the public. The site is presently used as a telecommunications facility and is zoned for commercial uses. Land use in the vicinity of Pacific City is designated by Tillamook County. The Comprehensive Plan for Tillamook County is presently being updated (Tillamook County Department of Community Development 1998). Surrounding land uses include park land to the north, undeveloped land to the south and east, and scattered housing to the west.

The beach area, where proposed trenching would occur, is located west of downtown Pacific City, across the Nestucca River. Surrounding land uses include the Pacific Ocean to the west, public beaches to the north and south, and a public parking lot to the east. Scattered commercial facilities are located to the southeast.

For the Pacific City alternative shore station, compliance with the goals of the Oregon Coastal Management Program would be required to determine consistency with the program and CZMA, as previously described under the alternative ADS ocean test location.

Transportation

Major roadways within the vicinity of the alternative shore station site include Cape Kiwanda Drive, a major roadway that runs in a north-south direction and provides access to the site; Pacific Avenue, the main east-west roadway that provides access into downtown Pacific City and the beach; and Sunset Drive, a north-south road that intersects Pacific Avenue and leads south to Kiwanda Beach.

MCB Camp Pendleton Alternative

Land Use/Recreation

The MCB Camp Pendleton alternative shore station would be located at an existing control tower situated within the boundaries of MCB Camp Pendleton, approximately 1 mile (1.6 km) north of the proposed shore station (refer to Figure 2-10). The area is presently designated as a “prohibited area” (no maneuvers) (USMC 1998). The site is located adjacent to the LCAC facility, which is utilized for the training of Naval personnel in the operation and maintenance of LCAC vehicles. Land uses surrounding the site include the Pacific Ocean to the west, undeveloped land to the east and south, and the LCAC facility to the north. Due to the proximity of the MCB Camp Pendleton sites to each other, land use issues would be similar at both locations; therefore, refer to Section 3.7.3.1 for a detailed discussion of land use at MCB Camp Pendleton.

Transportation

Access to the MCB Camp Pendleton alternative shore station location would be provided by an existing road located north of the site. Due to the proximity of the two sites to each other, transportation issues would be similar at both locations; therefore, refer to Section 3.7.3.1 for a detailed discussion of transportation at MCB Camp Pendleton.

3.8 SOCIOECONOMICS

3.8.1 Background

Socioeconomics describes the basic attributes and resources associated with the human environment, particularly population and economic activity. Economic activity typically encompasses employment, personal income, and industrial growth. Impacts on these fundamental socioeconomic components influence other issues such as housing availability and provision of public services.

The project area for socioeconomics is defined as the area in which the principal effects arising from implementation of the proposed action or an identified alternative are likely to occur. Due to the nature of the proposed action (i.e., a limited number of test personnel working at onshore and offshore locations, lack of large-scale construction activities, temporary nature of the testing, and the minimal amount of local material or manpower expenditures), the socioeconomic analysis focuses primarily on the commercial fishing and offshore recreational uses associated within the marine environment.

Executive Order 12898

In 1994, EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued to focus attention of federal agencies on human health and environmental conditions in minority and low-income communities and to ensure that disproportionately high and adverse human health or environmental impacts on these communities are identified and addressed. This evaluation focuses on the distribution of race and poverty status in areas potentially affected by implementation of proposed and alternative actions.

Executive Order 13045

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, states that each federal agency:

> "…shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children"; and
>
> "…shall ensure its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

This EO, commonly referred to as "Environmental Justice for Children," focuses on the human health and environmental conditions in communities with children and ensures that federal activities do not disproportionately affect children.

3.8.2 ADS Ocean Test Locations

3.8.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Large-scale commercial fishing activities occur within territorial waters. All nearshore activities (i.e., less than 3 nm [5.6 km] from shore) are regulated by the State of California.

Commercial Shipping

Commercial shipping in southern California is dominated by cargo transports, oil tankers, and barges. The region is used by commercial vessels traveling between northern Pacific ports (e.g., Vancouver, Seattle, and San Francisco) and those situated in southern

California. The region is also transited by vessels to and from the Panama Canal and western Pacific ports. According to the USCG, oil tankers using the Santa Barbara Channel voluntarily travel 50 nm (93 km) offshore (USCG 1997).

Commercial Fishing

Southern California is an extremely productive commercial fishing area, especially the area including and within the Santa Barbara Channel and Channel Islands. Kelp beds extending from the mainland coast to the Channel Islands provide habitat for and access to many commercial species (e.g., urchins, abalone, lobster, squid, sardines, anchovies, mackerel, bonito, and rockfish). The CDFG regulates commercial fishing operations within state waters.

Catch totals and associated revenues for ports within the Santa Barbara area (which includes ports and landings from Los Angeles to Avila Beach), Los Angeles, and San Diego are recorded by the CDFG through required reporting procedures. Commercial fleets within each district report catch totals by species. A summary of reported poundage and values for these areas is presented in Table 3-8. A list of commercially fished species and their respective seasons is presented in Table 3-9. Commercial fisheries are discussed in greater detail in Section 3.7.

Table 3-8. Regional Commercial Fishing Poundage and Value (1995)

Port	Pounds	Value
Santa Barbara	134,084,000	$46,058,300
Los Angeles	170,111,000	$29,147,100
San Diego	4,092,050	$6,966,680
Total	**187,611,050**	**$82,172,080**

Source: CDFG 1996.

Table 3-9. Commercially Fished Species within Southern California

Species	Season
King salmon (chinook)	Regulated by federal government
Silver salmon (coho)	Regulated by federal government
California halibut	Jun 16 - Mar 14
Surf perch	Jul 16 - Apr 30
Abalone[1]	Sep 1 - Dec 31; Mar 1 - Jul 31
Spiny lobster	1st Wed of Oct - 1st Wed after Mar 15
Clams	Sep 1 - Mar 31
Dungeness crab	Nov 15 - Jun 30
Shrimp (trawling)	Apr 1 - Oct 31
White sea bass	Jun 16 - Mar 14
Ridge back prawn (trawling)	Oct 1 - May 31
Spot prawn (trapping)	Apr 1 - Jan 15
Sea urchin	seasons vary [2]

Source: CDFG 1996.
[1] As of May 1997, the CDFG has placed a temporary closure on all commercial abalone harvesting.
[2] Sea urchin seasons are:

Nov 1 - Mar 31: 7 days per week
Apr and Oct: Mon-Thu
May and Sep: Mon-Thu (closed 2nd week)
Jun and Aug: Mon-Wed (closed 2nd week)
Jul: closed north of San Luis Obispo/Monterey County line but open Mon-Thu except 2nd week south of county line

Sport Fishing

Southern California is the leading recreational fishing area along the Pacific coast of the U.S.; the region is fished year-round due to favorable weather and sea conditions. Recreational fishing is commonly done from shore, private boats, and charter boats.

Inner waters from the U.S.-Mexico border to Point Conception are lined with kelp beds and reefs that provide recreational fishing opportunities to catch kelp bass, yellowtail, bonito, rockfish, barracuda, and others. Popular Channel Islands sport fishing areas are concentrated around the offshore kelp beds and open ocean south of Anacapa and Santa Cruz islands (CCC 1993). Total fish catches of recreational passenger fishing boats in California are recorded by the CDFG (Table 3-10). Recreational fishing is discussed in greater detail in Section 3.7.

Table 3-10. Fish Caught by California Recreational Passenger Fishing Fleets (1990 and 1991)

Species	1990 Totals (# fish)	1991 Totals (# fish)
Rockfish	311,992	339,025
Bass (various)	165,375	165,225
Mackerel (Pacific and jack)	40,844	57,999
Whitefish	19,288	26,435
California barracuda	16,429	25,109
Halfmoon	4,853	17,269
Sheephead	7,344	12,201
Sculpin	9,030	9,771
Lingcod	4,844	7,644
Flatfish	1,948	1,780
Cabezon	1,374	1,134
California halibut	842	811
Others	476	650
Salmon	3	404
White sea bass	1,248	302
Pacific bonito	10,377	251
Sanddab	17	205
White croaker	278	140
Opaleye	23	89
Sole	15	50
Sablefish	183	20
Yellowtail	1,000	16
Jacksmelt	80	10
Tuna	0	7
Total Fish	**597,863**	**666,548**
Total Anglers	**67,698**	**73,988**
Total Boats	**31**	**29**

Source: CCC 1993.

Other Recreational Activities/Tourism

The public also uses the area of the proposed ocean test location for other recreational activities, such as sport fishing, boating, diving, and whale watching. These activities originate from harbors, coves, and marinas along the mainland coast. Whale watching is popular in the region primarily from March through May (during the annual gray whale northward migration); bird watching and marine mammal observation are popular year-round. Recreational diving at shipwrecks and natural areas around the Channel Islands is also popular (CCC 1993).

Environmental Justice/Children's Justice

No permanent population centers exist within areas encompassed by the proposed ocean test location. Military and National Park Service support facilities on San Nicolas, Santa

Cruz, and San Miguel islands are staffed by civilian and Navy personnel on temporary assignments who are not recorded as residents during census counts. There are no data pertinent to ethnicity or income of persons temporarily residing on the islands; however, given the small number of potentially affected individuals, their temporary residential status, and the fact that the majority of them are employed by the federal government, it is unlikely that affected persons would be low income or otherwise disproportionately susceptible to adverse socioeconomic or environmental impacts. There are no schools located adjacent to or in the vicinity of the proposed ocean test location.

Area outside Territorial Waters

Areas outside territorial waters are subject to commercial fishing from U.S. and international interests. Best available data regarding current fishing levels within this area show a yield of approximately 593,403,536 pounds (269,166,078 kg) annually with an estimated value of $188,352,348 (NMFS 1996b).

Commercial shipping in areas outside territorial waters is dominated by cargo transports, oil tankers, and barges. Southern California is used by commercial vessels traveling between ports in the northern Pacific (e.g., Vancouver, Seattle, and San Francisco) and ports situated in southern California. The region is also transited by vessels to and from the Panama Canal and western Pacific ports. According to the USCG, oil tankers using the channel voluntarily travel 50 nm (93 km) offshore to reduce the potential for conflict with nearshore watercraft, sport fishing activities, and subsurface obstructions (USCG 1997).

Environmental Justice/Children's Justice

No permanent population centers exist within areas outside territorial waters.

3.8.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Limited large-scale commercial fishing activities occur within territorial waters. Nearshore activities (less than 3 nm [5.6 km] from shore) are regulated by the States of Oregon and Washington.

Commercial Shipping

Commercial shipping in the Pacific Northwest is similar to the proposed ocean test location; however, no established traffic routes are located in the region. Large and small ships and barges transport oil, containers, agricultural products, and raw lumber (i.e., logs) to and from Pacific Northwest ports. Ocean-going vessels use a number of ports along the Pacific Northwest coast, including major ports along the Columbia River, and the Strait of Juan de Fuca to the north, and smaller coastal ports throughout the coastline of Oregon and Washington. The Port of Portland leads in total tonnage of foreign trade handled, mainly from the export of grains from the Columbia Basin, followed by Seattle and Tacoma. Seattle dominates in ocean-going barge traffic to Alaska, while Portland leads in barge and small ship construction and in ship repair (Northam 1993).

Commercial Fishing

The Pacific Northwest is a highly productive commercial fishing area with commercial catches (e.g., flatfish, rockfish, roundfish, shrimp, prawns, halibut, sablefish, Dungeness crab, salmon, and albacore tuna) similar to those for the proposed ocean test location. Commercial fishing revenues generated for both the States of Oregon and Washington in 1996 are shown below in Tables 3-11 and 3-12. Commercial fisheries are discussed in greater detail in Section 3.7.

Table 3-11. Commercial Fishing Revenue, State of Oregon (1996)

Gear	Metric Tons	Pounds	Revenue ($)
Nets, excluding trawls	619	1,364,249	813,018
Trawls, unspecified	94,576	208,502,776	28,365,020
Otter trawl bottom, shrimp	7,566	16,680,788	9,759,149
Pots and traps, other	9,309	20,520,040	28,397,469
Lines hand, other	1,415	3,118,351	4,293,099
Lines troll, other	5,118	11,283,517	10,509,056
By hand, other	14	31,264	28,405
Unspecified gear	520	1,145,409	1,410,613
Totals	**119,136**	**262,646,394**	**83,575,829**

Source: NMFS 1996b.

Table 3-12. Commercial Fishing Revenue, State of Washington (1996)

Gear	Metric Tons	Pounds	Revenue ($)
Nets, excluding trawls	8,567	18,887,522	11,615,484
Trawls, unspecified	24,125	53,185,835	10,939,875
Otter trawl bottom, shrimp	2,722	6,000,302	3,459,359
Pots and traps, other	12,600	27,777,717	39,565,237
Lines hand, other	4,080	8,994,286	15,685,925
Lines troll, other	507	11,180,345	9,426,851
By hand, other	413	910,285	10,938,940
Unspecified gear	3,611	7,960,287	28,878,538
Totals	**61,189**	**134,896,579**	**130,510,209**

Source: NMFS 1996b.

Sport Fishing

Sport fishing interests within the Pacific Northwest consist primarily of large game fish common to the region (e.g., salmon, halibut, rockfish, lingcod, and albacore tuna) and, to a lesser degree, shellfish such as crabs, clams, and oysters. Exact sport fishing tallies are unavailable, but usage can be considered moderate with approximately 148 charterboats licensed in Oregon and 273 in Washington in 1993 (Alliant Techsystems, Inc. 1994). Recreational fishing is discussed in greater detail in Section 3.7.

Other Recreational Activities/Tourism

The Pacific Northwest is also used by the public for recreational purposes other than sport fishing (e.g., boating, and whale watching). These activities originate from harbors, coves, and marinas along the mainland coast. Whale watching is popular in the region primarily from March through May (during the annual gray whale northward migration); bird watching and marine mammal observation are popular year-round.

Environmental Justice/Children's Justice

No permanent population centers exist within areas encompassed by the alternative ocean test location. It is unlikely that any affected persons would be considered low income or otherwise disproportionately affected by adverse socioeconomic or environmental impacts.

<u>Area outside Territorial Waters</u>

Areas outside territorial waters are subject to commercial fishing from international interests. Best available data regarding current fishing levels within this area show a yield of approximately 397,000,000 pounds (180,000,000 kg) annually with an estimated value of $214 million (NMFS 1996b).

Commercial shipping in areas outside territorial waters is dominated by cargo transports and oil tankers. The alternative ocean test location is used by commercial vessels traveling between northern Pacific ports (e.g., Vancouver, Seattle, and San Francisco) and those situated in southern California. This area is also transited by vessels to and from Asian and other ports overseas. According to the USCG, oil tankers using the channel voluntarily travel 50 nm (93 km) offshore to reduce the potential for conflict with nearshore watercraft, sport fishing activities, and subsurface obstructions (USCG 1997).

Environmental Justice/Children's Justice

No permanent population centers exist within areas outside territorial waters.

3.8.3 ADS Shore Station Locations

3.8.3.1 Proposed Shore Station Location

<u>Socioeconomics</u>

The proposed shore station site would be located adjacent to the MCTSSA facility within MCB Camp Pendleton boundaries (refer to Figure 2-8). Activities in the vicinity of the site are centered entirely around military training operations. No permanent population centers exist within the area surrounding the site, and public access is limited on base.

Environmental Justice/Children's Justice

Communities on MCB Camp Pendleton are occupied by military families. Military housing areas are occupied by families of varying races. The mixture and nature of families in these areas is such that they are neither minority nor low-income communities. No housing areas are located in the vicinity of the proposed shore station site. There are no schools located adjacent to or in the vicinity of the proposed shore station site.

3.8.3.2 Alternative Shore Station Locations

Pacific City Alternative

This alternative shore station site would be located within the unincorporated boundaries of Pacific City (refer to Figure 2-9). The site is presently used as a telecommunications facility and is located in a fenced area with limited public access. Implementation of this alternative would also require some trenching activities within a public beach area. No residential areas or schools are located within the immediate vicinity.

MCB Camp Pendleton Alternative

The alternative MCB Camp Pendleton shore station site would be located adjacent to the LCAC facility approximately 1 mile (1.6 km) north of the proposed shore station location (refer to Figure 2-7). The site is presently utilized for LCAC vehicle military operations; no permanent population centers or schools exist within areas surrounding the site. Public access is limited on base.

3.9 NOISE

Noise is defined as undesirable or unwanted sound. Noise exposure can occur in two general media: air and water. The following discussion focuses on noise sources, sound transmission characteristics in these media, and background (ambient) noise. Ambient noise sources are an important parameter because they can mask other sounds (i.e., make them less detectable) as they propagate away from the source of disturbance. Typically, ambient noise is produced by a number of sources. In the ocean, ambient noise is produced by geological, oceanographic, and meteorological processes such as earthquakes, volcanos, wind, rain, waves, swells, and surf. Noise is also produced by various marine organisms and marine mammals. Man-made noise is produced by a number of sources such as motorized vessels, sonar, and seismic and oil explorations.

3.9.1 Background

Noise Terminology

Sound is composed of waves of energy that travel through air or water as vibrations of fluid particles. The rate at which the vibrations occur is referred to as sound frequency, and is measured in cycles per second or hertz (Hz). Sound exists in the environment even though it may not be audible to a given receptor; for example, humans cannot detect sounds below a frequency of 20 Hz or above a frequency of 20,000 Hz (or 20 kilohertz [kHz]).

The intensity of sound is expressed in decibels and is measured on a logarithmic scale; on the decibel scale, an increase of 10 units represents a 10-fold increase in sound energy. The decibel scale is a relative measure and, therefore, to express intensity in decibels, there needs to be a reference pressure. Accordingly, sound studies commonly acknowledge the "reference pressure" of a given sound. For example, the conventional reference pressure for airborne sounds is 20 µPa and the sound level is described in terms of dB re 20 µPa (decibels relative to a pressure of 20 micropascals). Alternatively, underwater sounds are referenced to 1 µPa, and described in terms of dB re 1 µPa.

The distinction made between airborne noise and underwater noise is based upon the very different sound propagation characteristics of the two media. In general, sound is transmitted much more efficiently in water than in air. This is due primarily to the higher density of water over air and the substantially lower absorption capacity of water molecules over their air counterparts. Sources of noise in either of these acoustical environments may be natural (e.g., wind, waves, biological organisms, etc.).

<u>Airborne Noise Characteristics</u>

Airborne noise in offshore areas typically consists of ambient noise levels from natural and man-made sources. Airborne sound decreases with magnitude as it moves away from the noise source due to spreading and absorption losses. These sound decreases are primarily dependent on the types of interaction surfaces (e.g., water, sand, and vegetation) and on atmospheric conditions (e.g., temperature inversions, wind speed and direction, and relative humidity). A common source of airborne noise in offshore areas is marine vessels. Noise sources associated with marine vessels include engine noise, intake and exhaust noise, auxiliary equipment such as pumps and winches, and onboard public address systems.

<u>Underwater Noise Characteristics</u>

Underwater Noise Propagation

Sound in water propagates more efficiently than sound in air but is subject to similar types of transmission loss (TL) (e.g., spherical spreading and attenuation). When sound spreads spherically, sound intensity from the source diminishes as the square of the distance from the source ($1/r^2$ or 6 dB per range doubling). This is based on the accepted approximation for transmission loss: TL = 20 Log r (Kinsler and Frey 1982). In the underwater environment, sound typically spreads spherically from the sound source until it is reflected by a surface, such as the ocean bottom or a submerged object, and multiple propagation paths are established. Sound can also reflect off various surfaces in the underwater environment resulting in cylindrical spreading (1/r or 3 dB per range doubling).

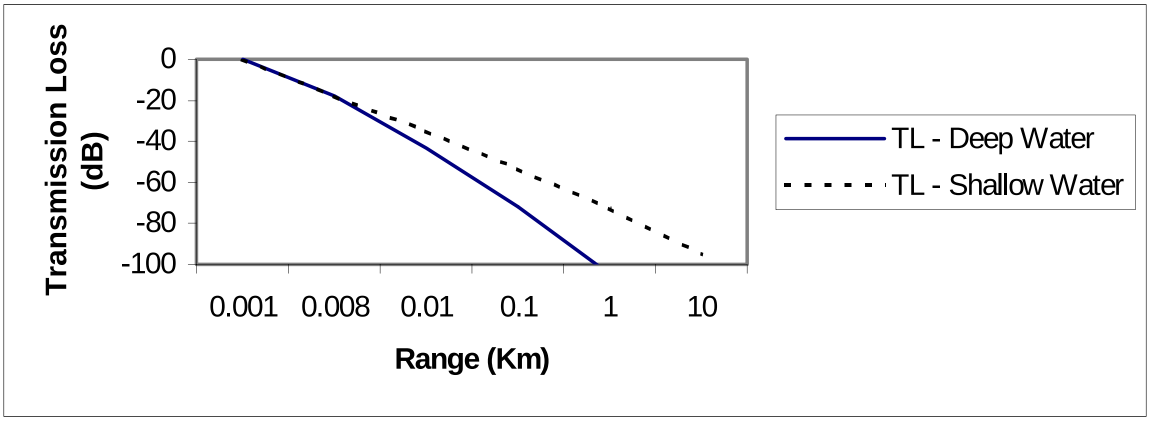
Reflections at the water-air boundary result in minimal sound loss. Noise levels resulting from reflections at the ocean bottom depend on the composition of the bottom (i.e., material properties) and the angle with which the wave strikes the surface (i.e., angle of incidence). Under hard bottom conditions, reflection losses are low and, as the direct and reflected sound paths combine, cylindrical spreading occurs. Typically, underwater sound attenuation in shallow ocean environments is described by a combination of spherical and cylindrical spreading. Figure 3-10 shows theoretical underwater transmission loss when the sound source and/or receiver are near the surface. In general, transmission loss is higher in shallow-water environments because the onset of cylindrical spreading occurs at much shorter ranges.

Underwater Ambient Noise Conditions

Underwater ambient noise can have several sources. Naturally occurring noise can be caused by wind and waves at the ocean surface (the primary source); biological noise from marine mammals, snapping shrimp, and fish; and subsurface geologic events such as earthquakes and magma movement. Table 3-13 provides a list of typical natural underwater noise sources and their associated levels.

Man-made ocean noise has increased steadily since the beginning of the industrial age. The predominant source of noise is from shipping traffic and underwater exploration. Most of these sounds are low frequency in nature (i.e., less than 250 Hz) and can travel considerable distances. Typical man-made underwater noise sources and their associated levels are shown in Table 3-14.

Figure 3-10. Theoretical Underwater Transmission Loss (TL)



Source: Richardson et al. 1995.

Table 3-13. Typical Natural Underwater Noise Sources and Levels

Noise Source	Noise Level (dB)
Wind and waves	85
Earthquake/magma movement	95-135
Bottlenose dolphin	125-173
Humpback whale call	175
Gray whale call	185
Killer whale call	160

Source: Scripps Institution of Oceanography (Scripps) 1997b.

Table 3-14. Typical Man-Made Underwater Noise Sources and Levels

Noise Source	Noise Level (dB)	Noise Characteristics
Large tanker	177	A continuous noise on shipping pathways worldwide
Icebreaker	183	A cycling noise primarily in Arctic Ocean, north of Canada, Alaska, and Russia
Supply ship	174	Continuous sound emitted along shipping lanes worldwide
Seismic oil exploration	210	Low-pitched pulses of sound, generated in oil-rich ocean areas worldwide
Dredging boat	167	Continuous, low frequency grinding, in nearshore construction areas

Source: Scripps 1997b.

3.9.2 ADS Ocean Test Locations

3.9.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Ambient Noise

The proposed ADS ocean test site would be located within the marine environment of southern California (refer to Figure 2-5). Sea state conditions are a large natural contributor to ambient noise (Wenz 1962). Sea state conditions in this area can be classified as moderate. The fetch (or area of water over which wind waves can be generated) is relatively large for most wind directions (over 10,000 nm^2 [34,000 km^2]), and thus wave heights can be large. Sea states can easily exceed 4 on the scale (moderate breeze between 11-16 kts, wave height 3-6 ft). Another predominant source of ambient noise is attributed to distant vessels, primarily commercial shipping and fishing vessels, recreational fishing boats, and smaller commercial craft. These two general noise sources (wind/waves and vessel traffic) comprise the major constituents of ambient noise.

Exact ambient noise levels for the proposed ocean test location were not available; however, ambient underwater noise conditions within southern California are predominately associated with distant commercial and recreational vessel traffic and wind action. In addition, military activities within this area slightly contribute to ambient noise conditions. Based upon previous studies (Wenz 1962), ambient noise levels for the proposed ocean test location can be expected to range between 60 and 70 dB re 1 µPa at higher frequencies (above 1,000 Hz) and between 85 and 95 dB re 1 µPa at lower frequencies (100 Hz). Sound emissions at or below 100 Hz are predominately from vessel traffic, while those above 400 Hz are primarily from wind and waves. Levels above 100 dB re 1 µPa are typically due to man-made activities; the relative intensity is an indicator of the source loudness.

Transmission Loss

Although the bathymetry of southern California is topographically complex, the ocean bottom where the proposed ocean tests would occur would be characteristic of soft bottom conditions and consist primarily of silts and clays. Underwater noise in this type of environment would experience primarily spherical spreading loss. Calculated transmission loss data characteristic of this area would range between 66-70 dB re 1 µPa at 1 nm down-range to upwards of 80-95 dB re 1 µPa at 6-12 nm (11-22 km) down-range (Applied Research Laboratory, University of Texas [ARLUT] 1998; Ogden 1998).

Area outside Territorial Waters

Ambient Noise

Areas outside territorial waters are primarily subject to commercial and military vessel noise. Sound levels adjacent to commercial and military activities are expected to reach upwards of 120-130 dB re 1 μPa, dropping off to natural ambient levels of 85-100 dB re 1 μPa in the open ocean (Scripps 1997b).

Transmission Loss

The ocean bottom at areas more than 12 nm from shore would be characteristic of soft bottom conditions, consisting primarily of silts and clays (Scripps 1997a) with depths of over 2,400 ft (730 m). Underwater noise would experience primarily spherical spreading loss. Calculated transmission loss data characteristic of this area would equal approximately 88-95 dB re 1 μPa at 6 nm (11 km) down-range (ARLUT 1998; Ogden 1998).

3.9.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Ambient Noise

The alternative ADS ocean test location would be located in the Pacific Northwest (refer to Figure 2-6). Sea state conditions along the coast of Oregon and Washington can be classified as moderate. The fetch is relatively large (over 21,000 nm^2 [72,000 km^2]) for most wind directions, and thus wave heights can be large. Sea states can easily exceed 4 to 5 on the Beaufort scale (moderate to fresh breeze between 11-21 kts, wave height 3-9 ft). As identified for the proposed site, sea state conditions are a large contributor to ambient noise (Wenz 1962).

Exact ambient noise levels for the alternative ocean test location were not available. Ambient underwater noise conditions at the alternative ocean test location within territorial waters are predominately associated with distant commercial and recreational vessel traffic (especially around the mouth of the Columbia River), which forms a relatively steady background level. Ambient noise estimations can be made using the known parameters (i.e., typical sea states and approximate vessel activity). Based upon an assumed sea state of 3 and light to moderate vessel activity, ambient noise levels for the alternative ocean test location can be expected to range between 70-85 dB re 1 μPa for frequencies greater than 1 kHz and between 80-90 dB re 1 μPa for frequencies lower than about 100 Hz (Wenz 1962; Kinsler and Frey 1982). The levels at or below 100 Hz are predominately from vessel traffic, while levels at or above 400 Hz are typically from wind and wave interaction.

Transmission Loss

The ocean bottom where the alternative ocean test location would be conducted would be characteristic of soft bottom conditions, consisting primarily of sand and mud (Scripps 1997a). Underwater noise in this type of environment would experience primarily spherical spreading loss. Calculated transmission loss data characteristic for this area would range between 50-60 dB re 1 μPa at 1 nm (1.8 km) down-range to upwards of 85-95 dB re 1 μPa at 6-12 nm (11-22 km) down-range (ARLUT 1998; Ogden 1998).

Area outside Territorial Waters

Ambient Noise

Areas outside territorial waters are subject primarily to commercial vessel noise. Ambient noise levels are assumed to be consistent with those identified for areas within territorial waters.

Transmission Loss

The ocean bottom at areas outside territorial waters from the shore within the alternative ocean test location would be characteristic of soft bottom conditions, consisting primarily of silts and clays with occasional rock outcroppings (Scripps 1997a). Depths of over 6,000 ft (1,800 m) are typical. Underwater noise in this environment would experience spherical spreading loss with cylindrical losses only occurring in areas with large rock outcroppings (ARLUT 1998).

3.9.3 ADS Shore Station Location

3.9.3.1 Proposed Shore Station Location

Ambient Noise

The proposed shore station site would be located at MCB Camp Pendleton, approximately 1 mile (1.6 km) south of the existing LCAC hangars and launch facility. Ambient noise levels at this site would be associated with military training operations and traffic noise along adjacent I-5. Airborne noise levels in excess of 85-90 dBA have been measured in this area (Ogden 1997b) and were found to be primarily due to LCAC training operations, helicopter training activities, and associated vehicular traffic noise.

3.9.3.2 Alternative Shore Station Locations

Pacific City Alternative

The alternative shore station would be located in Pacific City. The site would be located within a fenced facility compound with limited public access. Ambient nose levels within municipalities generally range between 65-70 dBA. Implementation of this alternative would also use the public beach for placement of the shore landing cable (refer to Figure 2-9). Airborne noise levels at this site are predominately due to surf action and create a constant background level between approximately 65 and 85 dBA depending on weather conditions (Ogden 1997b).

MCB Camp Pendleton Alternative

The MCB Camp Pendleton alternative shore station would be located within MCB Camp Pendleton boundaries in the vicinity of the existing LCAC facility. This site is located approximately 1 mile (1.6 km) north of the proposed shore station. Principal noise sources at this site would be associated with military training operations. Airborne noise levels in excess of 95-110 dBA have been measured and were found to be primarily due to military helicopter activity and LCAC training operations (Ogden 1997b).

3.10 CULTURAL RESOURCES

3.10.1 Background

Cultural resources represent and document activities, accomplishments, and traditions of previous civilizations and link current and former inhabitants of an area. Depending on their condition and historic use, these resources may provide insight to living conditions in previous civilizations and may retain cultural and religious significance to modern groups.

Archaeological resources comprise areas where prehistoric or historic activities measurably altered the earth or produced deposits of physical remains (i.e., arrowheads, bottles) discovered therein. Architectural resources include standing buildings, districts, bridges, dams, and other structures of historic or aesthetic significance and generally must be more than 50 years old to be included in the National Register of Historic Places (NRHP), an inventory of culturally significant resources identified in the United States. More recent structures, such as Cold War era resources, may warrant protection if they have the potential to gain significance in the future. Traditional cultural resources can include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential in the persistence of traditional culture.

Under federal laws and regulations, only significant cultural resources warrant consideration with regard to adverse impacts resulting from federal activities. Significant archaeological and architectural resources include those that are eligible or are recommended as eligible for inclusion in the NRHP. The significance of cultural resources is evaluated according to the NRHP eligibility criteria (36 CFR 60.4), in consultation with the State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation. According to these criteria, “significance” is present in districts, sites, buildings, structures, and objects that:

(a) are associated with events that have made a significant contribution to the broad patterns of history; or
(b) are associated with the lives of persons significant in the past; or

(c) embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value or represent a significant and distinguishable entity whose components may lack individual distinction; or
(d) have yielded, or may be likely to yield, information important in prehistory or history.

There are no legally established criteria for assessing the importance of a traditional cultural resource. These criteria must be established primarily through consultation with Native Americans, according to the requirements of the Native American Graves Protection and Repatriation Act. When applicable, consultation with other affected groups provides the means to establish the importance of their traditional resources. They may also be derived from 36 CFR 60.4 and from the Advisory Council on Historic Preservation guidelines.

Research Methodology

The project area for cultural resources includes both ocean test locations and shore station sites. For nearshore and offshore ocean test locations, cultural resource issues are primarily related to potential impacts on underwater archaeological resources. Resources of concern for the shore station areas include archaeological, historical, and traditional cultural resources. Refer to Figures 2-5 through 2-10 for a depiction of the proposed ocean test and shore station locations.

The methodology for determining the presence of significant cultural resources within the project area was based on a combination of existing data, literature searches, and site inspections. Specific databases on known underwater cultural resources were searched to analyze the potential for the proposed ocean test locations to contain submerged cultural resources. Literature searches were performed at the South Coastal Information Center and Museum of Man in San Diego, California for the proposed and MCB Camp Pendleton alternative shore station and the Oregon State Parks Department in Salem for the Pacific City alternative shore station. A site visit was conducted at each shore station site to assess the potential for significant cultural resources, as well as collect information on existing surveys in the area.

3.10.1.1 Regional Southern California History

Offshore

Southern California's offshore islands within the proposed ocean test location include the Channel Islands which consist of Santa Barbara, San Nicolas, Anacapa, Santa Cruz, Santa Rosa, San Miguel, Santa Catalina, and San Clemente islands. Archaeological evidence indicates that prehistoric populations were traversing the waters off the coast of southern California possibly as early as over 10,000 years ago. The presence of archaeological sites dating from 12,000-8,000 years before present (B.P.) on Santa Rosa, San Miguel, Santa Cruz, and San Clemente islands indicate that some type of watercraft was used to travel from the mainland to the outer islands. The Channel Islands were visited by the coastal Chumash in a variety of watercraft, (i.e., plank canoes [tomols], reed rafts or tule balsas, and dugout canoes). Later evidence shows the other islands (e.g., Santa Catalina and San Clemente) were frequented by the Gabrieleños. Bad weather and swift currents most likely contributed to the failure of many of these voyages, subsequently depositing heavy artifacts, such as stone bowls and mortars, on the sea floor, although precise records indicating the locations of undersea prehistoric artifacts are lacking.

Onshore

Prehistorically, the earliest period recorded for human occupation in the southern California region dates from 12,000-8,000 years B.P. and is typified by artifact assemblages, termed the San Dieguito complex, extending from Oregon to mid-Baja California. Subsequent to the San Dieguito, the Middle Archaic Period (La Jolla complex) lasted at least 7,000 years, possibly beginning as early as 8,000-9,000 years ago. Occupation was heaviest along the coast and major drainage systems extending inland. Middle Archaic Period sites situated in the inland area of northern San Diego County, termed the Pauma complex, are usually located on small saddles and low hills overlooking drainages.

Following the Middle/Archaic, around 1,500 B.P., Shoshonean-speaking people from the Great Basin area are believed to have begun migrating into southern California, including the northern area of San Diego County. Inland semi-sedentary villages were established along major water courses, and mountain areas were seasonally occupied to exploit acorns and pinon nuts. This period, called the Late Prehistoric Period, is represented by the San Luis Rey complex in northern San Diego County, which includes MCB Camp Pendleton. The San Luis Rey complex is considered to represent the Shoshonean predecessors of the ethnohistoric Luiseño.

Historically, the area known today as MCB Camp Pendleton was first visited by the Spanish explorer, Gaspar de Portolà, on his journey up the coast with Padre Junipero Serra to establish a chain of missions in 1769. The El Camino Real, or King's Highway, traversed the MCB Camp Pendleton area along the coast and served as the main corridor for all travel in the coastal region.

After the establishment of the missions, the MCB Camp Pendleton area and the Native Americans living on it came under the jurisdiction of Mission San Luis Rey. The MCB Camp Pendleton area became part of a large grant of land that included Rancho Santa Margarita and the Las Flores mission outpost. The land grant totaled 133,400 acres (54,000 ha) and included 35 miles (56 km) of coastline, seven rivers and streams, seven small lakes, and three mountain ranges. MCB Camp Pendleton comprises a part of the original rancho lands.

In 1931, land was leased from the owners by the U.S. government, at which time an emergency landing airstrip with beacon lights was established (Pourade 1975; Sully and Begelow 1988). In 1941, the U.S. government purchased 9,000 acres (3,600 ha) of the former rancho to establish the Naval Ammunition Depot. In 1942, shortly after the

Japanese attack on Pearl Harbor, the remaining rancho land was purchased by the U.S. Navy for use as its major west coast training base.

3.10.1.2 Regional Pacific Northwest History

Offshore

Offshore history for the Pacific Northwest consists mainly of coastal mapping activities and exploration for the Northwest Passage, overseas fur and lumber trading, and whaling. Spanish expeditions along the Pacific coasts began in the early 1500s and continued steadily for nearly 100 years. In the 1600s, exploration was dominated by traders, merchants, and eventually settlers.

Overseas trading of seal and otter furs expanded during the late 1700s with trans-Pacific expeditions to Asia. A demand for lumber import/export appeared in the 1800s due to the increasing numbers of Pacific coast settlers. During the late 1800s, the whaling industry in the Pacific peaked. However, the American shipping industry experienced a depression during the latter part of the 1850s that lasted through the Civil War. During the latter half of the century, both grain and lumber products became major worldwide export items from the Pacific Northwest coast.

Onshore

The first inhabitants of the Pacific Northwest are believed to be descendants of Siberian hunters who reached North America over the Bering land bridge during the last Ice Age at least 11,000 years ago. The Old Cordilleran culture, located in the river valleys of Oregon and Washington, is believed to have been the parent culture for later peoples of the Northwest coastal and plateau areas.

Native Americans of the Washington and Oregon coasts included various branches of the Wakashan, Chemakuan, Chinook, Oregon Penutin, and Coast Salish peoples. During the period of initial European contact, these peoples had a prosperous economy based on fishing and sea-mammal hunting. They used a variety of angling devices, traps, and harpoons and were noted for their dugout canoes.

The first Europeans to explore the coast of the Pacific Northwest were 16th century Spaniards traveling northward from Mexico. However, the area remained largely unexplored until the mid-18th century when Danish and Russian vessels arrived in search of sea otter and seal skins. This activity renewed Spanish interests in the region.

Robert Gray and John Kendrick were the first Anglo-Americans to explore the Pacific Northwest. These merchants arrived in the region in 1788 from the newly formed United States to take advantage of the lucrative Pacific fur trade. Gray traded along the Pacific coast just south of the Oregon and California border. He furthered his explorations northward to the site of present day Lincoln City. In 1792, Gray located the mouth of the Great River of the West and named the river “Columbia” after his vessel. This exploit helped the United States’ claim to the region (Nolan 1993).

Pacific City is located in Tillamook County along the Oregon coast. Tillamook County was created in 1853 and named after a Native American group, the Killamook, who occupied the region.

3.10.2 ADS Ocean Test Locations

3.10.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Archaeological resources within southern California waters are limited to shipwrecks and occasional isolated artifacts that were lost from Native American watercraft during prehistoric or historic voyages. More than 500 sunken vessels have been reported within the coastal waters of southern California. Precise locations are infrequently provided, with vague descriptive narratives of the area in which the ship was last known, or thought to have sunk. Generally, topography, weather conditions (e.g., high wind, dense fog), geographical features (e.g., submerged rocks or reefs), and human error are all factors that may influence vessel failures.

Although existing information on submerged cultural resources is limited, a shipwreck study was recently performed that combined several existing databases for known shipwrecks within the southern California coast. The study also developed a predictive model to determine areas most likely to contain shipwrecks. Information from this study was utilized to document known shipwreck locations and postulate areas where shipwrecks are likely to occur (DoN 1998b). Refer to Figure 2-5 for a depiction of known shipwreck locations. There are various explanations for their fates, such as mechanical failures, fires, collisions, or capsizing. The most concentrated locations of shipwrecks are along headlands and harbor approaches and in inner harbor waters on the main coastline and the offshore islands. It is estimated that that between 80 and 90 percent of all vessel losses in the region occurred in less than 33 ft (10 m) of water (Morris and Lima 1996).

Area outside Territorial Waters

Most vessels have been lost near the coast, especially near headlands and harbors in waters less than 33 ft (10 m) deep. The results are not surprising, given that vessels are heavily concentrated in those areas and nearshore areas are likely to have more hazards (e.g., shallow water, reefs, etc.) that may cause vessels to become stranded (Morris and Lima 1996; DoN 1998b). Refer to Figure 2-5 for a depiction of known shipwrecks outside of territorial waters.

3.10.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Archaeological resources offshore of the Pacific Northwest consist primarily of shipwreck sites. The majority of vessels tend to be lost within areas adjacent to the coast. Major factors contributing to this distribution are related to vessel traffic patterns and the physical environment as vessel traffic and navigational hazards are concentrated in the vicinity of the coast. The most likely locations for offshore wrecks are harbor approaches and high traffic sealanes (U.S. Department of the Interior 1990).

About 700 shipwrecks have been reported in the region that encompasses the alternative ocean test location. Table 3-15describes known shipwrecks by county. The majority of shipwrecks within the project area are located along the coastline near Grays Harbor, Washington. The frequency of vessels lost generally reflects the amount of maritime commerce along the Pacific coast and the increased hazards associated with the coast and harbors compared to sailing in the open seas. All sunken vessels found in this area are within 10 miles (16 km) of the shoreline (U.S. Department of the Interior 1990).

Table 3-15. Known Shipwrecks Located within the Alternative Ocean Test Site

County	Number of Wrecks
Grays Harbor	78
Pacific	102
Clatsop	324
Tillamook	68
Lincoln	79
Lane	50
Total	**701**

Source: U.S. Department of the Interior 1990.

Area outside Territorial Waters

As previously discussed above, all known shipwrecks within the alternative ocean test site are located within 10 miles (16 km) of the shoreline, due to the concentration of vessel traffic and navigational hazards in the vicinity of the coast (U.S. Department of the Interior 1990).

3.10.3 ADS Shore Station Locations

3.10.3.1 Proposed Shore Station Location

The proposed shore station is located near the coastline of MCB Camp Pendleton (refer to Figure 2-8). A cultural resource site inspection was conducted as part of this EA to inspect the proposed shore station site for evidence of prior disturbance and potential for archaeological remains.

The site is located in a previously disturbed area adjacent to existing buildings associated with the MCTSSA facility. The ground, which contains nonnative grasses and weeds, appears to have been graded and is littered with excess stone and metal pipes. The existing access road is graveled. No evidence of prehistoric or historic archaeological remains were discovered during the site inspection. No NRHP or state listed sites are located within the proposed project area. Buildings adjacent to the proposed shore station are typical of a military installation and have no distinctive characteristics (Rudolph 1998).

Based on a previous records search, there are eight prehistoric archaeological sites and one historic site recorded within 1 mile (1.6 km) of the project area (DoN 1995). None of these sites are located within the proposed shore station site or within the area proposed for trenching of the shore landing cable. In addition to these sites, a recent coastal archaeological survey at MCB Camp Pendleton (conducted during February and March 1997) identified 17 new sites within base boundaries. Of the 17 sites, 10 were located along the coastal strip and range from small shell scatters to an historic artifact scatter associated with the railroad (ASM Affiliates 1998). One site is located within the White Beach training area, approximately 0.6 mile (1 km) north of the proposed shore station site. It is located between the MCTSSA and LCAC facilities on a small ridge of Cockleburr Canyon. The site has been subject to considerable disturbance and is in poor condition; however, it has been identified as being of indeterminate eligibility for listing on the NRHP (ASM Affiliates 1998). In addition, MCB Camp Pendleton’s cultural resource Geographic Information System (GIS) database identifies one other prehistoric site located approximately 250 ft (76 m) west of the proposed shore station site.

3.10.3.2 Alternative Shore Station Locations

Pacific City Alternative

This alternative shore station would be located in Pacific City (refer to Figure 2-9). A cultural resources site inspection and record search was conducted as part of this EA to inspect the site for evidence of prior disturbance and potential for archaeological remains.

The Pacific City alternative shore station would be located at an existing telecommunications facility. The facility is completely fenced with restricted access. In addition, the facility is completely developed with modern buildings, landscaping, and parking facilities. The beach access area, where the proposed trenching would occur, consists of a sandy beach. No evidence of archaeological remains was discovered. No NRHP or state listed sites are located within the vicinity of this location (Rudolph 1998).

A records search, conducted as part of the cultural resource analysis, found information on four sites located within 5 miles (8 km) of the Pacific City alternative shore station; however, all the sites are located more than 1 mile (1.6 km) from the project area. In addition, a village site was noted as being located somewhere in the present location of Pacific City (Rudolph 1998).

MCB Camp Pendleton Alternative

The MCB Camp Pendleton alternative shore station would be located approximately 1 mile (1.6 km) north of the proposed shore station site (refer to Figure 2-10). A cultural resource site inspection and record search was conducted as part of this EA to inspect the site for evidence of prior disturbance and the potential for archaeological remains.

The MCB Camp Pendleton alternative shore station would be located on a ridge adjacent to the existing control tower and LCAC landing site. The majority of the area has been graded and graveled and consists of fill material. The road adjacent to the site consists of gravel and is eroded. An existing canyon/ditch, which slopes to the beach, has been modified with a concrete liner at the upper end and a large berm of soil along one side. The side of the canyon/ditch and beach area was systematically walked and inspected, and no archaeological remains were found (Rudolph 1998). As discussed under the proposed shore station site, several prehistoric and historic archaeological sites are located in the vicinity of the LCAC facility; however, none of these sites are located within the alternative shore station site or in the area proposed for trenching of the shore landing cable. One site has been identified within the White Beach training area, south of the LCAC facility and north of the MCTSSA facility. The site has been subject to considerable disturbance and is in poor condition; however, it has been identified as being of indeterminate eligibility for listing on the NRHP (ASM Affiliates 1998).

3.11 SAFETY AND ENVIRONMENTAL HEALTH

3.11.1 Background

For the purposes of this EA, safety and environmental health issues are defined as those that directly affect the continued ability to protect and preserve life and property within the areas proposed for testing of the ADS system. The primary safety issue regarding testing and use of the ADS system concerns the use of lithium batteries, which represent potential physical, chemical, and environmental hazards. Safety measures implemented for the use of lithium batteries, as well as existing environmental conditions for the areas potentially affected by their use, are described in Appendix B.

Other issues associated with implementation of the ADS system include public safety, which addresses the potential exposure of public citizens to unsafe conditions. Since the proposed action involves activities on the ocean and in coastal areas, safety issues focus on public access to the proposed test sites and potential interaction with system components. Examples of safety and environmental health issues include conflicts with recreational and commercial users of the ocean environment (e.g., divers), as well as exposure of these users to electromagnetic field (EMF) radiation generated by electrical signals associated with electronic or communication equipment. The American National Standards Institute (ANSI) has established safety thresholds for exposure of humans to EMF at various frequencies (ANSI 1991).

3.11.2 ADS Ocean Test Locations

3.11.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Commercial, military, and recreational vessels commonly transit within territorial waters (refer to Figure 2-5). Although large ships remain in shipping lanes, no restrictions exist for smaller vessels. Public safety issues are related to heavy boating and shipping activity, as well as commercial and Navy ocean testing operations that occur throughout the southern California marine environment. In addition, the SCB is popular for recreational activities. Common offshore recreational activities include boating, sport fishing, SCUBA diving, sailing, and kayaking. However, these types of activities are typically conducted with sufficient separation from areas of heavy public use.

Area outside Territorial Waters

Public safety issues are primarily related to boating and shipping activity, as well as commercial and Navy ocean testing operations that occur throughout southern California. These types of activities are generally conducted away from areas of heavy public use, or with sufficient separation from public activity.

3.11.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Commercial and recreational vessels commonly transit within the territorial waters area of the Pacific Northwest alternative site (refer to Figure 2-6). Although no established shipping lanes are located in the region, large vessels generally stay off the coast at least 3-5 miles (5-8 km). The Columbia River is heavily used for commercial shipping traffic; however, larger vessels must contact a bar pilot and be escorted in the river channel (USCG 1998). Public safety issues are related to boating and shipping activity, as well as Navy testing operations. In addition, the Pacific Northwest is a popular area for recreational activities. Common offshore recreational activities include boating, sport fishing, SCUBA diving, sailing, and kayaking. However, these types of activities are typically conducted with sufficient separation from areas of heavy public use.

Area outside Territorial Waters

Public safety issues are primarily related to boating and shipping activity, as well as Navy testing operations. These types of activities are generally conducted away from areas of heavy public use, or with sufficient separation from public activity.

3.11.3 ADS Shore Station Locations

3.11.3.1 Proposed Shore Station Location

The proposed shore station site would be located within the boundaries of MCB Camp Pendleton (refer to Figure 2-5). Since MCB Camp Pendleton is operated as a military installation, public access to the proposed shore station site is prohibited.

3.11.3.2 Alternative Shore Station Locations

<u>Pacific City Alternative</u>

The Pacific City alternative shore station site would be located at an existing telecommunications facility located within the municipal boundaries of Pacific City (refer to Figure 2-7). The site is completely fenced and public access is not allowed.

Implementation of the Pacific City alternative shore station site would involve use of a public beach where the shore landing cable would be placed. Currently, there is public access to the beach.

<u>MCB Camp Pendleton Alternative</u>

The MCB Camp Pendleton alternative shore station site would be located within the boundaries of MCB Camp Pendleton, approximately 1 mile (2 km) north of the proposed shore station (refer to Figure 2-10). Since MCB Camp Pendleton is operated as a military installation, public access is prohibited.

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter describes potential environmental consequences that would occur as a result of implementation of the proposed ADS ocean tests. The following analysis focuses on those resources that have the potential to be affected by the proposed action (proposed and alternative ocean test locations and proposed and alternative shore station locations) and the No-Action Alternative.

4.1 GEOLOGY, TOPOGRAPHY, AND SOILS

4.1.1 Approach to Analysis

Protection of unique geological features, minimization of soil erosion, and the siting of facilities in relation to potential geological hazards are considered when evaluating impacts of a proposed action on geological resources. Generally, such impacts can be avoided or minimized if proper construction techniques, erosion control measures, and structural engineering design are incorporated into project development.

Analysis of potential impacts to geology and soils typically includes: (1) identification and description of resources that could be potentially affected; (2) examination of the proposed action and potential impacts the action may have on the resource; (3) assessment of the significance of potential impacts; and (4) provision of mitigation measures in the event that potentially significant impacts are identified.

4.1.2 ADS Shore Station Locations

4.1.2.1 Proposed Shore Station Location

Construction of the proposed shore station would involve minor grading (approximately 23,250 ft^2 [2,160 m^2]) for widening of the access road and site preparation. Construction activities would not involve excessive grading due to the flat topography of the site and the limited amount of construction proposed. Onsite soils do not possess high erosion potential or shrink-swell characteristics; therefore, artificial fill soils would not be required for the proposed construction activities. Therefore, implementation of the proposed shore station would not result in impacts to geology, topography, and soils. Further, since development at the site would be temporary in nature and would not constitute an inhabitable facility, potential impacts resulting from geological activity on the proposed shore station (e.g., seismicity) would not be significant.

The proposed shore landing cable would be placed in an existing underground conduit from the proposed shore station site, trenched under an existing road, and laid above ground along the remainder of the marine terrace and down the bluff. Installation of the cable from the bottom of the bluff into the surf zone would involve trenching of approximately 111 cubic yards (yd^3) (85 cubic meters [m^3]) (89 yd^3 [68 m^3] along the beach and 22 yd^3 [17 m^3] in the tidal zone). The proposed trench would extend approximately 250 ft (76 m) from the bluff into the tidal zone and would be approximately 6 ft (2 m) deep and 2 ft (0.6 m) wide. The proposed trench would be covered with excavated material subsequent to placement of the shore landing cable. Trenching activities would cause a temporary change in existing conditions; however, due to the dynamic nature of coastal beaches (i.e., rapid, natural backfilling), impacts to geology, topography, or soils would not be significant.

4.1.2.2 Alternative Shore Station Locations

Pacific City Alternative

Use of the Pacific City alternative shore station location would not require any facility improvements with the exception of placement of the shore landing cable. Trenching associated with placement of the shore landing cable would be similar to that of the proposed action and would involve trenching of approximately 111 yd^3 (85 m^3) of sand. The cable would be placed in an existing conduit from the shore station to the edge of the beach, then trenched along the beach. The trench would extend approximately 250 ft (76 m) and would be approximately 6 ft (2 m) deep and 2 ft (0.6 m) wide. The proposed trench would be covered with excavated material subsequent to placement of the shore landing cable. Proposed trenching for placement of the shore landing cable would involve temporary excavation of beach sand; however, trenching would not significantly impact geology, topography, and soils.

MCB Camp Pendleton Alternative

Construction activities for the alternative MCB Camp Pendleton shore station location would be similar to those previously described for the proposed shore station site; however, additional grading (approximately 3,200 ft^2 [297 m^2]) would be required for the utility corridor. Therefore, a total of approximately 25,000 ft^2 (2,320 m^2) of grading would be required with implementation of this alternative. Impacts to geology, topography, and soils from construction of the MCB Camp Pendleton alternative shore station would be similar to those of the proposed action and would not be significant.

4.2 AIR QUALITY

4.2.1 Approach to Analysis

For the purposes of evaluating the significance of impacts, the state and federal attainment status for the affected air basins were used to identify *de minimis* thresholds. The evaluation of potential air quality impacts includes three separate analyses for the reasons identified below:

CAA General Conformity Analysis

To make an applicability determination pursuant to the General Conformity Rule (42 USC 7401 *et seq*.), the analysis focuses on operations that could potentially impact designated federal and state nonattainment areas within the project area. The CAA Conformity Applicability Analysis is presented below and includes an analysis of the applicability of the General Conformity Rule to the proposed action. For the purpose of evaluating the proposed action, emissions were estimated to assess whether the proposed action is subject to the provisions of the General Conformity Rule and the requirements to conduct a conformity determination. Because the proposed action is not specifically exempted under the provisions of the General Conformity Rule, it was necessary to compare the proposed project's emissions with *de minimis* levels that apply for the area in which the proposed action is located (Table 4-1).

Table 4-1. Applicable *de minimis* Levels for Affected Air Basins (tons/year)

	Air Basins in Project Area			
	Santa Barbara	**Ventura**	**South Coast**	**San Diego**
Conformity Analysis				
ROC	100	25	10	50
NO_X	100	25	10	50
SO_X	*	*	*	*
CO	*	*	100	100
PM_{10}	*	*	70	*
NEPA Analysis				
ROC	100	25	10	50
NO_X	100	25	10	50
SO_X	100	100	100	100
CO	100	100	100	100
PM_{10}	100	100	70	100
EO 12114 Analysis				
ROC	250	250	250	250
NO_X	250	250	250	250
SO_X	250	250	250	250
CO	250	250	250	250
PM_{10}	250	250	250	250

*The affected air basin is in attainment for regulated pollutant.

NEPA Air Quality Analysis

To assess the impact of air pollutant emissions from proposed ADS operations, the analysis focuses on those effects occurring within territorial waters. The NEPA analysis involves estimating emissions from the proposed activities and evaluating the emission estimates against New Source Review (NSR) thresholds to assess potential impacts on air quality (Table 4-1).

EO 12114 Air Quality Analysis

To assess the impact of air pollutant emissions from proposed ADS operations, the analysis focuses on those effects occurring outside territorial waters. The EO analysis involves estimating emissions from the proposed activities and evaluating the emission estimates against a significance threshold to assess potential impacts on air quality outside U.S. territorial waters. CAA General Conformity does not apply since project emissions would be outside of U.S. territorial waters. Since the offshore region beyond territorial waters can clearly be considered in attainment, for purposes of this EA the Prevention of Significant Deterioration (PSD) attainment threshold of 250 tons per year for criteria pollutants was used to assess the significance of potential air quality impacts under the EO. While CAA requirements are implemented by state agencies and apply to areas extending 3 nm (5.6 km) from shore, the federal thresholds were used in the absence of any other established criteria for emissions in offshore regions (Table 4-1).

Emissions from the proposed action would be limited to operation of the two ocean test vessels during the course of the four ADS ocean tests and development of a shore station. The analysis of ADS ocean tests focuses on total emissions expected from the proposed test vessels, as well as potential impacts of the action on the attainment status of regional air basins for regulated pollutants. Likewise, the analysis of shore station development focuses on grading and construction-related emissions, and their impact on local attainment status. No stationary sources are associated with the proposed action; therefore, stationary sources were not analyzed. For the purpose of estimating expected emissions from the proposed action, emission factors from USEPA's AP-42 were used.

Emissions associated with the ocean tests would be dependent upon equipment and operational mode, rather than location; therefore, the analysis for the proposed and alternative ocean test locations is the same. Impacts resulting from the proposed action, however, were applied to the corresponding onshore attainment status. For purposes of determining the significance of impacts to air quality, emissions have been broken down by those that would occur within 3 nm (5.6 km) of shore (CAA Conformity Analysis), those inside territorial waters (NEPA Analysis), and those emissions that would occur outside territorial waters (EO Analysis).

4.2.2 ADS Ocean Test Locations

4.2.2.1 Proposed ADS Ocean Test Location

Emissions associated with the proposed ADS ocean tests would be emitted from two marine test vessels. The vessel used for Tests 1 and 2 would consist of two 1,250-horsepower engines. The vessel used for Tests 3 and 4 would consist of two 425-horsepower engines.

Based on the air quality analysis, emissions associated with the ADS ocean tests would result in incremental increases of all criteria pollutants (see the Record of Non-Applicability [RONA] in Appendix C). A summary of total emissions expected from the proposed ADS ocean tests is presented in Table 4-2.

Table 4-2. Summary of Total Emissions from Proposed ADS Ocean Tests (tons/year)

Ocean Test Area	ROC	NO_X	SO_X	CO	PM_{10}
Within 3 nm					
Tests 1 & 2[1]	0.11	0.84	0.07	0.25	0.09
Test 3	0.01	0.07	0.01	0.02	0.01
Test 4	0.02	0.14	0.01	0.04	0.01
Area Within Territorial Waters					
Tests 1 & 2[1]	0.45	3.34	0.29	1.0	0.35
Test 3	0.04	0.27	0.03	0.08	0.03

Test 4	0.08	0.55	0.05	0.16	0.05
Area Outside Territorial Waters					
Tests 1 & 2[1]	3.44	25.34	2.23	7.57	2.59
Test 3	0.14	1.06	0.09	0.32	0.11
Test 4	0.22	1.61	0.14	0.48	0.16

[1] Tests 1 and 2 would be conducted in the same year.

CAA General Conformity Analysis

If emissions of criteria pollutants associated with the proposed action are below the *de minimis* levels, and the emissions are not regionally significant (i.e., greater than 10 percent of the air basin's emissions budget), the proposed action is exempt from the requirements of a full conformity determination under the General Conformity Rule. As presented in Table 4-2, emissions resulting from the proposed testing inside of 3 nm would not exceed *de minimis* levels for affected air basins within the project area (refer to Table 4-1); therefore, a full conformity determination is not required. A RONA is provided in Appendix C.

NEPA Air Quality Analysis

For the NEPA analysis, NSR thresholds for criteria pollutants were compared to the expected emissions from the proposed action and are identified in Table 4-1. Based on the air quality analysis, expected emissions for all four tests occurring within territorial waters would not exceed NSR threshold levels (Table 4-2). Therefore, implementation of the proposed ocean tests would not result in significant impacts to air quality.

EO 12114 Air Quality Analysis

Under the EO, PSD thresholds were compared to the emissions expected from the proposed action (Table 4-2). Based on the air quality analysis, expected emissions outside territorial waters would not exceed PSD thresholds (Table 4-1). Therefore, implementation of the proposed ocean tests would not result in significant impacts to air quality.

4.2.2.2 Alternative ADS Ocean Test Location

For the reasons stated above, emissions associated with the alternative ocean test location would be the same as those under the proposed ocean test location. However, the area in which the alternative ADS ocean test is located is in attainment for all criteria pollutants in both Oregon and Washington. Therefore, the provisions of the General Conformity Rule would not apply to activities occurring at the alternative ADS ocean test location.

4.2.3 ADS Shore Station Locations

Construction-related activities for the proposed action would be limited to minor grading activities associated with site preparation and roadway widening, trenching along a stretch of beach for installation of the shore landing cable, and construction of two culverts.

For the purpose of this analysis, it has been assumed that a single diesel-fueled backhoe would be used for grading, trenching, and roadway improvements. Specific maximum construction time and areas graded for each site are described below. Emission factors for the backhoe were taken from USEPA's AP-42. Estimated emissions associated with the construction of the proposed and alternative shore station locations are included in Appendix C.

4.2.3.1 Proposed Shore Station Location

The proposed shore station at MCB Camp Pendleton would require widening of the existing access road by approximately 5-15 ft (1.5-4.5 m), trenching a maximum of 111 yd^3 (85 m^3) of sand, and pouring of a concrete slab to accommodate a maximum of eight ISO-vans. For the purpose of this analysis, it was conservatively assumed that all improvements would require 23,250 ft^2 (2,160 m^2) of grading over a period of 1 week. Since the existing roadway is unpaved, no re-paving or asphalt paving emissions are included in this analysis.

Because the proposed trench route for the shore landing cable would run across the beach and through the tidal zone, the moisture content of the sand would be high, therefore, particulate emissions from proposed trenching activities would be negligible. Combustion emissions would result from use of a backhoe for excavation, trenching, and grading. A maximum of 8 hours for trenching, 8 hours for grading, and 8 hours for clearing was assumed for construction of the shore station. Particulate emissions would result from widening the access road. Using the AP-42 emission factors for grading activities, estimated emissions would be approximately 30 lbs of NO_X, 8 lbs of CO, and 3 lbs each of SO_X, PM_{10}, and ROC. Emissions from construction activities associated with the proposed shore station location are below *de minimis* thresholds, would be considered short-term, and would not significantly degrade regional air quality. Therefore, impacts to air quality would not be significant.

4.2.3.2 Alternative Shore Station Locations

<u>Pacific City Alternative</u>

Under this alternative, no site improvements would be required. Placement of the shore landing cable would require a trench approximately 250 ft (76 m) long and 6 ft (2 m) deep. Because the proposed trench route for the shore landing cable would run across the beach and through the tidal zone, the moisture content of the sand would be high; therefore, particulate emissions from proposed trenching activities would be negligible. A maximum of 8 hours was assumed for trenching activities. Estimated backhoe combustion emissions would be approximately 1 lb of ROC, 10 lbs of NO_X, 3 lbs of CO, and 1 lb each of SO_X and PM_{10}. Emissions from construction activities associated with the Pacific City alternative shore station location would be considered short-term and would not significantly degrade air quality. Therefore, impacts to air quality would not be significant.

MCB Camp Pendleton Alternative

Under this alternative, minor site grading would be required for construction of a concrete pad to accommodate eight ISO-vans, and trenching of a maximum of 111 yd^3 (85 m^3) of sand to accommodate placement of the shore landing cable. Because the proposed trench for the shore landing cable would run across the beach and through the tidal zone, the moisture content of the sand would be high; therefore, particulate emissions from trenching activities would be negligible. Combustion emissions would result from the use of the backhoe for grading and utility line and shore cable trenching. A maximum of 8 hours for trenching, 8 hours for grading, and 8 hours for clearing was assumed under this alternative. Estimated emissions under this alternative would be the same as under the proposed shore station site. Emissions from construction activities associated with the MCB Camp Pendleton alternative shore station are below *de minimis* thresholds, would be considered short-term, and would not significantly degrade regional air quality. Therefore, impacts to air quality would not be significant.

4.3 MARINE ENVIRONMENT

4.3.1 Approach to Analysis

For the ADS ocean tests, potential impacts would be limited to water quality and marine sediment issues due to the metals contained in individual test components. Determination of significant impacts on marine water quality is based upon criteria in the *Water Quality Control Plan for Ocean Waters of California* (The Ocean Plan) established by the SWRCB (SWRCB and California EPA 1997) and the *USEPA National Ambient Water Quality Criteria* (USEPA 1986).

4.3.2 ADS Ocean Test Locations

4.3.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Water Quality

Under the proposed ADS ocean tests, there would be minimal physical discharges to the marine environment. All component surfaces with the potential to corrode, with the exception of drogue chute clips (discussed below), are encapsulated in a chemically inert polyurethane (rubber-like) boot, coating, or secondary housing. This encapsulation would prevent all potentially corrodible metals from contacting the environment. Since the lithium or alkaline batteries proposed for use in the ocean test components would be self-contained, closed systems, there would be no exposure of inner battery constituents to seawater and no discharges to the marine environment. In addition, all ADS components would be retrieved upon completion of testing with the exception of the corroded drogue chute clips and plastic canister clips. Therefore, proposed ADS ocean tests would not have a significant impact on water quality.

Drogue chute clips are attached to each node. The clips, composed of magnesium and iron, are designed to corrode in seawater. To determine the mass of the clip, it was conservatively assumed to be 99 percent iron. The clip is 0.8 x 0.8 x 0.4 inches (2.0 x 2.0 x 1.0 cm) and has a volume of 0.25 in^3 (4.1 cm^3). Since the density of iron is 7.86 grams (g)/cm^3, the mass of each clip is 1.1 ounces (32.2 g). The total number of clips to be used for all four tests over the 3-year test period is 28. Therefore, a conservative estimate of the amount of iron exposed to the marine environment, over the 3-year test period, would be approximately 31 ounces (879 g). No water quality significance thresholds exist for naturally occurring magnesium or iron concentrations, suggesting that these constituents do not pose any potential impact to aquatic organisms (USEPA 1986; SWRCB 1997). Both magnesium and iron occur naturally in seawater; magnesium is present at a concentration of 1.35 ppt and iron is found in trace amounts (less than 0.001 ppt) (Lerman 1986; Nybakken 1988). River discharge and hydrothermal vents are the main sources of these materials into the ocean. Therefore, the negligible amount of material from drogue chute clips diluted over the volume of the SCB would not result in significant impacts to water quality.

The implosion of common household-type lightbulbs would be used as a sound source for ocean testing. The lightbulbs would be lowered into the water within nylon netting to facilitate retrieval and prohibit the release of glass chards into the water; all remnants of the imploded lightbulbs would be retrieved after use. Of the materials that comprise lightbulbs, only the gas contained within the bulb would not be retained within the nylon net and, therefore, would not be retrieved after bulb implosion. Incandescent lightbulbs are filled with argon gas at approximately 1 atmosphere of pressure. Argon gas is a normal constituent of the atmosphere (0.94 percent) and is also found dissolved in seawater at a level between 0.4 and 0.7 parts per million (ppm). As an inert gas, argon does not react chemically with seawater, and assuming a conservative volume of 0.5 liter of argon per lightbulb, the increase in argon content in a cubic meter of seawater would be 0.87 ppm. This volume would be further diluted by currents, resulting in negligible increases in ambient argon levels. Therefore, impacts on water quality from the use of lightbulbs would not be significant.

As multiple light bulbs would be used as sound sources on a single day, the impact of multiple imploding lightbulbs on water quality was assessed. Since the implosions of lightbulbs would have a separation time of 20-30 minutes, discrete volumes of argon gas would be dispersed by tidal currents; therefore, each event can be considered separately and impacts to water quality would not be significant.

Marine Sediments

ADS components have been designed to minimize drag, limiting sediment disturbance. Since the average cable to be deployed for the ADS ocean tests would only be 0.22 inches (0.56 cm) in diameter, the total interface area of the ocean bottom that would be momentarily disturbed during deployment of the cable would be a maximum 32,504 ft^2 (3,020 m^2) for Test 2. For Tests 1, 3, and 4 much shorter lengths of cable would be deployed and the average surface area of ocean bottom that would be disturbed as a result of deployment would be approximately 6,494 ft^2 (603 m^2). Any disturbance that would occur would be short-term and not significant. In addition, increases in turbidity would be minimal since the majority of cable would be deployed in the open ocean.

Under the proposed ADS ocean test, there would be limited physical discharges to the marine environment. All component surfaces with the potential to corrode, with the exception of the drogue chute slips (discussed above), are encapsulated in a chemically inert polyurethane (rubber-like) boot, coating, or secondary housing. This encapsulation would prevent all potentially corrosible metals from contacting the environment. Since the lithium or alkaline batteries proposed for use in the ocean test components would be self-contained, closed systems, there would be no exposure of inner battery constituents to seawater and no discharges to the marine environment. In addition, all ADS components will be retrieved upon completion of testing with the exception of the corrosive drogue chute clips and plastic canister clips. For these reasons, proposed ADS ocean tests would not have a significant impact on marine sediments.

Iron and magnesium from drogue clips used to deploy the cable would not impact marine sediment quality for reasons described above for water quality.

<u>Area outside Territorial Waters</u>

Impacts to the marine environment outside territorial waters would be similar to that described for the area within territorial waters. Therefore, impacts to water quality or marine sediments would not be significant.

4.3.2.2 Alternative ADS Ocean Test Location

<u>Area within Territorial Waters</u>

Impacts to the marine environment within territorial waters would be similar to those described for the proposed ADS ocean test location. Therefore, impacts to water quality or marine sediments would not be significant.

<u>Area outside Territorial Waters</u>

Impacts to the marine environment outside territorial waters would be similar to those described for the proposed ADS ocean test location. Therefore, impacts on water quality or marine sediments would not be significant.

4.3.3 ADS Shore Station Locations

4.3.3.1 Proposed Shore Station Location

Use of the shore station would require trenching and backfilling of approximately 22 yd^3 (17 m^3) of sand through the surf zone for placement of the shore landing cable. Trenching activities would result in resuspension and potential remobilization of sediments into the water column. High turbidity levels (20 percent above ambient conditions) are not anticipated to occur because of the high energy nature of the nearshore environment. In addition, the sand in this area is generally coarse and settles at a relatively fast rate. Therefore, trenching activities associated with the proposed shore station site would not have a significant impact on water quality or marine sediments.

4.3.3.2 Alternative Shore Station Locations

Pacific City Alternative

Impacts to the marine environment at the Pacific City alternative shore station site would be similar to those described for the proposed shore station location. Use of this shore station would require trenching and backfilling of approximately 22 yd^3 (17 m^3) of sand through the surf zone for placement of the shore landing cable. High turbidity levels are not anticipated to occur because of the high energy nature of the nearshore environment. Therefore, trenching activities associated with the Pacific City alternative shore station location would not have a significant impact on water quality or marine sediments.

MCB Camp Pendleton Alternative

Impacts to the marine environment at the MCB Camp Pendleton alternative shore station site would be similar to those described for the proposed shore station location. Use of this shore station would require trenching and backfilling of approximately 22 yd^3 (17 m^3) of sand through the surf zone for placement of the shore landing cable. High turbidity levels are not anticipated to occur because of the high energy nature of the nearshore environment. Therefore, trenching activities associated with the MCB Camp Pendleton alternative shore station location would not have a significant impact on water quality or marine sediments.

4.4 MARINE BIOLOGY

4.4.1 Approach to Analysis

Marine biology issues related to the ADS ocean tests are associated with potential impacts to sensitive habitats or species from the deployment of underwater components in the marine environment. Sensitive habitats or species are those that are demonstrably rare, threatened, or endangered; are protected by federal or state statutes or regulations; or have recognized commercial, recreational, or scientific importance. (Impacts on marine mammals are discussed in Section 4.5.)

Potential impacts to sensitive marine flora associated with the proposed project would come from the deployment of the cable and the cable resting on the seafloor. Since there are no chemical discharges of known toxicological concern associated with ADS, only physical impacts on marine biological resources are analyzed. In addition, impacts of underwater sound on fish populations are also addressed within this section due to the potential impacts on catchability.

4.4.2 ADS Ocean Test Locations

4.4.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Marine Flora

The ADS ocean tests would be short-term in duration (a total of 1,344 hours of active acoustic testing, inclusive of all tests over a 3-year period; refer to Table 2-3) and would not result in permanent alterations of marine plant composition or populations. ADS operational criteria require that the test locations be free of kelp or dense mats of benthic algae.

Historic records indicate that kelp has not been present offshore of the proposed shore station location (refer to Figure 3-4). Other benthic marine flora may be present; however, given the small area affected by the cable and the opportunistic nature of marine plants, impacts would be less than significant.

The diameter of the ADS test cables is relatively small, ranging in size from 0.06-0.625 inch (0.15-1.6 cm). Approximately 32,504 ft^2 (3,020 m^2) of ocean floor would be in direct contact with the ADS ocean test components for Test 2. For Tests 1, 3, and 4 much shorter lengths of cable would be deployed and the average surface area of ocean bottom that would be disturbed as a result of deployment would be approximately 6,494 ft^2 (603 m^2). In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed.

ADS operational criteria require that the tests be located in a relatively smooth bottom area; therefore, the ocean tests would be sited in an area free of kelp or dense mats of benthic algae. Even if sparse vegetation were located in the region of direct influence, permanent alterations of marine plant composition or populations would not occur because of minimal contact of the cable with marine flora. Therefore, impacts to marine flora would not be significant.

Marine Fauna

The ADS ocean tests would be short-term in duration (1,344 hours of active acoustic testing over 26,280 hours, or 3 years, inclusive of all tests) and would not result in permanent alterations to marine fauna. The diameter of the ADS test cables is relatively small, ranging in size from 0.06-0.625 inch [0.15-1.6 cm]). Over the course of the four ocean tests, approximately 32,504 ft^2 (3,020 m^2) of ocean floor would be in direct contact with the ADS ocean test components under Test 2 and an average of approximately 6,494 ft^2 (603 m^2) under Tests 1, 3, and 4. In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed.

Potential impacts on nektonic marine animals (e.g., fish, squid, etc.) would be limited to the momentary disturbance associated with ADS components traveling through the water column prior to reaching the sea floor. Impacts would not be significant since these organisms are highly mobile. Sessile biological assemblages (e.g., infauna and epifauna) directly in contact with ADS ocean test components could be minimally affected due to the minor disruption of the sediment in contact with the ADS test components. Most benthic species have hard outer coverings (e.g., mollusks have shells, crustaceans have exoskeletons), and many benthos have the ability to live buried in the sand (e.g., worms, echinoderms). Consequently, survival would be likely even if an ADS component were placed directly on a benthic organism. This would not be considered a potential lethal effect as movement away from the component would be probable. Therefore, impact to marine fauna would not be significant. Furthermore, since no discharges of chemicals would be released into the water column or sediments, no accumulation of chemicals in marine organisms would occur.

Impacts of Underwater Sound on Fish and Fisheries

A potential issue related to the proposed tests is that production of underwater noise could affect the behavior of fish in such a way that their catchability is reduced.

Fish can hear underwater sounds and often react to them. Impacts on fish and the distances at which these behavioral impacts can occur depend on the nature of the sound, the hearing ability of the fish, and species-specific behavioral responses. Changes in fish behavior can, at times, reduce their catchability. The following discussion summarizes the ability of fish to hear sounds and the reactions of fish to those sounds. This information is then used to predict the likely impacts of the proposed ADS ocean tests on fish and fisheries.

Fish vary widely in their ability to hear sounds, with some species having very good auditory capabilities. In many of these fish, such as the herring, the swim bladder is connected directly to the inner ear. For herring, the upper frequency limit of hearing ranges from 4,000 to 13,000 Hz (Enger 1967). The upper limit of hearing in fish without this type of connection is only about 1,000 to 1,200 Hz (Enger 1967). Herring are also relatively sensitive to sound. At 50 to 1,200 Hz, the herring hearing threshold is about 75 to 80 dB re 1 µPa (Enger 1967) (refer to Section 3.3 for a discussion of noise terminology). Some other fish that have no direct connection between the swim bladder and ear have other adaptations to enhance hearing. These fish, along with those having a direct connection between swim bladder and ear, have been called "hearing specialists." Although it is difficult to compare hearing capabilities in air and water, the hearing sensitivity of hearing specialists is similar to that of other vertebrates after standardization of units (Popper and Fay 1993). Salmon and cod do not have a direct connection between swim bladder and inner ear, and are less sensitive to sound than are some other species of fish (Olsen 1969; Popper and Fay 1993). Cod and other species that are not hearing specialists do not hear well at frequencies above 500 Hz. For those marine species that have been measured, their thresholds at frequencies of 1,000 Hz are on the order of 120-130 dB re 1 µPa.

As shown below, the lowest (best) hearing thresholds for common fish species are below 500 Hz (Fay 1988). Although there appears to be great diversity in the hearing abilities of different species of fish (Popper and Fay 1993), some of this diversity may be attributable to differences in measurement procedures. Three audiograms are available for cod; the sound pressure levels at this species' most sensitive frequency varies by 30 dB re 1 μPa. Atlantic salmon may not be very sensitive to sound; their best threshold is 96 dB re 1 μPa, a high (poor) value (Table 4-3).

Experiments cited by Fay (1988) and others did not expose fish to very high frequency sounds. As discussed in the following section, some species do react to sounds greater than 100 kHz. Due to this diversity in hearing abilities, one cannot make comprehensive statements concerning the ability of fish to detect sounds at a particular frequency and/or received level. However, it is clear that many species of fish, including some of those occurring in the study area, can hear low-frequency sound pulses, although most will not hear high frequencies very well.

Table 4-3. Hearing Thresholds (in dB re 1 μPa) for Various Species of Fish

Species	Hearing at Highest Measured Frequency	Hearing Threshold at Frequency of Best Hearing
Cod	119 dB @ 400 Hz	95 dB @ 283 Hz
Cod	110 dB @ 470 Hz	75 dB @ 160 Hz
Cod	140 dB @ 600 Hz	65 dB @ 150 Hz
Pollack	107 dB @ 470 Hz	81 dB @ 60-160 Hz
Plaice	126 dB @ 200 Hz	97 dB @ 110 Hz
Atlantic Salmon	132 dB @ 380 Hz	96 dB @ 160 Hz
Yellowfin Tuna	120 dB @ 1,000 Hz	89 dB @ 500 Hz

Source: Fay 1988.

The behavior of fish could be affected by the underwater sound source, vessel operations, and the lightbulb sound system. Potential impacts to fish and fisheries from the production of underwater noise is discussed below.

The ADS ocean tests would emit sounds by a towed underwater sound source. However, the sound source levels emitted would range from 120-175 dB re 1 μPa-m at frequencies between 20 to 1,000 Hz, which is within the range of hearing of most fish. Since sound source levels would not exceed 175 dB re 1 μPa-m and a sound source of 180 dB re 1 μPa-m is the established threshold found to cause reduced catchability of fish or hearing damage to fish (Hastings et al. 1996), there would be no significant impacts to fish hearing or catchability.

Under the proposed action, the vessel towing the sound source projector would be traveling at low speed in the test area (2-5 kts). This type of movement would cause short-term avoidance responses by some fish (Schwarz and Greer 1984; Engas et al. 1995; Misund et al. 1996). Vessels used to deploy and retrieve the equipment would also be traveling at low speeds. Fish may exhibit some avoidance response to a boat, but are expected to return to normal behavior after it moves away. Any reactions would be short-term and would be similar to fish reactions to the numerous other vessels occurring in the region. Therefore, vessel noise impacts on fish would not be significant.

Lightbulbs would be used during the acoustic testing portion of the ocean tests. The operation would consist of lowering standard, off-the-shelf lightbulbs to mid-water depth and causing the bulbs to implode, thus creating a short duration impulse of approximately 1.8 ms (refer to Section 2.1.2.1). Because of the very short duration of the pulse from the lightbulb source, the average received level would be below the threshold found to cause reduced catchability of fish or hearing damage to fish. Therefore, impacts on fish catchability from the proposed lightbulb implosions would not be significant.

Threatened and Endangered Species

The southern California ESU of westcoast steelhead was recently listed as endangered and typically spends 2-3 years in marine waters. Although the southern California ESU of westcoast steelhead could potentially occur in the area, steelhead are a highly dispersed, solitary species when they inhabit the open ocean and the threshold found to cause hearing damage to fish (180 dB re 1 μPa; Hastings et al. 1996) is greater than proposed sound source levels; therefore, implementation of the proposed ocean tests would not affect individuals or populations of steelhead. Impacts to the southern California ESU of westcoast steelhead would not be significant.

Although four federally listed species of sea turtles could potentially occur in the area, they are not commonly encountered. Implementation of the proposed ocean tests would not affect sea turtles due to the low potential of encountering any of the federally protected sea turtles and the short-term nature of the proposed tests. In addition, mitigation measures established for marine mammals, including the sound source ramp-up procedures and the dedicated observers (refer to discussion in Section 4.5.2.5), would also apply to sea turtles. Preliminary investigations indicate that hearing sensitivity is limited to low-frequency bandwidths (60-1,000 Hz) (Ridgway et al. 1969). Sea turtle hearing threshold at 70 Hz has been estimated at 132 dB re 1 μPa. At the maximum sound source level, a received sound level of 132 dB re 1 μPa would be achieved within approximately 260 ft (80 m) of the sound source. If a sea turtle is sighted during active acoustic testing, operations would be curtailed. This would provide additional assurance that there would be no affects to sea turtles. Based on this determination, there would be no affects or significant impacts to federally protected marine species (marine mammals are addressed in Section 4.5).

Area outside Territorial Waters

Sensitive ocean bottom marine resources in the open ocean are generally scarce since soft bottom habitats typically have low species diversity in relation to hard-bottom or nearshore habitats. Species densities also decrease in relation to depth; therefore, the area outside territorial waters would have fewer species. Potential impacts to marine biological resources in the area outside territorial waters would be similar to those discussed for the area within territorial waters; therefore, impacts to marine biological resources would not be significant.

4.4.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Marine Flora

ADS operational criteria require that the test locations be free of kelp or dense mats of benthic algae. The alternative ADS ocean test location consists of an extensive sandy beach and subtidal area. This does not provide suitable habitat for kelp or other sensitive marine flora; therefore, impacts to marine flora would not be significant.

Marine Fauna

The discussion of potential impacts at the proposed ADS ocean test location is relevant to the alternative test location since test components and procedures would be the same in either location.

Threatened and Endangered Species

Several anadromous ESUs have been federally listed within drainages in Washington and Oregon. In addition, four species of federally listed sea turtles potentially occur within the alternative ocean test location. Based on the determination made for threatened and endangered species for the proposed ocean test location (Section 4.4.2.1), there would be no affects or significant impacts to federally protected marine species (marine mammals are addressed in Section 4.5).

Area outside Territorial Waters

Potential impacts to marine biological resources in the area outside territorial waters would be similar to those under the proposed test location; therefore, impacts to marine biological resources would not be significant.

4.4.3 ADS Shore Station Locations

4.4.3.1 Proposed Shore Station Location

Trenching of approximately 111 yd^3 ($85m^3$) of sandy intertidal and beach areas would be required for installation of the shore landing cable at the proposed shore station site. This area is very dynamic (i.e., always changing due to waves) and occupied by relatively few organisms that adapt to the ever-changing environment (Nybakken 1988). In addition, trenching activities would be short-term, lasting less than 8 hours. Therefore, trenching activities would not have a significant impact on marine biological resources.

4.4.3.2 Alternative Shore Station Locations

Pacific City Alternative

Potential impacts to marine biological resources at the Pacific City alternative shore station location would be similar to those discussed under the proposed shore station location since the tidal area in this location is also very dynamic; therefore, impacts to marine biological resources would not be significant.

MCB Camp Pendleton Alternative

Potential impacts to marine biological resources at the MCB Camp Pendleton alternative shore station location would be similar to those discussed under the proposed shore station location since the tidal area in this location is also very dynamic; therefore, impacts to marine biological resources would not be significant.

4.5 MARINE MAMMALS

4.5.1 Approach to Analysis

Issues of concern to marine mammals analyzed in this EA include the potential for: (1) changes in behavior due to impacts of underwater noise associated with the tests, (2) attraction/ingestion/entanglement/collisions, and (3) chemical contamination. Of these, most attention is devoted to acoustic issues (Section 4.5.2) because marine mammals rely on hearing for feeding and communication. The main noise-producing aspects of the proposed tests are vessel operations, towed sound source operations, and lightbulb implosions. Characteristics of the underwater noise associated with each of these operations are described in Section 4.9.

Underwater sounds would be emitted either incidentally or intentionally during the proposed ocean tests. These include sounds incidental to vessel operations, as well as those emitted intentionally to test the ADS receiving equipment. The following analysis addresses whether these sounds have the potential to:

- interfere with (mask) the detection of marine mammal calls, or other natural sounds important to marine mammals;
- cause biologically significant disturbance reactions; or
- cause hearing damage or physical injury to marine mammals.

To address these questions, this section briefly presents background on acoustic masking, acoustic disturbance, and the potential for hearing damage. Predictions about the potential acoustic impacts of the major noise-producing elements of the proposed tests on marine mammals are included. Considerations specific to each of the four proposed tests are identified where appropriate.

The potential impacts of test activities are analyzed for three groups of marine mammals: mysticetes (baleen whales), odontocetes (toothed whales, dolphins, and porpoises), and pinnipeds (seals and sea lions). Activities associated with the proposed ocean tests would have essentially no impact on sea otters, given their extremely low numbers in the proposed test area, their restricted/nearshore distribution in waters less than 66 ft (20 m) deep (Estes and Jameson 1988; USFWS 1996) in both the proposed and alternative test area, and their habit of resting (rafting) at the surface with their ears above the water roughly 50 percent of the time. Available data on marine mammal hearing and behavioral reactions are limited to a few species, particularly when attention is restricted to low-frequency sounds (Richardson et al. 1995; Au et al. 1997; Kastak and Schusterman 1998). Accordingly, generalizations about certain species groups are based on test results on related species. For example, studies on the hearing range and behavioral reactions of bottlenose dolphins and a few other small toothed whales (i.e., Risso's dolphin, false killer whale) can be used to draw tentative conclusions about potential reactions of other types of small- and moderate-sized odontocetes that have not been studied. Similarly, audiograms and behavioral responses of California sea lions and harbor seals are referenced to infer likely pinniped responses to test activities.

In addition to acoustic issues, the potential for marine mammal entanglement, ingestion, and chemical contamination are addressed in Sections 4.5.3 and 4.5.4, respectively. Entanglement and ingestion are potential concerns because of the lengths of cable (31-342 miles [50-550 km]) and associated equipment to be deployed during the tests. Risk of entanglement, ingestion, and chemical contamination are mitigated by removal of all equipment and cable within 6 months of each test, and at the completion of all four tests. A related concern is the potential attraction of marine mammals (especially sea lions) to the lights on the ROV and TDV. Collisions with vessels and underwater gear are also briefly addressed.

The potential for a marine mammal "take," in accordance with the Marine Mammal Protection Act (MMPA) (16 USC 1361 *et seq.*) is addressed in Section 4.5.5, with emphasis given to species listed as threatened or endangered. The term "take" is statutorily defined in the MMPA to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Under the 1994 MMPA amendments, Congress statutorily defined and divided the term "harassment" to mean "any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or (2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding or sheltering (Level B Harassment)." Finally, although analyses presented throughout this section hold true for both the proposed and alternative test sites, this portion of the EA concludes with a summary of marine mammal issues specific to the alternative ADS ocean test location (Section 4.5.6).

4.5.2 Acoustic Sources

Two types of acoustic sources would be used during the proposed tests to locate hydrophones and to evaluate the listening capabilities of the ADS system: towed sources, consisting of pulsed and continuous sounds, and lightbulb implosions. A total of 1,344 hours of active acoustic testing would occur over 3 years, inclusive of all tests (see

Table 2-3). These sources emit fundamentally different acoustic stimuli, as discussed below.

Potential Impacts from the Towed Sound Source

A support vessel would tow a sound source projector at varied depths, distances, and speeds to test the detection and tracking capabilities of the ADS hydrophone array. Tow speeds would range from 2-5 kts, with sound source projector depth generally greater than 66 ft (20 m). The towed projector would emit both pulsed and continuous sounds within the 20-1,000 Hz frequency band. The maximum source level for pulsed sounds would be 175 dB re 1 μPa-m. Continuous sounds would be transmitted in two modes: one with maximum levels at 139 dB re 1 μPa-m, and the second with maximum source level at 170 dB re 1 μPa-m (refer to Table 2-3). The louder transmissions are required to determine sound transmission loss within the test field, and would comprise 33 percent (i.e., 412 of 1,240 hours) of total test operations. Odontocetes and pinnipeds have relatively poor hearing at frequencies below 1 kHz, requiring levels near 80-100 dB re 1 μPa for signal detection (refer to Figures 3-8 and 3-9). Conversely, mysticete ear structure indicates good hearing at these relatively low frequencies (Ketten 1994). Thus, mysticetes are the marine mammals having the greatest potential to be affected by signals from the towed sound source.

National Research Council (NRC) reported that NOAA/NMFS recommended (on an interim basis) the use of sound source levels 80 to 100 dB above absolute hearing threshold as harassment levels based on annoyance or TTS (see NRC 1996). Absolute hearing thresholds for odontocetes and pinnipeds in the band of sensitive hearing tend to fall in the range 40 to 80 dB (re 1 μPa), consistent with the lowest observed ambient noise levels in those bands. There are no measurements of hearing sensitivities for mysticetes, but for the low band (below 500 Hz), noise band levels in the quietest locations generally exceed 80 dB. Based upon the NOAA/NMFS recommendation, the harassment thresholds for mysticetes would then fall in the range from about 160 dB to 180 dB (re 1 μPa), depending on species, frequency, duration, waveform, etc. NMFS is re-examining sound pressure level thresholds in the context of the definition of harassment. For this EA, the Navy will take the conservative approach of mitigating to the range at which the level is estimated to be 120 dB or less for continuous sound and 160 dB or less for pulsed sound. In this case, the ADS program can meet the testing requirements while mitigating to these very conservative sound levels.

Assuming spherical spreading loss (20 log r), the 175 dB re 1 μPa-m pulsed source level would drop to 160 dB re 1 μPa at 20 ft (6 m) from the source. The 139 dB re 1 μPa-m continuous source would drop to 120 dB re 1 μPa at 32 ft (10 m) from the source. When the continuous sound source is transmitting at a source level of 170 dB re 1 μPa-m, the range of ensonification to 120 dB re 1 μPa would extend 1,050 ft (320 m) from the source. Given this, the maximum ranges for pulsed (at 160 dB re 1 μPa) and continuous (at 120 dB re 1 μPa) sound sources are 140 yd^2 (117 m^2) and 384,845 yd^2 (321,730 m^2), respectively. Similar "proxy" received levels have not been established for odontocetes nor pinnipeds (NRC 1994) but, as mentioned above, these groups all have comparatively poor hearing at frequencies below 1 kHz, so acoustic audibility ranges would be much smaller than those for mysticetes.

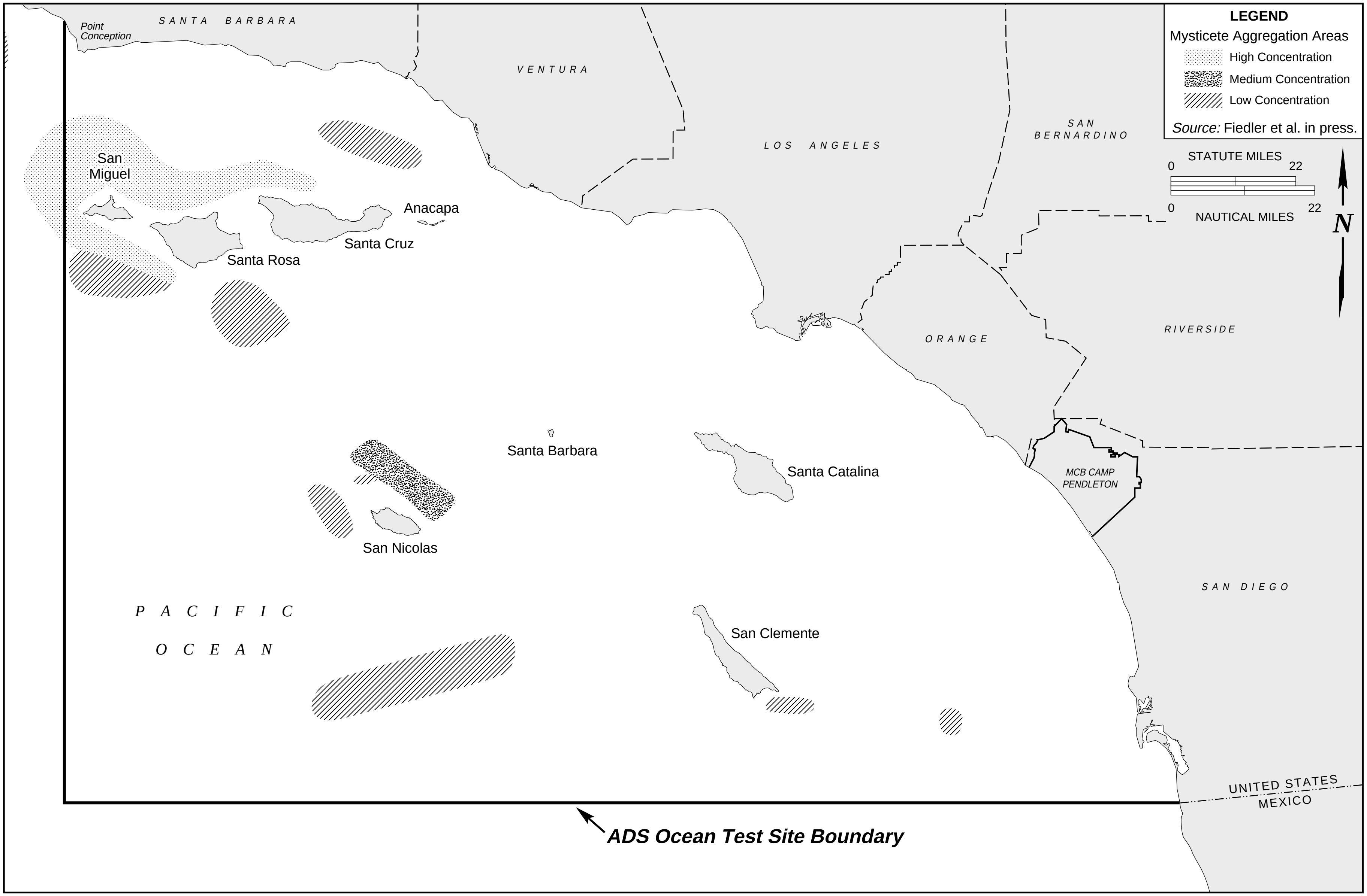
Even when the continuous source is operating at its loudest level (i.e., 170 dB re 1 μPa-m), the 120 dB re 1 μPa contour extends only 1,050 ft (320 m) from the source. For continuous sound source transmissions above 140 dB re 1 μPa-m, at least two shipboard personnel would stand dedicated watch to detect any animals that might approach the towed source. For example, at maximum sound source transmissions of 170 dB re 1 μPa-m, if animals approach within 1,050 ft (320 m) of the ship, the sound transmissions would be stopped. For sound transmissions below 140 dB re 1 μPa-m, standard ship's watch would be implemented (refer to Section 4.5.2.5).

The probability of a mysticete swimming within 20 ft (6 m) of the pulsed source without detection is low. During summer/fall when blue, fin, and humpback whales feed in the proposed ADS ocean test location, they are generally concentrated in waters modified by upwelling south of Point Conception (Figure 4-1), where prey are plentiful (Fiedler et al. in press). A conservative scenario for mysticetes, based on potential numbers of animals in the test area, would be the occurrence of comparatively high numbers of gray whales during their south- and north-bound migrations in winter/spring (refer to Table 3-2). Forney et al. (1995) provides a density estimate of 0.0145 gray whales/km^2 for a region approximating the proposed test area in winter/spring. Using the previously calculated 120 dB contour area for the 170 dB 1 μPa-m continuous source of 384,845 yd^2 (321,730 m^2), and the conservative assumption of uniform whale distribution, a maximum of 0.0047gray whales could be exposed to a received level of 120 dB (i.e., 0.3217 km^2 x 0.0145 gray whales/km^2 = 0.0047). Even though the number of gray whales potentially exposed to a received level of 120 dB re 1 μPa is small (0.0047), visual watch mitigation measures would be implemented during sound transmissions to ensure that a gray whale would not be exposed to continuous sound levels in excess of 120 dB re 1 μPa (see Section 4.5.2.5).

Gray whales, of course, are not distributed uniformly during migration, but are clustered near the shoreline of California and the Channel Islands (Poole 1984; Jones and Swartz in press). Available data suggest most south-bound animals (65-80 percent) remain on a southerly course after passing Point Conception and migrate primarily along the western coasts of the Channel Islands. Gray whales aggregate near inter-island channels and submerged rocky outcroppings offshore the northern Channel Islands (Jones and Swartz in press), with main migration pathways along the western coasts of the southern Channel Islands (Sumich and Show in press; Figure 4-2). The ADS laydown area would not overlap gray whale aggregation areas, but would coincide with portions of the migration pathway during the migration seasons. Avoidance of mysticete feeding and aggregation areas, in combination with proposed mitigation measures, would result in insignificant biological impacts to mysticetes associated with towed sound source emissions.

Potential Impacts from Imploding Lightbulbs

The implosion of one lightbulb produces a single 1.8 ms pulse, with a peak source level that can range from 159-216 dB re 1 μPa-m at primary resonance frequencies of 130-876 Hz and depths of 23-705 ft (7-215 m) (Heard et al. 1997). Lightbulb implosions are considered independent events given the instantaneous nature of the pulse and the time (20-30 minutes) between implosions. As discussed above, the potential impacts of anthropogenic noise on marine mammals depends in part on whether the sounds are transient or continuous. Marine mammal responses to a pulsed sound with a particular



Mysticete Aggregation Areas – Summer/Fall
Southern California Bight

FIGURE

4-1

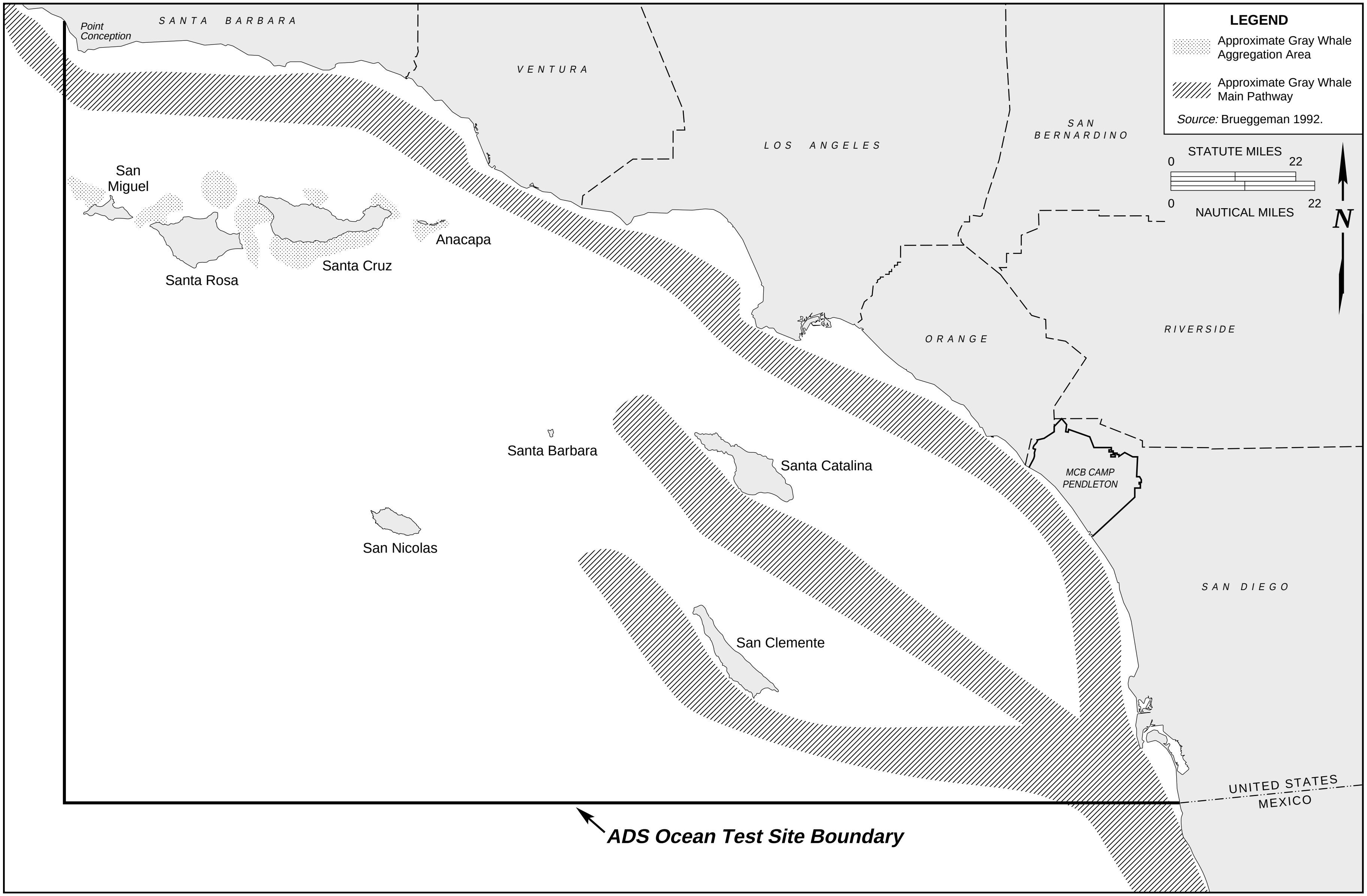


FIGURE 4-2

Gray Whale Aggregation Areas and Main Pathways – Winter/Spring
Southern California Bight

peak level can be quite different than responses to a continuous sound at the same level (Richardson et al. 1995; Richardson and Wursig 1997).

Recent research indicates that the pulse rise time (the rate at which pressure increases to its peak) may be the key factor when considering harm to marine mammals (ONR 1998). To create the pulse from a lightbulb implosion, water pressure pushes inward, as compared to outward pressure generated by an explosion. For example, an explosion of 0.5 kg reaches a peak pressure of approximately 267 dB re 1 μPa-m within about 0.001 ms (Richardson et al. 1995). Conversely, the rise time for lightbulb implosions is on the order of 0.5 ms, or roughly 500 times slower (longer) than the rise time associated with explosions. In addition, the peak pressure produced by a lightbulb implosion is much lower (maximum = 216 dB re 1 μPa-m) than the peak pressure produced by an explosion (Note: 215 dB is one-thousandth the pressure of 275 dB.). In summary, the lightbulb implosion reaches a comparatively low peak pressure (216 dB re 1 μPa-m) within 0.5 ms, as compared to the 267 dB re 1 μPa-m peak pressures in about 0.001 ms from small explosions. Also, in the case of imploding lightbulbs, peak levels would last for only 1.8 ms and would not in themselves be harmful to marine mammals. Thus, if a marine mammal were exposed to a single pulse generated from one imploding lightbulb, a momentary startle, but not harm, could occur. It is the interpretation of NMFS (1995, 1997) that a momentary startle response would not constitute harassment and would not result in a “take” of any marine mammal. Therefore, impacts to marine mammals as a result of lightbulb implosions would not be significant.

4.5.2.1 Masking Effects

Masking is a natural phenomenon whereby a sound source becomes inaudible if sufficiently far away, or when increased background noise reduces the distance over which a listener can detect calls or other sounds of interest. The following subsections provide specific assessments of the potential for masking by vessel operations, towed sound source projector operations, and lightbulb implosions during the proposed ADS ocean tests.

<u>Masking by Vessel Operations</u>

The two vessels to be used during the proposed ADS ocean tests would be of moderate size and power as compared with the many other vessels operating in and near the test areas. Due to the ADS ocean tests operational requirements, project vessels would operate mainly at low speeds, thus reducing noise emissions and any possibility of collision with marine mammals. Vessels would operate, as required, a maximum of 265 days during a 3-year period (with 1,344 hours of active acoustic testing), inclusive of all four tests (refer to Table 2-3). Vessel noise would occur primarily at low frequencies (i.e., less than 1 kHz), which would overlap the dominant components of mysticete, but not odontocete, calls (Richardson et al. 1995). Most communication, and all echolocation calls of odontocetes are at frequencies well above those associated with vessel noise. In addition, audiograms and ear structure indicate that most odontocetes have poor hearing at frequencies below about 1 kHz (refer to Figure 3-8; Ketten 1994). Specifically, recent studies have determined that hearing threshold was roughly 140 dB re 1 μPa for a pure-tone signal at 75 Hz for a false killer whale and a Risso's dolphin (Au et al. 1997). Thus, environmental sounds important to most toothed whales are presumably also at frequencies higher than those of the strong components of vessel noise. Therefore, vessel operations would not have significant masking effects for odontocetes.

Vessel noise would overlap frequencies of mysticete calls. This could result in some temporary reduction in the radius around a calling whale within which its calls could be heard by another animal. However, characteristics of whale calls, and variability in calling behavior, would likely mediate any potential problem. For example, blue and fin whales produce most of their calls at about 20 Hz, frequencies below those commonly associated with propeller cavitation tones (40-50 Hz), the dominant spectrographic feature of vessel noise. Humpback whales produce complex sounds across a wide frequency band, such that their calls would not likely be masked by tonal peaks of vessel noise. Gray whales appear to call infrequently and, in breeding lagoons, have been shown to modify their calls with changes in the ambient noise environment (Dahlheim et al. 1984). Overall, with respect to planned test activities, vessel noise should not have any significant biological consequences for mysticetes for the following reasons:

- The noise associated with project vessels would be a negligible increment to the total vessel noise that is encountered by any whales occupying the test areas.

- The vessel sounds would be less than 175 dB re 1 μPa-m because of the typical slow speed of the vessels during the proposed ADS ocean tests.

- The duration of vessel operations in any one area would be relatively brief given the need to move to different locations to accommodate various test activities.

Masking by vessel noise does not seem to be a significant problem for pinnipeds, given their frequent proximity and lack of response to vessels of a variety of classes (Richardson et al. 1995). There is some overlap between the frequencies important to pinnipeds and the underwater noise emitted by moderate-sized vessels. However, the predominant frequencies of most pinniped calls, and the frequency range of best auditory sensitivity (refer to Figure 3-9) described for pinnipeds, are higher than the dominant frequencies of underwater sound from moderate-sized vessels. Therefore, as for odontocetes, vessel activities associated with the proposed ADS ocean tests would not present significant masking effects for pinnipeds.

<u>Masking by the Towed Sound Source Projector</u>

It is unlikely that signals associated with the towed sound source projector would mask acoustic signals important to whales (odontocetes and mysticetes) for the same reasons as those given for vessel noise. Signals from the towed sound source projector share many of the attributes of vessel noise (i.e., levels to 175 dB re 1 μPa-m at frequencies less than 1 kHz). Therefore, sounds emitted by the projector would not have a significant masking effect on odontocetes because they would be at frequencies below almost all of the sounds important to toothed whales. In addition, during pulsed-sound projection, signals would consist of a 0.25- to 10-second signal separated by seconds to hours or days between signals. For continuous sound source transmission and vessel noise, the continuous sound source signals overlap frequencies of mysticete whale calls, which could result in some temporary masking of signals important to those whales. However, as with vessel noise, characteristics of whale calls and variability in calling behavior would likely mediate any potential problems. The projected sounds would be no stronger than those of many vessels, and both mysticetes and odontocetes commonly tolerate vessels transiting as close as a few hundred meters away (Richardson et al. 1995). Given these factors, masking effects of the projected sounds on mysticetes or odontocetes would not result in acoustic harassment and therefore would not be significant.

Similarly, signals emitted by the towed source would not pose a significant masking problem for pinnipeds given that:

- projected sound levels, whether pulsed or continuous, would be no higher than those emitted by many ships;
- boat sounds do not seem to be a problem for pinnipeds;
- during pulsed-sound emissions, pinnipeds would be able to detect other signals between pulses; and
- projected sounds would be strong in any one location for limited periods.

Masking by Lightbulb Implosions

Based on the duration of sound produced by the breaking lightbulbs (1.8 ms pulse), masking would not occur for any marine mammal species (see previous discussion in Section 4.5.2, Acoustic Sources).

Summary of Potential Masking Effects

In summary, vessel and, to a lesser degree, towed sound source operations may cause some minor masking of sounds relevant to mysticetes. No masking would occur from lightbulb implosions due to their brevity. Given the limited area of potential impact, the low likelihood of encountering marine mammals during test operations, and the negligible consequences resulting from potential masking during the ADS ocean tests, impacts would not be significant and would not constitute a “take” by harassment as defined by the MMPA.

4.5.2.2 Disturbance Impacts

As described elsewhere, the proposed tests would include vessel operations, sequences of pulsed and continuous low-frequency sounds to test the ADS receiving equipment, and brief sound pulses associated with lightbulb implosions. For each major group of marine mammals in the region, this section:

- summarizes what is known about the responses to these types of sounds, based primarily on the review of Richardson et al. (1995); and

- evaluates the expected disturbance impacts of each of these types of sound as they would occur during the proposed ADS ocean tests.

Disturbance to Mysticetes (Baleen Whales)

In general, reaction thresholds of mysticetes to anthropogenic sounds are usually well above the assumed threshold for detection. However, reaction thresholds vary widely depending on the type of noise and other circumstances. Reaction thresholds can be low for "threatening" or variable sounds (e.g., an approaching boat with received noise level less than 100 dB re 1 μPa), higher for continuous sounds (e.g., industrial noise with received levels near 120 dB re 1 μPa), and much higher for regularly repeated, short pulsed signals (e.g., seismic exploration with received levels near 160 dB re 1 μPa). In all situations, there is considerable variation in responses among individual whales.

Vessel Operations

Mysticetes show highly variable reactions to boats, ranging from approach to indifference to active avoidance (Richardson et al. 1995; Richardson and Wursig 1997). In general, baleen whales usually tolerate and may even approach idling or slowly moving vessels, especially when the vessels do not head toward the whales, nor change course, speed, or propeller setting. In these cases, whales generally do not react conspicuously at distances exceeding about 980 ft (300 m), and often tolerate closer approaches. In contrast, whales often interrupt their prior activities and dive or swim rapidly away from vessels that are approaching directly at high speed or maneuvering nearby. In these latter cases, reaction distances can range up to several kilometers, and the received sound levels eliciting the reactions can sometimes be quite low (e.g., less than 100 dB re 1 μPa). However, even the reactions to direct vessel approaches are short-term in nature. The best example of this is the continued occupancy by mysticetes of busy shipping lanes and fishing grounds in many parts of the world.

The two vessels that would be used during the proposed ocean tests are of moderate size and power as compared with the many other vessels operating in and near the test areas. Project vessels would operate mainly at low speeds within a specific test area, thus reducing noise emissions and potential disturbance impacts. Project vessels would not purposefully approach baleen whales, and it is unlikely that a baleen whale would approach the vessels. In the unlikely event that an animal is present, vessel disturbance impacts would be unlikely due to the planned consistency (i.e., lack of erratic movements) of test vessel operations. Consequently, vessel operations associated with the proposed ADS ocean tests would not result in significant disturbance impacts on mysticetes.

Towed Sound Source Projector

Reactions of mysticetes to several types of steady, low-frequency anthropogenic noise sources have been studied (Richardson et al. 1995; Richardson and Wursig 1997). In general, whales tend to tolerate exposure to these types of sounds when the received level is low, that is, not more than 10-20 dB re 1 μPa above the prevailing ambient noise conditions in the corresponding bandwidth. Because baleen whale hearing is believed to be acute at these low frequencies (Ketten 1994), it is assumed that they tolerate rather than simply not hear, these low-level anthropogenic sounds. At higher received levels (e.g., 20-30 dB re 1 μPa above ambient), increasing proportions of whales show subtle or conspicuous changes in behavior, sometimes including short-term avoidance of an area. Reaction thresholds vary considerably depending on the physical situation, the activity of the whales, and among individual whales. Some whales react to steady anthropogenic sounds only a few decibels above ambient, while others show no overt reactions to received levels 20-30 dB re 1 μPa above ambient. In general, behavioral reactions to continuous low-frequency sounds often become evident at overall received levels near 120 dB re 1 μPa, and usually are conspicuous at overall received levels near 140 dB re 1 μPa (Richardson et al. 1995).

Mysticete responses to pulsed low-frequency signals associated with marine seismic exploration have been comparatively well studied (Richardson et al. 1995; Richardson and Wursig 1997). Compared to the pulsed signals associated with the proposed ADS ocean tests, seismic exploration requires pulses with much higher sound source levels (to 232 dB re 1 μPa-m for a single large airgun; to 259 dB re 1 μPa-m for a full array), shorter duration, and wider spacing. During observational studies on gray, humpback, and bowhead whales, received levels of seismic pulses had to be quite high (roughly 160-170 dB re 1 μPa) before conspicuous disturbance reactions were evident (Richardson et al. 1986). Although the duration and location of operations would vary among tests, in each case, potential disturbance impacts on mysticetes would be avoided by implementation of mitigation measures (see Section 4.5.2.5). Therefore, the range of potential impacts addressed above would not constitute a "take" by harassment as defined by the MMPA.

Lightbulb Implosions

Reactions of mysticetes to lightbulb implosions would be limited to a brief startle reaction at most (see Section 4.5.2). Any momentary reaction would have no lasting consequences for the whales and would not constitute a "take" by harassment as defined by the MMPA.

<u>Disturbance to Odontocetes (Toothed Whales)</u>

As for mysticetes, odontocete reaction thresholds are generally well above detection thresholds in instances where responses to anthropogenic noise have been described. Reactions can be quite variable, from attraction to active avoidance of noise sources. Examples germane to the proposed ADS ocean tests are provided below.

Vessel Operations

Small- and moderate-sized odontocetes inhabiting littoral waters may show either attraction to or avoidance of boats, depending on species and circumstances. Many species of dolphins and some porpoises (e.g., Dall's porpoise) often approach vessels and ride their bow waves. At other times the same species show at least minor avoidance reactions to vessels, especially if they associate the vessel with harassment (Au and Perryman 1982). Harbor porpoises tend to move away from approaching boats (Polacheck and Thorpe 1990). Killer whales and various dolphin species, although often seen from boats, sometimes exhibit subtle tendencies to avoid approaching vessels (Richardson and Wursig 1997). Although some odontocetes have been reported to show strong avoidance of vessels at ranges up to a few kilometers, these were special cases that usually involved animals that had previously been chased or otherwise harassed by boats. With the probable exception of boats that purposefully approach toothed whales, there is no evidence that routine operations by small and moderate-sized boats cause deleterious disturbance impacts to odontocetes in littoral waters (Richardson et. al 1995).

The two vessels associated with the proposed ADS ocean tests would operate mainly at low speeds due to test requirements, thus reducing noise emissions, potential disturbance impacts, and the likelihood that odontocetes would approach the vessels to bow-ride. Thus, vessel disturbance impacts on toothed whales during the proposed tests would result in negligible consequences to the animals, and would not constitute a "take" by harassment as defined by the MMPA.

Towed Sound Source Projector

Reactions of odontocetes to steady low-frequency anthropogenic noise have not been studied extensively. In one study, captive beluga whales showed very little reaction to playbacks of recorded low-frequency drilling sounds even when received levels were as high as 153 dB re 1 μPa (Thomas et al. 1990). During the Heard Island Feasibility Test, hourglass dolphins were commonly seen in waters where the level of the 57 Hz test sounds was near 160 dB re 1 μPa (Bowles et al. 1994). There have been a few reports of free-ranging odontocetes that apparently showed localized avoidance of areas strongly ensonified by low-frequency drilling or dredging sounds. However, responses and sound exposure levels were not well quantified, and in some cases there was considerable tolerance of strong continuous low-frequency sounds (Richardson et al. 1995). In general, disturbance thresholds for odontocetes exposed to steady low-frequency sounds are poorly documented but seem high. This is probably related to the high hearing thresholds of most toothed whales at frequencies below 1 kHz (refer to Figure 3-8).

Similarly, there are few reports of odontocete responses to pulsed low-frequency sound in littoral waters. Seismic operators occasionally see dolphins near airgun arrays where received sound levels must be quite high, and there is some evidence of localized avoidance of such arrays (Mate et al. 1994; Arnold 1996; Goold 1996). The relevance of these observations to the proposed ADS ocean tests is uncertain, as seismic survey sounds are generated at much higher sound source levels, are shorter, and have longer intervals between pulses than the pulsed sounds proposed for use during the ADS ocean tests. In general, odontocetes apparently are not strongly disturbed by low-frequency pulsed sounds, again probably because of their high hearing thresholds at low frequencies. Overall, predicted disturbance impacts on toothed whales, both by the continuous and pulsed emissions from the towed sound source projector, are expected to be negligible with no significant consequences to odontocetes.

Lightbulb Implosions

Reactions of toothed whales to the lightbulb sound source system would be limited to a brief startle reaction at most (see Section 4.5.2). Any momentary reaction would have no lasting consequences for the animals and would not constitute a "take" by harassment as defined by the MMPA.

Disturbance to Pinnipeds (Seals and Sea Lions)

As for cetaceans, there are few quantified reports of pinniped responses to anthropogenic noise. Where information is available, it appears that pinniped reactions to noise are quite variable, ranging from tolerance to flight, as summarized below.

Vessel Operations

Although the reactions of pinnipeds hauled out on land (or ice) to nearby boats have often been described, there is very little information about reactions of seals and sea lions in the water to approaching vessels (Richardson et al. 1995). Sea lions in the water often tolerate close and frequent approaches by vessels, and often congregate around fishing boats. Other species of pinnipeds have been sighted in proximity to both commercial and recreational vessels. Indeed, Kastak and Schusterman (1998) conclude that low-frequency thresholds obtained from California sea lions suggest that this species is "relatively insensitive to the frequencies associated with most types of anthropogenic sound in the ocean." Thresholds for harbor seals were about 20 dB re 1 μPa more sensitive at 100 Hz, indicating that phocids have more sensitive amphibious hearing than otariids (Kastak and Shusterman 1998). Northern elephant seals had the best amphibious hearing of the three species tested, suggesting this species would likely hear vessel operations associated with ADS ocean tests in the proposed test area. However, the laydown area would be sufficiently distant from elephant sea haul-out beaches on the Channel Islands that impacts from such "hearing" are unlikely. Overall, because vessels associated with the ADS ocean tests are of moderate size and would move at slow speeds, noise associated with vessel operations would not be expected to have a significant impact on pinnipeds in the water.

When hauled out, pinnipeds are more responsive but rarely react unless a boat approaches within 330-660 ft (100-200 m). Hauled out harbor seals sometimes become alert when a boat approaches within 495-990 ft (150-300 m), and may move into the water if the boat comes closer. Since the project vessels would not approach terrestrial haul-out sites, no such disturbance events would occur.

Towed Sound Source Projector

Reactions of pinnipeds to continuous low-frequency sounds have rarely been reported. However, ringed and bearded seals exposed to low-frequency drilling sounds at received levels as high as 130-140 dB re 1 μPa showed little if any avoidance (Richardson et al. 1995). Although associated noise levels were not reported, sea lions were reported as "common" around oil production platforms offshore California and Alaska (Gales 1982). Harbor seals and California sea lions often tolerate high received levels (140+ dB re 1 μPa) of higher-frequency sound (see next subsection), even though their hearing appears more sensitive at those frequencies (refer to Figure 3-9).

Strong low-frequency noise pulses used in attempts to scare pinnipeds away from fishing nets or fish ladders sometimes cause brief startle reactions, but habituation is rapid (Mate and Harvey 1987). Sound source levels of these devices commonly range from 185-195 dB re 1 μPa-m. Sea lions in particular are very tolerant of strong noise pulses, especially when attracted to an area by prey (Richardson et al. 1995). Both phocids and otariids show considerable tolerance of the strong pulses from marine seismic exploration. Reactions are, at most, subtle and inconsistent even at distances as close as a few hundred meters, where received levels of the seismic pulses are on the order of 190 dB re 1 μPa (Arnold 1996).

Because pinnipeds show tolerance, and often habituate, to strong low-frequency sound, the predicted disturbance impacts on pinnipeds from the towed sound source projector during the proposed ADS ocean tests would be insignificant and not constitute a "take" by harassment as defined by the MMPA.

Lightbulb Implosions

Reactions of pinnipeds to lightbulb implosions would be limited to a brief startle reaction at most (see Section 4.5.2). Any momentary reaction would have no lasting consequences for the animals and would not constitute a "take" by harassment as defined by the MMPA.

<u>Summary of Potential Disturbance Impacts</u>

Vessel and emissions from the towed sound source projector may cause minor disturbance to some mysticete whales, but probably not to odontocetes or pinnipeds. Lightbulb implosions may cause a brief startle response to all marine mammals, but in all cases the consequences would be negligible. Given the negligible consequences of minor disturbance, the limited area of potential impact, and the low likelihood of a marine mammal being present during the proposed tests, impacts are not expected to be significant and would not constitute a "take" by harassment as defined by the MMPA.

4.5.2.3 Hearing Damage

In humans and other terrestrial mammals, exposure to high levels of sound within the frequency range to which the auditory system is sensitive can lead to temporary reduction in sensitivity, termed Temporary Threshold Shift (TTS). If the noise exposure is sufficiently prolonged, or the level is sufficiently high, the noise can cause permanent hearing impairment, termed Permanent Threshold Shift (PTS).

There is little direct information about the levels of noise necessary to cause TTS or PTS in marine mammals. Recently, Ridgway et al. (1997) reported preliminary results of the first TTS experiments with bottlenose dolphins. After baseline masked-hearing thresholds were obtained, TTS was induced in each of four dolphins using high-amplitude 1-second pure-tone-bursts at three discrete frequencies: 3 kHz, 20 kHz and 75 kHz. Temporary threshold shifts were observed above 194-201 dB re 1 μPa at 3 kHz, 193-196 dB re 1 μPa at 20 kHz, and 192-194 dB re 1 μPa at 75 kHz. Of note, agitation by the dolphins was observed at levels above 186 dB at 3 kHz, 181 dB at 20 kHz, and 178 dB at 75 kHz (all dB re 1 μPa). Ridgway et al. (1997) conducted the experiments specifically to address auditory criteria for three Navy sonars, and cite the need for additional research, including replication and testing across greater frequency ranges and with additional species. Overall, however, the preliminary results indicate that for bottlenose dolphins, TTS is lower at higher frequencies.

For pinnipeds, the only specific information on noise-induced TTS or PTS is for a harbor seal (Kastak and Schusterman 1996). This seal was intermittently exposed, over a 6-day period, to airborne noise from sandblasting. The received level was 90-105 dB re 20 μPa overall, and 75-90 dB re 20 μPa in the ½-octave band centered at 100 Hz (please note use of in-air standard reference level of 20 μPa versus the 1 μPa reference used for underwater sounds). Immediately after this noise exposure, the seal's in-air hearing threshold at 100 Hz was increased by 8 dB above the pre-exposure thresholds (i.e., 72 versus 64 dB re 20 μPa), and the seal had more difficulty in determining the presence or absence of the 100 Hz test tone. Complete recovery occurred by 1 week after the end of the noise exposure, indicating that hearing impairment was temporary, not permanent. Of note, TTS was evident at 100 Hz, even though the received level of sandblasting noise in the ½-octave band near 100 Hz was only about 10-25 dB above the normal hearing threshold at that frequency. Kastak and Schusterman (1996) speculate that the TTS at 100 Hz was related to higher received noise levels at lower or higher frequency bands.

The likelihood of TTS and PTS is briefly addressed in the following subsections, based on frequency-band and source levels of the ADS ocean test-related noise sources.

<u>Vessel Operations and Towed Sound Source Projector</u>

No TTS or PTS is expected for any marine mammal exposed to sounds from project vessels or sounds transmitted from the towed sound source projector. As described in previous sections, these sounds are all low frequency (less than or equal to 1 kHz) with maximum source levels at 175 dB re 1 μPa-m. At locations a few meters from the sound source, overall received levels would be less than 160 dB re 1 μPa; i.e., levels at which whales might respond to, but not experience damage by noise. At 3 kHz, bottlenose dolphins responded negatively to received levels of 186 dB re 1 μPa, but did not exhibit TTS until exposed to sound at 194 dB re 1 μPa and higher. At their source, the less than or equal to 1 kHz sounds from the vessels and towed sources are a full 20 dB re 1 μPa below the TTS level, and 12 dB re 1 μPa below agitation levels, suggesting there is no possibility of TTS nor agitation in odontocetes. Although not yet tested for TTS underwater, one might expect TTS in pinnipeds at somewhat lower received levels based on comparison audiograms depicting pinniped and odontocete hearing at 1 kHz. Although otariid thresholds are only approximately 5 dB re 1 μPa lower than odontocetes at 1 kHz, phocid thresholds are roughly 15-20 dB re 1 μPa lower than those of odontocetes (refer to Figures 3-8 and 3-9). Still, a harbor or elephant seal would have to be right at the source and remain there for repeated exposures to induce TTS, which is extremely unlikely.

As discussed earlier, mysticetes are the marine mammals thought to have the "best" hearing at frequencies less than or equal to 1 kHz. Still, because TTS requires comparatively long-term exposure to noise, the likelihood of any TTS or PTS to mysticetes is extremely remote. Rorquals, including blue, fin, Bryde's, and minke whales, are comparatively fast-swimming mysticetes (approximately 5-7 kts), humpbacks somewhat less so (approximately 4-5 kts), while northern right whales and gray whales are comparatively slow swimmers (approximately 2-5 kts). As mentioned earlier, the ADS laydown area would be away from areas of concentration for all these species, so no long-term exposures to vessel noise or towed sound source projector transmissions is anticipated. Even a very slow-swimming (2 kts or 3.7 km/hr) mysticete passing through the ADS operational area during transmission of the 170 dB re 1 μPa-m continuous source would pass through the 1,050 ft (320 m) radial zone defining the 120 dB re 1 μPa boundary in roughly 10 minutes (i.e., swimming 640 m at approximately 62 m per minute) (Figure 4-3). The swimming speed used in this hypothetical example is roughly half that reported by Swartz and Jones (1987) for migrating whales. In addition, the dedicated watch, which will accompany transmission of the 170 dB re 1 μPa-m continuous source, will serve to insure that mysticete whales are not exposed to loud sounds for periods long enough to cause TTS or PTS. Overall, due to comparatively low source levels, visual mitigation during continuous transmission, and short exposure times during pulsed transmissions, there is no possibility of TTS or PTS to mysticete whales during the ADS ocean tests.

Lightbulb Implosions

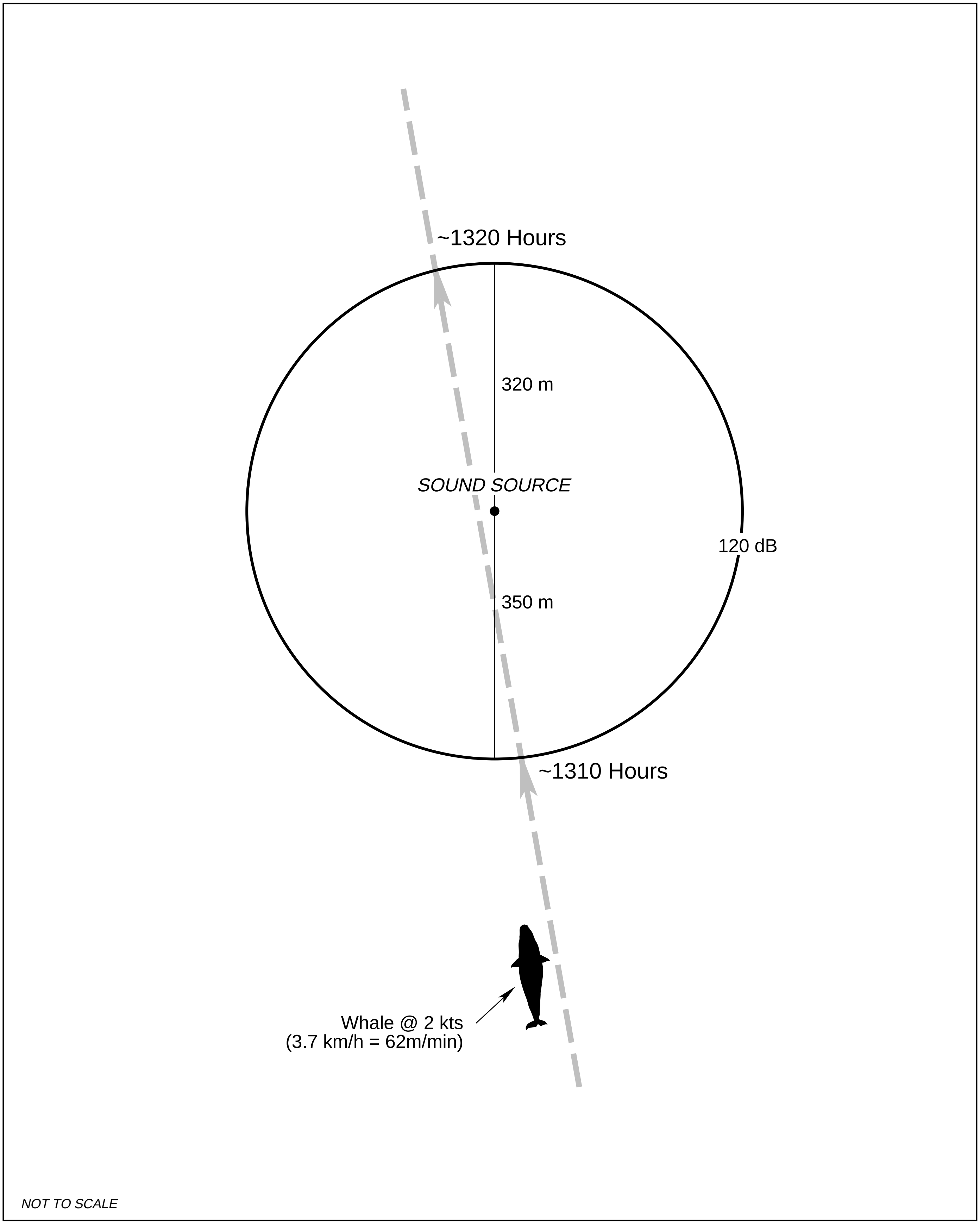
The implosion of lightbulbs during ADS testing would produce brief (1.8 ms) sound pulses, with comparatively slow rise times. The potential for hearing damage is associated with rapid rise time to high peak level, or prolonged exposure to high sound levels (refer to Section 2.1.2.1). The relatively long (i.e., slow) rise time for lightbulb implosions, in addition to the brief duration and relatively low peak pressure produced (compared to other explosive sources), would not cause TTS or PTS to any marine mammal.

Summary of Potential for Hearing Damage

In summary, vessel and towed sound source projector operations would not cause PTS in any marine mammal, or cause TTS in any odontocete; TTS is extremely unlikely for phocids and mysticetes. In addition, lightbulb implosions would not cause TTS or PTS in any marine mammal. Therefore, impacts would not be significant and would not constitute a "take" by harassment as defined by the MMPA.

4.5.2.4 Summary of Potential Acoustic Impacts

Potential acoustic impacts of ADS ocean test operations on marine mammals vary with hearing capabilities of each major group (refer to Section 3.5.3.1) (Table 4-4). For example, mysticete whales may hear noise from both the project vessels and the towed



Transit Times of Mysticetes through the ADS Test Area

FIGURE **4-3**

sound source projector. However, maximum source levels for the pulsed sources (175 dB re 1μPa-m) and continuous sources (170 dB re 1μPa-m) are such that the area ensonified to levels above 160 dB re 1 μPa and 120 dB re 1 μPa, respectively, is comparatively small. The visual watch, which would accompany sound transmissions, would ensure that mysticetes would not be adversely affected by pulsed or continuous sounds produced by the towed sound source projector. It is unlikely that odontocetes or pinnipeds would be affected by either vessel or towed sound source projector noise due to comparatively poor hearing at frequencies less than or equal to 1 kHz. In addition, due to their short duration, lightbulb implosions pose no risk to mysticetes. As stated at the outset, it is quite unlikely that any noise associated with ADS ocean test operations would be heard by sea otters due to their low numbers and exclusive occupation of coastal waters.

Table 4-4. Potential Impacts of ADS Acoustic Sources on Marine Mammals[1]

	Acoustic Source (dominant frequencies)		
Marine Mammal	**Vessels (< 1 kHz)**	**Towed Source (20-1,000 Hz)**	**Light Bulbs (130-876 Hz)**
Mysticetes	possible	possible	N/A
Odontocetes	unlikely	unlikely	N/A
Pinnipeds	unlikely	unlikely	N/A
Sea Otters	unlikely	unlikely	N/A

Note: N/A = not applicable due to brevity of signal
[1] Based on marine mammal hearing capabilities as summarized in Ketten (1992, 1994) for mysticetes, and in Figures 3-5 (odontocetes) and 3-6 (pinnipeds).

Area within Territorial Waters

The potential for encountering marine mammals is somewhat greater if operations occur within territorial waters of an island or coastal shoreline, due to higher relative abundance of both cetaceans and pinnipeds there (refer to Section 3.5). Specifically, gray whales migrate close to both the mainland and island coastlines in winter and spring (refer to Figure 4-2) and would be more likely to hear noise associated with the ADS ocean tests if operations occur within territorial waters. Similarly, aggregations of mysticetes commonly feed just offshore the northern Channel Islands in summer and fall (refer to Figure 4-1), so operations within territorial waters, even if adjacent to the actual feeding zones, would be more likely to encounter whales. Although pinniped occupancy of haul-outs on Channel Island beaches varies seasonally and among species (refer to Figure 3-3 and Table 3-2), overall pinniped relative abundance is likely to always be higher within territorial waters of shore than beyond it. Specifically, relative abundance of California sea lions was reported to be at least five times higher within about 10 nm (19 km) of various Channel Island beaches than areas farther from shore throughout the year (Bonnell and Ford 1987). Overall, as described above, there is a low potential for acoustic impacts due to the nature of the noise exposures anticipated during the ADS ocean tests inside and outside territorial waters; however, the potential for encountering marine mammals is higher within territorial waters.

Area outside Territorial Waters

Conversely, the potential for encountering marine mammals is less if operations occur beyond territorial waters of an island or coastal shoreline, due to the general decrease in relative abundance for many species with distance from the coast. However, as described in Section 3.5, this is not a simple linear decrease in abundance with distance, especially in the topographically complex proposed test area. Distribution and relative abundance of common dolphins and pilot whales are associated with undersea topography, specifically the contour index (i.e., relative abruptness of change in depth) of the underlying seafloor (Hui 1985). As described in Section 3.5, topographically complex seafloors usually affect current patterns and influence upwelling, which in turn affects productivity, prey density, and ultimately marine mammal occurrence. Thus, although marine mammal relative abundance is generally lower beyond territorial waters, factors affecting animal occurrence are dynamic and difficult to predict.

In summary, acoustic impacts from the ADS ocean tests are not predicted to result in a "take" by harassment of any marine mammal as defined by the MMPA (refer to Section 4.5.1). It is the interpretation of NMFS (1995, 1997) that minor changes in behavior do not constitute harassment under the MMPA. Furthermore, since the 1994 MMPA amendments were adopted, NMFS has not expressed an interest in requiring take permits for vessels and associated acoustics, or for common vessel devices that employ active acoustics such as fish finders. Although the behavioral responses of marine mammals to low-frequency anthropogenic noise have been the focus of recent study (e.g., Bowles et al. 1994; Au et al. 1997), there as yet are no firm conclusions as to specific noise levels that constitute "take" by harassment as defined by the MMPA. Based on the best-available data, marine mammal reaction to the noise-producing elements of the ADS tests would not be significant and all potential impacts would be below the threshold requiring incidental take authorization.

4.5.2.5 Mitigation Measures for Acoustic Issues

The proposed ADS ocean tests are not intrusive and have been designed to minimize environmental impacts, including potential impacts to marine mammals. Although acoustic impacts associated with the proposed tests would be negligible, the following mitigation measures would be adopted to ensure that the ADS ocean tests would have no significant impacts on marine mammals (Table 4-5).

Table 4-5. Mitigation Measures for Marine Mammals during ADS Ocean Tests Acoustic Transmissions

Acoustic Source		Watch Type[1]		
Continuous	**Pulsed**	**Ship's**	**Dedicated**	**Operations Curtailed[2]**
< 140 dB		√		Any marine mammal within 33 ft (10 m)
140-170 dB[3]			√	Mysticetes within: 1,050 ft (320 m) @ 170 dB 330 ft (100 m) @ 160 dB 105 ft (32 m) @ 150 dB 33 ft (10 m) @ 140 dB
140-170 dB[3]		√		Pinnipeds or odontocetes within 1,050 ft (320 m) for more than 0.5 hour
	160-175 dB	√		Any marine mammal within 33 ft (10 m)

[1]A ship's or dedicated watch will begin 20 minutes before the start of any acoustic transmission and will continue for the duration of the transmission.
[2]Operations would also be curtailed if sea turtles are observed.
[3]Acoustic transmission during daylight hours only.

For the proposed ADS ocean tests, two types of visual searches for marine mammals would be conducted: (1) a *ship's watch* by the operations personnel, and (2) a *dedicated watch* by at least two personnel specifically trained in marine mammal identification. A ship's watch of surrounding waters would be conducted at least 20 minutes before and continuing during any pulse or continuous sound source transmission.

For continuous sound source transmissions, a ship's watch by operations personnel would be conducted at all times during transmissions less than 140 dB re 1 μPa-m. Operations would be curtailed only if marine mammals approach within 33 ft (10 m) of the towed sound source projector during continuous sound transmission at less than 140 dB re 1 μPa-m.

When active acoustics involve continuous sound source transmission greater than 140 dB re 1 μPa-m, a dedicated watch would be conducted. Continuous sound source transmission between 140 and 170 dB re 1 μPa-m would be conducted only during daylight hours and when visibility is not limited by weather conditions (e.g., fog, adverse sea state). Transmissions would be curtailed in accordance with Table 4-5.

Because pinnipeds (seals and sea lions) and odontocetes (toothed whales: dolphins, porpoises, etc.) do not have good hearing below 1 kHz, continuous sound source transmissions between 140 and 170 dB re 1 μPa-m would continue unless pinnipeds and/or odontocetes remain within 1,050 ft (320 m) of the sound source projector for periods greater than one-half hour. If pinnipeds or odontocetes remain during continuous sound source transmission over one-half hour, transmission would be stopped.

At the start of sound source transmission, the transmission level would be increased gradually or ramped-up from an overall level less than or equal to 140 dB re 1 μPa-m to the desired operating level, at a rate not exceeding 6 dB re 1 μPa-m per minute. Although there was some discussion as to the utility of ramp-up procedures at a recent ONR

Workshop (ONR 1998), it is thought that such procedures may allow any marine mammals near the sound source projector, during the onset of test operations, the opportunity to move away before being exposed to maximum levels. To ensure implementation, this action would be a test requirement and would be added to the test plan for all ADS ocean tests.

If any marine mammals are attracted to sounds associated with the ADS ocean test operations, they may actually approach or remain in the test area. Such long-term exposure should be avoided to mitigate potential hearing damage to marine mammals. Although such behavior is not anticipated for any species, active acoustic transmissions would be delayed in accordance with the proposed mitigation measures as outlined in Table 4-5.

With implementation of the mitigation measures, impacts would be below the threshold of "take" by harassment as defined by the MMPA. There is no direct evidence that any marine mammal species would significantly modify their normal behavior in response to the localized, short-term impacts generated by implementation of the proposed ocean tests. However, visual search, ramp-up of the towed sound source and delay of active acoustic operations have been integrated into ADS ocean test plans to provide additional assurance that there would be no significant impacts on marine mammals. Specifically, the ramp-up procedure would allow marine mammals within auditory range of the towed sound source projector to modify their actions according to their normal repertoire of behavioral responses to underwater acoustic stimuli.

4.5.3 Attraction, Collision, Entanglement, and Ingestion Issues

It is possible that activities associated with the ADS ocean tests could attract marine mammals, and lead to potential for collision, entanglement, or ingestion of test-related materials. Although this possibility is extremely remote, these factors are considered in the following subsections.

4.5.3.1 Attraction and Collisions

The primary attractants for marine mammals are other members of their own species, areas of prey concentration, and (in the case of odontocetes that bow-ride) moving boats. None of the activities associated with the proposed ADS ocean tests would be expected to concentrate prey organisms for marine mammals, nor to make food more readily available to them. Project vessels might attract dolphins to bow ride. This could result in exposure of these animals to sounds transmitted by the towed sound source projector. Although this is unlikely due to slow vessel speeds required for test operations, sounds received by bow-riding dolphins would primarily be those from the ship since those from the towed sound source would be 26-89 ft (8-27 m) behind the vessel and would not likely be detectable. Dolphins approaching the vessel might pass close to the towed sound source projector and be exposed to detectable levels of low-frequency sound. However, as discussed in Section 4.5.2, any such short-term disturbance would have no lasting consequences for the animals and would not constitute a "take" by harassment as defined by the MMPA.

Minke whales are sometimes attracted to stationary boats and may remain with them for hours (Richardson et al. 1995). This species occurs in both the proposed and alternative ADS ocean test areas, but is not expected to linger within test areas. Minke whales are unlikely to be attracted during towed sound source operations because the test vessels would be underway at 2-5 kts, and because normal avoidance responses to vessels are likely to be reinforced by the additional noise from the sound source.

The ROV and TDV have lights (two 200-watt lights and one 100-watt light), capable of illuminating to a maximum distance of approximately 10 ft (3 m), depending on water conditions. For comparison purposes, typical dive lights used for video (usually a single 100-watt light), illuminates to a distance up to about 6 ft (2 m). The glow for the lights might be visible at distances up to about 66 ft (20 m). Based on the limited size of the illuminated area, the potential for attracting marine mammals would be minimal and no significant impacts would be anticipated.

On infrequent occasions, whales and ships collide, resulting in injury or death to the whale. Most reports of ship collisions with marine mammals have involved baleen and sperm whales, but bottlenose dolphins also have been struck (Richardson et al. 1995). Slow-moving species, especially right and gray whales, are most likely to be struck by ships. However, this is unlikely given the slow speed of the vessel (2-5 kts) during ADS operations. In assessing the likelihood of collisions, it is relevant to consider the following: baleen and sperm whales often try to avoid approaching vessels, the limited amount of Navy vessel traffic as compared with commercial vessel traffic, and vessels associated with the proposed ADS ocean tests do not operate at high speed. Given this, it is unlikely that a marine mammal would be injured or killed by collision with a Navy vessel during any given year. Because of the rarity of the northern right whale (the species least able to avoid ships) in the SCB (see Section 3.5.2.1), the probability of a collision with this highly endangered species approaches zero.

Area within Territorial Waters

The potential for marine mammal attraction to or collision with vessels associated with ADS ocean tests is higher within territorial waters of the mainland or island shore. As reviewed earlier, cetaceans and pinnipeds are generally more abundant closer to shore, so the likelihood of interaction is higher there. Overall, however, the two vessels associated with the ADS ocean tests would not add significantly to the vessel traffic already common to both the proposed and alternative test areas.

Area outside Territorial Waters

Conversely, the potential for marine mammal attraction or collision in association with ADS ocean tests is lower beyond territorial waters because in general marine mammal relative abundance decreases with distance from shore. As reviewed in the preceding section, however, complex topography can belie this general rule of thumb because animal abundance is influenced by prey availability, which is usually enhanced over topographically complex regions (such as certain regions in the proposed test area).

Visual mitigation described in Section 4.5.2.5 should further reduce any chance of collision with marine mammals.

4.5.3.2 Entanglement and Ingestion

Marine mammals sometimes ingest plastic bags and other small objects and commonly become entangled in fishing gear. However, the equipment planned for deployment during the proposed ADS ocean tests does not have characteristics likely to cause entanglement or ingestion. Even though considerable laydown of cable is anticipated (31-342 miles [50-550 km/test]), all cable line is designed to rest on the seafloor. At any one location, the cable would consist of a single line extending more-or-less linearly along the bottom. It is highly unlikely that any marine mammals would become entangled with this cable arrangement or ingest the cable. Most species do not dive to or forage near the bottom. However, gray whales are known to be benthic feeders and typically feed at the mouths of rivers and estuaries while migrating. If a gray whale were to feed in an area where there is ADS cable, the threat of ingestion or entanglement is low due to the size of the animal relative to the size and breaking strength of the cable. Situations where marine mammals do become entangled usually involve fishing gear or flotation lines, where the animals become ensnared in multiple lines or meshes; howver, this situation would not occur in this project. Other gear associated with the test are too large to be ingested, and in any case do not have properties that would be attractive to marine mammals.

All in-water components would be removed within 6 months of the completion of each test. The equipment deployed during the ADS ocean tests would not pose an entanglement nor ingestion risk to marine mammals. Therefore, the exposure of marine mammals to cables would be temporary and would not be significant.

Area within and outside Territorial Waters

The potential for marine mammals to become entangled, or to ingest any foreign material associated with ADS ocean tests is extremely remote. However, as stated above, the likelihood of encountering marine mammals is less outside territorial waters. It is highly unlikely that any marine mammal would become entangled with the cable arrangement or ingest the cable. Most species do not dive to or forage near the bottom and any that do would not become entangled in a single cable. In addition, the potential for entanglement and ingestion is limited due to the system design (i.e., breaking strength of cable); therefore, impacts would not be significant.

4.5.4 Chemical Contamination Issues

All ADS component surfaces with the potential to corrode (except the drogue chute clips, refer to Section 4.3, Marine Environment) are encapsulated in chemically inert polyurethane (rubber-like) boots, coatings, or secondary housings. This encapsulation would inhibit virtually all corrosion-related metals from contacting the environment. In addition, there would be no exposure of the inner battery constituents to the seawater, so there would be no discharges to the surrounding marine environment. Thus, neither marine mammals, nor their prey, would be significantly impacted by materials associated with the ADS ocean tests.

4.5.5 Potential for Marine Mammal Take

Based on the analyses described in Sections 4.5.1 through 4.5.4, there would be no anticipated marine mammal take, as defined by the amended MMPA, associated with the proposed ADS ocean test operations. Overall, source levels of ADS ocean test-related operations are low enough that the areas ensonified at noise levels greater that 120 dB re 1 μPa-m (continuous source) and 160 dB re 1 μPa-m (pulsed source) are very small, thereby making the likelihood of exposure of marine mammals to high received levels quite remote. In addition, during ADS acoustic testing, mitigation measures would be implemented (refer to Section 4.5.2.5). For all marine mammals, lightbulb implosions are too brief to be considered injurious or likely to cause more than a momentary startle response. NMFS (1995, 1997) does not consider such momentary alterations of behavior to be harassment.

NMFS Concurrence

As stated in the NMFS letter dated October 23, 1998 (Appendix E), NMFS concluded that the likelihood that a marine mammal will be incidentally taken (including harassed) by the ADS activities is low. NMFS did not recommend that the Navy obtain an incidental harassment authorization under the MMPA.

4.5.5.1 Threatened and Endangered Marine Mammals

Five mysticete species and one odontocete species (sperm whale) common to the proposed and alternate ADS ocean test locations are federally listed as endangered (refer to Tables 3-1 and 3-3). In addition, Guadalupe fur seals (proposed test area only) and sea otters (both areas) are listed as threatened.

As stated above, based on analyses presented in the preceding sections, there would be no anticipated impact on federally listed threatened or endangered marine mammals posed by the proposed ADS ocean tests. The proposed tests would be conducted well away from known areas where endangered mysticetes feed and migrate. Thus, although a few individuals may hear sounds associated with ADS ocean testing, they are not likely to be affected by them. Anthropogenic noise associated with ADS ocean tests would be no louder than ongoing noise associated with natural phenomena (e.g., seismic T-phase events) and with shipping common to the proposed and alternative test areas. Therefore, the proposed ADS ocean tests may affect, but would not adversely affect, federally listed marine mammal species at the proposed ocean test location and no significant impacts would occur as a result of implementation of the proposed action.

Under informal Section 7 consultation, the Navy requested NMFS to concur that no adverse impacts would result from implementation of the proposed ADS ocean tests, (consultation correspondence is included in Appendix E). As stated in the NMFS letter dated October 23, 1998 (Appendix E), NMFS concurred that the proposed ADS test activities would not affect species under their jurisdiction.

Area within and outside Territorial Waters

Although no "take" of a marine mammal, listed or otherwise, would be anticipated during the proposed ADS ocean tests, the potential for interaction with marine mammals would be higher based on general densities of marine mammals within territorial waters of the mainland or island coasts, as previously described. With implementation of the proposed mitigation measures (see Table 4-5), no adverse impacts to threatened or endangered marine mammals would occur and impacts to marine mammals would not be significant.

4.5.6 Alternative ADS Ocean Test Location

The analyses included in Sections 4.5.1 through 4.5.5 are applicable to both the proposed and alternative ADS test locations, with the exception of whale aggregation areas. While not as large as areas identified at the proposed test site, areas offshore Oregon and Washington have been identified for the gray whale coastal migration corridor (fall/winter) and localized areas identified where humpback and fin whales occur in summer/fall (Brueggemen 1992) (Figure 4-4). Since many of the same species of marine mammals are expected at both the alternative and proposed ADS ocean test locations, and given the additional mitigation efforts described in Section 4.5.2.5, implementation of the ADS ocean tests may affect, but would not adversely affect, federally listed or endangered marine mammal species at the alternative ocean test location. Therefore, no significant impacts would occur as a result of implementation of the ADS ocean tests at the alternative test location.

Area within Territorial Waters

Unlike the proposed test area, overall marine mammal relative abundance would not necessarily be higher within territorial waters of shore in the alternative test area (refer to Section 3.5.2.2). Therefore, potential for acoustic impacts, attraction, collision, entanglement, and ingestion would be about the same whether the ADS ocean tests were conducted within or beyond territorial waters. With the exception of harbor porpoise, which occur close to shore year-round, cetacean relative abundance varies seasonally in the alternative test area. Gray whales migrate close to shore during both their north- and south-bound migrations in winter and spring. As summarized in Brueggeman (1992), the southbound gray whale migration usually peaks off Oregon and Washington in late December/early January, while the first pulse of the northbound migration peaks in mid-March, usually followed 7 to 9 weeks later by the second pulse comprised of cow/calf pairs (Herzing and Mate 1984). Mean gray whale distances offshore during the southbound and northbound migrations were 8.9 miles (14.3 km) and 5 miles (8.0 km), respectively. In addition, an unknown percentage of gray whales summer along the Oregon and Washington coasts (Sumich 1984). Thus, it seems that ADS test operations could be disrupted more often by passing gray whales, especially during migration periods, if the tests are conducted in the alternative test location. In addition, the likelihood of gray whales hearing anthropogenic noise associated with the ADS ocean tests would be higher if the test were conducted within territorial waters of the coast during that season.

<u>Area outside Territorial Waters</u>

As described above, the potential for acoustic impacts, attraction, collision, entanglement, and ingestion would be similar to the area within territorial waters. However, distribution plots of Risso's dolphin, Pacific white-sided dolphin, Dall's porpoise, killer whales, and sperm whales (Brueggeman 1992) all indicate greater relative abundance at distances greater than 12 nm (22 km) from shore. In addition, humpback and fin whales occur in

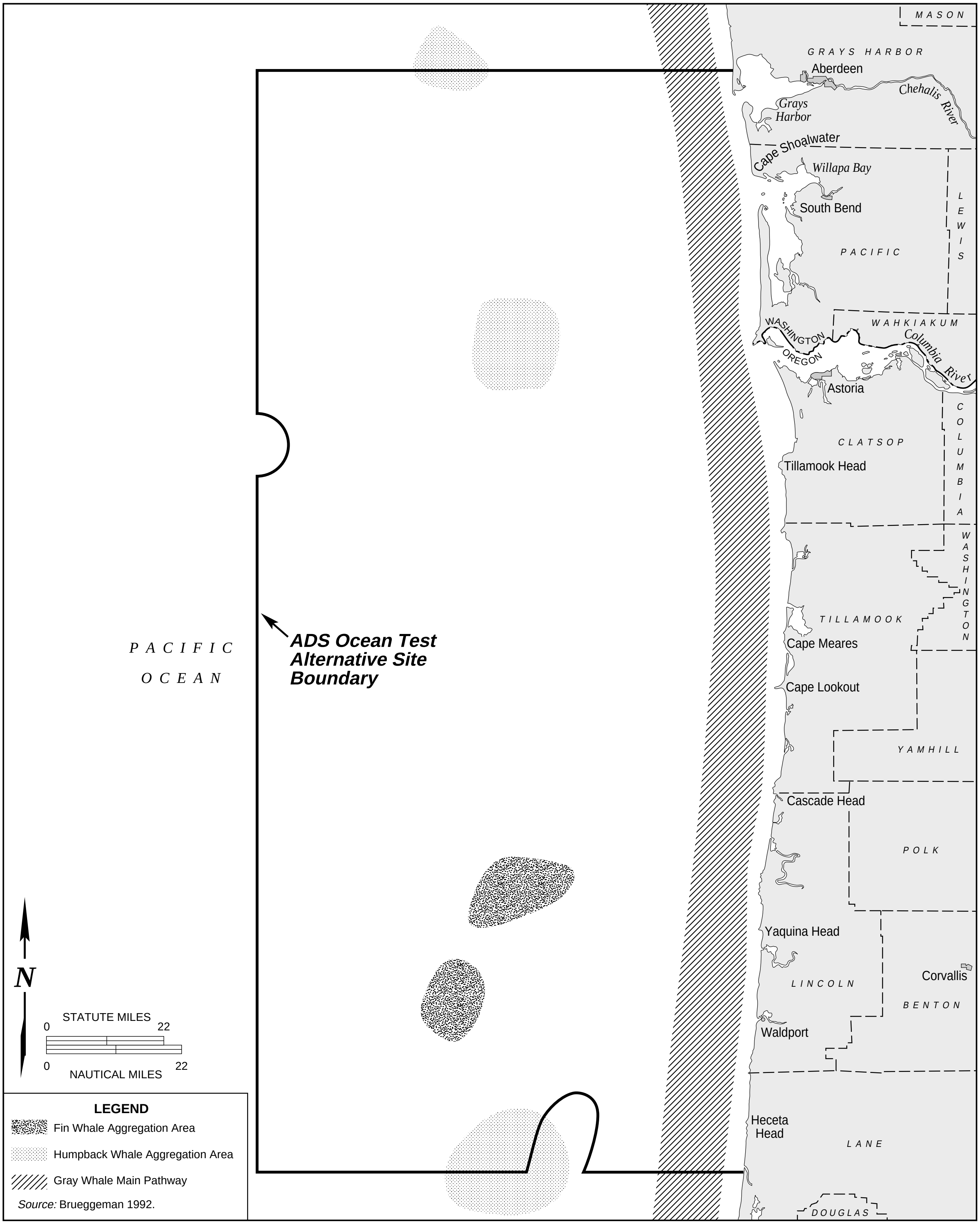


FIGURE 4-4

Mysticete Whale Aggregation Areas and Main Pathways Oregon and Washington

localized areas roughly 35-50 nm (65-93 km) offshore Oregon and Washington in summer and fall, and blue whale calls have been localized from waters roughly 100 nm (185 km) offshore during that season (refer to Figure 3-4). Thus, the likelihood of these mysticete whale species hearing noise associated with ADS ocean tests would be higher if tests were conducted outside territorial waters from shore in summer and fall.

4.6 TERRESTRIAL BIOLOGY

4.6.1 Approach to Analysis

Determination of the significance of potential impacts to biological resources is based on (1) the importance (i.e., legal, ecological, or scientific) of the resource; (2) the proportion of the resource that would be affected relative to its occurrence in the region; (3) the sensitivity of the resource to proposed activities; and (4) the duration of ecological ramifications. Impacts to biological resources are significant if species or habitats of high concern are adversely affected over relatively large areas or disturbances cause reductions in the population size or distribution of a species of high concern.

Potential impacts on terrestrial biological resources from the proposed ADS ocean tests would be limited to the placement of eight vans at a shore station site for a maximum of 265 days of testing (1,344 hours of active acoustical testing over 3 years, inclusive of all tests; refer to Table 2-3). Impacts would be considered significant if transport, placement, operation, or removal of onshore components associated with the proposed action affected federally listed threatened, endangered, or candidate species, or their critical habitat; or habitats identified as sensitive by the Oregon or California Natural Heritage Programs.

4.6.2 ADS Ocean Test Locations

4.6.2.1 Proposed ADS Ocean Test Location

<u>Area within Territorial Waters</u>

Activities associated with the four proposed ocean tests would involve the use of two marine vessels offshore and would occur entirely within the marine environment. Contact with terrestrial species would be limited to permanent or seasonal nearshore, marine, or offshore birds. Boating activities are common in the area and are not known to adversely affect sight-feeding bird species. Therefore, impacts to terrestrial species, including federally or state-listed sensitive species, would not be significant.

<u>Area outside Territorial Waters</u>

Many of the same species that utilize the area inside territorial waters also use the area outside territorial waters; therefore, impacts to terrestrial species, including federally or state-listed sensitive species, would not be significant.

4.6.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Potential impacts to terrestrial species at the alternative ocean test location would be similar to those under the proposed ocean test location; therefore, impacts to terrestrial species would not be significant.

Area outside Territorial Waters

Potential impacts to terrestrial species at the alternative ocean test location would be similar to those under the proposed ocean test location; therefore, impacts to terrestrial species would not be significant.

4.6.3 ADS Shore Station Locations

4.6.3.1 Proposed Shore Station Location

Vegetation, Wetlands, and Wildlife

The proposed shore station would be located at MCB Camp Pendleton within a previously disturbed area adjacent to the MCTSSA facility (refer to Figure 2-8). Improvements to the site would include upgrading an existing gravel access road; redirecting and widening the access road, construction of a concrete slab to accommodate the support ISO-vans; and the installation of security fencing around the proposed site. Minor construction activities and facility improvements would occur in previously disturbed areas that currently support no sensitive plant or animal species or habitats (e.g., wetlands or vernal pools); therefore, temporary impacts to terrestrial species and habitats would not be significant.

Threatened and Endangered Species

Use of the shore station would also involve installation of a cable to receive data associated with the offshore ADS ocean tests. Cable installation would involve trenching through a section of beach that is currently subject to vehicular activity (e.g., cars, trucks, and tanks). Two federally listed bird species are found on beach areas in the vicinity of the proposed cable installation: California least tern and western snowy plover. The closest endangered least tern breeding areas are 1-1.5 miles (1.6-2 km) from the area proposed for trenching. The federally listed threatened western snowy plover is known to nest in the area between the heavily used lower beach and heavily vegetated upper sand dunes. Although the proposed trenching activities would run through this area, all activities associated with the trenching would be conducted outside of the snowy plover breeding season which is from March 1 - September 15 (i.e., trenching would occur sometime from October - February). In addition, if any repairs are needed to the buried cable during the plover breeding season, all activities would be coordinated with Environmental Security personnel at MCB Camp Pendleton and USFWS prior to any beach or dune disturbance. Based on implementation of the above conditions, as requested by USFWS during informal consultation (refer to Appendix E), the USFWS concurred that proposed shore station activities would not adversely affect endangered or threatened species or their critical habitats.

The brown pelican has the potential to occur within the project area; however, these are transient visitors to the area and implementation of the proposed action would not interfere with their foraging habitat. Although the threatened California gnatcatcher is in the vicinity of the MCTSSA facility, the proposed shore station construction would not adversely impact gnatcatchers since the closest known gnatcatcher locality is 1,000 ft (305 m) away and no loss of its habitat (i.e., coastal sage scrub) would occur. No other threatened or endangered species are known to occur in the vicinity of any of the proposed minor construction activities; therefore, impacts to threatened and endangered species would not be significant.

4.6.3.2 Alternative Shore Station Locations

<u>Pacific City Alternative</u>

Vegetation, Wetlands, Wildlife, and Threatened and Endangered Species

The alternative shore location at Pacific City would be located within an existing fenced and paved telecommunications facility. The only construction associated with this alternative location would involve trenching a section of beach for installation of the shore landing cable. The section of beach proposed for trenching is currently subject to extensive vehicular and pedestrian traffic and supports no sensitive plant or animal species or habitats. Therefore, impacts to terrestrial species would not be significant.

<u>MCB Camp Pendleton</u>

Vegetation, Wetlands, Wildlife, and Threatened and Endangered Species

The alternative MCB Camp Pendleton shore station location would be sited adjacent to the LCAC facility, approximately 1 mile (1.6 km) north of the proposed shore station location (refer to Figure 2-7). Due to the proximity of the sites, the similarity of habitats, and the use of a beach area, impacts to biological resources would be similar to those previously described for the proposed shore station. Breeding snowy plovers are not on the immediate vicinity of the alternative shore station or in the area of beach proposed for trenching of the shore landing cable. Therefore, impacts to terrestrial species, including threatened or endangered species, would not be significant.

4.7 LAND USE, TRANSPORTATION, AND RECREATION

4.7.1 Approach to Analysis

This section addresses the potential of the proposed ADS ocean tests to adversely affect existing land use activities at the proposed and alternative test sites. Activities are considered to have significant land use impacts if they cause substantial changes to currently approved land uses. This analysis focuses primarily on ocean test activities and how they would affect issues such as commercial shipping, recreational boating, commercial and recreational fishing, and ocean tourist activities, particularly in the coastal zone. Results of the noise analysis are incorporated into this section as needed. Specifically, this analysis addresses the potential for noise contours associated with proposed activities to affect land use in the areas surrounding the proposed and alternative test locations. Compatibility of Navy operations with local planning policies and state coastal policies (which apply to coastal waters out to 3 nm from any land mass) are specifically addressed.

4.7.2 ADS Ocean Test Locations

4.7.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

Land Use and Recreation

As discussed in Section 3.7, commercial and recreational fishing, recreational boating, diving, and ocean tourist activities occur at various locations off the coast of southern California, especially in the shallower waters near the main coastline and offshore islands.

To minimize the potential for disturbance to existing land uses and recreational resources, operational and environmental constraint areas were identified within southern California and excluded from proposed testing activities (refer to Figure 2-5). These exclusion areas include a 1 nm buffer around the 6 nm Channel Islands National Marine Sanctuary boundary and a 3 nm buffer around the other offshore islands.

Because the majority of commercial and recreational fishing, recreational boating, diving, and ocean tourist activities occur relatively close to shore within areas excluded from the proposed testing, implementation of the proposed ADS ocean tests would not result in significant impacts to existing land uses or recreational resources. Furthermore, the ocean tests would be temporary, lasting a total of 265 days over a period of 3 years (1,344 hours of active acoustic testing). During the ocean tests, fishermen and recreational users could operate within the test area, given a safe distance from the test vessels (approximately 0.5 mile [1 km]). The Navy and its contractors have performed military operations within this region in the past and have not conflicted with fishing or recreational uses, even during the peak fishing season. Given the large area in which the ocean tests would occur and the limited duration of the tests over a 3-year period, impacts to existing land uses or recreational resources would not be significant. Refer to Section 4.11 for a detailed discussion of recreational diver safety.

A Coastal Consistency Determination (CCD) has been prepared in compliance with Section 930.34 *et seq*. of the National Oceanic and Atmospheric Administration (NOAA) Federal Consistency Regulations (15 CFR 930) for the proposed ocean tests and the proposed and alternative shore station site located within MCB Camp Pendleton boundaries. The CCD is included as Appendix D.

Transportation

As discussed in Section 3.7, major shipping lanes are located within southern California; the area has also historically been utilized for military operations. To minimize potential impacts to transportation, the ocean tests would be sited to avoid major shipping lanes and heavily utilized military operation areas. Also, a NOTMAR would be issued 48 hours prior to commencement of the tests to give regular boat traffic ample notice prior to testing in a given area. For these reasons, and due to the temporary nature of the tests, impacts to marine traffic would not be significant.

<u>Area outside Territorial Waters</u>

Land Use and Recreation

As discussed above, the majority of commercial and recreational fishing, recreational boating, diving, and ocean tourist activities occur relatively close to shore. Given the large area in which the ocean tests would occur and the limited duration of the tests, impacts to land use and recreational resources would not be significant.

Transportation

The ADS ocean tests would be sited to avoid major shipping lanes and heavily used areas. The majority of commercial fishing and recreational vessels transit nearshore areas. Therefore, impacts to marine traffic would not be significant.

4.7.2.2 Alternative ADS Ocean Test Location

<u>Area within Territorial Waters</u>

Land Use and Recreation

As discussed in Section 3.7, commercial and recreational fishing, recreational boating, diving, and ocean tourist activities occur off the coast of Oregon and southern Washington state, especially in the shallower waters near the coast.

To minimize the potential for disturbance to existing land uses and recreational resources, constraint areas were also identified within the alternative ocean test footprint (refer to Figure 2-6). Potential impacts would be similar to the proposed ocean test location. Therefore, impacts to land use and recreational resources would not be significant.

Based on the goals and policies set forth by the Oregon Coastal Management Program and the Washington State Department of Ecology (refer to Section 3.7.2.2), implementation of the ADS ocean tests at the alternative location would be consistent to the maximum extent practicable with the provisions of the CZMA and Coastal

Management programs adopted by the states of Oregon and Washington. Overall, implementation of the ADS ocean tests would be consistent with the concept of conservation and protection of coastal resources. In addition, implementation of the ADS ocean tests at the alternative location would be compatible with economic, recreational, and aesthetic resources and values of the coastal zone.

Transportation

As discussed in Section 3.7, the Pacific Northwest is heavily utilized for commercial and recreational vessel traffic. Although no established shipping lanes are located in the area, impacts would be similar to those identified for the proposed ocean test location. Therefore, use of two vessels would not significantly affect marine traffic.

<u>Area outside Territorial Waters</u>

Land Use and Recreation

Potential impacts to land use and recreational resources in this area would be similar to those in the area within territorial waters; therefore, impacts to land use and recreational resources would not be significant.

Transportation

Although no established shipping lanes are located in this area, potential marine traffic impacts would be similar to those under the proposed ocean test location. Therefore, impacts to marine traffic would not be significant.

4.7.3 ADS Shore Station Locations

4.7.3.1 Proposed Shore Station Location

Land Use and Recreation

The proposed shore station would be located on MCB Camp Pendleton within a previously disturbed area adjacent to the MCTSSA facility (refer to Figure 2-8). Use of the shore station would require parking a maximum of eight ISO-vans onshore. In addition, trenching is proposed through a section of the beach for placement of the shore landing cable. Implementation of the site would not preclude access to coastal recreational areas. Temporary use of the site would be coordinated with MCB Camp Pendleton to ensure that no land use conflicts occur. Since the site is presently used and zoned for military operations, and no sensitive natural or visual resources are located in the vicinity of the proposed shore station location, impacts to land use or recreational resources would not be significant.

Transportation

Access to the site would be provided by an existing road; only minor road improvements would be required to accommodate use of the site. A maximum of 30 personnel would be at the shore station during testing, which would generate approximately 60 traffic trips per day to and from the shore station. These trips would cease upon completion of tests and would not interfere with existing access to agricultural production areas. Since no traffic problems currently exist and use of the proposed shore station location would only result in a temporary minor increase in traffic volumes, impacts to transportation would not be significant.

4.7.3.2 Alternative Shore Station Locations

<u>Pacific City</u>

Land Use and Recreation

The alternative shore location at Pacific City would be located within an existing fenced and paved telecommunications facility. No improvements would be required for use of the site. Since the site is located on private property zoned for commercial uses, and no sensitive natural or visual resources are located in the vicinity, use of this site would not result in significant impacts to land use or recreational resources.

Use of the Pacific City alternative shore station location would require trenching a section of beach for placement of the shore landing cable. The area of beach proposed for trenching is currently subject to vehicular and pedestrian traffic; however, minor trenching activities (less than 8 hours) would not affect existing land use or recreational resources. In addition, implementation of this alternative would not preclude access to coastal recreational areas. Therefore, impacts to land use or recreational resources would not be significant.

Implementation of the Pacific City alternative shore station would comply with the goals and policies set forth in the Oregon Coastal Management Program (refer to Section 3.7.2.2). Implementation of this alternative shore station site would be consistent to the maximum extent practicable with the provisions of the CZMA and the Oregon Coastal Management Plan. Overall, implementation of this alternative would be consistent with the concept of conservation and protection of coastal resources.

Transportation

Access to the site would be provided by an existing road and no improvement would be required. Since no traffic problems currently exist and use of the alternative site would only result in a temporary minor increase in traffic volumes (approximately 60 trips per day), impacts to transportation would not be significant.

MCB Camp Pendleton Alternative

Land Use and Recreation

The alternative MCB Camp Pendleton shore station location would be sited adjacent to the existing LCAC facility, approximately 1 mile (1.6 km) north of the proposed shore station location (refer to Figure 2-7). As described in Section 3.7, the site is presently used for training of Naval personnel in the operation and maintenance of the LCAC vehicle. Noise levels associated with the LCAC training facility have been measured in excess of 95-110 dBA in the area. Exposure to noise in the work place is regulated by the Occupational Safety and Health Administration (OSHA). When employees are exposed to noise levels of 85 dBA or greater during an 8-hour workday, the employer is responsible for workers safety (OSHA 1998). When reducing the noise levels is not feasible, ear protective devices must be used. Implementation of this alternative would result in exposure of ADS personnel to high noise levels and thus would require the use of ear protective devices at the shore station site. If these protective devices are used by shore station personnel, implementation of this alternative would not result in significant impacts.

Transportation

Access to the alternative shore station location would be provided by an existing dirt road. No road improvements would be required; however, implementation of this alternative would require trenching along the existing road for placement of a utility line to the site. Since no traffic problems currently exist and use of the alternative site would only result in temporary minor increases in traffic volume (60 trips per day), impacts to transportation would not be significant.

4.8 SOCIOECONOMICS

4.8.1 Approach to Analysis

This socioeconomic analysis addresses the potential of the proposed ADS ocean test to adversely affect socioeconomic activities that occur within the boundaries of the proposed and alternative ocean test to sites (refer to Figures 2-5 through 2-10). Potentially affected socioeconomic activities that are somewhat unique to this action include commercial shipping, commercial fishing, and tourist-related activities.

Primary socioeconomic issues of concern identified include those associated with continued viability of affected commercial fishing and shipping industries, and Environmental Justice and Children's Justice (e.g., impacts with regard to minority communities, poverty status, and impacts to children). Implementation of the proposed action at either of the ocean test locations would have the potential to affect commercial fishermen if the proposed testing displaced them from their primary means of livelihood during the peak fishing season. Significant impacts occur when a project adversely affects the economic viability of individuals, groups, or larger populations, or disproportionately affects human health or the environment in low-income, minority areas, or disadvantaged populations.

4.8.2 ADS Ocean Test Locations

4.8.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

The majority of activities associated with the four proposed ocean tests would occur within the marine environment and would involve the use of two marine test vessels offshore. During implementation of the ADS ocean tests, commercial ship traffic would likely be present in the proposed ocean test area. However, commercial shipping traffic would not be significantly affected by the proposed action, given the large area in which the ocean tests would occur. Vessels could continue to operate within a 0.5-mile radius of the test location without interfering with the integrity of the tests.

Primary impacts are associated with the potential for commercial fishermen and recreational water users to be impacted by the proposed ADS ocean tests. However, the ocean tests would be short-term and temporary, lasting a total of 265 days over a period of 3 years. During the ocean tests, fishermen and recreational users could operate within the test area given that they maintain a safe distance from the test vessels. The Navy and its contractors have performed military operations within this region in the past and have not conflicted with fishing or recreational uses, even during peak fishing seasons. Furthermore, environmental and operational constraints identified exclusion areas adjacent to the mainland and shoreline of the islands. The majority of commercial fisherman and recreational water users operate within the identified ADS exclusion areas. Given the large area in which the ocean tests would occur, the short duration of the tests, and the absence of any permanent population in territorial waters, the potential to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

Area outside Territorial Waters

Although some commercial and recreational fishing and recreational boating occurs outside territorial waters, the majority of these activities occur within territorial waters. Further, no permanent populations are located outside territorial waters or would be affected by ADS ocean testing in these waters. Therefore, the potential for the proposed ADS ocean tests to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

4.8.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Potential impacts to socioeconomic resources at the alternative ocean test location within territorial waters would be similar to those under the proposed ocean test location;

therefore, for the reasons listed above, the potential for the proposed ADS ocean tests to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

Area outside Territorial Waters

Potential impacts to socioeconomic resources at the alternative ocean test location outside territorial waters would be similar to those under the proposed ocean test location; therefore, for the reasons listed above, the potential for the proposed ADS ocean tests to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

4.8.3 ADS Shore Station Locations

4.8.3.1 Proposed Shore Station Location

The proposed shore station would be located on MCB Camp Pendleton within a previously disturbed area adjacent to the MCTSSA site (refer to Figure 2-8). Minority, low income, or disadvantaged populations would not be affected as a result of implementation because it is a previously disturbed industrial area located within military base boundaries. No permanent populations are located within the vicinity. Therefore, the potential for the proposed shore station location to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

4.8.3.2 Alternative Shore Station Locations

Pacific City Alternative

Under this alternative, the shore station location would be located in Pacific City within an existing telecommunications facility. Minority, low income, or disadvantaged populations would not be affected with use of this site because it is a secured (i.e., fenced with restricted access) telecommunications facility, located on private property. Further, proposed activity at this site would remain within the boundaries of the site (i.e., they would not impact any off-site populations). Therefore, the potential for the Pacific City alternative shore station location to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

MCB Camp Pendleton Alternative

Under this alternative, the shore station location would be sited adjacent to the LCAC facility, approximately 1 mile (1.6 km) north of the proposed shore station location (refer to Figure 2-7). Due to the proximity of the sites, impacts associated with implementation of this alternative shore station location would be similar to those previously described for the proposed shore station location; therefore, the potential to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

4.9 NOISE

4.9.1 Approach to Analysis

Noise impact analyses typically evaluate potential changes to existing noise environments that would occur from implementation of a proposed action. To adequately assess potential noise consequences, it is important to assess the range of ambient noise that may be expected at any sites of interest. Man-made noise always appears in the context of background noise and should be assessed in relation to it. The absolute level of noise, measured in units of sound pressure, is an important measure of potential disturbance.

4.9.2 ADS Ocean Test Locations

4.9.2.1 Proposed ADS Ocean Test Location

<u>Area within Territorial Waters</u>

Airborne Noise Environment

Noise-producing elements associated with the proposed ADS ocean tests would include continuous sound sources (e.g., vessel engines) and transient sound sources (e.g., deck machinery that may not run continuously) operating over a maximum of 70 days for Test 1, 150 days for Test 2, 15 days for Test 3, and 30 days for Test 4 over a period of 3 years. Due to the open ocean setting, human receptors would be limited to test participants and occupants of other vessels transiting the areas. Wildlife receptors would be primarily limited to seabirds in transit. Project-related airborne noise associated with the operation of two vessels characterized by regular boat traffic would not contribute substantially to existing ambient noise conditions. Due to the limited noise generated and the lack of sensitive receptors, the introduction of airborne noise from additional vessels in the proposed test area would not cause a significant impact.

The dominant source of underwater sound for vessels underway are propellers. However, aboveboard machinery (e.g., auxiliary engines, generators, etc.) also contribute to the underwater radiated sound. These variables are accounted for in the analysis of underwater noise from project vessels. Other sources of airborne noise generated during the tests (e.g., deck handling equipment) would not be major contributors to the underwater noise environment, in part because such equipment operates only intermittently. In addition, because of the large difference in acoustic impedance (the product of density and sound speed) between air and water, less than one one-thousandth (i.e., less than 0.001) of the sound intensity in air is transmitted into the water. Only for sound rays incident on the water at angles steeper than the critical angle (from Snell's law: 13 degrees from vertical incidence [Richardson et al. 1995]), there is a significant sound pressure at the water surface and beneath, which will decrease with increasing depth. However, sound sources at deck height may be substantially shielded by the hull and are so close to the water that the cone within which sound couples into the water is small. Further, given that commercial, military, and recreational shipping and boating activity currently occurs in areas proposed for ADS ocean testing, noise associated with ADS ocean vessel activity would not represent a new (or newly introduced) noise type for the proposed project area. Overall, such air-to-water sound contributions would generally be negligible compared to underwater sources.

Underwater Noise Environment

Similar to the airborne noise environment, the underwater noise environment would include background (ambient) elements and ADS elements upon implementation of the proposed action. The primary elements of the background underwater noise environment would be from wind, waves, boats, and marine life. The primary elements of the ADS ocean tests would be the ADS test vessels, whose engines and propellers couple directly to the water, and the underwater towed sound sources projector, which would emit continuous and pulsed sounds during certain portions of the proposed ADS ocean tests. The noise-producing components of the proposed action and estimated received levels of sound relative to the location of the noise-producing elements have been identified in Chapter 2. The results of the noise-producing elements were used to assess the potential acoustic impacts of ADS ocean tests on fish, marine mammals, and recreational SCUBA divers and are specifically addressed in Sections 4.4, 4.5, and 4.11, respectively.

Underwater noise produced by the vessels, TDV, and ROV would be similar to noise produced by other vessels and similar acoustic devices (e.g., depth sounders, fish finders) employed on other ships and boats operating in the area and would not significantly change underwater ambient noise conditions of the area.

<u>Area outside Territorial Waters</u>

Airborne Noise Environment

Since the size and characteristics of the ADS ocean tests would be the same as the area within territorial waters, and operations and procedures would be the same, impacts would not be qualitatively or quantitatively different.

Underwater Noise Environment

Since the size and characteristics of the ADS ocean tests would be the same as the area within territorial waters and operations and procedures would be the same, impacts would not be qualitatively or quantitatively different. Affects on fish, marine mammals, and recreational divers in areas outside of territorial waters, as a result of ADS noise-producing elements are discussed in detail in Chapters 4.4, 4.5, and 4.11, respectively.

4.9.2.2 Alternative ADS Ocean Test Location

<u>Area within Territorial Waters</u>

Airborne Noise Environment

Since the size and characteristics of the ADS ocean tests are similar to the proposed ADS ocean test location, and operations and procedures would be the same at either test site, impacts would not be qualitatively or quantitatively different.

Underwater Noise Environment

Since the size and characteristics of the ADS ocean tests are similar to the proposed ADS ocean test location, and operations and procedures would be the same at either test site, received sound levels are predicted to be the same as those described for the proposed action; therefore, impacts would not be qualitatively or quantitatively different.

<u>Area outside Territorial Waters</u>

Airborne Noise Environment

Since the size and characteristics of the ADS ocean tests would be the same as the area within territorial waters and operations and procedures would be the same, impacts would not be qualitatively or quantitatively different.

Underwater Noise Environment

Since the size and characteristics of the ADS ocean tests would be the similar to the area within territorial waters, and operations and procedures would be the same, received sound levels are predicted to be the same as those described for the proposed action; therefore, impacts would not be qualitatively or quantitatively different.

4.9.3 ADS Shore Station Locations

4.9.3.1 Proposed Shore Station Location

Construction of the proposed temporary shore station would involve grading for site preparation, upgrading and widening an existing access road, installation of security fencing, construction of concrete slabs, and trenching in the beach for placement of the shore landing cable. Noise generated from construction activities would be confined to the base and would not be noticeable offbase. Introduction of construction noise would last for only the duration of construction (a maximum of one week); therefore, short-term construction-related noise would not result in significant impacts. Operational activity at the shore station (i.e., system monitoring within ISO-vans) would not generate significant levels of noise; therefore, long-term impacts from noise associated with the shore station would not be significant.

4.9.3.2 Alternative Shore Station Locations

Pacific City Alternative

Construction of the proposed temporary shore station would only involve trenching in the beach for placement of the shore landing cable. Noise generated by construction activities would be confined to the beach area. Introduction of construction noise would last for only the duration of trenching activities (a maximum of 8 hours); therefore, short-term construction-related noise would not result in significant impacts.

MCB Camp Pendleton Alternative

Construction of the proposed temporary shore station would involve grading for site preparation, upgrading and widening an existing access road, trenching for utility lines, installation of security fencing, construction of concrete slabs, and trenching in the beach for placement of the shore landing cable. Noise generated by construction activities would be confined to the base and would not be noticeable offbase. Introduction of construction noise would last for only the duration of construction (a maximum of one week); therefore, short-term construction-related noise would not result in significant impacts.

4.10 CULTURAL RESOURCES

4.10.1 Approach to Analysis

The methodology for identifying, evaluating, and mitigating impacts to cultural resources has been established through federal laws and regulations including the National Historic Preservation Act (NHPA), the Archaeological Resource Protection Act, the Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act.

A project affects a significant resource when it alters the property's characteristics, including relevant features of its environment or use that qualify it as significant according to NRHP criteria. Impacts may include the following:

- physical destruction, damage, or alteration of all or part of the resource;
- alteration of the character of the surrounding environment that contributes to the resource's qualification for the NRHP;
- introduction of visual, audible, or atmospheric elements that are out of character with the resource or alter its setting; and
- neglect of the resource resulting in its deterioration or destruction.

Potential impacts are assessed by (1) identifying project activities that could directly or indirectly affect significant resources; (2) identifying known or expected significant resources in areas of potential impact; and (3) determining whether a project activity would have no effect, no adverse impact, or an adverse impact on significant resources (36 CFR 800.9). Direct impacts are usually those associated with ground disturbance, although architectural resources may be impacted by activities that destroy or modify the structure itself. Indirect impacts to significant resources can result from improved access leading to vandalism or changes in land status or other actions that limit scientific investigation.

In accordance with Section 106 of the National Historic Preservation Act, federal agencies consult with the SHPO for concurrence on an agency's effects determination. When an agency finds that their undertaking would have "No Effect" on historic properties, an agency submits their findings to the SHPO for concurrence. Appendix E contains the Navy's "No Effect" determination letters to the SHPOs and concurrence letters received from California, Washington and Oregon SHPOs. The basis for the findings of "No Effect" are established below.

4.10.2 ADS Ocean Test Locations

4.10.2.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

The majority of activities associated with the proposed ocean tests would occur within the marine environment and would involve the use of two marine test vessels. The primary impacts from the proposed ocean tests would be the potential for underwater archaeological resources to be affected by the laydown of ADS components on the ocean floor.

As discussed in Section 3.10, Cultural Resources, the majority of known underwater cultural resources (e.g., shipwrecks) in the region occur in less than 33 ft (10 m) of water. The most concentrated locations of shipwrecks are along headlands and harbor approaches and within inner harbor waters on the main coastline and offshore islands. To minimize the potential for disturbance to cultural resources, operational and environmental constraint areas (exclusion areas) were identified within southern California (refer to Figure 2-5). These areas include a 1 nm buffer around the 6 nm area comprising the Channel Islands National Marine Sanctuary and a 3 nm buffer around the other offshore islands.

Although shipwrecks are relatively abundant within the area of potential effect for the ADS ocean tests, documented shipwrecks would be avoided not only to avoid potentially historic resources, but also to avoid complicating the ADS retrieval process upon test completion. In addition, exclusion areas around the islands have been established to avoid potential sensitive underwater archaeological resources. Therefore, the potential for impacts to underwater archaeological resources within territorial waters would not be significant.

Area outside Territorial Waters

The majority of known underwater cultural resources generally occur in less than 33 ft (10 m) of water. Some shipwrecks may occur in offshore waters, but the majority of shipwrecks are located near islands and the mainland. Any documented shipwrecks outside territorial waters would be avoided not only to avoid potentially historic resources but also to avoid complicating the ADS retrieval process upon test completion. In addition, exclusion areas around the islands have been established to avoid sensitive archaeological resources underwater archaeological resources are unlikely to be affected by the laydown. Therefore, the potential for impacts to underwater archaeological resources outside territorial waters would not be significant.

4.10.2.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

As shown on Figure 2-6, the majority of shipwrecks have occurred close to the coastline and mostly in the area of Willapa Bay (between the mouth of the Columbia River and Grays Harbor). Although shipwrecks are relatively abundant within the area of potential effect for the ADS ocean tests, documented shipwrecks would be avoided not only to avoid potentially historic resources, but also to avoid complicating the ADS retrieval process upon test completion. Therefore, the potential for impacts to underwater archaeological resources within territorial waters would not be significant.

Area outside Territorial Waters

The majority of known underwater cultural resources generally occur in less than 33 ft (10 m) of water. Some shipwrecks may occur in offshore waters, but the majority of shipwrecks are located near islands and the mainland. Since no known shipwrecks have been documented outside territorial waters of the Pacific Northwest site; underwater archaeological resources are unlikely to be affected by the laydown. Therefore, the potential for impacts to underwater archaeological resources within territorial waters would not be significant.

4.10.3 ADS Shore Station Locations

4.10.3.1 Proposed Shore Station Location

The proposed shore station would be located on MCB Camp Pendleton within a previously disturbed area adjacent to the MCTSSA facility (refer to Figure 2-8). Improvements to the shore station site would include upgrading an existing gravel access road, redirecting and widening the access road, construction of a concrete slab to accommodate the support ISO-vans, and the installation of security fencing around the proposed site. Implementation of the proposed action would involve no permanent structures and upon conclusion of the tests, all facilities would be dismantled.

The proposed shore station site is located within a previously disturbed area. Based on site reconnaissance and record search, no archaeological resources were found within the area of potential effect, including the area where the cable would be placed. Therefore, impacts to cultural resources would not be significant.

4.10.3.2 Alternative Shore Station Locations

Pacific City Alternative

The alternative shore station would be located in Pacific City within an existing fenced and paved telecommunications facility (refer to Figure 2-9). The only construction associated with this alternative location consist of trenching a section of beach for the shore landing cable. A field reconnaissance survey and record search indicated that no known cultural resources are located within the alternative shore station location or the section of beach proposed for trenching. Therefore, impacts to cultural resources would not be significant.

MCB Camp Pendleton Alternative

The alternative MCB Camp Pendleton shore station location would be sited adjacent to the LCAC facility, approximately 1 mile (1.6 km) north of the proposed shore station location (refer to Figure 2-7). The alternative shore station site at MCB Camp Pendleton is located within a previously disturbed area. Based on the site reconnaissance and record search, no archaeological resources were found within the area of potential effect. Therefore, impacts to cultural resources under this alternative would not be significant.

4.11 SAFETY AND ENVIRONMENTAL HEATH

4.11.1 Approach to Analysis

For the purpose of this analysis, impacts are considered significant if the general public is endangered as a result of DoN activities. For the proposed action, there are specific, documented procedures in place to ensure that the general public is not put in danger by DoN actions.

The major safety issue for the proposed action concerns the use of lithium batteries, which represent potential physical, chemical, and environmental hazards. Other issues associated with implementation of the ADS system include public safety, which addresses the potential exposure of public citizens to unsafe conditions. Since the proposed action involves activities on the ocean and in coastal areas, safety issues focus on public access to the proposed test sites, especially for divers.

4.11.2 Lithium Battery Safety

Under the proposed action, lithium/thionyl chloride would be used in the ADS system. Thionyl chloride is toxic by inhalation and corrosive to the skin, eyes, and mucous membranes on contact. Continuous inhalation of the fumes may cause lung damage. On contact with water (or moist air), thionyl chloride reacts violently to give off corrosive fumes of hydrochloric acid (HC1) and SO_2 (Levy and Bro 1994). To reduce potential hazards associated with use of lithium batteries, safety measures would be implemented. These safety measures include precautions taken during receiving, storage, assembly, shipping, recovery, and disposal. These and other precautions are identified in the ADS

Site Safety Plan, which includes established Lithium Battery Safety Guidelines, Handling, and Emergency Procedures that would be followed. Further information on lithium battery use and safety precautions is provided in Appendix B.

In addition, lithium battery components have been subjected to a series of tests to ensure battery safety during normal shipping, handling, and usage. Even if all battery safety devices described in Appendix B failed, the tests demonstrated a minimal risk of accident in all but extreme conditions. The lithium battery assembly was found to meet all Department of Transportation (DOT) shipping requirements of 49 CFR 173 (Naval Surface Warfare Center 1998). Therefore, public safety impacts associated with lithium batteries would not be significant.

4.11.3 ADS Ocean Test Locations

4.11.3.1 Proposed ADS Ocean Test Location

Area within Territorial Waters

As discussed in Section 3.11, commercial, military, and recreational vessels commonly transit the area. Public safety issues are related to heavy boating and shipping activity, as well as commercial and Navy testing operations and recreational activities that occur throughout southern California. Given the large area in which the ocean tests would occur and that ADS test vessels would only require less than 0.5-mile (1 km) clearance to efficiently and safely conduct the proposed tests, other activities could continue to occur without interfering with the integrity of the tests.

During vessel operations, TDV towing, deployment activities, and retrieval operations, standard operating safety procedures would be implemented to protect public nonparticipants and military personnel. To prevent any risk to the public during deployment of the ADS, the Navy would implement the following procedures: (1) ensure that the test area is free of nonparticipants (recreational and commercial users); (2) use established clearance procedures (including prior notice to the USCG of plans to conduct testing and the issuance of a NOTMAR [see Section 4.7, Land Use]); and (3) avoid shipping lanes and populated areas.

Retrieval of all ADS components would be achieved upon conclusion of the tests. To minimize the risk of excess cable becoming entangled with an object and interfering with the test, the Navy would use the minimum length of cable necessary to perform the tests. ADS test components sink in ocean water; therefore, once components are laid on the ocean floor, the cable would not be expected to be influenced by underwater currents and would not constitute a safety hazard during testing periods. Therefore, given standard component retrieval procedures, impacts to public safety would not be significant.

Safety thresholds have been established for exposure of humans to EMF at various frequencies (ANSI 1991). However, the proposed ADS system would not generate substantial EMF. The majority of the underwater components utilize photo-optical signals, which do not generate EMF. Electrical signals and corresponding low levels of

EMF would occur at the pressure vessels and hydrophone arrays. However, ADS is a low-power system (a total of 2 watts per node) and would not generate EMF of concern to humans or marine life. Specifically, EMF levels for the in-water hardware would be extremely low; signal power levels in the node sensor array and node are on the order of only 75 milliwatts in the 1-megahertz frequency band and are conducted along twisted wire pairs, which tend to cancel out the EMF. These EMF levels are equal to those generated by computer electronics in a typical office space. The EMF produced by a 2-watt-per-node system spread over several kilometers would have a negligible impact on safety.

Recreational and commercial diving activities could occur in the vicinity of the proposed tests. The majority of recreational diving takes place within 0.5 nm (1 km) of shore, inside approximately 30 m (100 ft). Exclusion areas for sound source levels associated with active acoustic testing of the ADS system have been established as part of the proposed ocean tests. These include no sound source levels in waters 200 ft (61 m) or less and a maximum sound source level of 175 dB re 1 μPa-m in waters deeper than 200 ft (61 m). In addition, all active acoustic transmission would cease if divers or dive flags are observed within 0.5 mile (1 km) of the test vessel. This would ensure that no potential dive site within the ADS ocean test location would be exposed to significant acoustic levels. Therefore, potential safety impacts to divers as a result of implementation of the proposed ocean tests would not be significant.

Area outside Territorial Waters

Public safety issues in this area are related to boating and shipping activity, and limited recreational activities. Given the large area in which the ocean tests would occur and that ADS test vessels would require less than a 0.5-mile clearance, other activities could occur within the vicinity of the test location without interfering with the integrity of the tests. Therefore, impacts to public safety would not be significant.

4.11.3.2 Alternative ADS Ocean Test Location

Area within Territorial Waters

Similar to the proposed ADS ocean test location, public safety issues are related to boating and shipping activity, as well as commercial and recreational activities that occur offshore of Oregon and Washington. Impacts would be similar to those under the proposed ADS ocean test location because the test parameters would not change; therefore, impacts to public safety would not be significant.

Area outside Territorial Waters

Potential public safety impacts in the area outside territorial waters at the alternative ocean test location would be similar to those under the proposed ocean test location; therefore, impacts to public safety would not be significant.

4.11.4 ADS Shore Station Locations

4.11.4.1 Proposed Shore Station Locations

The proposed shore station site would be located within the boundaries of MCB Camp Pendleton and security fencing would be constructed around the facility. Since MCB Camp Pendleton is operated as a military installation and public access is prohibited, use of the proposed shore station would not impact public safety. Therefore, impacts to public safety would not be significant.

4.11.4.2 Alternative Shore Station Locations

Pacific City Alternative

The Pacific City alternative shore station site would be located within an existing fenced telecommunications facility that does not allow public access. Implementation of this alternative would also involve temporary construction activities at a public beach; however, construction activities would last no more than 8 hours and would not impact public safety. Therefore, impacts to public safety would not be significant.

MCB Camp Pendleton Alternative

The MCB Camp Pendleton alternative shore station site would be located within the boundaries of MCB Camp Pendleton, approximately 1 mile (1.6 km) north of the proposed shore station. Since public access is not allowed on military installations, implementation of this alternative shore station location would not impact public safety. Therefore, impacts to public safety would not be significant.

4.12 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the proposed ADS ocean tests would not be conducted. Existing environmental conditions for resources potentially affected by the proposed action, as described in Chapter 3 of this EA, would remain unchanged. Consequently, implementation of the No-Action Alternative would have no impact on environmental resources.

4.13 MEANS TO MITIGATE ADVERSE ENVIRONMENTAL IMPACTS

Mitigation measures in the form of avoidance, design modification, resource restoration and preservation, or compensation are frequently implemented to lessen adverse environmental impacts that may otherwise occur as a result of a project. In the resource-specific analysis described in Sections 4.1 through 4.11 of this EA, no significant impacts have been identified for any resource. The proposed ADS tests are not intrusive and have been designed to minimize environmental impacts. However, the following mitigation measures have been recommended and incorporated into the ADS ocean tests program to minimize any potential for impacts to threatened and endangered terrestrial species or acoustic impacts to marine mammals (refer to Section 4.5.2.5).

Marine Mammals

1. For the proposed ADS ocean tests, two types of visual searches for marine mammals would be conducted: (1) a *ship's watch* by the operations personnel, and (2) a *dedicated watch* by at least two personnel specifically trained in marine mammal identification. A ship's watch of surrounding waters would be conducted at least 20 minutes before and continuing during any pulse or continuous sound source transmission.

2. For continuous sound source transmissions, a ship's watch by operations personnel would be conducted at all times during transmissions less than 140 dB re 1 μPa-m. Operations would be curtailed only if marine mammals approach within 33 ft (10 m) of the towed sound source projector during continuous sound transmission at less than 140 dB re 1 μPa-m.

3. When active acoustics involve continuous sound source transmission greater than 140 dB re 1 μPa-m, a dedicated watch would be conducted. Continuous sound source transmission between 140 and 170 dB re 1 μPa-m would be conducted only during daylight hours and when visibility is not limited by weather conditions (e.g., fog, adverse sea state). Transmissions would be curtailed in accordance with Table 4-5.

4. Because pinnipeds (seals and sea lions) and odontocetes (toothed whales: dolphins, porpoises, etc.) do not have good hearing below 1 kHz, continuous sound source transmissions between 140 and 170 dB re 1 μPa-m would continue unless pinnipeds and/or odontocetes animals remain within 1,050 ft (320 m) of the sound source projector for periods greater than one-half hour. If pinnipeds or odontocetes remain during continuous source transmissions over one-half hour, transmissions would be stopped.

5. At the start of sound source transmission, the transmission level would be increased gradually or ramped-up from an overall level less than or equal to 140 dB re 1μPa-m to the desired operating level, at a rate not exceeding 6 dB re 1 μPa-m per minute. Although there was some discussion as to the utility of ramp-up procedures at a recent ONR Workshop (ONR 1998), it is thought that such procedures may allow any marine mammals near the sound source project, during the onset of test operations, the opportunity to move away before being exposed to maximum levels. To ensure implementation, this action would be a test requirement and would be added to the test plan for all ADS ocean tests.

6. If any marine mammals are attracted to sounds associated with the ADS ocean test operations, they may actually approach or remain in the test area. Such long-term exposure should be avoided to mitigate potential hearing damage to marine mammals. Although such behavior is not anticipated for any species, active acoustic transmissions would be delayed in accordance with the proposed mitigation measures as outlined in Table 4-5 (refer to Section 4.5.2.5).

Implementation of the above mitigation measures would support the finding that impacts would be below the threshold of significance and would be below the threshold of "take" by harassment as defined by the MMPA. There is no direct evidence that any marine mammal species would significantly modify their normal behavior in response to the localized, short-term impacts generated by implementation of the proposed action. However, these mitigation measures have been integrated into ADS test plans to provide additional assurance that there would be no significant impacts on marine mammals or threatened and endangered terrestrial species.

Threatened and Endangered Terrestrial Species

Implementation of the following mitigation measures would ensure that trenching activities associated with placement of the shore landing cable at the proposed shore station location would not adversely impact the western snowy plover.

1. All activities associated with trenching would occur outside the plover nesting season (1 March - 15 September).

2. In addition, if any repairs are needed to the buried shore landing cable during the plover breeding season, all activities would be coordinated with MCB Camp Pendleton Environmental Security personnel and USFWS, prior to any beach or dune disturbance.

SCUBA Diver Mitigation

To eliminate potential risk of acoustic exposure to SCUBA divers, no active acoustics would be projected in waters less than 200 ft (61 m) in depth (refer to Figure 2-5). In addition, all active acoustic transmission would cease if divers or dive flags are observed within 0.5 mile (1 km) of the test vessel.

4.14 ENVIRONMENTAL IMPACTS THAT CANNOT BE AVOIDED

As described in Section 4.13, no significant impacts on resources from implementation of the proposed ADS ocean tests have been identified. The Navy would retrieve all components following testing. Therefore, the proposed action would not result in significant adverse environmental impacts.

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CHAPTER 5
CUMULATIVE IMPACTS

The CEQ regulations (40 CFR §§1500-1508 [1997]) implementing the procedural provisions of NEPA of 1969, as amended (42 USC §§4321 *et seq*. [1996]) define cumulative effects as:

> "The impact on the environment which results from the increment impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR §1508.7 [1997]).

The contribution of a proposed action to the overall cumulative impacts in a ROI is of particular concern. A single project may have individually minor impacts; however, when considered together with other projects, the effects may be collectively significant. A cumulative impact is, therefore, the additive effect of all projects in the same geographic area.

In general, effects of a particular action or group of actions must meet all of the following criteria to be considered cumulative impacts:

- Effects of several actions occur in a common locale or ROI (i.e., action can contribute to effects of an action in a different location).
- Effects on a particular resource are similar in nature (i.e., affects the same specific element of a resource).
- Effects are long-term; short-term impacts dissipate over time and cease to contribute to cumulative impacts.

The proposed action would involve temporary, localized ocean testing activities. As a result, no significant impacts on any resource areas would occur from use of the proposed open-ocean or onshore testing components (refer to Section 4). Offshore activities would involve movement of approximately two vessels within southern California for a maximum duration of 265 days over a period of 3 years (combined total of all four tests); acoustical testing would be performed over a maximum of 1,344 hours (56 days) within this period. Since southern California supports consistent volumes of commercial and recreational boating activities, impacts associated with the vessel operations of the proposed action would not create cumulative impacts.

Onshore components associated with the ocean testing would be limited to no more than eight stationary vans, minor facility construction, and a shore landing cable connecting from the temporary shore station to the offshore components. These elements would be sited in a previously disturbed area of MCB Camp Pendleton and would be consistent with surrounding land use. As a result, short-term, temporary operation of these facilities would not result in cumulative impacts.

Due to the short-term, localized nature of the ADS ocean tests, the proposed action does not meet the criteria listed above to be considered as contributing to cumulative impacts.

Upon completion of the four tests, the marine environment of southern California would remain essentially unchanged from its condition prior to the proposed action.

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CHAPTER 6
POSSIBLE CONFLICTS BETWEEN THE ACTION AND THE OBJECTIVES OF FEDERAL, REGIONAL, STATE, AND LOCAL PLANS, POLICIES, AND CONTROLS

Various federal and state laws, ordinances, rules, regulations, and policies are pertinent to the proposed ADS ocean tests. Table 6-1 provides a summary of environmental compliance for the proposed ADS ocean tests. Based on the EA's evaluation of the proposed action with respect to consistency to land use and environmental guidelines for the southern California area, the proposed action does not conflict with the objectives of federal, regional, state, and local land use plans, policies, and controls.

Table 6-1. Possible Conflicts Between the Action and the Objectives of Federal, State, and Local Land Use Plans, Policies, and Controls

Plans, Policies, and Controls	Responsible Agency	Status of Compliance
National Environmental Policy Act (NEPA) of 1969, 42 United States Code (42 USC 4321 *et seq*.), as amended.	Department of the Navy	This EA for the ADS Program Definition and Risk Reduction Phase ocean tests satisfies the requirements of 32 CFR 775 regarding environmental compliance for federal actions. This EA has determined that no significant impacts would occur as a result of the proposed action.
Executive Order (EO) 12114 *Environmental Effects Abroad of Major Federal Actions*	Department of the Navy	This EA/OEA satisfies the requirement for EO 12114. No significant harm would occur to the global commons as a result of implementation of the proposed actions.
The Endangered Species Act of 1973, 16 USC 1531, as amended.	U.S. Fish and Wildlife Service (USFWS) National Marine Fisheries Service (NMFS)	It has been determined that the proposed action would not adversely effect any threatened and endangered species or their critical habitat. Therefore, formal section 7 consultation is not required. Informal consultation with USFWS and NMFS resulted in agency concurrence with the EA conclusions and mitigation measures. Agency letters are included in Appendix E.
Marine Mammal Protection Act, 16 USC 1361 e*t seq.*	National Marine Fisheries Service (NMFS)	The proposed action would not result in a "take" by harassment of marine mammals; therefore, permits from NMFS are not required. NMFS concurred that an incidental harassment authorization was not needed for the proposed tests (Appendix E).

Table 6-1. Possible Conflicts Between the Action and the Objectives of Federal, State, and Local Land Use Plans, Policies, and Controls (continued)

Plans, Policies, and Controls	Responsible Agency	Status of Compliance
Coastal Zone Management Act, 16 USC 1451 *et seq*. NOAA Federal Consistency Regulations (15 CFR 930).	California Coastal Commission Oregon Coastal Management Program Washington State Department of Ecology	The Navy has determined that the proposed action and alternative shore station site would be consistent to the maximum extent practicable with the policies of the California Coastal Commission and has completed a CCD in accordance with CZMA. Additionally, based on the analysis in the EA, the alternative ocean test site and shore station site were found to be consistent with Oregon and Washington Coastal Plans in accordance with CZMA.
Clean Water Act, 33 USC 1344. Rivers and Harbors Act of 1899, 33 USC 403.	USEPA/USACOE	The proposed action would not discharge dredged or fill material into the marine environment. Test components would be retrieved upon completion of ocean tests. However, because the proposed action involves trenching and backfilling of approximately 111 yd^3 (86 m^3) of material for placement of the shore landing cable, a Section 401 and 404/ Section 10 permit has been requested in compliance with the Rivers and Harbors Act. No in-water construction would occur until permits are obtained.
National Historic Preservation Act, 16 USC 470 and 36 CFR 800: Protection of Historic Properties.	Department of the Navy	The proposed action would not have a significant impact on cultural resources (including underwater archaeological resources). Based on the findings of this EA, no effect letters were distributed to the appropriate SHPO (California, Oregon, and Washington) by the Navy and concurrence letters were received (Refer to Appendix E).
Clean Air Act, 42 USC 7401 *et seq*.	USEPA	Project-related emissions within the affected air basins would be short-term in nature. The proposed action would not compromise air quality attainment status in California or conflict with attainment and maintenance goals established in the State Implementation Plan. Therefore, a CAA conformity determination would not be required and a RONA is included in Appendix C.

Table 6-1. Possible Conflicts Between the Action and the Objectives of Federal, State, and Local Land Use Plans, Policies, and Controls (cont'd)

Plans, Policies, and Controls	Responsible Agency	Status of Compliance
EO 12898: *Federal Actions to Address Environmental Justice in Minority and Low-income Populations*. EO 13045: *Protection of Children from Environmental Health Risks and Safety Risks.*	Department of the Navy	The proposed action would not have the potential to disproportionately affect human health or the environment in low-income, minority, or disadvantaged including children populations.

CHAPTER 7
ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL OF THE PROPOSED ACTION AND ALTERNATIVES

7.1 PROPOSED ACTION

The proposed action would involve four short-term ocean tests associated with ADS, lasting a maximum duration of 265 days over a period of 3 years (inclusive of all four tests), at specific locations in southern California. Equipment involved in each of the tests would include two marine vessels, underwater cables, and various subsea sensory components (as described in Chapter 2). The proposed temporary shore station would consist of as many as eight vans, monitoring equipment housed within the shore station facility, and a shore landing cable.

Energy required to successfully implement the proposed action is minimal, limited only to fuels needed by ocean vessels and the shore station vehicles, and electricity required to operate equipment at the proposed shore station. The ocean vessels are owned by Navy contractors and would use existing commercial fuel supplies. These fuels are currently available and are in adequate supply at retail distributors in marinas throughout southern California. Similarly, fuel for the shore research vehicles would be obtained either from Navy-owned sources or from widely available retail distribution.

Electrical power required onboard the vessels would be supplied by an auxiliary power supply (e.g., a generator). Electricity required for the shore station would be supplied by existing electrical service at the project site.

Only a minimal amount of energy is required for construction of the shore station and implementation of the proposed action; the proposed ADS ocean tests are short-term and involve a limited amount of fuel-dependent equipment. Fuels and energy that are required (gasoline and electricity) are mass-produced and widely distributed. Furthermore, energy expended during implementation of the proposed action would likely represent a negligible amount compared to total gasoline and electricity consumed by similar watercraft and shore vehicles in the vicinity of the test site during proposed test periods.

Direct energy requirements of the proposed action are limited to those necessary to operate equipment. No superfluous use of energy related to the proposed action has been identified, and proposed energy uses have been minimized to the maximum extent possible without compromising the integrity of the ADS ocean tests. Therefore, no conservation measures related to direct energy consumption by the proposed action are identified.

7.2 ALTERNATIVE OCEAN TEST AND SHORE STATION SITES

Implementation of the ADS ocean tests at the alternative ocean test and shore station locations would have energy requirements as described for the proposed action above. Energy required would be minimal, limited to fuels needed by ocean vessels and the shore station. The difference in fuel use required by project vessels at the alternative ocean test site would be negligible. Energy requirements for the alternative shore station locations would be similar to the proposed location and would be limited to gasoline and electricity. As described above for the proposed action, energy consumption would be insignificant, and no conservation measures related to direct energy consumption have been identified.

7.3 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no energy would be consumed conducting the ADS ocean tests. However, given the availability of fuels and the minor amounts required by the project, the amount of energy consumption related to the proposed action that would be conserved by implementing the No-Action Alternative would be insignificant and negligible.

CHAPTER 8
IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires an analysis of irreversible and irretrievable effects. Resources that are irreversibly or irretrievably committed to a project are those used on a long-term or permanent basis. This includes the use of nonrenewable resources such as metal, wood, fuel, paper, and other natural or cultural resources. Human labor would also be a nonrenewable resource. These resources are nonrenewable or irretrievable because they would be used for the proposed action when they could have been used for other purposes. Another impact that falls under the category of the irreversible and irretrievable commitment of resources is the unavoidable destruction of natural resources, which could limit the range of potential uses of that particular environment.

Implementation of the ADS ocean tests would not result in the destruction of environmental resources such that the range of potential uses of the environment would be limited. The proposed action would not adversely affect the cultural integrity or biodiversity of the southern California marine or terrestrial environment.

The proposed action would not constitute an irreversible or irretrievable commitment of nonrenewable or depletable resources other than the materials and energy expended for construction of temporary shore station facilities and implementation of the ocean tests. These tests would result in a net increase of irretrievable ADS production materials; however, much of the test equipment is preexisting. Furthermore, the ADS components would be retrieved and reused for subsequent tests. Construction of the proposed shore station facility would result in an irretrievable commitment of building materials, fuel (for construction vehicles and equipment), and other resources. In addition, the project would commit work force time for construction, and upon completion, operation.

Therefore, although ADS ocean tests would require the use of depletable and renewable resources (such as fossil fuels and manpower time), the Navy has determined that there would be minimal irreversible or irretrievable commitment of resources associated with the proposed action.

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CHAPTER 9
RELATIONSHIP BETWEEN SHORT-TERM ENVIRONMENTAL IMPACTS AND LONG-TERM PRODUCTIVITY

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development option reduces future flexibility in pursuing other options, or that giving over a parcel of land or other resource to a certain use often eliminates the possibility of other uses being performed at that site.

To implement the ADS ocean tests, assets (e.g., personnel, vessels, and equipment) currently used for other purposes would be relocated. Four ocean tests are planned; the proposed tests would last for a cumulative total of 265 days. It is proposed that all system components would be retrieved after each test. The proposed action would not permanently alter any existing environmental resources. Although construction of the shore station would occur under the proposed action, the facilities would be removed upon completion of the ocean tests. Upon completion of the four ocean tests, the marine and terrestrial environment of southern California would remain essentially unchanged from its condition prior to the proposed action. Therefore, resource productivity for biological, commercial, and recreational resources would not be significantly affected.

Due to the localized, short-term nature of the proposed action, its implementation would not result in any environmental impacts that would permanently narrow the range of beneficial uses of the environment, or pose significant long-term risks to health, safety, or the general welfare of the public.

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CHAPTER 10
LIST OF PERSONNEL AND AGENCIES CONTACTED

California Coastal Commission (CCC). Mark Delaplaine. San Francisco, CA.

California Department of Fish and Game (CDFG). Gerry Kobilinsky. Sacramento, CA.

California Department of Parks and Recreation. State Historic Preservation Office. Daniel Abeyta. Sacramento, CA.

California Regional Water Quality Control Board. Mr. Garret Williams. San Diego, CA.

National Marine Fisheries Service. Irma Lagomarsino, Southwest Fisheries Science Center. La Jolla, CA.

Olympic Air Pollution Control Agency (OAPCA). Planning Department staff. Lacy, WA.

Oregon Natural Heritage Program. Connie Levesque, Data Services Assistant. Portland, OR.

Oregon Parks Department. State Historic Preservation Office (SHPO) staff. Salem, OR.

San Diego Air Pollution Control District (SDAPCD). Planning Department staff. San Diego, CA.

Santa Barbara County Air Pollution Control District (SBAPCD). Planning Department staff. Santa Barbara, CA.

South Coast Air Quality Management District (SCAQMD). Meteorological Group staff. Diamond Bar, CA.

Tillamook County Department of Community Development. George Plummer, Associate Planner. Tillamook County, OR.

United States Army Corps of Engineers. Dr. Eric Stein. Los Angeles, CA.

United States Coast Guard (USCG). Lt. Matt Phillip, Marine Safety Office. Santa Barbara, CA.

USCG. Bernie Penkin, Operations Department. Astoria, OR.

U.S. Fish and Wildlife Service (USFWS). Angie Hernandez, Biologist. Portland, OR.

USFWS. Jim Bartel, Assistant Field Supervisor. Carlsbad, CA.

USFWS. Roy Lowe, Biologist. Newport, OR.

Ventura County Air Pollution Control District (VCAPCD). Planning Department staff. Ventura, CA.

Washington Department of Community, Trade and Economic Development, Office of Archaeology and Historic Preservation. Mr. Gregory Griffith. Olympia, WA.

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SECTION 12
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APPENDIX A

Classified Technical Information and ADS Ocean Test Locations

(not available electronically, see Program Office for hard copy)

APPENDIX B

Lithium Battery Safety

APPENDIX B
LITHIUM BATTERY SAFETY

The batteries proposed for use in the ADS system consist of lithium/thionyl chloride. The lithium/thionyl chloride battery is one of the highest energy systems available, delivering up to 480 watt hours per kilogram. In addition to their high energy content, these batteries contain liquid thionyl chloride, which is toxic by inhalation and corrosive to the skin, eyes, and mucous membranes on contact. Continuous inhalation of the fumes may cause lung damage. On contact with water (or moist air), thionyl chloride reacts violently to give off corrosive fumes of hydrochloric acid (HCl) and SO_2 (Levy and Bro 1994).

Safety measures implemented for the use of lithium batteries include precautions taken during receiving, storage, assembly, shipping, recovery, and disposal. These and other precautions are identified in the ADS Site Safety Plan, which includes Lithium Battery Safety Guidelines, Handling, and Emergency Procedures. The Test Director will have a copy of the safety plan on the test vessel while tests are underway. A brief overview of the safety measures implemented by the Navy for use of lithium batteries is included below.

Battery Receiving Station

At the battery receiving station, all personnel are trained in safety and handling of the battery units. Upon receipt, batteries are inspected for any defects and to ensure proper shipping containers were used. All personnel are equipped with proper gloves, safety glasses and shields, and chemical aprons. The receiving facility is equipped with an eyewash center, shower, flak jacket/container, and cleanup kit (DoN 1998).

Battery Storage

At the storage facility, all personnel are trained in handling and storing batteries. The facility is equipped with monitoring and alarm equipment that is sensitive to temperature, SO_2, HCl, humidity, and smoke. Safety equipment is provided to all personnel, similar to the receiving station. Emergency procedures include precautions and safety plans for fire, high temperature, toxic gas leakage, spills, and explosion. Emergency equipment located at the storage facility includes fire extinguishers, ventilation equipment, and a cleanup kit (DoN 1998).

Battery Assembly

All personnel are trained for safety in assembly of battery units. Batteries are transported for assembly in their original shipping containers, removed from the containers, and placed on a workbench for assembly. The assembly area includes monitoring equipment for SO_2, HCl (sensidyne tubes), temperature, and smoke. Specific assembly directions are provided for each step in the process. Safety precautions are included for each step, as identified on the assembly directions. Emergency procedures include precautions and safety plans for fire, high temperature, toxic gas leakage, spills, and explosion.

Emergency equipment at the assembly facility includes fire extinguishers, ventilation equipment, and a cleanup kit (DoN 1998).

Battery Shipping

The U.S. Department of Transportation (DOT) must authorize shipment of lithium batteries. This requires submittal of engineering drawings and test results data at the shipping level. The transport of batteries would comply with the DOT regulations for loading, securing, and monitoring of the batteries throughout transit. Shipping container monitoring devices would be installed for SO_2, HCl, and temperature. Monitoring devices include an audible and visual alarm system for the transport provider. All vehicles used for temporary storage of batteries would be properly marked with hazardous materials placards, per DOT regulations (DoN 1998).

Battery Use

Battery units are proposed to be contained inside the ADS system canisters and loaded onto the Navy's research vessel on the aft deck for installation into the TDV. Normal handling procedures are identified in the Operations Manual. ISS Operational Safety Training is provided prior to each sea test period, in which emergency situations are addressed. Emergency situations accounted for include high temperature, toxic gas leakage, spill, fire, and dropped batteries. All shipping containers would be equipped with safety monitoring devices. Personnel would be provided with all required safety equipment and an appropriate evacuation route in case of an emergency. Emergency procedures include precautions and safety plans for fire, high temperature, toxic gas leakage, spills, and explosion. Emergency equipment on the vessel would include fire extinguishers, ventilation equipment, and a cleanup kit (DoN 1998).

Safety design features incorporated into the main and auxiliary batteries and the system including the following:

- Each string consists of two safety components: a re-settable fuse and a diode, which are in series with the string. The fuse opens at 600 milli-amps and the diode isolates the string from the others so that it does not "see" a reverse voltage from the rest of the battery. This has the effect of leveling off the strings so they share the load and discharge at the same rate.

- A re-settable thermal fuse that opens between 194° and 205°F (90° and 96°C) and a 3.2-amp re-settable fuse are contained in series with the battery. These devices will turn the battery off if either is activated.

- A battery voltage monitoring circuit that automatically removes the load from the battery when the battery voltage drops 8.4 VDC at the battery terminals. This results in the safest shutdown condition for the battery.

- A pressure relief vent in each pressure housing containing a battery prevents excessive buildup of pressure inside the housing.

Battery Recovery

All lithium batteries associated with ADS ocean tests would be recovered by ROV. Upon recovery, the batteries would be placed in a metal container located onboard the Navy research vessel. The container would be equipped with safety monitoring devices.

Accidental Recovery

All shells containing lithium batteries would be marked with an appropriate "DANGER" sign to advise mariners of the potential dangers of the containers. Several safety devices have been designed into the system to limit potential safety hazards. These include circuit fuses and thermal shut-off switches within the battery and a fail-safe voltage shut-off circuit that unloads the battery prior to reaching a critical voltage level (DoN 1998).

Battery Disposal

Once onshore, an authorized company would transport the batteries to an authorized recycling facility, where the batteries would be recycled. All safety measures described above would be implemented during disposal.

APPENDIX B
REFERENCES

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APPENDIX C

Technical Background Information and RONA

APPENDIX D

Coastal Consistency Determination

APPENDIX E

Agency Letters

(not available electronically, see Program Office for hard copy)

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RECORD OF NON-APPLICABILITY (RONA) FOR CLEAN AIR ACT CONFORMITY

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) published "Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule," in the 30 November 1993, Federal Register (40 CFR Parts 6, 51, and 93). The U.S Navy published "Draft Interim Guidance on Compliance with the Clean Air Act General Conformity Rule" in Chief Naval Operations (CNO) letter dated 26 April 1994 (Ser N457/4U596107) and in Appendix F, OPNAVINST 5090.1B dated 1 November 1994. These publications provide implementing guidance to document Clean Air Act Conformity Determination requirements.

Federal regulations state that no department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license to permit, or approve any activity which does not conform to an applicable implementation plan. It is the responsibility of the Federal agency to determine whether a Federal action conforms to the applicable implementation plan, before the action is taken (40 CFR Part 1 51.850[a]).

Federal actions may be exempt from conformity determinations if they do not exceed designated *de minimis* levels for criteria pollutants (40 CFR Part 51.853[b]). *De minimis* levels (in tons/year) for the air basins potentially affected by the proposed action are listed in Table 1.

Table 1. *De minimus* Levels for Criteria Pollutants in Affected Air Basins

	Affected Air Basin			
Criteria Pollutant	**Santa Barbara**	**Ventura**	**South Coast**	**San Diego**
ROC	100	25	10	50
NO_X	100	25	10	50
SO_x	*	*	*	*
CO	*	*	100	100
PM_{10}	*	*	70	*

* The affected air basin is in attainment for regulated pollutant.

PROPOSED ACTION

Activity: Proposed acoustic testing in the marine environment and construction of a temporary shore station facility.

Proposed Action Name: Advanced Deployable System (ADS) Ocean Tests Program Definition and Risk Reduction Phase

Proposed Action Summary: The Navy is proposing to conduct four ADS ocean tests over a period of 3 years. ADS consists of sensors connected by cables placed on the ocean floor designed to "listen" to sounds produced by vessels operating in the shallow waters. The Navy would use ADS to help detect underwater and surface marine vessel activity. Activities associated with the four tests would primarily include the establishment of a temporary land-based shore station and the deployment, inspection and operation, and retrieval of ADS system components. Two surface vessels would be used for deployment, inspection and operation, and retrieval; however, only one vessel would be used at any given time. The proposed shore station would be used for receiving, processing, displaying, and storing data.

Construction of the temporary shore station would require minor grading activities for site preparation and trenching for installation of a shore landing cable.

Air Emissions Summary: Based on the air quality analysis for the proposed action, the maximum estimated emissions for the proposed ADS ocean tests and construction of the shore station are below conformity *de minimis* levels (Table 2). Net emissions would be generated during the ocean tests and construction of the shore station. However, no net emissions are expected from the use of the shore station after construction is complete.

Table 2. Per Year Emissions Associated with the Proposed ADS Ocean Tests and Shore Station Construction

	Criteria Pollutant				
Activity	**ROC**	**NO_x**	**SO_x**	**CO**	**PM_{10}**
Surface Vessels[1]					
Tests 1 & 2[2]	0.11 tons	0.84 tons	0.07 tons	0.25 tons	0.09 tons
Test 3	0.01 tons	0.07 tons	0.01 tons	0.02 tons	0.01 tons
Test 4	0.02 tons	0.14 tons	0.01 tons	0.04 tons	0.01 tons
Construction					
Backhoe	2.9 lbs	30.2 lbs	3.3 lbs	8.3 lbs	2.7 lbs

[1] Estimated emissions within 3 nm.
[2] Tests 1 and 2 would be conducted in the same year.

Affected Air Basins: South Coast, Ventura, Santa Barbara, and San Diego for the proposed ocean tests and San Diego for construction of the proposed shore station site.

Date RONA prepared: 19 August 1998.

EMISSIONS EVALUATION CONCLUSION

The Navy concludes that *de minimis* thresholds for applicable criteria pollutants would not be exceeded nor would the projected emissions be regionally significant (i.e., greater than 10 percent of the air basins' emission budgets) as a result of implementation of the proposed action. The emissions summary supporting that conclusion are shown above, and the calculation methodology and references are included in the Environmental Assessment for ADS. Therefore, the Navy concludes that further formal Conformity Determination procedures are not required, resulting in this Record of Non-Applicability.

RONA APPROVAL

To the best of my knowledge, the information presented in this Record of Non-Applicability is correct and accurate and I concur in the finding that the proposed action is not subject to the General Conformity Rule.

Signature: ______________________ Date: ______________________

Insert appropriate signature authority

Assumptions used for RONA preparation:

<u>Ocean Test Assumptions</u>

Ocean Tests:	Two test vessels (vessels would not be operating at the same time)
Ocean Test Area:	Southern California Bight
Ocean Test Time-frame:	Tests 1 & 2 would be performed the first year, Test 3 during the second year, and Test 4 during the third year.

<u>Shore Station Assumptions</u>

Site Preparation and Trenching:	7 days
Overall acreage for site preparation:	0.5 acres
Use of Backhoe:	24 hrs (site prep and trenching)

For purposes of estimating expected emissions from the proposed action, emission factors from USEPA's AP-42 were used.

COASTAL CONSISTENCY DETERMINATION
FOR THE
ADVANCED DEPLOYABLE SYSTEM OCEAN TESTS

October 1998

1. AUTHORITY

This General Consistency Determination is being submitted in compliance with Section 930.34 et seq. of the National Oceanic and Atmospheric Administration (NOAA) Federal Consistency Regulations (15 CFR 930).

2. DETERMINATION

In accordance with the Federal Coastal Zone Management Act of 1972, as amended, Section 307(c)(1), the Department of the Navy (Navy) has determined that this proposed General Consistency Determination is consistent to the maximum extent practicable with the California Coastal Act of 1976, Chapter 3, Coastal Resources Planning and Management Policies, as amended January 1998, for the reasons stated below.

3. PROJECT DESCRIPTION

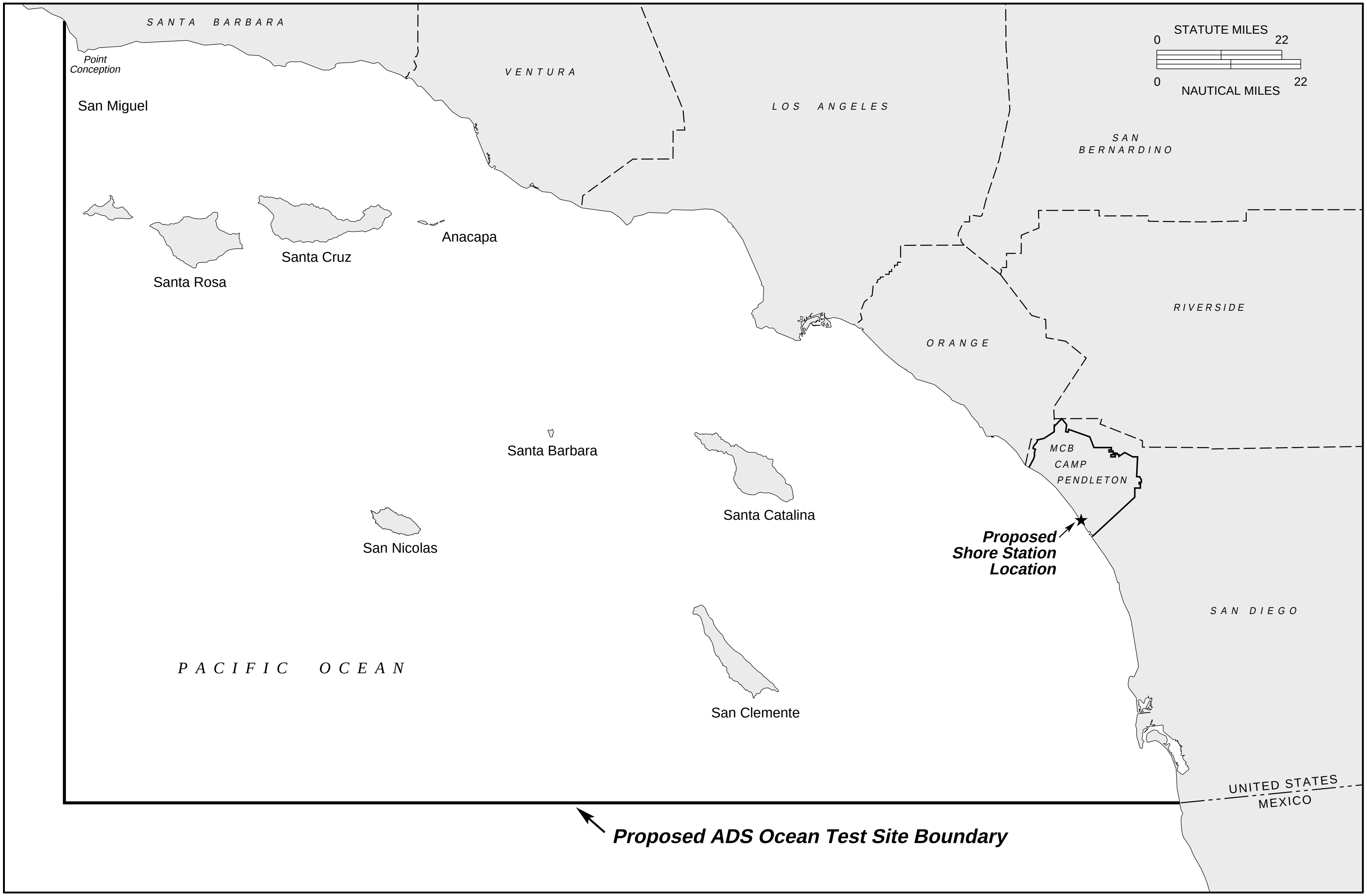
Project Location

The area proposed for conducting the Advanced Deployable System (ADS) ocean tests would be located within the marine environment of southern California, from Point Conception to the U.S.-Mexican border (Figure 1). The laydown of the system would occur within a portion of this area; however, the specific location of the laydown of the system is classified.

As part of implementation of the ADS ocean tests, a temporary shore station is proposed and would be used for receiving, processing, displaying, and storing data from the in-water hardware. The proposed shore station would be located within Marine Corps Base (MCB) Camp Pendleton property boundaries.

Purpose and Need

ADS was created in response to the Navy's *Mission Needs Statement for Undersea Surveillance in Littoral Waters*. The Mission Statement identifies the need to provide undersea surveillance capability, cites shortfalls of current systems to furnish this capability, and identifies additional capabilities being explored by the ADS Program Office. Surveillance requirements include the ability to:



Proposed ADS Ocean Test Site

FIGURE **1**

- detect, locate, and report submarines and surface shipping;
- provide a worldwide, flexible, and tailored response;
- bring tactical forces into contact with threat submarines; and
- gather operational and technical intelligence.

The overall purpose of these tests is to demonstrate that the ADS system could be used to locate the position of submarines and other craft within the littoral zone. Data derived from other systems would be used together with ADS data to confirm detections, classify contacts, and process contact reports.

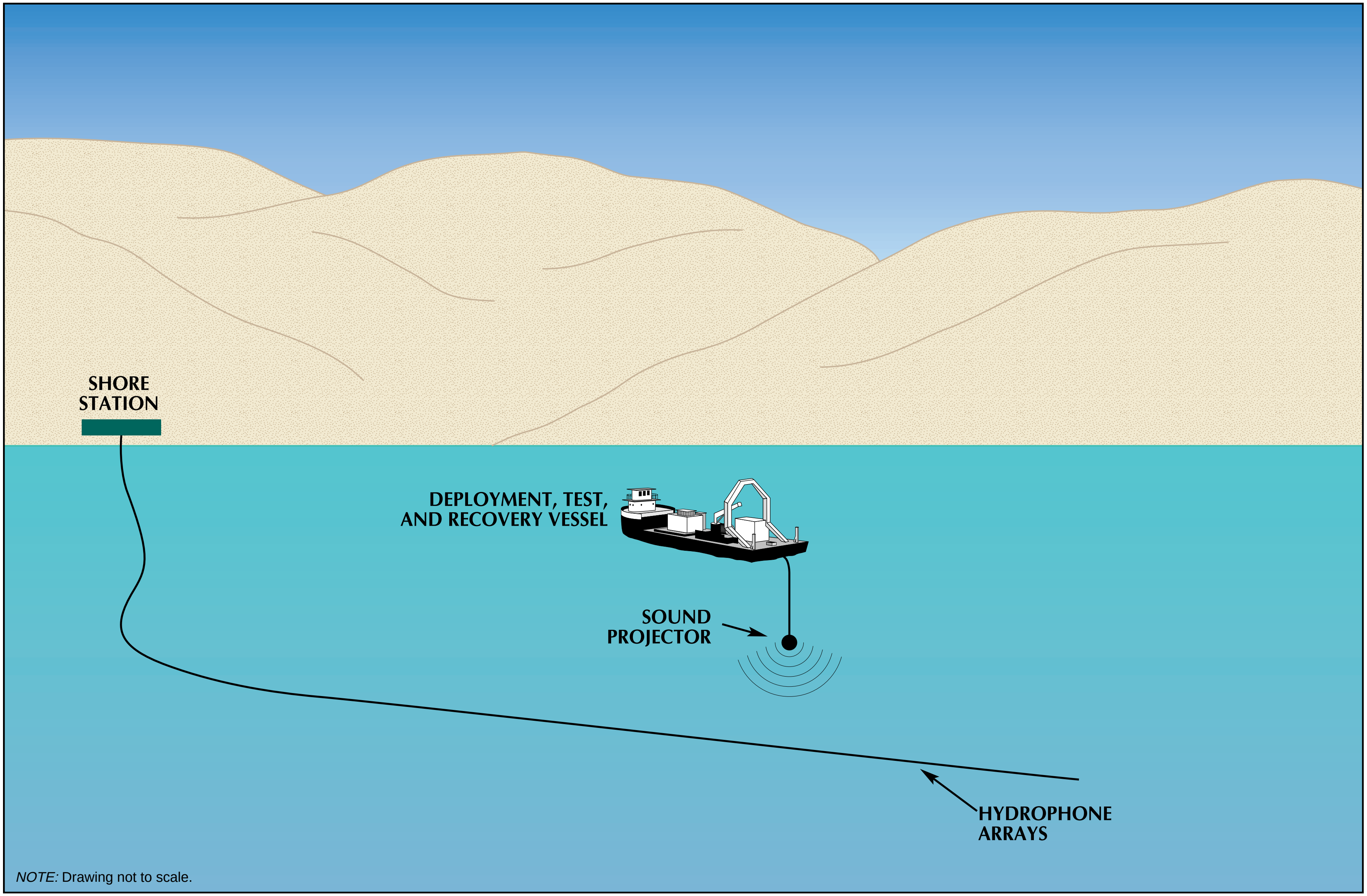
The overall need for the four proposed ocean tests is to demonstrate and validate the operational realism, survivability, scheduling, availability, and supportability of all the segments of the ADS system working as a whole. The ocean tests are needed to verify that design goals and performance requirements of the ADS system could be achieved.

The ADS passive acoustic undersea surveillance system is designed to detect, locate, and report surface vessel and submarine activities in the littoral, or nearshore marine environment. ADS is complex and can best be described by its general components; representations of a typical ADS are depicted in Figures 2 and 3 (these figures are for illustration purposes only; configurations can vary). Basically, once the system is deployed, underwater sounds are received by listening devices (hydrophones). These sound signals are converted to electronic signals (and ultimately optical signals) that are amplified in a pressure vessel and transmitted via internode cable to the next series of hydrophones. These data are combined and transmitted via internode cable to a connecting shore cable until they reach a shore station where optical data are recorded, processed, and analyzed.

General Background of ADS

To the greatest extent possible, ADS hardware and associated components have been and will continue to be tested in laboratories, environmental simulation chambers, high-pressure test tanks, and mock ocean beach facilities. However, to attain realistic testing conditions and deploy full-scale hardware, certain tests must be performed in a shallow water ocean environment.

As part of the proposed action, four ocean tests would be conducted as part of the Program Definition and Risk Reduction phase to evaluate the capability and performance of ADS. The Navy proposes to conduct these tests at a location within the shallow water ocean environment. These tests are proposed to demonstrate and validate operational realism, survivability, scheduling, availability, and supportability of all segments of the ADS system working as a whole. By implementing these tests in the marine environment and establishing a shore station, more realistic conditions can be achieved. The various types of hardware, components, and activities associated with operation and deployment of the ADS system are discussed in the following sections.



Advanced Deployable System Ocean Test

FIGURE 2

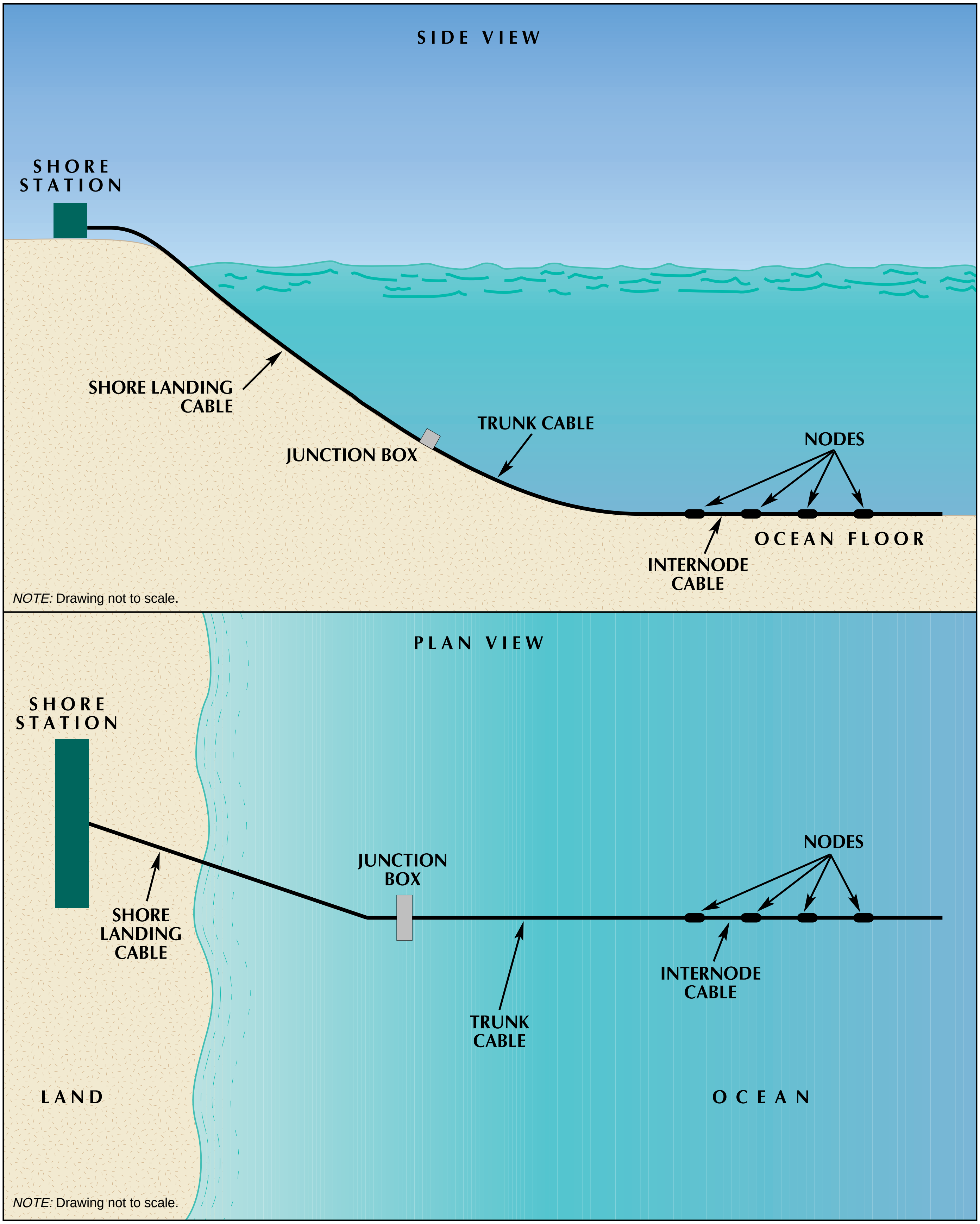


FIGURE 3

Advanced Deployable System Concept

ADS Ocean Tests Description

The Navy is proposing to conduct four ADS ocean tests: Multinode Test (Test 1), Development Test-ID (Test 2), Integrated Deployment Test (Test 3), and All Optical Deployable System Test (Test 4). The purpose of the tests would be to evaluate the capability and performance of the entire ADS system. The proposed project would occur within the Southern California Bight (SCB); however, the exact laydown of the system is classified.

ADS ocean test activities would require a maximum of 24 shipboard personnel (16 scientists and 8 crew) and 30 shore station personnel for installation, operation, and retrieval of the system. The proposed tests would occur over a 3-year period. Once the system has been deployed, the maximum number of days of operation for all four tests would be approximately 265 days; however, tests would not occur continually. ADS ocean test activities would incorporate both active and passive acoustic testing. Although ADS is an inherently passive system, artificial low frequency active acoustics must be introduced into the ocean environment to enable testing the system over its full range. A maximum of 1,344 hours (56 days) of active acoustic testing is proposed over the 3-year period. The capability of the system and the hydrophone sensors would also be tested by listening passively to ship traffic in the area. During active acoustic testing of the system, a sound projector would be deployed from the side of a test vessel and would be towed 26-89 ft (8-27 m) behind the vessel. Data processing would take place at the shore station. Table 1 provides a summary of each of the four proposed ADS ocean tests.

<u>ADS Ocean Test Activities</u>

Activities associated with the four proposed ocean tests would primarily include the following: establishment of the shore station, deployment of the system, operation and inspection of the system, and retrieval of the system.

<u>Establishment of the Shore Station</u>

As part of the ocean tests, a temporary land-based shore station would be established and used for receiving, processing, displaying, and storing data. A suitable shore station site would consist of a flat, relatively open area and would have electric power available in its vicinity. Specifically, the shore station site must meet the following requirements:

- It must be close to a Navy/contractor facility;
- An access road for equipment and personnel must be available;
- An area must be available near the shore that could accommodate up to eight support International Standards Organization (ISO)-vans;
- Docking facilities must be nearby;
- It must be a secured, fenced area with limited/controlled access;

Table 1. Summary of ADS Ocean Tests

Key Test Parameters	Test 1 Multinode Test (MNT)	Test 2 Development Test-ID	Test 3 Integrated Deployment Test (IDT)	Test 4 All Optical Deployable System (AODS)
TEST CHARACTERISTICS				
Maximum Test Period	70 days	150 days	15 days	30 days
Number of Test Vessels	2	2	2	2
Nodes/Fingers	4/1	20/5	1/1	3/1
Total Length of Cable	130 km	550 km	50 km	150 km
Remotely Operated Vehicle	Yes	Yes	Yes	Yes
Battery Type	Lithium	Lithium	Alkaline	Alkaline
Maximum Number of Batteries	4	20	1	3
Shore Station	Yes	Yes	Yes	Yes
Wet-end Inspection and Repair[1]	Yes	Yes	Yes	Yes
Component Retrieval[2]	Yes	Yes	Yes	Yes
ACOUSTIC PARAMETERS				
Maximum Active Acoustic Testing	480 hours	720 hours	48 hours	96 hours
Pulsed Sound Source				
Total Number of Hours of Operation[3]	32 hours	48 hours	8 hours	16 hours
Source Level	120-175 dB	120-175 dB	120-175 dB	120-175 dB
Frequency Range	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz
Signal Duration	0.25 to 10 seconds	0.25 to 10 seconds	0.25 to 10 seconds	0.25 to 10 seconds
Range of Time between Pulses	1.75 seconds to days	1.75 seconds to days	1.75 seconds to days	1.75 seconds to days
Continuous Sound Source				
Total Number of Hours of Operation[3]	448 hours	672 hours	40 hours	80 hours
Continuous Source Level Range	130-170 dB	130-170 dB	130-170 dB	130-170 dB
No. of hours less than 140 dB	335 hours	426 hours	17 hours	50 hours
No. of hours between 140 and 170 dB	113 hours	246 hours	23 hours	30 hours
Frequency Range	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz	20-1,000 Hz
Light Bulb Acoustic Tests				
Number of Lightbulb Tests	32	96	16	48
Duration of Pulse for Lightbulb Tests	1.8 ms	1.8 ms	1.8 ms	1.8 ms
Time between Implosions	20-30 minutes	20-30 minutes	20-30 minutes	20-30 minutes

[1] Wet-end inspection and repair would occur only as required.
[2] Plastic clips used to hold shells together in canister would not be retrieved (5 for Test 1, 30 for Test 2). No clips are used for Tests 3 and 4.
[3] The total hours for continuous sound source do not represent constant transmission since some time would elapse between sound source operations.

- Utilities, such as water, electricity, sewage, and phone lines, must be available; and
- Access to the shore must not be in an area used extensively by the public.

Deployment of the System

Deployment procedures would consist of placing a Towed Deployment Vehicle (TDV) in the water and unreeling an attached cable from the deployment vessel. Typical deployment for ADS is illustrated in Figure 4. As the TDV nears the bottom and stable towing conditions are reached, components would be mechanically ejected from the canisters in a pre-loaded sequence. A maximum of 12 canisters would be used for all four tests. As each node sinks to the bottom, its associated array would be stretched out on the ocean floor and would be followed by an internode cable and connected to the next node.

Once the desired test components are deployed on the ocean floor, the internode/trunk cable would be connected to a junction box. The junction box is approximately 10 feet (ft) x 8 ft x 4 ft (3 meters [m] x 2 m x 1 m) and would be set on the ocean floor within 3 miles (5 kilometers [km]) of shore. For deployment of all four tests, a maximum of

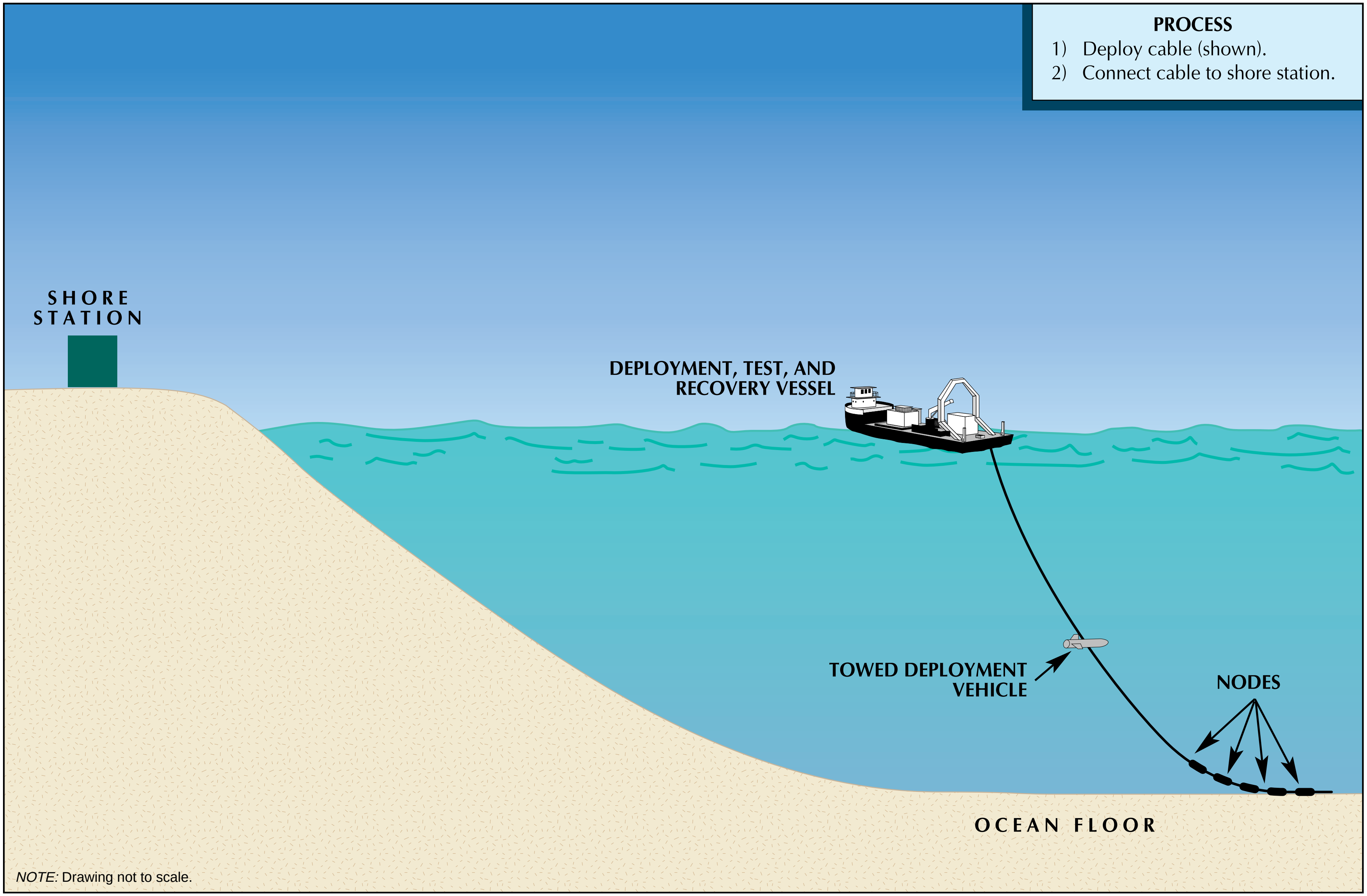


FIGURE 4

Typical Deployment for ADS Ocean Test

547 miles (880 km) of cable would be laid on the ocean floor. A shore landing cable would then be connected from the junction box to the shore station. The cable would be laid at low tide and buried 6 ft (2 m) deep through the intertidal zone. The shore landing cable and junction box would be deployed using the deployment vessel and smaller boats (most likely inflatable Zodiacs) near shore.

As part of the system, a maximum of 4 lithium batteries would be deployed for Test 1 and 20 for Test 2. The batteries would be used to power the pressure vessel and hydrophone array electronics. The main lithium battery assembly would consist of 32 parallel strings of cells with four cells per string. An auxiliary battery would consist of two parallel cells. Both main and auxiliary batteries would share a common housing. Alkaline batteries would be used for Tests 3 and 4.

<u>Operation of the System</u>

Although ADS is a passive acoustic system, active (or not naturally occurring) acoustics would be used during the system's proposed testing. Operation of the system would consist of the following four principal sound sources used during the proposed ADS ocean tests:

- ADS marine test vessels;
- a standard commercial acoustic positioning system;
- lightbulbs; and
- a towed sound source projector.

Test Vessels. Two test vessels would be used as part of the proposed activities; however, only one vessel would be deployed at any given time. The test vessels would have deck lights which would provide visibility from between 150-300 ft (46-91 m) at night.

Acoustic Positioning System. The acoustic positioning system is a commercially available projector/hydrophone and standard vessel component used frequently by the oil industry and oceanographic community for bathymetric surveying, Remotely Operated Vehicle (ROV) operations, and manned submersible operations. It is considered a standard tracking system for locating equipment in water. The acoustic positioning system would be used during deployment and repair of ADS components.

Lightbulbs. A simple system consisting of imploding lightbulbs to generate acoustic signals would be used during the acoustic testing portion of all ADS ocean tests. The operation would consist of lowering standard, off-the-shelf lightbulbs (for example, a 2.5-inch diameter General Electric 40625/W 40-watt globe) to a specified depth and breaking the lightbulbs, thus creating a short duration impulse on the order of 2 ms. For the ADS ocean tests, a mousetrap would be used to implode the lightbulb. The system would consist of a cable and a set of mousetraps connected to its end. Each mousetrap would have an actuator that releases the trap's spring mechanism and is triggered at the surface using a battery. Each lightbulb would be encased in nylon to facilitate retrieval and to ensure that no glass chards are released into the water. This system is often used as a cost-efficient means to provide a sound source.

Towed Sound Source. A U.S. Navy Underwater Sound Reference Detachment sound projector (model J15-1) is proposed for use during the proposed ADS ocean tests. According to its specifications, this projector is capable of transmitting tonals at sound source levels shown in Table 2.

Table 2. Underwater Sound Source Levels for Sound Projector

	J15-1 Sound Source Levels at 3 amps			
Frequency	**100 Hz**	**400 Hz**	**700 Hz**	**1,000 Hz**
dB re 1 µPa at 1 meter from sound source	175	171	169	163

The towed source would have *two* modes of operation: a pulsed mode and a continuous mode. The maximum amount of time proposed for all four tests for pulsed sound source (maximum of 175 dB) testing is 104 hours (refer to Table 1). Maximum proposed continuous sound source testing in 1,240 hours (828 hours at less than 140 dB and 412 hours at no greater than 170 dB). A support vessel would be used to tow a sound source at various depths and distances from the hydrophone array to test its listening capabilities. The sound source would be towed at speeds of 2-6 knots. The maximum sound source level would be 175 dB in waters deeper than 200 ft (61 m). The towed sound source projector would not be used in waters 200 ft (61 m) or less in depth. In addition, all active acoustic transmission would cease if divers or dive flags are observed within 0.5 mile (1 km) of the test vessel.

Inspection of the System

To inspect and repair the system, wet-end inspection and repair equipment (WIRE) would be utilized during the ocean tests. The WIRE would include deck handling equipment, internode splicing equipment, and a ROV that would be used for underwater inspections and cable retrieval. Specifically, the ROV would be used to locate a node (which would serve as a reference point) and inspect the cable for a repair; the internode cable would be cut at that point. A buoy, attached to the end of the cable, would be used so the cable could be brought to the surface and subsequently brought aboard the deployment vessel. Repairs would be made by splicing the cable using the WIRE's splicing system. The "repaired" cable would then be re-placed on the ocean floor. The ROV would be equipped with an acoustic positioning system as well as a camera and lights.

Retrieval of the System

The ROV would be used to cut the cables and attach retrieval lines to the nodes. The lines would be used to haul sections of the cable and nodes aboard. A hydraulic winch on the deployment vessel would be used to raise cables and other in-water hardware components. Retrieval of all components would occur after completion of Tests 1 and 2. The system components would then be re-deployed for Test 3, retrieved after Test 3, re-deployed for Test 4, and retrieved following Test 4. Retrieval of the components would occur within 6 months of completion of each test; however, the shore landing cable would be installed prior to Test 1 and remain in place during all four tests and be retrieved only upon completion of Test 4.

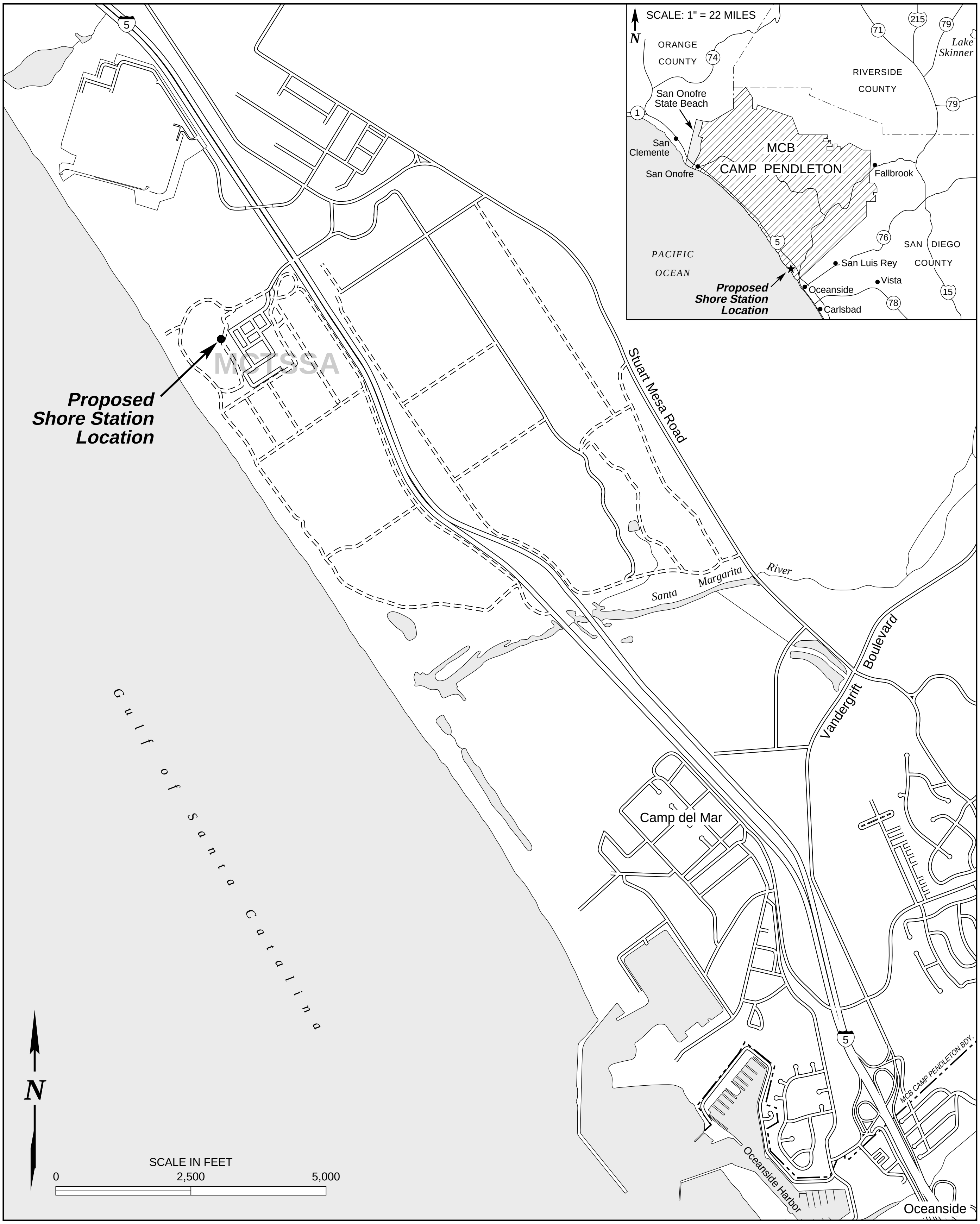
Proposed Shore Station Location

As part of implementation of the ADS ocean tests, a temporary shore station is proposed and would be used for receiving, processing, displaying, and storing data from the in-water hardware. The proposed shore station would be located within MCB Camp Pendleton property boundaries (Figure 5).

The proposed shore station site would be located on approximately 0.5 acres (0.2 hectare) within a previously disturbed area adjacent to the Marine Corps Tactical Systems Support Activity (MCTSSA) facility (Figure 6). An existing road would be used to provide access to the site. The site currently has ample space to park up to eight support ISO-vans. However, in order to utilize the site, an area of approximately 23,250 square feet (ft^2) (2,160 square meters [m^2]) would require grading to accommodate access and parking for the ISO-vans. Proposed improvements and grading activities would occur over a period of one week. In addition, the proposed shore station site would require the following improvements:

- upgrade existing access road (Grade 2 gravel);
- redirect and widen existing access road by 5 ft (1.5 m), (15 ft [4.5 m] at the curve);
- install security fencing around the proposed site;
- place gravel within the proposed fenced area; and
- construct a concrete slab to accommodate the support ISO-vans.

To use the shore station for receiving and processing the data associated with the ADS ocean tests, a cable must be connected from an offshore junction box to the shore station site. Installation of the cable would require trenching across the beach and into the surf zone to bury the cable. Approximately 111 yd^3 (85 cubic meters [m^3]) of sand would be trenched (89 yd^3 [68 m^3] along the beach and 22 yd^3 [17 m^3] in the tidal area) and then be used to bury the cable. The cable would be laid and buried at low tide about 6 ft (2 m) deep through the intertidal zone. The trench across the beach would be a maximum of 250 ft (76 m) in length and 2 ft (0.6 m) wide. From the beach, the cable would then be laid on the ground (uncovered) until it reached an existing distribution box and conduit. At that point, the cable would be placed in the 4-inch (10-cm) conduit and run through to the proposed shore station (Figure 6).



FIGURE

5

Proposed Shore Station Site Map
MCB Camp Pendleton, California

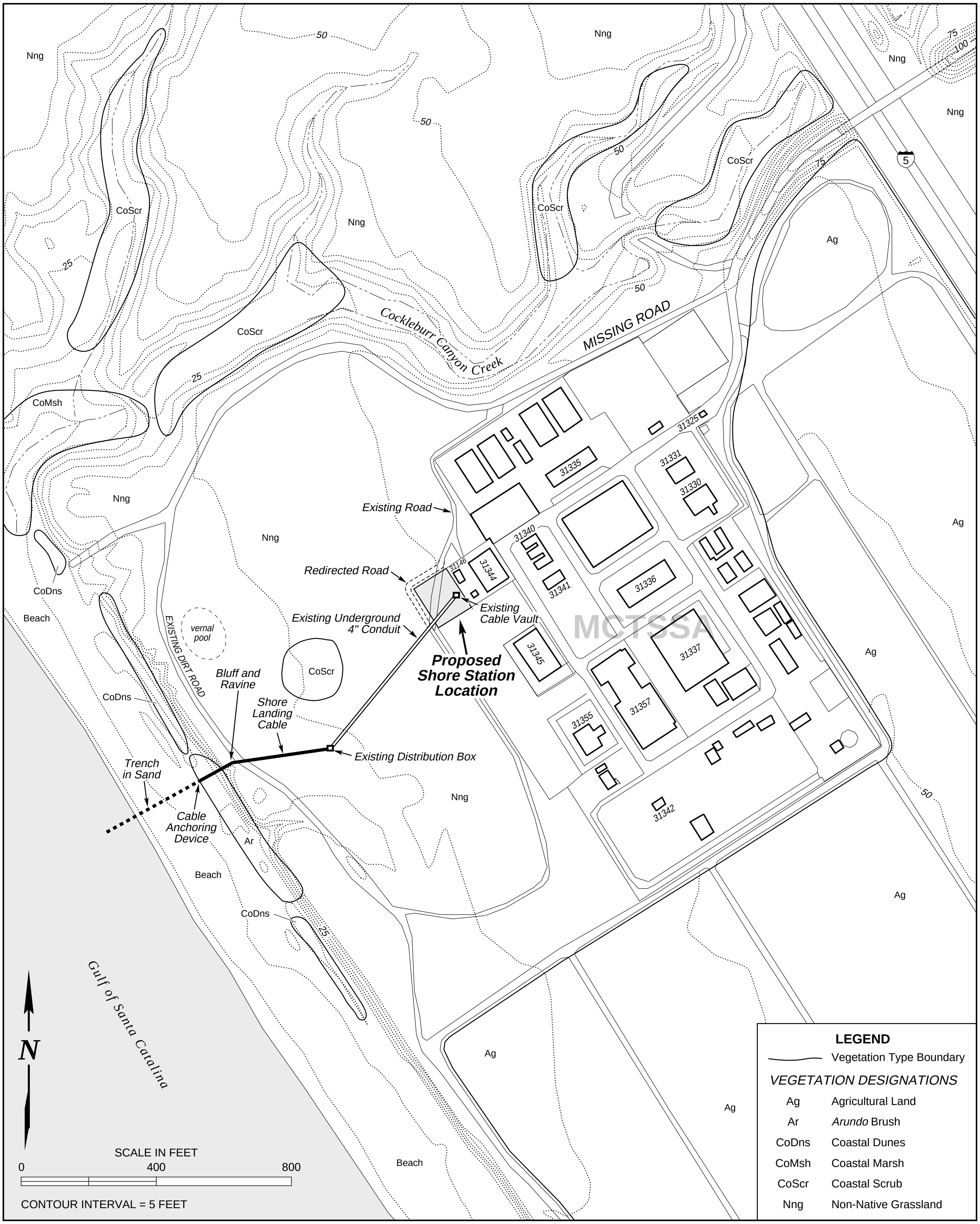


FIGURE 6

Proposed Shore Station Location Map
MCB Camp Pendleton, California

4. CONSISTENCY WITH PROVISION OF CALIFORNIA COASTAL ACT (DIVISION 20 PUBLIC RESOURCES CODE)

Since the project area is located within the coastal zone, a Consistency Determination is required for the proposed ADS ocean tests. The following Determination of Consistency is prepared in compliance with the Federal Coastal Zone Management Act of 1972, Section 307 (Title 16, U.S.C. Section 1456(c)), which states that federal actions must be consistent with approved state coastal management programs to the maximum extent practicable. Sections of the California Coastal Act of 1976 applicable to this project, as determined by the Navy, include Article 2 - Public Access (Sections 30210-30214); Article 3 - Recreation (Sections 30220-30224); Article 4 - Marine Environment (Sections 30230-30237); Article 5 - Land Resources (Section 30240-30244); and Article 6 - Development (Sections 30250-30255).

It is the opinion of the Navy, based on a review of the applicable sections of the Act and on the findings of the Environmental Assessment (EA), that the proposed action is consistent with the California Coastal Act of 1976 to the maximum extent practicable. This Determination of Consistency has been prepared with the following applicable sections of the California Coastal Act of 1976 listed below.

a. Article 1 - General (Sections 30200):

Section 30200

Implementation of the proposed shore station site would be consistent with the MCB Camp Pendleton Master Plan. The shore station site would be located adjacent to the MCTSSA facility and would be completely fenced. Implementation of the proposed shore station would not add any additional impacts on coastal zone resources.

b. Article 2 - Public Access (Sections 30210-30214):

Section 30210

Under the proposed action, public access to the shoreline would not be affected. The construction of the proposed shore station and installation of the shore landing cable would be implemented on federal property at MCB Camp Pendleton. Public access to the shoreline is currently restricted at MCB Camp Pendleton in the interest of public safety and military security. The proposed action would not interfere with existing beach access at any public beach within the identified project footprint area.

Implementation of the proposed action would potentially affect public access to coastal waters (e.g., commercial fishing, recreational fishing, and sport diving boats); however, access restrictions would be minimal. During proposed testing periods, commercial and recreational boating activities would be temporarily restricted within 0.5 mile of the test location during cable deployment and active acoustic testing. To minimize potential impacts to public access, the proposed ocean tests would be sited to avoid major shipping lanes and heavily utilized military operational areas. Also, a Notice to Mariners (NOTMAR) would be issued 48 hours before commencement of tests to give regular boat traffic ample notice prior to testing in a given area. The proposed access restrictions would not prevent recreational access to any public shoreline area or cause unnecessary hardships for commercial fishing operations. Therefore, impacts to public access would not be significant.

Section 30211

The proposed action would not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation. Public access to the sea would not be limited outside the boundaries of MCB Camp Pendleton. See response to Section 30210 above for a detailed description of potential limitations to public access.

Section 30212

Public access would be provided from the nearest public roadway to the shoreline and along the coast except where access would be inconsistent with public safety, military security needs, or the protection of fragile coastal resources. Public access from the nearest public roadway to the shoreline would be limited within the boundaries of MCB Camp Pendleton for military security needs. See response to Section 30210 above for a detailed description of potential limitations to public access.

Section 30212.5

An analysis was not provided for this section because the proposed action is not a public facility.

Section 30213

An analysis was not provided for this section because the proposed action does not involve lower-cost visitor and recreational facilities.

Section 30214

The proposed action considered public access policies to provide the maximum public access possible. See response to Section 30210 above for a detailed description of potential limitations to public access.

c. Article 3 - Recreation (Sections 30220-30224):

Section 30220

Under the proposed action, recreational opportunities within the shoreline area would not be affected. To minimize the potential for disturbance to existing recreational resources, operational and environmental constraint areas were identified within southern California and were excluded from proposed testing. Currently, a 6 nautical mile (nm) boundary comprises the Channel Islands National Marine Sanctuary (San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara islands). As part of the proposed project the existing 6 nm sanctuary boundary plus a 1 nm buffer area around the sanctuary has been established as an exclusion area. A 3 nm buffer around the other offshore islands (San Nicolas, Santa Catalina, and San Clemente islands) was also identified as an exclusion area. In addition, an exclusion area for acoustical testing would be established for diver safety so that no active acoustic transmissions associated with ADS acoustic testing would occur within waters less than 200 ft (61 m) deep. In addition, all active acoustic transmission would cease if divers or dive flags are observed within 0.5 mile (1 km) of the test vessel.

The proposed shore station and shore landing cable would be constructed on federal property at MCB Camp Pendleton. Recreational activities are currently restricted in the area of the proposed shore station at MCB Camp Pendleton in the interest of public safety and military security. The proposed action would not interfere with existing recreational facilities or activities at any public beach within the identified project footprint area.

Implementation of the proposed action would potentially affect recreational uses in offshore coastal waters. Recreational uses would be temporarily restricted within a 0.5-mile radius of the test vessel while deploying cable and towing the sound source projector for purposes of public safety and military security; however, a NOTMAR would be issued 48 hours prior to commencement of the tests to give regular boat traffic ample notice prior to testing in a given area. Although access would be temporarily restricted in the project area, notification of the proposed test area would substantially reduce potential impacts to recreational opportunities. Given the large area in which the ocean tests could occur and the limited duration of the tests, impacts to recreational uses would not be significant.

Section 30221

No oceanfront land suitable for recreational use is proposed for development under the proposed action. The proposed temporary shore station and associated facilities would be constructed within the boundaries of MCB Camp Pendleton. Upon completion of ocean tests, the shore station would be removed. Public access and recreational activities are restricted in the area of the proposed shore station site in the interest of public safety and military security. Therefore, impacts to oceanfront land suitable for recreational use would not occur.

Section 30222

No private land suitable for visitor-serving commercial recreational facilities is proposed for development under the proposed action. No private lands would be affected under implementation of the proposed action; therefore, impacts to private land suitable for visitor-serving commercial recreational uses would not occur.

Section 30222.5

No oceanfront land suitable for coastal-dependent aquaculture is proposed for development under the proposed action. Therefore, impacts to oceanfront land suitable for coastal-dependent aquaculture would not occur.

Section 30223

No upland areas necessary to support coastal recreational uses are proposed for development under the proposed action. Therefore, impacts to upland areas necessary to support coastal recreational uses would not occur.

Section 30224

No oceanfront land suitable for recreational boating use is proposed for development under the proposed action. Therefore, impacts to land suitable for support of recreational boating use would not occur.

d. Article 4 - Marine Environment (Sections 30230-30237):

Section 30230

Under the proposed action, marine resources would be adequately maintained. As discussed in detail in the EA, although the proposed ocean tests would potentially affect the marine environment, impacts would not be significant and biological productivity of coastal waters would be maintained. Potential impacts to specific marine resources (i.e., water quality, marine biology, marine mammals, and threatened and endangered species) are discussed below.

Water Quality

Under the proposed ADS ocean tests, there would be minimal physical discharges to the marine environment. All component surfaces with the potential to corrode, with the exception of drogue chute clips (discussed below), are encapsulated in a chemically inert polyurethane (rubber-like) boot, coating, or secondary housing. This encapsulation would prevent all potentially corrodible metals from contacting the environment. Since the lithium or alkaline batteries proposed for use in the ocean test components would be self-contained, closed systems, there would be no exposure of inner battery constituents to seawater and no discharges to the marine environment. In addition, all ADS components would be retrieved upon completion of testing. Therefore, proposed ADS ocean tests would not have a significant impact on water quality.

Drogue chute clips, which are used to slow the descent of the shell, are attached to each node. The clips, composed of magnesium and iron, are designed to corrode within a week in seawater. To determine the mass of the clip, it was conservatively assumed to be 99 percent iron. The clip is 0.8 x 0.8 x 0.4 inches (2.0 x 2.0 x 1.0 cm) and has a volume of 0.25 in^3 (4.1 cm^3). Since the density of iron is 7.86 grams (g)/cm^3, the mass of each clip is 1.1 ounces (32.2 g). The total number of clips to be used for all four tests over the 3-year test period is 28. Therefore, a conservative estimate of the amount of iron exposed to the marine environment, over the 3-year test period, would be approximately 31 ounces (879 g). No water quality significance thresholds exist for naturally occurring magnesium or iron concentrations, suggesting that these constituents do not pose any potential impact to aquatic organisms (USEPA 1986; SWRCB 1997). Both magnesium and iron occur naturally in seawater; magnesium is present at a concentration of 1.35 parts per thousand (ppt) and iron is found in trace amounts (less than 0.001 ppt) (Lerman 1986; Nybakken 1988). Therefore, the negligible amount of material from drogue chute clips diluted over the volume of the SCB would not result in significant impacts to water quality.

The implosion of common household-type lightbulbs would be used as a sound source for ocean testing. The lightbulbs would be lowered into the water within nylon netting to facilitate retrieval and prohibit the release of glass chards into the water; all remnants of the imploded lightbulbs would be retrieved after use. Of the materials that comprise lightbulbs, only the gas contained within the bulb would not be retained within the nylon net and, therefore, would not be retrieved after bulb implosion. Incandescent lightbulbs are filled with argon gas at approximately 1 atmosphere of pressure. Argon gas is a normal constituent of the atmosphere (0.94 percent) and is also found dissolved in seawater at a level between 0.4 and 0.7 parts per million (ppm). As an inert gas, argon does not react chemically with seawater, and assuming a conservative volume of 0.5 liter of argon per lightbulb, the increase in argon content in a cubic meter of seawater would be 0.87 ppm. This volume would be further diluted by currents, resulting in negligible increases in ambient argon levels. Therefore, impacts on water quality from the use of lightbulbs would not be significant.

Use of the shore station would require trenching and backfilling through the surf zone for placement of the shore landing cable. Trenching activities would result in resuspension and potential remobilization of sediments into the water column. However, this area is naturally dynamic (i.e., always changing due to waves) and occupied by relatively few organisms that adapt to the ever changing environment (Nybakken 1988). Therefore, trenching activities associated with the proposed shore station site would not result in a significant impact on water quality or marine sediments.

Marine Biology

Marine Flora

The ADS ocean tests would be short-term in duration (a total of 1,344 hours of active acoustic testing, inclusive of all tests over a 3-year period; refer to Table 1) and would not result in permanent alterations of marine plant composition or populations. ADS operational criteria require that the test locations be free of kelp or dense mats of benthic algae.

Historic records indicate that kelp has not been present offshore of the proposed shore station location. Other benthic marine flora may be present; however, given the small area affected by the cable and the opportunistic nature of marine plants, impacts would be less than significant.

The diameter of the ADS test cables is relatively small, ranging in size from 0.06-0.625 inch (0.15-1.6 cm). Approximately 32,504 ft^2 (3,020 m^2) of ocean floor would be in direct contact with the ADS ocean test components for Test 2. For Tests 1, 3, and 4, much shorter lengths of cable would be deployed and the average surface area of ocean bottom that would be disturbed as a result of deployment would be approximately 6,494 ft^2 (603 m^2). In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed.

ADS operational criteria require that the tests be located in a relatively smooth bottom area; therefore, the ocean tests would be sited in an area free of kelp or dense mats of benthic algae. Even if sparse vegetation were located in the region of direct influence, permanent alterations of marine plant composition or populations would not occur because of minimal contact of the cable with marine flora. Therefore, impacts to marine flora would not be significant.

Marine Fauna

The ADS ocean tests would be short-term in duration (1,344 hours of active acoustic testing over 26,280 hours [3 years] inclusive of all tests) and would not result in permanent alterations to marine fauna. Approximately 32,504 ft^2 (3,020 m^2) of ocean floor would be in direct contact with the ADS ocean test components for Test 2. For Tests 1, 3, and 4, much shorter lengths of cable would be deployed and the average surface area of ocean bottom that would be disturbed as a result of deployment would be approximately 6,494 ft^2 (603 m^2). In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed.

Potential impacts on nektonic marine animals (e.g., fish, squid, etc.) would be limited to the momentary disturbance associated with ADS components traveling through the water column prior to reaching the sea floor. Impacts would not be significant since these organisms are highly mobile. Sessile biological assemblages (e.g., infauna and epifauna) directly in contact with ADS ocean test components could be minimally affected due to the minor disruption of the sediment in contact with the ADS test components. Most benthic species have hard outer coverings (e.g., mollusks have shells, crustaceans have exoskeletons), and many benthos have the ability to live buried in the sand (e.g., worms, echinoderms). Consequently, survival would be likely even if an ADS component were placed directly on a benthic organism. This would not be considered a potential lethal effect as movement away from the component would be probable. Therefore, impact to marine fauna would not be significant. Furthermore, since no discharges of chemicals would be released into the water column or sediments, no accumulation of chemicals of known toxicological concern (refer to Section 30230, Water Quality) in marine organisms would occur.

Impacts of Underwater Sound on Fish and Fisheries

A potential issue related to the proposed tests is that production of underwater noise could affect the behavior of fish in such a way that their catchability is reduced.

Fish can hear underwater sounds and often react to them. Impacts on fish and the distances at which these behavioral impacts can occur depend on the nature of the sound, the hearing ability of the fish, and species-specific behavioral responses. Changes in fish behavior can, at times, reduce their catchability. The following discussion summarizes the ability of fish to hear sounds and the reactions of fish to those sounds. This information is then used to predict the likely impacts of the proposed ADS ocean tests on fish and fisheries.

The ADS ocean tests would emit sounds by a towed underwater sound source projector. However, the sound source levels emitted would range from 120-175 dB re 1 µPa at frequencies between 20 to 1,000 Hz. The frequencies used would be within the range at which most fish can hear best. Since sound levels would not exceed 175 dB and a sound source of 180 dB is the established threshold found to cause reduced catchability of fish or hearing damage to fish (Hastings et al. 1996) there would be no significant impacts to fish hearing or catchability.

The vessel towing the sound source would be traveling at low speed (2-5 knots) in the test area. This type of movement would cause short-term avoidance responses by some fish (Schwarz and Greer 1984; Engas et al. 1995; Misund et al. 1996). Vessels used to deploy and retrieve the equipment would also be traveling at low speeds. Fish may exhibit some avoidance response to a boat, but are expected to return to normal behavior after it moves away. Any reactions would be short-term and would be similar to fish reactions to the numerous other vessels occurring in the region. Therefore, vessel noise impacts on fish would not be significant.

Lightbulbs would be used during the acoustic testing portion of the ocean tests. The operation would consist of lowering standard, off-the-shelf lightbulbs to mid-water depth and causing the bulbs to implode, thus creating a short duration impulse of approximately 1.8 ms. Because of the very short duration of the pulse from the lightbulb source, the average received level would be below the threshold found to cause reduced catchability of fish or hearing damage to fish. Therefore, impacts on fish catchability from the proposed lightbulb implosions would not be significant.

Marine Mammals

Issues of concern related to marine mammals include the potential for (1) changes in behavior due to impacts of underwater noise associated with the proposed ocean tests, (2) attraction/ingestion/entanglement/collisions, and (3) chemical contamination. Of these, most attention is devoted to acoustic issues because marine mammals rely on hearing for foraging and communication. The main noise-producing aspects of the proposed tests are vessel operations, towed sound source projector operations, and lightbulb implosions.

The potential impacts of test activities are analyzed for three groups of marine mammals: mysticetes (baleen whales), odontocetes (toothed whales, dolphins and porpoises), and pinnipeds (seals and sea lions). Activities associated with the proposed tests will have essentially no impact on sea otters, given their extremely low numbers in the proposed test area, their restricted/nearshore distribution in waters less than 66 ft (20 m) deep (Estes and Jameson 1988, USFWS 1996), and their habit of resting (rafting) at the surface with their ears above the water roughly 50 percent of the time.

Potential Acoustic Impacts

For purposes of the acoustic analysis, the proposed frequency range for the ADS ocean tests is 20-1,000 Hz. However, the majority of testing specifically for low frequency occurs above 50 Hz. When the frequency is below 50 Hz, the maximum sound source level would be limited to 130 dB re 1 μPa-m.

As shown in Table 3, using 20 log r (which is an accepted approximation of source level measured at a given distance), received sound levels at a maximum 170 dB re 1 μPa-m continuous transmission would diminish to 160 dB re 1 μPa at about 10 ft (3 m), to 140 dB re 1 μPa at 105 ft (32 m), and 120 dB re 1 μPa at 1,050 ft (320 m). When the source level is at a maximum 175 dB re 1 μPa-m for pulsed transmission, received sound levels would diminish to 160 dB re 1 µPa at 20 ft (6 m), to 140 dB re 1 µPa at 184 ft (56 m), and to 120 dB re 1 µPa at 1,800 ft (560 m).

Table 3. Predicted Received Sound Levels Relative to Distance from Sound Source

	Received Sound Levels		
Source Level	**120 dB**	**140 dB**	**160 dB**
175 dB (pulsed)	1,800 ft (560 m)	184 ft (56 m)	20 ft (6 m)
170 dB (continuous)	1,050 ft (320 m)	105 ft (32 m)	10 ft (3 m)

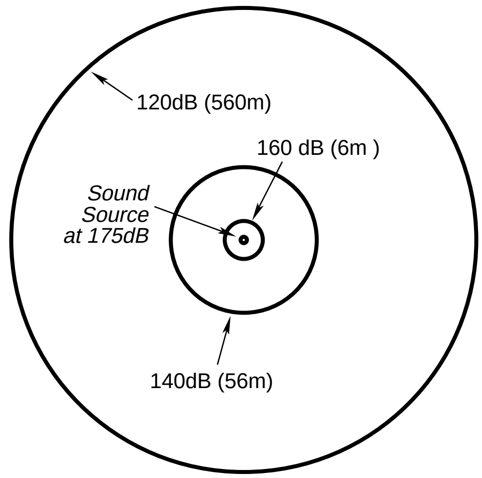
During ADS ocean tests, a sound source would be towed along predetermined paths. Potential impacts of sound on marine life depends partly on whether sounds are pulsed or continuous. An animal's response to a pulsed sound with a particular peak level can be quite different than its response to a continuous sound at the same level (Richardson et al. 1995). Corresponding zones of ensonification for maximum pulsed and continuous sound source levels for day and night operations that would affect fish and marine mammals are depicted on Figure 7.

Potential acoustic impacts of ADS ocean test operations on marine mammals vary with hearing capabilities of each major group. Odontocetes and pinnipeds have relatively poor hearing at frequencies below 1 kHz, requiring levels near 80-100 dB for signal detection. Conversely, mysticete ear structure indicates good hearing at these relatively low frequencies (Ketten 1994). Thus, mysticetes are the marine mammals having the greatest potential to be affected by signals from the towed sound source. As stated above, it is unlikely that any noise associated with ADS ocean test operations would be heard by sea otters due to their low numbers and exclusive occupation of nearshore waters.

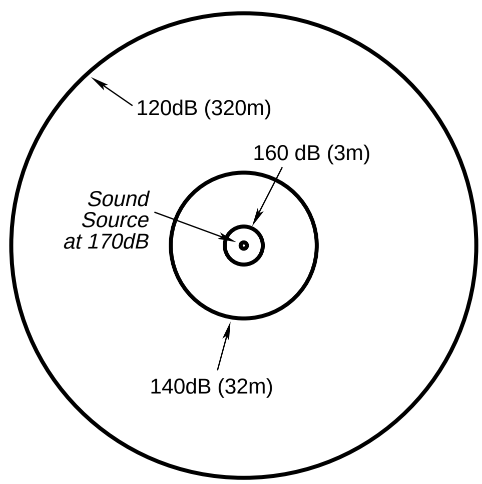
Potential Impacts from the Towed Sound Source

A support vessel would tow a sound source projector at varied depths, distances, and speeds to test the detection and tracking capabilities of the ADS hydrophone array. Tow speeds would range from 2-5 knots, with sound source projector depth generally greater than 66 ft (20 m). The towed projector would emit both pulsed and continuous sounds within the 20-1,000 Hz frequency band. The maximum source level for pulsed sounds would be 175 dB re 1 µPa-m. Continuous sounds would be transmitted in two modes: one with maximum levels at 139 dB re 1 µPa-m, and the second with maximum source level at 170 dB re 1 µPa-m. The louder transmissions are required to determine sound transmission loss within the test field, and would comprise 33 percent (i.e., 412 of 1,240 hours) of total test operations. Odontocetes and pinnipeds have relatively poor hearing at frequencies below 1 kHz, requiring levels near 80-100 dB re 1 µPa for signal detection. Conversely, mysticete ear structure indicates good hearing at these relatively low frequencies (Ketten 1994). Thus, mysticetes are the marine mammals having the greatest potential to be affected by signals from the towed sound source.

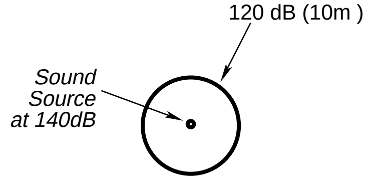
Estimated Zones of Ensonification at 175dB Pulsed Sound Source (Day/Night Operations)



Estimated Zones of Ensonification at 170dB Continuous Sound Source (Day-Only Operations)



Estimated Zones of Ensonification at 140dB Continuous Sound Source (Night Operations)



Note: All radial distances based on 20 log r.

NOT TO SCALE

FIGURE 7

Estimated Zones of Ensonification for ADS Ocean Tests at Maximum Levels

National Research Council (NRC) reported that National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NOAA/NMFS) recommended (on an interim basis) the use of sound source levels 80 to 100 dB above absolute hearing threshold as harassment levels based on annoyance or TTS (See NRC 1996). Absolute hearing thresholds for odontocetes and pinnipeds in the band of sensitive hearing tend to fall in the range 40 to 80 dB (re 1 μPa), consistent with the lowest observed ambient noise levels in those bands. There are no measurements of hearing sensitivities for mysticetes, but for the low band (below 500 Hz), noise band levels in the quietest locations generally exceed 80 dB. Based upon the NOAA/NMFS recommendation, the harassment thresholds for mysticetes would then fall in the range from about 160 dB to 180 dB (re 1 μPa), depending on species, frequency, duration, waveform, etc. NMFS is re-examining sound pressure level thresholds in the context of the definition of harassment. For this EA, the Navy will take the conservative approach of mitigating to the range at which the level is estimated to be 120 dB or less for continuous sound and 160 dB or less for pulsed sound. In this case, the ADS program can meet the testing requirements while mitigating to these very conservative sound levels.

Assuming spherical spreading loss (20 log r), the 175 dB re 1 μPa-m pulsed source level would drop to 160 dB re 1 μPa at 20 ft (6 m) from the source. The 139 dB re 1 μPa-m continuous source would drop to 120 dB re 1 μPa at 32 ft (10 m) from the source. When the continuous sound source is transmitting at a source level of 170 dB re 1 μPa-m, the range of ensonification to 120 dB re 1 μPa would extend 1,050 ft (320 m) from the source. Given this, the maximum ranges for pulsed (at 160 dB re 1 μPa) and continuous (at 120 dB re 1 μPa) sound sources are 140 yd^2 (117 m^2) and 384,845 yd^2 (321,730 m^2), respectively. Similar “proxy” received levels have not been established for odontocetes nor pinnipeds for sound exposure below 1 kHz (NRC 1994) but, as mentioned above, these groups all have comparatively poor hearing at frequencies below 1 kHz, so acoustic audibility ranges would be much smaller than those for mysticetes.

Even when the continuous source is operating at its loudest level (i.e., 170 dB re 1 μPa-m), the 120 dB contour extends only 1,050 ft (320 m) from the source. For continuous sound source transmissions above 140 dB re 1 μPa-m, at least two shipboard personnel would stand dedicated watch to detect any animals that might approach the towed source. For example, at maximum sound source transmissions of 170 dB re 1 μPa-m, if animals approach within 1,050 ft (320 m) of the ship, the sound transmissions would be stopped. For sound transmissions below 140 dB re 1 μPa-m, standard ship’s watch would be implemented.

The probability of a mysticete swimming within 20 ft (6 m) of the pulsed source without detection is low. During summer/fall when blue, fin, and humpback whales feed in the proposed ADS ocean test location, they are generally concentrated in waters modified by upwelling south of Point Conception (Figure 8), where prey are plentiful (Fiedler et al. in press). A conservative scenario for mysticetes, based on potential numbers of animals in

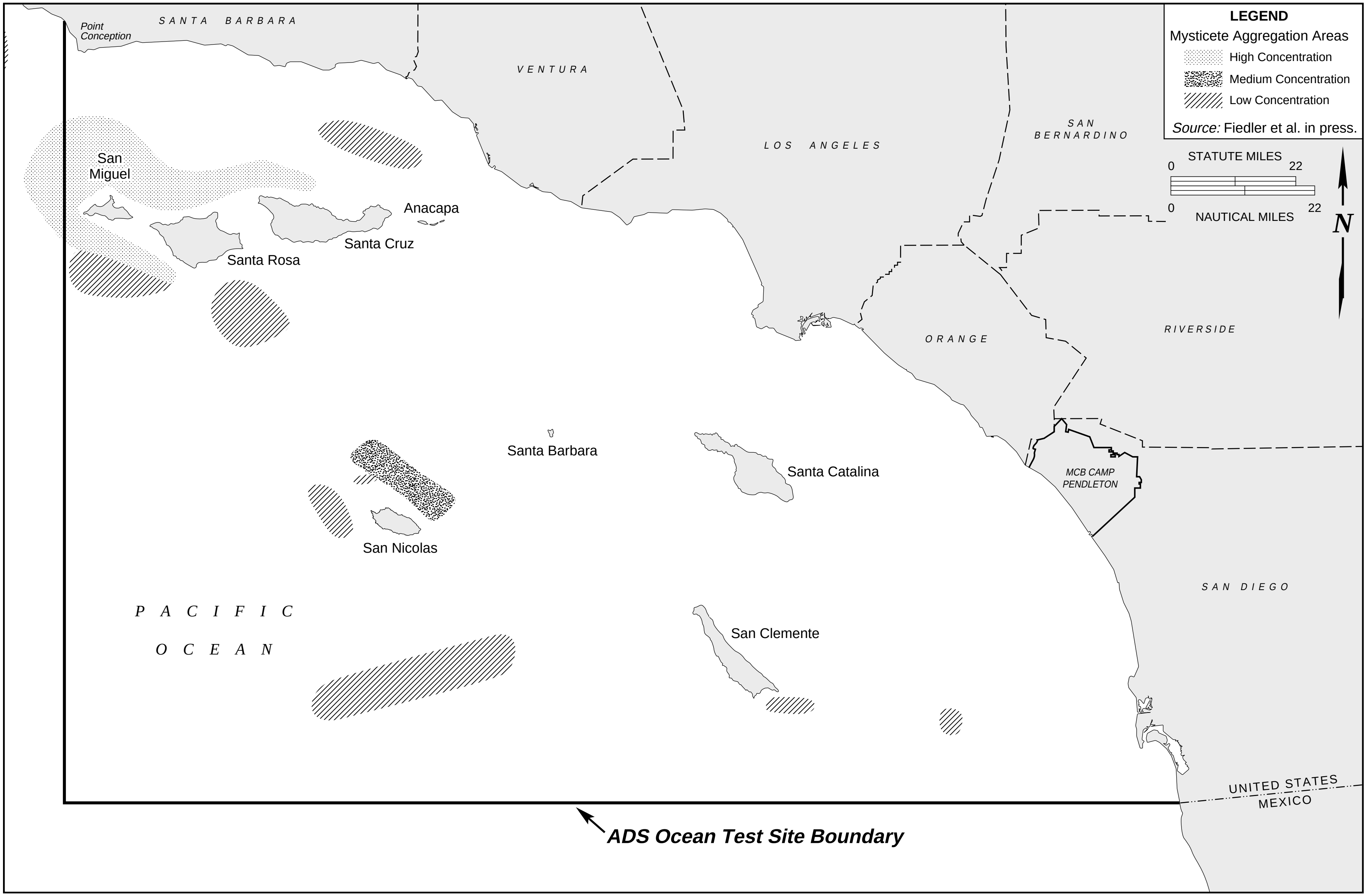


FIGURE 8

Mysticete Aggregation Areas – Summer/Fall
Southern California Bight

the test area, would be the occurrence of comparatively high numbers of gray whales during their south- and north-bound migrations in winter/spring. Forney et al. (1995) provides a density estimate of 0.0145 gray whales/km2 for a region approximating the proposed test area in winter/spring. Using the previously calculated area of the 120 dB contour for the 170 dB 1 μPa-m continuous source of 384,845 yd^2 (321,730 m^2), and the conservative assumption of uniform whale distribution, a maximum of 0.0047gray whales could be exposed to a received level of 120 dB (i.e., 0.3217 km^2 x 0.0145 gray whales/km^2 = 0.0047). Even though the number of gray whales potentially exposed to a received level of 120 dB re 1 μPa is small (0.0047), visual watch mitigation measures would be implemented during sound transmissions to ensure that a gray whale would not be exposed to continuous sound levels in excess of 120 dB re 1 μPa.

Gray whales, of course, are not distributed uniformly during migration, but are clustered near the shoreline of California and the Channel Islands (Poole 1984; Jones and Swartz in press). Available data suggest most south-bound animals (65-80 percent) remain on a southerly course after passing Point Conception and migrate primarily along the western coasts of the Channel Islands. Gray whales aggregate near inter-island channels and submerged rocky outcroppings offshore the northern Channel Islands (Jones and Swartz in press), with main migration pathways along the western coasts of the southern Channel Islands (Sumich and Show in press; Figure 9). The ADS laydown area would not overlap gray whale aggregation areas, but would coincide with portions of the migration pathway during the migration seasons . Avoidance of mysticete feeding and aggregation areas, in combination with proposed mitigation measures, would result in insignificant biological impacts to mysticetes associated with towed sound source emissions.

<u>Potential Impacts from Imploding Lightbulbs</u>

The implosion of one lightbulb produces a single 1.8 ms pulse, with a peak source level that can range from 159-216 dB re 1 μPa-m at primary resonance frequencies of 130-876 Hz and depths of 23-705 ft (7-215 m) (Heard et al. 1997). Lightbulb implosions are considered independent events given the instantaneous nature of the pulse and the time (20-30 minutes) between implosions. As discussed above, the potential impacts of anthropogenic noise on marine mammals depends in part on whether the sounds are transient or continuous. Marine mammal responses to a pulsed sound with a particular peak level can be quite different than responses to a continuous sound at the same level (Richardson et al. 1995; Richardson and Wursig 1997).

Recent research indicates that the pulse rise time (the rate at which pressure increases to its peak) may be the key factor when considering harm to marine mammals (ONR 1998). To create the pulse from a lightbulb implosion, water pressure pushes inward, as compared to outward pressure generated by an explosion. For example, an explosion of 0.5 kg reaches a peak pressure of approximately 267 dB re 1 μPa-m within about 0.001 ms (Richardson et al. 1995). Conversely, the rise time for lightbulb implosions is on the order of 0.5 ms, or roughly 500 times slower (longer) than the rise time associated

Figure 9. Gray Whale Winter/Spring Aggregation Areas and Main Pathways - Winter/Spring Southern California Bight

with explosions. In addition, the peak pressure produced by a lightbulb implosion is much lower (maximum = 216 dB re 1 μPa-m) than the peak pressure produced by an explosion (Note: 215 dB is one-thousandth the pressure of 275 dB.). In summary, the lightbulb implosion reaches a comparatively low peak pressure (216 dB re 1 μPa-m) within 0.5 ms, as compared to the 267 dB re 1 μPa-m peak pressures in about 0.001 ms from small explosions. Also, in the case of imploding lightbulbs, peak levels would last for only 1.8 ms and would not in themselves be harmful to marine mammals. Thus, if a marine mammal were exposed to a single pulse generated from one imploding lightbulb, a momentary startle, but not harm, could occur. It is the interpretation of NMFS (1995, 1997) that a momentary startle response would not constitute harassment and would not result in a "take" of any marine mammal. Therefore, impacts to marine mammals as a result of lightbulb implosions would not be significant.

Masking Effects

Masking is a natural phenomenon whereby a sound source becomes inaudible if sufficiently far away, or when increased background noise reduces the distance over which a listener can detect calls or other sounds of interest. The following subsections provide specific assessments of the potential for masking by vessel operations, towed sound source projector operations, and lightbulb implosions during the proposed ADS ocean tests.

Masking by Vessel Operations

The two vessels to be used during the proposed ADS ocean tests would be of moderate size and power as compared with the many other vessels operating in and near the test areas. Due to the ADS ocean tests operational requirements, project vessels would operate mainly at low speeds, thus reducing noise emissions and any possibility of collision with marine mammals. Vessels would operate, as required, a maximum of 265 days during a 3-year period (with 1,344 hours of active acoustic testing), inclusive of all four tests. Vessel noise would occur primarily at low frequencies (i.e., less than 1 kHz), which would overlap the dominant components of mysticete, but not odontocete, calls (Richardson et al. 1995). Most communication, and all echolocation calls of odontocetes are at frequencies well above those associated with vessel noise. In addition, audiograms and ear structure indicate that most odontocetes have poor hearing at frequencies below about 1 kHz (Ketten 1994). Specifically, recent studies have determined that hearing threshold was roughly 140 dB re 1 μPa for a pure-tone signal at 75 Hz for a false killer whale and a Risso's dolphin (Au et al. 1997). Thus, environmental sounds important to most toothed whales are presumably also at frequencies higher than those of the strong components of vessel noise. Therefore, vessel operations would not have significant masking effects for odontocetes.

Vessel noise would overlap frequencies of mysticete calls. This could result in some temporary reduction in the radius around a calling whale within which its calls could be heard by another animal. However, characteristics of whale calls, and variability in calling behavior, would likely mediate any potential problem. For example, blue and fin whales produce most of their calls at about 20 Hz, frequencies below those commonly associated with propeller cavitation tones (40-50 Hz), the dominant spectrographic feature of vessel noise. Humpback whales produce complex sounds across a wide frequency band, such that their calls would not likely be masked by tonal peaks of vessel noise. Gray whales appear to call infrequently and, in breeding lagoons, have been shown to modify their calls with changes in the ambient noise environment (Dahlheim et al. 1984). Overall, with respect to planned test activities, vessel noise should not have any significant biological consequences for mysticetes for the following reasons:

- The noise associated with project vessels would be a negligible increment to the total vessel noise that is encountered by any whales occupying the test areas.

- The vessel sounds would be less than 175 dB re 1 μPa-m because of the typical slow speed of the vessels during the proposed ADS ocean tests.

- The duration of vessel operations in any one area would be relatively brief given the need to move to different locations to accommodate various test activities.

Masking by vessel noise does not seem to be a significant problem for pinnipeds, given their frequent proximity and lack of response to vessels of a variety of classes (Richardson et al. 1995). There is some overlap between the frequencies important to pinnipeds and the underwater noise emitted by moderate-sized vessels. However, the predominant frequencies of most pinniped calls, and the frequency range of best auditory sensitivity described for pinnipeds, are higher than the dominant frequencies of underwater sound from moderate-sized vessels. Therefore, as for odontocetes, vessel activities associated with the proposed ADS ocean tests would not present significant masking effects for pinnipeds.

Masking by the Towed Sound Source Projector

It is unlikely that signals associated with the towed sound source projector would mask acoustic signals important to whales (odontocetes and mysticetes) for the same reasons as those given for vessel noise. Signals from the towed sound source projector share many of the attributes of vessel noise (i.e., levels to 175 dB re 1 μPa-m at frequencies less than 1 kHz). Therefore, sounds emitted by the projector would not have a significant masking effect on odontocetes because they would be at frequencies below almost all of the sounds important to toothed whales. In addition, during pulsed-sound projection, signals would consist of a 0.25- to 10-second signal separated by seconds to hours or days between signals. For continuous sound source transmission and vessel noise, the continuous sound source signals overlap frequencies of mysticete whale calls, which could result in some temporary masking of signals important to those whales. However, as with vessel noise, characteristics of whale calls and variability in calling behavior would likely mediate any potential problems. The projected sounds would be no stronger than those of many vessels, and both mysticetes and odontocetes commonly tolerate vessels transiting as close as a few hundred meters away (Richardson et al. 1995). Given these factors, masking effects of the projected sounds on mysticetes or odontocetes would not result in acoustic harassment and therefore would not be significant.

Similarly, signals emitted by the towed source would not pose a significant masking problem for pinnipeds given that:

- projected sound levels, whether pulsed or continuous, would be no higher than those emitted by many ships;
- boat sounds do not seem to be a problem for pinnipeds;
- during pulsed-sound emissions, pinnipeds would be able to detect other signals between pulses; and
- projected sounds would be strong in any one location for limited periods.

Masking by Lightbulb Implosions

Based on the duration of sound produced by the breaking lightbulbs (1.8 ms pulse), masking would not occur for any marine mammal species (see previous discussion in Section 4.5.2, Acoustic Sources).

Summary of Potential Masking Effects

In summary, vessel and, to a lesser degree, towed sound source operations may cause some minor masking of sounds relevant to mysticetes. No masking would occur from lightbulb implosions due to their brevity. Given the limited area of potential impact, the low likelihood of encountering marine mammals during test operations, and the negligible consequences resulting from potential masking during the ADS ocean tests, impacts would not be significant and would not constitute a “take” by harassment as defined by the MMPA.

Disturbance Impacts

As described elsewhere, the proposed tests would include vessel operations, sequences of pulsed and continuous low-frequency sounds to test the ADS receiving equipment, and brief sound pulses associated with lightbulb implosions. For each major group of marine mammals in the region, this section:

- summarizes what is known about the responses to these types of sounds, based primarily on the review of Richardson et al. (1995); and

- evaluates the expected disturbance impacts of each of these types of sound as they would occur during the proposed ADS ocean tests.

Disturbance to Mysticetes (Baleen Whales)

In general, reaction thresholds of mysticetes to anthropogenic sounds are usually well above the assumed threshold for detection. However, reaction thresholds vary widely depending on the type of noise and other circumstances. Reaction thresholds can be low for “threatening” or variable sounds (e.g., an approaching boat with received noise level less than 100 dB re 1 μPa), higher for continuous sounds (e.g., industrial noise with received levels near 120 dB re 1 μPa), and much higher for regularly repeated, short pulsive signals (e.g., seismic exploration with received levels near 160 dB re 1 μPa). In all situations, there is considerable variation in responses among individual whales.

Vessel Operations

Mysticetes show highly variable reactions to boats, ranging from approach to indifference to active avoidance (Richardson et al. 1995; Richardson and Wursig 1997). In general, baleen whales usually tolerate and may even approach idling or slowly moving vessels, especially when the vessels do not head toward the whales, nor change course, speed, or propeller setting. In these cases, whales generally do not react conspicuously at distances exceeding about 980 ft (300 m), and often tolerate closer approaches. In contrast, whales often interrupt their prior activities and dive or swim rapidly away from vessels that are approaching directly at high speed or maneuvering nearby. In these latter cases, reaction distances can range up to several kilometers, and the received sound levels eliciting the reactions can sometimes be quite low (e.g., less than 100 dB re 1 μPa). However, even the reactions to direct vessel approaches are short-term in nature. The best example of this is the continued occupancy by mysticetes of busy shipping lanes and fishing grounds in many parts of the world.

The two vessels that would be used during the proposed ocean tests are of moderate size and power as compared with the many other vessels operating in and near the test areas. Project vessels would operate mainly at low speeds within a specific test area, thus reducing noise emissions and potential disturbance impacts. Project vessels would not purposefully approach baleen whales, and it is unlikely that a baleen whale would approach the vessels. In the unlikely event that an animal is present, vessel disturbance impacts would be unlikely due to the planned consistency (i.e., lack of erratic movements) of test vessel operations. Consequently, vessel operations associated with the proposed ADS ocean tests would not result in significant disturbance impacts on mysticetes.

Towed Sound Source Projector

Reactions of mysticetes to several types of steady, low-frequency anthropogenic noise sources have been studied (Richardson et al. 1995; Richardson and Wursig 1997). In general, whales tend to tolerate exposure to these types of sounds when the received level is low, that is, not more than 10-20 dB re 1 μPa above the prevailing ambient noise conditions in the corresponding bandwidth. Because baleen whale hearing is believed to be acute at these low frequencies (Ketten 1994), it is assumed that they tolerate rather than simply not hear, these low-level anthropogenic sounds. At higher received levels (e.g., 20-30 dB re 1 μPa above ambient), increasing proportions of whales show subtle or conspicuous changes in behavior, sometimes including short-term avoidance of an area. Reaction thresholds vary considerably depending on the physical situation, the activity of the whales, and among individual whales. Some whales react to steady anthropogenic sounds only a few decibels above ambient, while others show no overt reactions to received levels 20-30 dB re 1 μPa above ambient. In general, behavioral reactions to continuous low-frequency sounds often become evident at overall received levels near 120 dB re 1 μPa, and usually are conspicuous at overall received levels near 140 dB re 1 μPa (Richardson et al. 1995).

Mysticete responses to pulsed low-frequency signals associated with marine seismic exploration have been comparatively well studied (Richardson et al. 1995; Richardson and Wursig 1997). Compared to the pulsed signals associated with the proposed ADS ocean tests, seismic exploration requires pulses with much higher sound source levels (to 232 dB re 1 μPa-m for a single large airgun; to 259 dB re 1 μPa-m for a full array), shorter durations, and wider spacing. During observational studies on gray, humpback, and bowhead whales, received levels of seismic pulses had to be quite high (roughly 160-170 dB re 1 μPa) before conspicuous disturbance reactions were evident (Richardson et al. 1986). Although the duration and location of operations would vary among tests, in each case, potential disturbance impacts on mysticetes would be avoided by implementation of mitigation measures. Therefore, the range of potential impacts addressed above would not constitute a "take" by harassment as defined by the MMPA.

Lightbulb Implosions

Reactions of mysticetes to lightbulb implosions would be limited to a brief startle reaction at most. Any momentary reaction would have no lasting consequences for the whales and would not constitute a "take" by harassment as defined by the MMPA.

Disturbance to Odontocetes (Toothed Whales)

As for mysticetes, odontocete reaction thresholds are generally well above detection thresholds in instances where responses to anthropogenic noise have been described. Reactions can be quite variable, from attraction to active avoidance of noise sources. Examples germane to the proposed ADS ocean tests are provided below.

Vessel Operations

Small- and moderate-sized odontocetes inhabiting littoral waters may show either attraction to or avoidance of boats, depending on species and circumstances. Many species of dolphins and some porpoises (e.g., Dall's porpoise) often approach vessels and ride their bow waves. At other times the same species show at least minor avoidance reactions to vessels, especially if they associate the vessel with harassment (Au and Perryman 1982). Harbor porpoises tend to move away from approaching boats (Polacheck and Thorpe 1990). Killer whales and various dolphin species, although often seen from boats, sometimes exhibit subtle tendencies to avoid approaching vessels (Richardson and Wursig 1997). Although some odontocetes have been reported to show strong avoidance of vessels at ranges up to a few kilometers, these were special cases that usually involved animals that had previously been chased or otherwise harassed by boats. With the probable exception of boats that purposefully approach toothed whales, there is no evidence that routine operations by small and moderate-sized boats cause deleterious disturbance impacts to odontocetes in littoral waters (Richardson et. al 1995).

The two vessels associated with the proposed ADS ocean tests would operate mainly at low speeds due to test requirements, thus reducing noise emissions, potential disturbance impacts, and the likelihood that odontocetes would approach the vessels to bow-ride. Thus, vessel disturbance impacts on toothed whales during the proposed tests would result in negligible consequences to the animals, and would not constitute a "take" by harassment as defined by the MMPA.

Towed Sound Source Projector

Reactions of odontocetes to steady low-frequency anthropogenic noise have not been studied extensively. In one study, captive beluga whales showed very little reaction to playbacks of recorded low-frequency drilling sounds even when received levels were as high as 153 dB re 1 μPa (Thomas et al. 1990). During the Heard Island Feasibility Test, hourglass dolphins were commonly seen in waters where the level of the 57 Hz test sounds was near 160 dB re 1 μPa (Bowles et al. 1994). There have been a few reports of free-ranging odontocetes that apparently showed localized avoidance of areas strongly ensonified by low-frequency drilling or dredging sounds. However, responses and sound exposure levels were not well quantified, and in some cases there was considerable tolerance of strong continuous low-frequency sounds (Richardson et al. 1995). In general, disturbance thresholds for odontocetes exposed to steady low-frequency sounds are poorly documented but seem high. This is probably related to the high hearing thresholds of most toothed whales at frequencies below 1 kHz.

Similarly, there are few reports of odontocete responses to pulsed low-frequency sound in littoral waters. Seismic operators occasionally see dolphins near airgun arrays where received sound levels must be quite high, and there is some evidence of localized avoidance of such arrays (Mate et al. 1994; Arnold 1996; Goold 1996). The relevance of these observations to the proposed ADS ocean tests is uncertain, as seismic survey sounds are generated at much higher sound source levels, are shorter, and have longer intervals between pulses than the pulsed sounds proposed for use during the ADS ocean tests. In general, odontocetes apparently are not strongly disturbed by low-frequency pulsed sounds, again probably because of their high hearing thresholds at low frequencies. Overall, predicted disturbance impacts on toothed whales, both by the continuous and pulsed emissions from the towed sound source projector, are expected to be negligible with no significant consequences to odontocetes.

Lightbulb Implosions

Reactions of toothed whales to the lightbulb sound source system would be limited to a brief startle reaction at most. Any momentary reaction would have no lasting consequences for the animals and would not constitute a "take" by harassment as defined by the MMPA.

Disturbance to Pinnipeds (Seals and Sea Lions)

As for cetaceans, there are few quantified reports of pinniped responses to anthropogenic noise. Where information is available, it appears that pinniped reactions to noise are quite variable, ranging from tolerance to flight, as summarized below.

Vessel Operations

Although the reactions of pinnipeds hauled out on land (or ice) to nearby boats have often been described, there is very little information about reactions of seals and sea lions in the water to approaching vessels (Richardson et al. 1995). Sea lions in the water often tolerate close and frequent approaches by vessels, and often congregate around fishing boats. Other species of pinnipeds have been sighted in proximity to both commercial and recreational vessels. Indeed, Kastak and Schusterman (1998) conclude that low-frequency thresholds obtained from California sea lions suggest that this species is "relatively insensitive to the frequencies associated with most types of anthropogenic sound in the ocean." Thresholds for harbor seals were about 20 dB re 1 μPa more sensitive at 100 Hz, indicating that phocids have more sensitive amphibious hearing than otariids (Kastak and Shusterman 1998). Northern elephant seals had the best amphibious hearing of the three species tested, suggesting this species would likely hear vessel operations associated with ADS ocean tests in the proposed test area. However, the laydown area would be sufficiently distant from elephant sea haul-out beaches on the Channel Islands that impacts from such "hearing" are unlikely. Overall, because vessels associated with the ADS ocean tests are of moderate size and would move at slow speeds, noise associated with vessel operations would not be expected to have a significant impact on pinnipeds in the water.

When hauled out, pinnipeds are more responsive but rarely react unless a boat approaches within 330-660 ft (100-200 m). Hauled out harbor seals sometimes become alert when a boat approaches within 495-990 ft (150-300 m), and may move into the water if the boat comes closer. Since the project vessels would not approach terrestrial haul-out sites, no such disturbance events would occur.

Towed Sound Source Projector

Reactions of pinnipeds to continuous low-frequency sounds have rarely been reported. However, ringed and bearded seals exposed to low-frequency drilling sounds at received levels as high as 130-140 dB re 1 μPa showed little if any avoidance (Richardson et al. 1995). Although associated noise levels were not reported, sea lions were reported as "common" around oil production platforms offshore California and Alaska (Gales 1982). Harbor seals and California sea lions often tolerate high received levels (140+ dB re 1 μ Pa) of higher-frequency sound (see next subsection), even though their hearing appears more sensitive at those frequencies (refer to Figure 3-9).

Strong low-frequency noise pulses used in attempts to scare pinnipeds away from fishing nets or fish ladders sometimes cause brief startle reactions, but habituation is rapid (Mate and Harvey 1987). Sound source levels of these devices commonly range from 185-195 dB re 1 μPa-m. Sea lions in particular are very tolerant of strong noise pulses, especially when attracted to an area by prey (Richardson et al. 1995). Both phocids and otariids show considerable tolerance of the strong pulses from marine seismic exploration. Reactions are, at most, subtle and inconsistent even at distances as close as a few hundred meters, where received levels of the seismic pulses are on the order of 190 dB re 1 μPa (Arnold 1996).

Because pinnipeds show tolerance, and often habituate, to strong low-frequency sound, the predicted disturbance impacts on pinnipeds from the towed sound source projector during the proposed ADS ocean tests would be insignificant and not constitute a "take" by harassment as defined by the MMPA.

Lightbulb Implosions

Reactions of pinnipeds to lightbulb implosions would be limited to a brief startle reaction at most. Any momentary reaction would have no lasting consequences for the animals and would not constitute a "take" by harassment as defined by the MMPA.

<u>Summary of Potential Disturbance Impacts</u>

Vessel and emissions from the towed sound source projector may cause minor disturbance to some mysticete whales, but probably not to odontocetes or pinnipeds. Lightbulb implosions may cause a brief startle response to all marine mammals, but in all cases the consequences would be negligible. Given the negligible consequences of minor disturbance, the limited area of potential impact, and the low likelihood of a marine mammal being present during the proposed tests, impacts are not expected to be significant and would not constitute a "take" by harassment as defined by the MMPA.

Hearing Damage

In humans and other terrestrial mammals, exposure to high levels of sound within the frequency range to which the auditory system is sensitive can lead to temporary reduction in sensitivity, termed Temporary Threshold Shift (TTS). If the noise exposure is sufficiently prolonged, or the level is sufficiently high, the noise can cause permanent hearing impairment, termed Permanent Threshold Shift (PTS).

There is little direct information about the levels of noise necessary to cause TTS or PTS in marine mammals. Recently, Ridgway et al. (1997) reported preliminary results of the first TTS experiments with bottlenose dolphins. After baseline masked-hearing thresholds were obtained, TTS was induced in each of four dolphins using high-amplitude 1-second pure-tone-bursts at three discrete frequencies: 3 kHz, 20 kHz and 75 kHz. Temporary threshold shifts were observed above 194-201 dB re 1 µPa at 3 kHz, 193-196 dB re 1 µPa at 20 kHz, and 192-194 dB re 1 µPa at 75 kHz. Of note, agitation by the dolphins was observed at levels above 186 dB at 3 kHz, 181 dB at 20 kHz, and 178 dB at 75 kHz (all dB re 1 µPa). Ridgway et al. (1997) conducted the experiments specifically to address auditory criteria for three Navy sonars, and cite the need for additional research, including replication and testing across greater frequency ranges and with additional species. Overall, however, the preliminary results indicate that for bottlenose dolphins, TTS is lower at higher frequencies.

For pinnipeds, the only specific information on noise-induced TTS or PTS is for a harbor seal (Kastak and Schusterman 1996). This seal was intermittently exposed, over a 6-day period, to airborne noise from sandblasting. The received level was 90-105 dB re 20 µPa overall, and 75-90 dB re 20 µPa in the ½-octave band centered at 100 Hz (please note use of in-air standard reference level of 20 µPa versus the 1 µPa reference used for underwater sounds). Immediately after this noise exposure, the seal's in-air hearing threshold at 100 Hz was increased by 8 dB above the pre-exposure thresholds (i.e., 72 versus 64 dB re 20 µPa), and the seal had more difficulty in determining the presence or absence of the 100 Hz test tone. Complete recovery occurred by 1 week after the end of the noise exposure, indicating that hearing impairment was temporary, not permanent. Of note, TTS was evident at 100 Hz, even though the received level of sandblasting noise in the ½-octave band near 100 Hz was only about 10-25 dB above the normal hearing threshold at that frequency. Kastak and Schusterman (1996) speculate that the TTS at 100 Hz was related to higher received noise levels at lower or higher frequency bands.

The likelihood of TTS and PTS is briefly addressed in the following subsections, based on frequency-band and source levels of the ADS ocean test-related noise sources.

Vessel Operations and Towed Sound Source Projector

No TTS or PTS is expected for any marine mammal exposed to sounds from project vessels or sounds transmitted from the towed sound source projector. As described in previous sections, these sounds are all low frequency (less than or equal to 1 kHz) with maximum source levels at 175 dB re 1 μPa-m. At locations a few meters from the sound source, overall received levels would be less than 160 dB; i.e., levels at which whales might respond to, but not experience damage by noise. At 3 kHz, bottlenose dolphins responded negatively to received levels of 186 dB re 1 μPa, but did not exhibit TTS until exposed to sound at 194 dB re 1 μPa and higher. At their source, the less than or equal to 1 kHz sounds from the vessels and towed sources are a full 20 dB re 1 μPa below the TTS level, and 12 dB re 1 μPa below agitation levels, suggesting there is no possibility of TTS nor agitation in odontocetes. Although not yet tested for TTS underwater, one might expect TTS in pinnipeds at somewhat lower received levels based on comparison audiograms depicting pinniped and odontocete hearing at 1 kHz. Although otariid thresholds are only approximately 5 dB re 1 μPa lower than odontocetes at 1 kHz, phocid thresholds are roughly 15-20 dB re 1 μPa lower than those of odontocetes. Still, a harbor or elephant seal would have to be right at the source and remain there for repeated exposures to induce TTS, which is extremely unlikely.

As discussed earlier, mysticetes are the marine mammals thought to have the "best" hearing at frequencies less than or equal to 1 kHz. Still, because TTS requires comparatively long-term exposure to noise, the likelihood of any TTS or PTS to mysticetes is extremely remote. Rorquals, including blue, fin, Bryde's, and minke whales, are comparatively fast-swimming mysticetes (approximately 5-7 knots), humpbacks somewhat less so (approximately 4-5 knots), while northern right whales and gray whales are comparatively slow swimmers (approximately 2-5 knots). As mentioned earlier, the ADS laydown area would be away from areas of concentration for all these species, so no long-term exposures to vessel noise or towed sound source projector transmissions is anticipated. Even a very slow-swimming (2 kts or 3.7 km/hr) mysticete passing through the ADS operational area during transmission of the 170 dB re 1 μPa-m continuous source would pass through the 1,050 ft (320 m) radial zone defining the 120 dB re 1 μPa boundary in roughly 10 minutes (i.e., swimming 640 m at approximately 62 m per minute). The swimming speed used in this hypothetical example is roughly half that reported by Swartz and Jones (1987) for migrating whales. In addition, the dedicated watch, which will accompany transmission of the 170 dB re 1 μPa-m continuous source, will serve to insure that mysticete whales are not exposed to loud sounds for periods long enough to cause TTS or PTS. Overall, due to comparatively low source levels, visual mitigation during continuous transmission, and short exposure times during pulsed transmissions, there is no possibility of TTS or PTS to mysticete whales during the ADS ocean tests.

Lightbulb Implosions

The implosion of lightbulbs during ADS testing would produce brief (1.8 ms) sound pulses, with comparatively slow rise times. The potential for hearing damage is associated with rapid rise time to high peak level, or prolonged exposure to high sound levels. The relatively long (i.e., slow) rise time for lightbulb implosions, in addition to the brief duration and relatively low peak pressure produced (compared to other explosive sources), would not cause TTS or PTS to any marine mammal.

Summary of Potential for Hearing Damage

In summary, vessel and towed sound source projector operations would not cause PTS in any marine mammal, or cause TTS in any odontocete; TTS is extremely unlikely for phocids and mysticetes. In addition, lightbulb implosions would not cause TTS or PTS in any marine mammal. Therefore, impacts would not be significant and would not constitute a "take" by harassment as defined by the MMPA.

Summary of Potential Acoustic Impacts

Potential acoustic impacts of ADS ocean test operations on marine mammals vary with hearing capabilities of each major group. For example, mysticete whales may hear noise from both the project vessels and the towed sound source projector. However, maximum source levels for the pulsed sources (175 dB re 1µPa-m) and continuous sources (170 dB re 1µPa-m) are such that the area ensonified to levels above 160 dB and 120 dB, respectively, is comparatively small. The visual watch, which would accompany sound transmissions, would ensure that mysticetes would not be adversely affected by pulsed or continuous sounds produced by the towed sound source projector. It is unlikely that odontocetes or pinnipeds would be affected by either vessel or towed sound source projector noise due to comparatively poor hearing at frequencies less than or equal to 1 kHz. In addition, due to their short duration, lightbulb implosions pose no risk to mysticetes. As stated at the outset, it is quite unlikely that any noise associated with ADS ocean test operations would be heard by sea otters due to their low numbers and exclusive occupation of coastal waters.

In summary, acoustic impacts from the ADS ocean tests are not predicted to result in a "take" by harassment of any marine mammal as defined by the MMPA. It is the interpretation of NMFS (1995, 1997) that minor changes in behavior do not constitute harassment under the MMPA. Furthermore, since the 1994 MMPA amendments were adopted, NMFS has not expressed an interest in requiring take permits for vessels and associated acoustics, or for common vessel devices that employ active acoustics such as fish finders. Although the behavioral responses of marine mammals to low-frequency anthropogenic noise have been the focus of recent study (e.g., Bowles et al. 1994; Au et al. 1997), there as yet are no firm conclusions as to specific noise levels that constitute "take" by harassment as defined by the MMPA. Based on the best-available data, marine mammal reaction to the noise-producing elements of the ADS tests would not be significant and all potential impacts would be below the threshold requiring incidental take authorization. NMFS has concurred with the conclusions of the ADS impact analysis and proposed mitigation measures, and has recommended that the Navy not obtain an incidental harassment authorization under the MMPA.

Mitigation Measures for Acoustic Issues

The proposed ADS ocean tests are not intrusive and have been designed to minimize environmental impacts, including potential impacts to marine mammals. Although acoustic impacts associated with the proposed tests would be negligible, the following mitigation measures would be adopted to ensure that the ADS ocean tests would have no significant impacts on marine mammals (Table 4).

Table 4. Mitigation Measures for Marine Mammals during ADS Ocean Tests Acoustic Transmissions

Acoustic Source		Watch Type[1]		
Continuous	**Pulsed**	**Ship's**	**Dedicated**	**Operations Curtailed[2]**
< 140 dB		√		Any marine mammal within 33 ft (10 m)
140-170 dB[3]			√	Mysticetes within: 1,050 ft (320 m) @ 170 dB 330 ft (100 m) @ 160 dB 105 ft (32 m) @ 150 dB 33 ft (10 m) @ 140 dB
140-170 dB[3]		√		Pinnipeds or odontocetes within 1,050 ft (320 m) for more than 0.5 hour
	160-175 dB	√		Any marine mammal within 33 ft (10 m)

[1]A ship's or dedicated watch will begin 20 minutes before the start of any acoustic transmission and will continue for the duration of the transmission.
[2]Operations would also be curtailed if sea turtles are observed.
[3]Acoustic transmission during daylight hours only.

For continuous sound source transmissions, a ship's watch by operations personnel would be conducted at all times during transmissions less than 140 dB. Operations would be curtailed only if marine mammals approach within 33 ft (10 m) of the towed sound source projector during continuous sound transmission when source level is below 140 dB.

When active acoustics involve continuous sound source transmission greater than 140 dB, a dedicated watch would be conducted. Continuous sound source transmission between 140 and 170 dB would be conducted only during daylight hours and when visibility is not limited by weather conditions (e.g., fog, adverse sea state). Transmissions would be curtailed in accordance with Table 4.

Because pinnipeds (seals and sea lions) and odontocetes (toothed whales: dolphins, porpoises, etc.) do not have good hearing below 1 kHz, transmissions between 140 and

170 dB would continue unless these animals remain with 1,050 ft (320 m) of the sound source for periods greater than one-half hour. If pinnipeds or odontocetes remain near the continuous sound source over one-half hour, transmissions would be stopped.

At the start of low-frequency transmission, the transmission level would be increased gradually or ramped-up from an overall level less than or equal to 140 dB the desired operating level, at a rate not exceeding 6 dB per minute. Although there was some discussion as to the utility of ramp-up procedures at a recent ONR Workshop (ONR 1998), it is thought that such procedures may allow any marine mammal near the sound source during the onset of test operations the opportunity to move away before being exposed to maximum levels. To ensure implementation, this action would be a test requirement and would be added to the test plan for all ADS ocean tests.

There is no direct evidence that any marine mammal species would significantly modify their normal behavior in response to the localized, short-term impacts generated by implementation of the proposed ocean tests. However, avoidance of overlap in the laydown area with whale aggregation areas, visual search, ramp-up of the towed sound sources, and delay of active acoustic operations have been integrated into ADS ocean test plans because these procedures would not have an overall adverse impact on ADS ocean test activities and they provide additional assurance that there would be no significant impacts on marine mammal. Specifically, the ramp-up procedure would allow marine mammals within auditory range of the towed sources a perceived element of choice, as they could modify their actions according to their normal repertoire of behavioral responses to underwater acoustic stimuli.

Attraction and Collisions

The primary attractants for marine mammals are other members of their own species, areas of prey concentration, and (in the case of toothed whales that bow-ride) moving boats. None of the activities associated with the proposed ADS ocean tests would be expected to concentrate prey organisms for marine mammals, nor to make food more readily available to them. Project vessels might attract dolphins to bow-ride. This could result in exposure of these animals to sounds transmitted by the towed sound source projector. Although this is unlikely due to slow vessel speeds required for test operations, sounds received by bow-riding dolphins would primarily be those from the ship, as those from the towed source would be 26-89 ft (8-27 m) behind the vessel and would not likely be detectable. Dolphins approaching the vessel might pass close to the towed sound source projector and be exposed to detectable levels of low-frequency sound.

Minke whales are sometimes attracted to stationary boats and may remain with them for hours (Richardson et al. 1995). This species occurs in the proposed test area, but is not expected to linger within test areas. Minke whales are unlikely to be attracted during towed sound source operations because the test vessels would be underway at 2-5 knots and because normal avoidance responses to vessels are likely to be reinforced by the additional noise from the towed sound source projector.

Overall, attraction of marine mammals by project activities would not result in significant harmful impacts due to the low speed of the test vessels (2-5 knots) and the limited amount of Navy vessel traffic as compared with commercial traffic.

Entanglement and Ingestion

Marine mammals sometimes ingest plastic bags and other small objects and commonly become entangled in fishing gear. However, the equipment planned for deployment during the proposed ADS ocean tests does not have characteristics likely to cause entanglement or ingestion. Even though considerable laydown of cable is anticipated (31-342 miles [50-550 km/test]), all cable line is designed to rest on the seafloor. At any one location, the cable would consist of a single line extending more-or-less linearly along the bottom. It is highly unlikely that any marine mammals would become entangled with this arrangement of cable or ingest the cable. Most species do not dive to or forage near the bottom, and any that do would not become entangled in a single cable. Situations where marine mammals do become entangled usually involve fishing gear or flotation lines, where the animals become ensnared in multiple lines or meshes. This situation would not occur in this project. Other gear associated with the test are too large to be ingested, and in any case do not have properties that would be attractive to marine mammals.

All in-water components would be removed within 6 months of the completion of each test. The equipment deployed during the ADS ocean tests would not pose an entanglement nor ingestion risk to marine mammals. Therefore, the exposure of marine mammals to cables would be temporary and would not be significant.

Chemical Contamination Issues

Under the proposed ADS ocean test, there would be limited physical discharges to the marine environment. All component surfaces with the potential to corrode, with the exception of the drogue chute clips, are encapsulated in a chemically inert polyurethane (rubber-like) boot, coating, or secondary housing. This encapsulation would prevent all potentially corrosible metals from contacting the environment. Iron and magnesium from drogue clips used to deploy the cable would not impact marine sediment quality for reasons described above for water quality. Since the lithium or alkaline batteries proposed for use in the ocean test components would be self-contained, closed systems, there would be no exposure of inner battery constituents to seawater and no discharges to the marine environment. In addition, all ADS components will be retrieved upon completion of testing. For these reasons, proposed ADS ocean tests would not have a significant impact on marine sediments.

Terrestrial Biology

Activities associated with the four proposed ocean tests would occur entirely within the marine environment and would involve the use of two marine vessels offshore with only one being used at any given time. Contact with terrestrial species would be limited to permanent or seasonal nearshore, marine, or offshore birds. Boating activities are common in the area and are not known to adversely affect sight-feeding bird species. Therefore, significant impacts to terrestrial species would not occur upon implementation of the proposed ocean tests.

Threatened and Endangered Species

Use of the shore station would also involve installation of a cable to receive data associated with the offshore ADS ocean tests. Cable installation would involve trenching through a section of beach that is currently subject to vehicular activity (e.g., cars, trucks, and tanks). Two federally listed bird species are found on beach areas in the vicinity of the proposed cable installation: California least tern and western snowy plover. The closest endangered least tern breeding areas are 1-1.5 miles (1.6-2 km) from the area proposed for trenching. The threatened western snowy plover is known to nest in the area between the heavily used lower beach and heavily vegetated upper sand dunes. Although the proposed trenching activities would run through this area, all activities associated with the trenching would be conducted outside of the snowy plover breeding season which is from March 1 - September 15 (i.e., trenching activities would occur sometime from October - February). In addition, if any repairs are needed to the buried cable during the plover breeding season, all activities would be coordinated with natural resource personnel at MCB Camp Pendleton and USFWS prior to any beach or dune disturbance. Based on the above conditions, the proposed installation of the shore landing cable will not adversely affect endangered or threatened species or their habitats.

Although the threatened California gnatcatcher is in the vicinity of the MCTSSA facility, the closest gnatcatcher locality is 1,000 ft (305 m) away and would not be adversely impacted due to the proposed construction activities. No other threatened or endangered species are known to occur in the vicinity of any of the proposed minor construction activities; therefore, impacts to threatened and endangered species would not be significant.

Threatened and Endangered Fish and Sea Turtle Species

The southern California Evolutionary Significant Unit (ESU) of westcoast steelhead was recently listed as endangered and typically spends 2-3 years in marine waters. Although the southern California ESU of westcoast steelhead could potentially occur in the area, impacts would not be significant since steelhead are a highly dispersed, solitary species when they inhabit the open ocean. Although four federally listed species of sea turtles could potentially occur in the area, they are not commonly encountered. Implementation of the proposed ocean tests would not effect sea turtles due to the low potential of encountering any of the federally protected sea turtles and the short-term nature of the proposed tests. In addition, mitigation measures established for marine mammals, including the sound source ramp-up procedures and the dedicated observers (refer to Table 4), would also apply to sea turtles. Preliminary investigations indicate that hearing sensitivity is limited to low-frequency bandwidths (60-1,000 Hz) (Ridgway et al. 1969). Sea turtle hearing threshold at 70 Hz has been estimated at 132 dB. At the maximum pulsed sound source level, a received sound level of 132 dB would be achieved within approximately 260 ft (80 m) of the sound source. If a sea turtle is sighted during active acoustic testing, operations would be curtailed. This would provide additional assurance that there would be no impacts to sea turtles. Based on this determination, there would be no significant impacts to federally protected marine species.

Threatened and Endangered Marine Mammals

Five mysticete whale species and one odontocete species (sperm whale) common to the proposed ADS ocean test location are federally listed as endangered. In addition, Guadalupe fur seals and sea otters are listed as threatened.

As stated above, based on analyses presented in the preceding sections, there is no anticipated impact on federally listed threatened or endangered marine mammals posed by the proposed ADS ocean tests. Thus, although a few individuals may hear sounds associated with ADS ocean testing, they would not likely be affected by them. Anthropogenic noise associated with ADS ocean tests would be no louder than ongoing noise associated with natural phenomena (e.g., seismic T-phase events) and with shipping common to the proposed test area.

NMFS has concurred that with the implementation of the proposed mitigation measures, the ADS tests should not affect species under the jurisdiction of NMFS that are listed as threatened or endangered under the Endangered Species Act.

Section 30231

Under the proposed action, the biological productivity and quality of coastal waters, streams, wetlands, estuaries, and lakes would be maintained to ensure adequate populations of marine organisms and to protect human health. See response to Section 30230 above for a detailed description of potential impacts to the marine environment.

Section 30232

Under the proposed action, protection against the spillage of crude oil, gas, petroleum products, or hazardous substances would be provided. The Department of the Navy currently has established containment and cleanup facilities and procedures for accidental spills that occur, which comply with applicable federal regulations regarding hazardous substances. Therefore, protection against the spillage of crude oil, gas, petroleum products, and hazardous substances would be provided under the proposed action.

Section 30233

An analysis was not provided for this section since the proposed action does not involve diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes.

Section 30234

Although facilities serving the commercial fishing and recreational boating industries would not be affected under the proposed action, commercial fishing and recreational boating activities could be affected by the proposed ocean tests. Some recreational and commercial fishing vessels would potentially be restricted from entering open waters within a 0.5-mile-radius of the proposed ADS ocean tests during deployment of the cable and towing of the sound source projector. A NOTMAR would be provided to these vessels 48 hours in advance, which would allow the boats to select alternate destinations without substantially affecting their activities. In addition, the proposed tests would be temporary and would not result in long-term access restrictions to open water areas; therefore, impacts to commercial and recreational fishing would not be significant.

Section 30234.5

Implementation of the proposed action would result in short-term access restrictions for commercial and recreational fishing vessels within the proposed ocean test area during deployment of the cable and towing of the sound source projector. The temporary restrictions would be required to adequately test the operational characteristics of the proposed system. A NOTMAR would be provided to all vessels 48 hours in advance, which would allow fishing vessels to select alternate destinations without substantially affecting their activities. Temporary restrictions associated with the proposed action would result in insignificant impacts to regional fishing activities; therefore, the economic, commercial, and recreational importance of fishing activities would be recognized and protected under the proposed action.

Section 30235

Implementation of the proposed action does not involve revetments, breakwaters, groins, harbor channels, seawalls, cliff-retaining walls, and other such construction that alters natural shoreline processes. Trenching and installation of the cable associated with the proposed action would not alter natural shoreline processes; therefore, impacts to the local shoreline would not occur.

Section 30236

An analysis was not provided for this section because the proposed action does not involve channelizations, dams, or other substantial alterations of rivers and streams.

Section 30237

An analysis was not provided for this section because the proposed action does not involve the Bolsa Chica wetlands or any portion thereof in the County of Orange.

e. Article 5 - Land Resources (Sections 30240-30244):

Section 30240

Implementation of the proposed action would not result in disturbance of any identified environmentally sensitive habitat areas. Refer to Section 30230 for a detailed discussion of environmentally sensitive habitat areas.

Section 30241

The proposed action would not impact agricultural lands. Construction and operation of the proposed shore station would occur on previously disturbed and developed property at MCB Camp Pendleton. In addition, trenching associated with the proposed ocean test cable would not affect existing agricultural lands or property proposed for agricultural use; therefore, impacts to agricultural land would not occur.

Section 30241.5

An analysis was not provided for this section because the proposed action would not impact the viability of agricultural land.

Section 30242

An analysis was not provided for this section because the proposed action would not impact the conversion of any land suitable for agricultural use.

Section 30243

An analysis was not provided for this section because the proposed action would not impact the long-term productivity of soils and timberland or result in the conversion of coastal commercial timberlands.

Section 30244

Activities associated with the four proposed ocean tests would occur entirely within the marine environment and would involve the use of two surface vessels offshore (only one at any given time). The primary impacts associated with the ocean tests would be the potential for underwater archaeological resources to be affected by laying ADS components on the ocean floor.

The majority of known underwater cultural resources (e.g., shipwrecks) in the region occur in less than 10 m (33 ft) of water. The most concentrated locations of shipwrecks are along headlands and harbor approaches and within inner harbor waters on the main coastline and offshore islands. To minimize the potential for disturbance to cultural resources, operational and environmental constraint areas were identified within southern California and were excluded from the proposed testing areas. These areas include a 1 nm buffer around the existing 6 nm Channel Islands National Marine Sanctuary and a 3 nm buffer around the other offshore islands. Any documented shipwrecks would be avoided not only to avoid potentially historic resources but also to avoid complicating the ADS retrieval process upon test completion. In addition, since the ADS components have been designed to minimize drag, disturbance of marine sediments from movement across the ocean floor would be unlikely. Therefore, the potential for disturbance to underwater archaeological resources is minimal, and implementation of the ocean tests would not significantly impact cultural resources.

The proposed shore station would be located on MCB Camp Pendleton within a previously disturbed area. Implementation of the proposed action would involve no permanent structures; upon completion of the proposed tests, all facilities would be removed. Since minor construction activities and facility improvements would occur in previously disturbed areas, and no archaeological resources were identified within the area of potential effect, impacts to cultural resources would not be significant. The California State Historic Preservation Officer has concurred with the Navy's "No Effect" determination.

f. Article 6 - Development (Sections 30250-30255):

Section 30250

Development of the proposed shore station and associated facilities would occur within a disturbed area adjacent to the MCTSSA facility. All necessary utilities and public services for the temporary shore station facility would be accommodated by existing development adjacent to the site and basewide services on MCB Camp Pendleton. Development associated with the proposed action would not result in significant impacts, either individually or cumulatively, to coastal resources.

Section 30251

Implementation of the proposed action would not affect the existing visual quality of coastal areas. Development of the proposed shore station and associated facilities would occur adjacent to existing development at the MCTSSA facility. The proposed shore station structure would be visually compatible with the character of the surrounding development and would not result in the alteration of natural land forms. The proposed test cable would not be a visually prominent feature in the area it is placed above ground and would be entrenched along the open beach area. Vessel activity associated with the proposed ADS tests would be compatible with existing boating activities in the coastal waters. Therefore, the scenic and visual qualities of the coastal areas would be protected under the proposed action and visual impacts would not occur.

Section 30252

As discussed in Section 30210, the proposed action would not impact existing or future public access to coastal areas. Refer to Section 30210 for a detailed discussion of public access.

Section 30253

The proposed action would not involve development in areas of high geologic, flood, or fire hazards. Proposed development would ensure stability and structural integrity, and would neither create nor significantly contribute to erosion, geologic instability, or destruction of the site or surrounding area.

An air quality analysis was performed for the proposed action, which concluded that emissions associated with the proposed ocean tests would be below *de minimis* levels or not subject to the General Conformity Rule; therefore, the General Conformity Rule is not applicable to the proposed action.

An analysis was not provided for minimized energy consumption and vehicle miles traveled since the proposed action does not involve an increase in personnel.

As discussed in Section 30220, the proposed action would not impact popular visitor destination points for recreational uses. Refer to Section 30220 for a detailed discussion of availability of public access to recreational areas.

Section 30254

An analysis was not provided for this section because the proposed action does not involve new or expanded public works facilities.

Section 30254.5

An analysis was not provided for this section because the proposed action does not involve development of a sewage treatment plant.

Section 30255

Development associated with the proposed action would be considered coastal-dependent due to the required location of the shore station adjacent to coastal waters. The proposed shore station would not be sited in a wetland. The shore station would be accommodated within reasonable proximity to the coastal-dependent uses (i.e., ocean test vessels) it supports and would not result in significant impacts to coastal resources.

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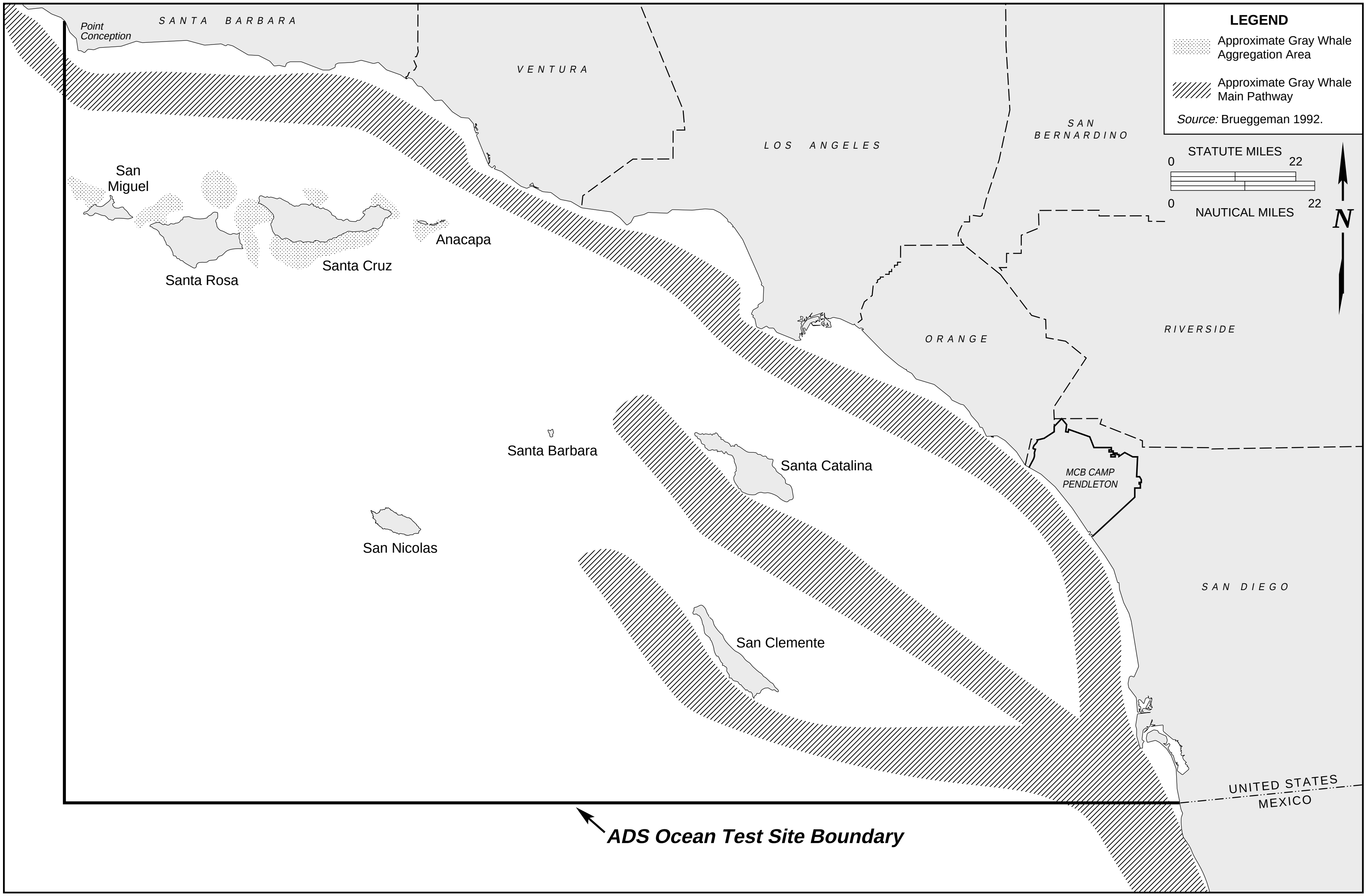

Gray Whale Aggregation Areas and Main Pathways – Winter/Spring
Southern California Bight

FIGURE **9**