3.4 Acoustic Environment (Airborne)

3.4 ACOUSTIC ENVIRONMENT (AIRBORNE)

3.4.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the region of influence (ROI) for the acoustic environment includes the Temporary Maritime Activities Area (TMAA). Activities involving use of airspace inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

Aircraft overflights occurring above 15,000 feet (ft) in altitude will take place in airspace over the U.S. territorial seas (0-12 nautical miles [nm]) to the TMAA. Given the altitude of these subsonic flights, they will have no effect on the acoustic environment and are, therefore, dismissed from further analysis.

3.4.1.1 Introduction to Sound

Sound is a physical phenomenon and a form of energy that can be described, measured, and represented with mathematical expressions. Noise, on the other hand, is not a physical process, but rather an implicit social value, defined generally as unwanted sound. Recognition of sound is based on the receptor's objective and reproducible response to sound's primary physical attributes: intensity (perceived by the receptor as loudness), frequency (perceived as pitch), frequency distribution and variation over time, and duration (whether continuous, sporadic, or impulse). Perception of sound, however, is subjective and circumstantial. Sounds that are soothing to some are annoying to others, and sounds barely noticed and generally ignored in one circumstance may be considered highly objectionable in another circumstance.

Beyond subjective effects, however, sound at higher intensities or power levels can have physical consequences. The range of such impacts have been defined for humans as falling into three categories as sound pressure levels increase: subjective effects (e.g., annoyance, nuisance, dissatisfaction), interferences with activities (e.g. communication, sleep, learning, behavioral changes), and physiological effects (e.g., anxiety, hearing impacts, loss of hearing).

3.4.1.2 Sound Characteristics

Sound Fundamentals

Sound is typically described by its magnitude (otherwise referred to as amplitude), intensity, and frequency and the changes in those values over time (e.g., sudden impulse vs. continuous vs. repetitive). The physical phenomenon of sound is generated by mechanical vibrations traveling through an elastic medium (i.e., air or water), resulting in a rapid change in pressure (high and low pressure fluctuations or waves) in the medium.

Sound waves are characterized by parameters such as amplitude, intensity, wavelength, frequency, and velocity. The amount of energy contained in a sound pressure wave is referred to as its amplitude, while the amount of energy passing through a unit area per unit of time is the sound wave's intensity. The units of sound intensity are watts per square meter (energy per unit of time per unit of area). Amplitude and intensity are directly and linearly related. Higher amplitude sounds are perceived to be louder than lower amplitude sounds. Sound pressures are usually represented in micropascals (μPa). A pascal is equal to one newton of force distributed over 1 square meter. The maximum sound pressure level of a noise event is referred to as the "peak noise level."

The frequency of sound represents the rate at which the source produces sound waves (a complete cycle of high and low pressure waves) or the rate at which the sound-producing body completes one vibration cycle. Frequency is a precisely measurable quantity representative of a particular sound. Sounds are produced throughout a wide range of frequencies, including frequencies beyond the audible range of a given receptor. Most of the sounds we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The intensities of each frequency add to generate the sound we hear.

The speed of sound is not affected by its intensity, amplitude, or frequency, but rather depends wholly on the characteristics of the medium through which it is passing. Sound generally travels faster as the density of the medium increases. Speeds of sound through air are primarily influenced by air temperature, and negligibly by the air's relative humidity and pressure, averaging about 1,115 feet/second (ft/sec) (340 meters/second [m/sec]) at standard barometric pressure. Sound speeds in air increase as air temperature increases. Speed of sounds in liquid is similarly influenced primarily by the liquid's density and temperature. Thus, the speed of sound in 32 degrees Fahrenheit (°F) (0 degrees Celsius [°C]) water is 4,600 ft/sec (1,402 m/sec) and in 68°F (20°C) water is 4,862 ft/sec (1,482 m/sec). The speed of sounds in solids is a more complex matter, with longitudinal and transverse waves traveling at different speeds depending on the density of the material as well as its geometry and molecular structure.

The mathematical relationship between sound stimulus and sound perception by a human receptor is logarithmic. This logarithmic relationship between magnitude and perception is the basis for the decibel (dB) scale used to express sound intensity. The decibel scale measures relative sound intensities rather than absolute intensities; specifically, it measures the ratio of a given intensity (of sound) to the threshold sound intensity of human hearing (by definition 0 dB). For most human individuals, a sound wave pressure of 20 μPa represents the hearing threshold. As sound stimuli increases geometrically (i.e., multiplied by a fixed factor), the corresponding perception changes arithmetically (i.e., additive by constant amounts). Thus, a tenfold increase in sound stimulus over the threshold of hearing is assigned a value of 10 dB but is perceived as a doubling of loudness; a hundredfold increase to 20 dB is perceived as sound that is four times louder, and so forth (Figure 3.4-1).

Although sound is a physical phenomenon that can be represented by mathematical expressions and measured with precision, perception of sound pressure level is the result of physiological responses as well as subjective factors, each influenced by current circumstances and past exposures. The sound pressure level is the perception of a sound wave's pressure by a single receptor at a specified distance and direction from the sound source.

Sound pressure levels are measured by sound level meters, which typically contain filters that reduce the meter's sensitivity to frequencies of little or no relevance to the human receptor. The method commonly used to quantify environmental sounds consists of determining all of the frequencies according to a weighting system that reflects the nonlinear response characteristics of the human ear. Filtering the very low and very high frequency sounds thus acts as a general approximation of the human ear's response to sounds of medium intensity. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

A common method of describing sound pressure levels is by comparing commonly experienced sounds. Typical sound sources and their corresponding environments are presented in Figure 3.4-1. Sound levels indicated are for single events. Such events are discrete, and two or more events cannot simply be added together. Integrating varying noise levels and sources over a given period requires complex calculations or modeling.

The sound measure employed by federal agencies is known as the day-night average sound level (DNL). The DNL is defined as the A-weighted average sound level for a 24-hour day. It is a calculated noise metric derived from measurements but includes a 10-dB penalty for late-night (i.e., 10:00 p.m. to 7:00 a.m.) sound levels. This penalty accounts for the increased sensitivity of humans to noise at night.

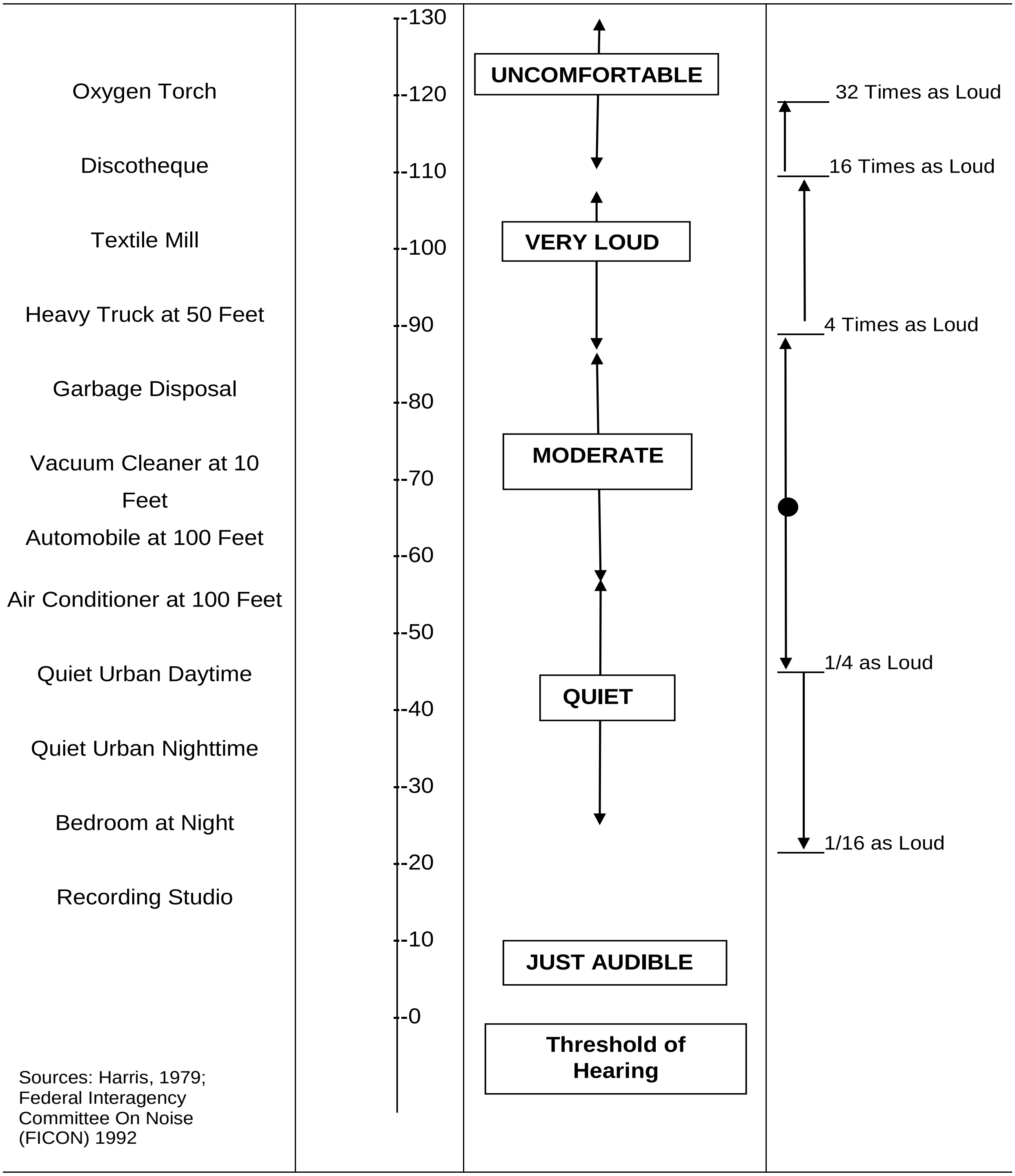

Figure 3.4-1: Sound Levels of Typical Airborne Noise Sources and Environments

Sound Propagation

Understanding the impact of sound on a receptor requires a basic understanding of how sound propagates from its source. Sound propagation follows the inverse square law: the intensity of a sound wave decreases inversely with the square of the distance between the source and the receptor. Thus, doubling the distance between the receptor and a sound source results in a reduction in the intensity of the sound of one fourth of its initial value; tripling the distance results in one ninth of the original intensity, and so on.

Sound propagates through gases and liquids primarily as longitudinal waves, causing displacements of the molecules comprising the gas or liquid in directions generally parallel to the direction of the sound wave. While the concept of a longitudinal or transverse sound wave traveling from its source to a receptor is relatively simple, sound propagation in fact is quite complex due to the simultaneous presence of numerous sound waves of different frequencies and other phenomena such as reflections of sound waves and subsequent constructive or destructive interferences between reflected and incident waves.

Interferences between two waves with different frequencies result in the production of “beats.” Depending on whether the interferences between these waves are constructive (where their amplitudes are additive) or destructive (where their amplitudes cancel each other), the sound perceived by the receptor is alternately loud and soft, with the rate at which such amplitude changes occur generally reflecting the difference between the frequencies of the two interacting waves. Perception of interfering sound waves is complex, and in some frequency ranges the receptor perceives (“hears”) neither of the frequencies of the interacting waves, but rather a third frequency known as a “subjective tone” or “difference tone.”

3.4.2 Existing Conditions

3.4.2.1 Ambient Sound

Airborne noise sources at sea include those from manmade sources such as sounds produced from commercial, fishing, research, and recreational vessels, and general and commercial aviation. Navy training events may also add to these sounds intermittently and at widely separate locations in the TMAA during an exercise period (an exercise lasting a maximum of 21 days in the April to October timeframe occurring once or twice a year depending on the alternative).

Issues with regard to airborne noise as transmitted underwater are discussed in Sections 3.5 (Marine Plants and Invertebrates), 3.6 (Fish), 3.7 (Sea Turtles), 3.8 (Marine Mammals), and 3.9 (Birds).

3.4.2.2 Sound from Military Sources

Airborne noise attributable to military activities in the TMAA emanates from multiple sources including naval ship power plants, military aircraft, target engine noise, bombs, missiles, and gunfire. The boundaries of the TMAA form a roughly rectangular area oriented from northwest to southeast, approximately 300 nautical miles (nm) (556 kilometers [km]) long by 150 nm (278 km) wide, situated south of Prince William Sound and east of Kodiak Island. The TMAA is an area 42,146 square nautical miles (nm^2) (144,556 square kilometers [km^2]) in size. With the exception of Cape Cleare on Montague Island located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA’s northern boundary. The approximate middle of the TMAA is located 140 nm (259.3 km) offshore. Therefore, sound in the TMAA from military sources will originate no closer than approximately 12 nm (22 km) from the nearest shoreline, and these will be sounds generally dominated by high aircraft overflight noise.

Military Aircraft

Flying aircraft contribute sound to the environment. As with most manmade sounds, most aircraft sounds involve low frequencies. Aircraft sound entering the water at an angle of incidence of 13 degrees from the vertical or less will lose some of the sound energy as sound is transmitted under the water's surface. At greater angles of incidence, the water surface acts as an effective reflector of the sound wave, allowing the sound energy to remain largely unchanged in the above-water environment (Urick 1972, Eller and Cavanagh 2000). Navy training activities involving aircraft in the TMAA are generally dispersed over large expanses of the open ocean. Representative sound levels associated with military aircraft and ordnance use are depicted in Table 3.4-1.

Table 3.4-1: Representative Aircraft and Ordnance Sound Sources in the TMAA

Noise Source	Sound Level (dBA)
Jet Aircraft Takeoff	115 @ 1,000 ft
SH-60 Helicopter Hovering	90 @ 50 ft
ASW Target Drop	90 @ 50 ft
Chaff (packet rupture at high altitude) Aircraft ALE-37	90 @ 50 ft
Aircraft Defensive Flares	65 @ 50 ft
Practice Bombs, 25 lb inert, spotting charge	60 @ 50 ft
Inert Bombs, 500 lb (at impact)	105 @ 50 ft
Inert Bombs, 1,000 lb (at impact)	108 @ 50 ft
Live Bombs, 500 lb (at impact)	110 @ 50 ft
Live Bombs, 1,000 lb (at impact)	125 @ 50 ft
Naval Gun Ammunition 5"/54	110 @ 50 ft
Cannon Shells, 20mm (at source)	105 @ 50 ft
Cannon Shells, 25mm (at source)	110 @ 50 ft
7.62mm M60 Machine Gun	90 @ 50 ft
0.50-caliber Machine Gun	98 @ 50 ft

Notes: 50 ft and 1,000 ft are standard reference distances. ASW - Anti-Submarine Warfare; dBA - decibels, A-weighted; ft - feet; lb - pound; TMAA – Temporary Maritime Activities Area; mm - millimeters
Source: Investigative Science and Engineering (ISE), 1997; Naval Air Station Whidbey Island, 1993; Ewbank, 1977

Sonic Boom Noise

Supersonic aircraft flights can occur from time to time in the TMAA. Such flights are usually limited to altitudes above 30,000 ft (9,144 m) and/or locations more than 30 nm (55.6 km) from shore. Several factors influence sonic booms: weight, size, shape of aircraft or vehicle; altitude; flight paths; and atmospheric conditions. A larger and heavier aircraft must displace more air and create more lift to sustain flight compared with small, light aircraft. Therefore, larger aircraft create sonic booms that are stronger and louder than those of smaller, lighter aircraft. Consequently, the larger and heavier the aircraft, the stronger the sonic boom shock waves will be (Department of Navy [DoN] 2007).

Of all the factors influencing sonic booms, increasing altitude is the most effective method of reducing sonic boom intensity. The width of the boom "carpet" or area exposed to sonic boom beneath an aircraft is about 1 mile (mi) (1.6 km) for each 1,000 ft (305 m) of altitude. For example, an aircraft flying supersonic straight and level at 50,000 ft (15,240 km) can produce a sonic boom carpet about 50 mi (80 km) wide. The sonic boom, however, will not be uniform. Maximum intensity is directly beneath the aircraft, and decreases as the lateral distance from the flight path increases until shock waves refract away from the ground and the sonic boom attenuates. The lateral spreading of the sonic boom depends only on altitude, speed, and the atmosphere, and is independent of the vehicle's shape, size, and weight. The ratio of the aircraft length to maximum cross-sectional area also influences the intensity of the sonic boom. The longer and more slender the aircraft, the weaker the shock waves will be. The wider and more blunt the vehicle, the stronger the shock wave can be (DoN 2007). Sonic booms are generated as aircraft reach Mach 1.0 (speed of sound) and increase in intensity as the Mach number increases.

Ordnance Use

Impulsive sound results from ordnance use in the TMAA. Some representative ordnance sound levels are depicted in Table 3.4-1.

Missile and Target Launch

Sound associated with missile and target launches occurs in the TMAA infrequently, and then only during scheduled events. Due to safety concerns over launch activities, a buffer zone of several square miles is always instituted and enforced. Sound due to missile and target launches is typically at a maximum at the point of initiation of the booster rocket, and rapidly fades as (1) the missile or target reaches optimal thrust conditions, and (2) the missile or target reaches a downrange distance where the booster burns out and a sustainer engine continues. For example, data for the BQM-34 show that its booster Jet Assisted Take-Off (JATO) bottles generate 113 dBA at the source at launch. Sound levels decrease to 99 dBA at 2,400 ft (731.5 m) (DoN 1998). The BQM-34 may be used in the TMAA (though much less frequently than the smaller BQM-74).

In the TMAA, the BQM-74 is likely to be the typical target drone. It can be launched from surface vessels as shown in Figure 3.4-2, as well as aircraft. The BQM-74s will be used during Surface-to-Air (S-A) Missile Exercise (MISSILEX) training proposed to occur under Alternatives 1 and 2. They are proposed to occur very infrequently. The events take place at high altitude (between 10,000 ft and 20,000 ft [3,048 m and 6,096 m) and over 12 nm (22.2 km) from shore.

Figure 3.4-2: Target Drone Launch

Nonexplosive Impact Noise

Nonexplosive impact sound in the TMAA is generally from high-velocity “dummy” projectiles and inert training bombs. Sounds of this type are produced by the kinetic energy transfer of the object with the target or earth’s surface, and are highly localized to the area of disturbance. Sound associated with the impact event is typically of low frequency (less than 250 Hertz [Hz]) and of a short enough duration (i.e., impulse sound) that it produces negligible amounts of acoustic energy. These events occur far out to sea in connection with events such as an Air-to-Surface (A-S) Bombing Exercise (BOMBEX) that are restricted from the public, so they often go unobserved. The impacts may be scored by remote observers—participants in the exercise who are at a safe distance from the source.

Ordnance Detonations

Ordnance detonated at the water surface can introduce loud, impulsive, broadband sounds into the marine environment. The potential impacts of explosive detonations on wildlife are considered in Sections 3.5 (Marine Plants and Invertebrates), 3.6 (Fish), 3.7 (Sea Turtles), 3.8 (Marine Mammals), and 3.9 (Birds). The airborne noise associated with underwater explosions is minimal. A characteristic phenomenon of the difference in acoustic impedance between air and water is that the air/water interface will act as a very good reflector, the so-called Lloyd mirror. Therefore, very little energy will pass this reflector, meaning that sound generated in the water will not pass over to the air and vice versa.

Three source parameters influence the effect of an explosive: the weight of the explosive warhead, the type of explosive material, and the detonation depth. The net explosive weight (NEW) accounts for the first two parameters. The NEW of an explosive is the weight of the explosive material in a given round, referenced to the explosive power of trinitrotoluene (TNT) or C4. Table 3.4-2 sets forth the explosive weight of various explosive ordnance items used in the TMAA. The ordnance used is shown with the particular training event using that ordnance. All events will occur in the open ocean far from shore.

Table 3.4-2: Training Events Utilizing Explosives in the TMAA

Training Event	Ordnance Involved (Net Explosive Weight per Item)
Air-to-Air MISSILEX	AIM 7 Sparrow (85 lb), AIM 9 Sidewinder (20.8 lb), AIM-120 AMRAAM (48 lb)
Surface-to-Air MISSILEX	Standard missile (223 lb)
Air-to-Surface BOMBEX, SINKEX	MK-82 (192.2 lb), MK-83 (415.8 lb) and MK-84 (944.7 lb)
Gunnery Exercise (GUNEX, SINKEX)	5-inch naval gunfire (8.8 lb), 76mm gun rounds (1.3 lb)
ASW Tracking Exercise (TRACKEX)-Maritime Patrol Aircraft (MPA)	IEER sonobuoys (two 4 lb charges per sonobuoy)
SINKEX (Surface to Surface, Air to Surface, Torpedo)	HARM (41.6 lb), Harpoon (265 lb), Maverick (78.5 lb), Hellfire (16.4 lb), Penguin (123 lb), Standard Missile 1 (223 lb), MK-48 (851 lb)

The detonation depth of an explosive in the water is important due to a propagation effect known as surface-image interference. For sources located near the sea surface, a distinct interference pattern arises from the coherent sum of the two paths that differ only by a single reflection from the pressure-release surface. As the source depth and/or the source frequency decreases, the destructive interference of these two paths increases and reaches total cancellation at the surface (barring surface reflection scattering loss). Since all explosive sources used in military activities in the TMAA (with two exceptions) are munitions that detonate essentially on impact, the effective source depths are quite shallow, and therefore the surface-image interference effect can be pronounced. The exceptions are the SSQ-110 (Improved Extended Echo Ranging [IEER]) sonobuoy, which is a small underwater detonation producing no airborne noise and the MK-48 torpedo (associated with SINKEX).

3.4.2.3 Current Requirements and Practices

In accordance with aircraft standard operating procedures, each aircrew will be familiar with the noise profiles of their aircraft and shall be committed to minimizing noise impacts without compromising operational and safety requirements. Flights of naval aircraft shall be conducted so that a minimum of annoyance is experienced by persons that may be below. It is not enough for the pilot to be satisfied that no person is actually endangered. Definite and particular effort shall be taken to fly in such a manner that individuals do not believe they or their property are endangered.

3.4.3 Environmental Consequences

As noted in Section 3.4.1, the ROI for the acoustic environment includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace (SUA) and the Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, and Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) in the TMAA are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114.

3.4.3.1 Previous Analyses

Impacts related to the acoustic environment were previously evaluated in Sections 3.3, 4.3, and Appendix F of the *Alaska Military Operations Areas EIS* (USAF 1995); Sections 3.2.5 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007); Sections 3.22 and 4.22 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.16 and 4.16 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.4.3.2 Approach to Analysis

A description of noise-related environmental stressors, data sources, and methodology related to assessing airborne-noise related environmental consequences follows.

Noise-Related Environmental Stressors

Navy GOA training activities will involve fixed-wing aircraft, helicopters, ships, missiles, gunfire, and explosive ordnance that are all potential sources of airborne noise. Airborne noises generated through implementation of the proposed action generally consist of either (1) noise that would be experienced over the course of an aircraft overflight or (2) impulse noise such as would be experienced during gunfire or ordnance detonation. The discussion of noise associated with Navy training events focuses on airborne sound above the water’s surface and its potential impacts to human receptors. In the ocean area of the TMAA, the potential receptors could be merchant seamen, fishermen, and boaters (personnel participating in training are not considered to be sensitive receptors[1] of airborne noise for purposes of environmental impact analysis). Given the distance from shore for the majority of the TMAA, Notices to Mariners (NOTMARs), and the inability to safely conduct most training activities in the vicinity of non-training participants, these potential human receptors should not be present and therefore will not be exposed to high levels of sound resulting from training activities.

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[1] For analysis of impacts on the acoustic environment, a “sensitive receptor” is a location of a human activity where the introduction of sound as noise would have an adverse impact on the activity associated with that location. Examples of typical types of locations (sensitive receptors) include residences, places of worship, schools, hospitals, some businesses (e.g., cinema, concert hall), or the outdoors (e.g., parks, natural areas). Examples of potential impacts to these locations can involve the effects to occupancy, re-sale, purpose, or enjoyment of the environment (natural quiet).

Noise impacts on humans depend on a variety of factors, including the duration of the noise event, the decibel level of the noise event, and the context of the noise within the ambient noise environment. Table 3.4-3 illustrates the various training events that occur associated with the proposed training activities, the noise stressors associated with each training event, and the general location where the events occur. As shown in the table, potential noise stressors can emanate from aircraft engine noise, surface vessel engine noise, and ordnance noise. Most training event types occur far out in the open ocean, given the approximate center of the TMAA is located 140 mi from the coast with the closest boundary 24 nm from shore and thus beyond the hearing of any human receptors on shore.

Table 3.4-3: Warfare Areas and Noise-Related Environmental Stressors

		Stressors			Location		
Primary Warfare Area and Activity	**Training Area(s)**	**Surface Vessel Engine Noise**	**Aircraft Engine Noise**	**Explosive or Gunfire Noise**	**Over land**	**0-12 nm from shore**	**Beyond 12 nm**
Anti-Air Warfare (AAW)							
Air Combat Maneuver (ACM)	TMAA, Air Force SUA		✓		✓	✓	✓
Air Defense Exercise (ADEX)	TMAA	✓	✓			✓	✓
Missile Exercise (Surface-to-Air) (MISSILEX [S-A])	TMAA	✓	✓	✓			✓
Gunnery Exercise (Surface-to-Air) (GUNEX [S-A])	TMAA	✓	✓	✓		✓	✓
Missile Exercise (Air-to-Air) (MISSILEX [A-A])	TMAA, Air Force SUA		✓	✓	✓	✓	✓
Surface Warfare (SUW)							
Visit Board Search and Seizure (VBSS)	ATA	✓	✓				✓
Missile Exercise (Air-to-Surface) (MISSILEX [A-S])	TMAA	✓	✓				✓
Bombing Exercise (Air-to-Surface) (BOMBEX [A-S])	TMAA		✓	✓			✓
Gunnery Exercise (Air-to-Surface) (GUNEX [A-S])	TMAA		✓	✓			✓
Gunnery Exercise (Surface-to-Surface) (GUNEX [S-S])	TMAA	✓		✓			✓
Maritime Interdiction	ATA	✓	✓			✓	✓
Sea Surface Control (SSC)	ATA	✓	✓				✓
Sinking Exercise (SINKEX)	TMAA	✓	✓	✓		✓	✓
Anti-Submarine Warfare (ASW)							
Anti-Submarine Warfare Tracking Exercise – Helicopter (ASW TRACKEX-Helo)	TMAA		✓				✓
Anti-Submarine Warfare Tracking Exercise – Maritime Patrol Aircraft (ASW TRACKEX-MPA)	TMAA		✓			✓	✓
Anti-Submarine Warfare Tracking Exercise – Extended/ Improved/ Advanced Echo Ranging (EER / IEER / AEER)	TMAA		✓				✓

Table 3.4-3: Warfare Areas and Noise-Related Environmental Stressors (continued)

		Stressors			Location		
Primary Warfare Area and Activity	**Training Area(s)**	**Surface Vessel Engine Noise**	**Aircraft Engine Noise**	**Explosive or Gunfire Noise**	**Over land**	**0-12 nm from shore[1]**	**Beyond 12 nm**
Anti-Submarine Warfare (ASW) (continued)							
Anti-Submarine Warfare Tracking Exercise-Surface Ship (ASW TRACKEX-Surface)	TMAA	✓					✓
Anti-Submarine Warfare Tracking Exercise – Submarine (ASW TRACKEX-Sub)	TMAA		✓				✓
Electronic Combat (EC)							
Electronic Combat (EC) Exercises	TMAA, Air Force SUA	✓	✓			✓	✓
Chaff Exercise (CHAFFEX)	TMAA, Air Force SUA	✓	✓			✓	✓
Counter Targeting Exercise	TMAA	✓	✓				✓
Naval Special Warfare (NSW)							
Insertion/Extraction	ATA		✓		✓		
Strike Warfare (STW)							
Bombing Exercise (Air-to-Ground) (BOMBEX [A-G])	Air Force SUA, Army ranges		✓	✓	✓	✓	
Personnel Recovery (PR)	TMAA, Air Force SUA, Army ranges	✓	✓		✓		✓
Other Activities							
Deck Landing Qualifications (DLQs)	ATA		✓				✓

Note: ATA- Alaska Training Areas; TMAA – Temporary Maritime Activities Area; SUA – Special Use Airspace
1 - The only activities that occur within 0-12 nm are aircraft overflights above 15,000 feet.

Data Sources

A review of relevant literature and data has been conducted to complete this analysis for airborne noise in the TMAA. Of the available scientific literature (both published and unpublished), the following types of documents were utilized in the assessment: journals, books, periodicals, bulletins, Department of Defense (DoD) operations reports, theses, dissertations, and other technical reports published by government agencies, private businesses, or consulting firms.

Assessment Methods

The method used in this EIS/OEIS to assess the airborne noise environment impacts associated with existing and proposed Navy training and testing within the TMAA includes the following steps:

- Analyze existing federal noise management regulations applicable to the proposed action;

- Consider existing Navy policies affecting noise production levels (e.g., standard operating procedures [SOPs]);
- Analyze the natural ambient or background noise levels in the TMAA;
- Analyze the various types of noise sources associated with training and testing within the TMAA (e.g., continuous versus impulsive noises); and
- Determine the overall noise environment impacts associated with existing Navy training and testing within the TMAA given the regulatory/procedural framework.

The analysis presented in this section is limited to impacts of airborne sound on humans. Impacts of military-generated sound on natural resources are addressed in Sections 3.6 (Fish), 3.7 (Sea Turtles), 3.8 (Marine Mammals), and 3.9 (Birds).

3.4.3.3 No Action Alternative

Under the No Action Alternative, noise levels would remain at current levels. Navy training in the TMAA, especially live firing of weapons and aircraft activities, is a source of intrusive noise in the immediate vicinity, but the only receptors of that noise should be personnel engaged in the training. Area clearance procedures and the issuance of NOTMARs are undertaken to prevent exposure of non-military personnel in ocean areas (such as fishermen in the TMAA). Training activities, such as launch and recovery of aircraft from a CVN and firing of weapons, would not take place if civilian vessels are present in the vicinity.

Personnel engaged in the training events who might be exposed to noise from these activities are required to take precautions, such as the wearing of protective equipment, to reduce or eliminate potential harmful effects of such exposure (personnel engaged in the training are not considered sensitive receptors for purposes of impacts analysis). The center of the TMAA is located approximately 140 nm (259.3 km) from shore, and at its closest is over 12 nm (22.2 km) from shore. Activities in the TMAA are likely to be beyond the hearing of any human receptors other than personnel who are part of the training event.

Because sound-generating events in the TMAA are intermittent, occur in remote areas or off-limits areas, and do not expose the public to high noise levels, no sensitive receptors are likely to be exposed to sound from military activities under the No Action Alternative.

3.4.3.4 Alternative 1

Under Alternative 1, in addition to training activities currently conducted, the Navy would increase the number of training activities above baseline levels for some activities and would conduct training associated with the introduction of new weapon systems, vessels, and aircraft into the Fleet. This alternative would include conducting Anti-Submarine Warfare (ASW) activities and the use of active sonar sources during ASW activities. Some of those ASW activities introduce the use of additional helicopters in low-level flight over the water and the use of the P-3 for the detection and tracking of submarines.

The replacement of the EA-6B with the EA-18G would decrease the contribution to the noise environment from these activities over the foreseeable future. Slight decreases in noise levels from past Navy training activities throughout the TMAA airspace would be expected given the projected decreases in noise levels from the EA-18G aircraft. Also planned is the use (beginning in 2013) of the P-8A Poseidon (Multimission Maritime Aircraft [MMA]) as the Navy's replacement for the aging P-3 Orion turbo-prop aircraft. MPA is a term used to describe both the P-3 Orion aircraft and the P-8A Poseidon. The P-8A is a modified Boeing 737-800ERX that brings together a highly reliable airframe and high-bypass turbo fan jet engine. It will be equipped with modern ASW, Anti-Surface Warfare (ASUW), and intelligence, surveillance, and reconnaissance (ISR) sensors. In short, the P-8A MMA is a long-range ASW, ASUW, ISR aircraft that is capable of broad-area, maritime, and littoral activities. Average sound levels for the P-3 and P-8A are similar (for example, the P-8A is approximately 1 dB louder than the P-3 during takeoff; DoN 2008) so the minimal difference resulting from the proposed replacement of this aircraft should not result in any noticeable changes in sound levels in the TMAA.

Under Alternative 1, the majority of activities involving or potentially involving explosive ordnance in the TMAA would increase above current levels, as discussed in Chapter 2. As noted previously, precautions are taken to eliminate exposure of non-military personnel to unwanted sound from military activities. As with the No Action Alternative, sound-generating events under Alternative 1 are intermittent during the exercise period and would occur in remote areas or off-limits areas. The center of the TMAA is located approximately 140 nm (259.3 km) from shore and at its closest is over 12 nm (22 km) from shore. Activities in the TMAA are likely to be beyond the hearing of any human receptors.

3.4.3.5 Alternative 2

Under Alternative 2, the majority of Navy training activities would increase approximately twofold, as discussed in Chapter 2. Activities that include or would include aircraft make up a large portion of Alternative 2 activities. Although a small proportion of flights would be at altitudes as low as 300 ft, the preponderance of these air activities would take place at high altitudes far out to sea and out of range of human receptors.

Under Alternative 2, activities involving or potentially involving explosive ordnance would double. The types of sound generated by military activities under Alternative 2 would be identical to those under the No Action Alternative and Alternative 1. As with the No Action Alternative and Alternative 1, sound generating events under Alternative 2 are intermittent and would occur in remote ocean areas or off-limits areas. The center of the TMAA is located approximately 140 nm (259.3 km) from shore, and at its closest is over 12 nm (22 km) from shore. Activities in the TMAA are likely to be beyond the hearing of any human receptors. Precautions are taken pursuant to safety exclusion zone SOPs would prevent noise generating activities from occurring in the proximity to non-exercise personnel in ocean areas (such as fishermen in the TMAA). Members of the public at-sea in the TMAA, therefore, would not likely be exposed to high noise levels (such as may be generated by aircraft engine noise or explosive-related events).

Because sound-generating events in the TMAA are intermittent, occur in remote areas or off-limits areas, and do not expose the public to high noise levels, no sensitive receptors are likely to be exposed to sound from military activities under Alternative 2.

3.4.4 Mitigation

In the TMAA, most Navy training takes place far out to sea, and airborne noise levels will primarily affect military personnel operating the equipment/weapon systems producing the noise. Personnel engaged in the exercise wear personal protective equipment and are not considered sensitive receptors for purposes of this EIS/OEIS analysis. No additional noise-specific mitigation measures are required.

3.4.5 Summary of Effects

Table 3.4-4 summarizes the effects for the No Action Alternative, Alternative 1, and Alternative 2 on airborne noise under both NEPA and EO 12114.

Table 3.4-4: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, >12 nm)
No Action Alternative	• Current Navy activities involving aircraft overflight were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. territorial seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	*Surface Ship Noise* • No change from current conditions. No sensitive receptors present. *Aircraft Noise* • No change from current conditions. Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • No change from current conditions. Very short-term noise impacts. No sensitive receptors present at sea.
Alternative 1	• Current Navy activities involving aircraft overflight were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. territorial seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	*Surface Ship Noise* • Minor localized engine noise. No sensitive receptors present. *Aircraft Noise* • Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • Very short-term noise impacts. No sensitive receptors present at sea.
Alternative 2 (Preferred Alternative)	• Current Navy activities involving aircraft overflight were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. territorial seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	*Surface Ship Noise* • Minor localized engine noise. No sensitive receptors present. *Aircraft Noise* • Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • Very short-term noise impacts. No sensitive receptors present at sea.

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