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3.2 AIR QUALITY

AIR QUALITY SYNOPSIS

The United States Department of the Navy considered all potential stressors and the following have been analyzed for air quality:

- Criteria air pollutants
- Hazardous air pollutants

Preferred Alternative

- All reasonably foreseeable direct and indirect emissions of criteria air pollutants in nonattainment and maintenance areas do not equal or exceed applicable *de minimis* levels.
- The public would not be exposed to substantial concentrations of hazardous air pollutants.

3.2.1 INTRODUCTION AND METHODS

3.2.1.1 Introduction

Air pollution can threaten public health and damage the environment. Congress passed the Clean Air Act (CAA) and its amendments, which set regulatory limits on air pollutant emissions and help to ensure basic public health and environmental protection from air pollution. Air pollution damages trees, crops, other plants, lakes, and animals. In addition to damaging the natural environment, air pollution damages the exteriors of buildings, monuments, and statues. It can create haze or smog that reduces visibility in national parks and cities or that interferes with aviation.

Air quality is defined by atmospheric concentrations of specific air pollutants – pollutants the United States (U.S.) Environmental Protection Agency (EPA) determined may affect the health or welfare of the public. The six major air pollutants of concern, called "criteria pollutants," are: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter (PM), and lead (Pb). Suspended particulate matter is further categorized as particulates less than or equal to 10 microns in diameter (PM_{10}) and fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$). The EPA established National Ambient Air Quality Standards for these criteria pollutants.

In addition to the six criteria pollutants, the EPA designated 188 substances as hazardous air pollutants under the federal CAA. Hazardous air pollutants are air pollutants known to cause or suspected of causing cancer or other serious health effects, or adverse environmental effects (EPA 2010b). The State of Hawaii recognizes only the 188 federally designated hazardous air pollutants. The State of California regulates over 250 toxic air contaminants, including all of the federally designated hazardous air pollutants.

National Ambient Air Quality Standards have not been established for hazardous air pollutants. However, the EPA has developed rules that limit emissions of hazardous air pollutants from specific industrial sources. These emissions control standards are known as "maximum achievable control technologies" and "generally achievable control technologies." They are intended to achieve the maximum degree of reduction in emissions of hazardous air pollutants, taking into consideration the

cost of emissions control, non-air quality health and environmental impacts, and energy requirements. Examples of hazardous air pollutants include benzene, which is found in gasoline; perchloroethylene, which is emitted by some dry cleaning facilities; and methylene chloride, a solvent and paint stripper used in some industries. Hazardous air pollutants are regulated under the CAA's National Emission Standards for Hazardous Air Pollutants, which apply to specific sources of hazardous air pollutants; and under the Urban Air Toxics Strategy, which applies to area sources.

Air pollutants are classified as either primary or secondary pollutants, based on how they are formed. Primary air pollutants are emitted directly into the atmosphere from the source, and retain their chemical form. Examples of primary pollutants are the CO produced by a power plant burning fuel and volatile organic compounds emitted by a dry cleaner (EPA 2010b). Secondary air pollutants are formed through atmospheric chemical reactions – reactions that usually involve primary air pollutants (or pollutant precursors) and normal constituents of the atmosphere (EPA 2010b). O_3, a major component of photochemical smog that is the greatest air quality concern in California, is a secondary air pollutant. O_3 precursors consist of two groups of chemicals: nitrogen oxides (NO_X) and organic compounds. NO_X consists of nitric oxide (NO) and NO_2. Organic compound precursors of O_3 are routinely described by various terms, including volatile organic compounds, reactive organic compounds, and reactive organic gases. Finally, some air pollutants are a combination of primary and secondary pollutants. PM_{10} and $PM_{2.5}$ are both emitted as primary air pollutants by various mechanical processes (e.g., abrasion, erosion, mixing, or atomization) or combustion processes. They are generated as secondary air pollutants through chemical reactions or through the condensation of gaseous pollutants into fine aerosols.

Air pollutant emissions are reported as the rate (by weight or volume) at which specific compounds are emitted into the atmosphere by a source. Typical units for emission rates from a source are pound (lb.) per thousand gallons of fuel burned, lb. per U.S. ton of material processed, and grams (g) per vehicle-mile (mi.) traveled.

Ambient air quality is reported as the atmospheric concentrations of specific air pollutants at a particular time and location. The units of measure are expressed as a mass per unit volume (e.g., micrograms per cubic meter [$\mu g/m^3$] of air) or as a volume fraction (e.g., parts per million [ppm] by volume).The ambient air pollutant concentrations measured at a particular location are determined by the pollutant emissions rate, local meteorology, and atmospheric chemistry. Wind speed and direction, the vertical temperature gradient of the atmosphere, and precipitation patterns affect the dispersal, dilution, and removal of air pollutant emissions from the atmosphere.

3.2.1.2 Methods

Section 176(c)(1) of the CAA, commonly known as the General Conformity Rule, requires federal agencies to ensure that their actions conform to applicable implementation plans for achieving and maintaining the National Ambient Air Quality Standards for criteria pollutants.

3.2.1.2.1 Application of Regulatory Framework

3.2.1.2.1.1 National Ambient Air Quality Standards

National Ambient Air Quality Standards for criteria pollutants are set forth in Table 3.2-1. Areas that exceed a standard are designated as "nonattainment" for that pollutant, while areas that are in

Table 3.2-1: National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide (CO)	9 ppm (10 mg/m^3)	8-hour(1)	None	
	35 ppm (40 mg/m^3)	1-hour(1)	None	
Lead (Pb)	0.15 µg/m^3 (2)	Rolling 3-month average	Same as Primary	
Nitrogen Dioxide (NO_2)	53 ppb(3)	Annual (arithmetic mean)	Same as Primary	
	100 ppb	1-hour(4)	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour(5)	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual(6) (arithmetic mean)	Same as Primary	
	35 µg/m^3	24-hour(7)	Same as Primary	
Ozone (O_3)	0.075 ppm (2008 std)	8-hour(8)	Same as Primary	
	0.08 ppm (1997 std)	8-hour(9)	Same as Primary	
	0.12 ppm	1-hour(10)	Same as Primary	
Sulfur Dioxide (SO_2)	0.03 ppm(11) (1971 std)	Annual (arithmetic mean)	0.5 ppm	3-hour(1)
	0.14 ppm(11) (1971 std)	24-hour(1)		
	75 ppb(12)	1-hour	None	

Source: U.S. Environmental Protection Agency 2011b, Updated 4 August 2011.

Notes: mg/m^3 = milligrams/cubic meter; µg/m^3 = micrograms/cubic meter; ppm = parts per million; ppb = parts per billion; std = standard

(1) Not to be exceeded more than once per year.

(2) Final rule signed 15 October 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(3) The official level of the annual nitrogen dioxide standard is 0.053 parts per million (ppm), equal to parts per billion (53 ppb), which is shown here for the purpose of a clearer comparison with the 1-hour standard.

(4) To attain this standard, the three-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective 22 January 2010).

(5) Not to be exceeded more than once per year on average over three years.

(6) To attain this standard, the three-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 micrograms per cubic meter (µg/m^3).

(7) To attain this standard, the three-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective 17 December 2006).

(8) To attain this standard, the three-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective 27 May 2008).

(9) (a) To attain this standard, the three-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as the U.S. Environmental Protection Agency (EPA) undertakes rulemaking to address the transition from the 1997 O_3 standard to the 2008 O_3 standard.
(c) The EPA is reconsidering these standards (established in March 2008).

(10) (a) The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

(11) The 1971 sulfur dioxide standards remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

(12) Final rule signed 2 June 2010. To attain this standard, the three-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

compliance with a standard are in "attainment" for that pollutant. An area may be nonattainment for some pollutants and attainment for others simultaneously.

States, through their air quality management agencies, are required to prepare and implement State Implementation Plans for nonattainment areas, which demonstrate how the area will meet the National Ambient Air Quality Standards. Areas that have achieved attainment may be designated as

"maintenance areas," subject to maintenance plans showing how the area will continue to meet federal air quality standards. Nonattainment areas for some criteria pollutants are further classified, depending upon the severity of their air quality problem, to facilitate their management:

- O_3 – marginal, moderate, serious, severe, and extreme
- CO – moderate and serious
- PM – moderate and serious

The EPA delegates the regulation of air quality to the state once the state has an approved State Implementation Plan. The CAA also allows states to establish air quality standards more stringent than the National Ambient Air Quality Standards.

The Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) is offshore of California and Hawaii, and some elements of the Proposed Action occur within or over state waters. The attainment status for most of the Study Area is unclassified because only areas within state boundaries are classified. The federal CAA has no provision for classifying waters outside of the boundaries of state waters. Air quality in adjacent onshore areas may be affected by emissions of air pollutants from Study Area sources; however, because of the prevailing onshore winds during certain seasons and at certain times of day. The National Ambient Air Quality Standards attainment status of adjacent onshore areas is considered in determining whether appropriate controls on air pollution sources in the adjacent offshore state waters are warranted.

3.2.1.2.1.2 Conformity Analyses in Nonattainment and Maintenance Areas

General Conformity Evaluation

Federal actions are required to conform with the approved State Implementation Plan for those areas of the United States that are designated as nonattainment or maintenance air quality areas for any criteria air pollutant under the CAA (40 Code of Federal Regulations [C.F.R.] §§ 51 and 93). The purpose of the General Conformity Rule is to demonstrate that the Proposed Action would not cause or contribute to a violation of an air quality standard and that the Proposed Action would not adversely affect the attainment and maintenance of federal ambient air quality standards. A federal action would not conform if it increased the frequency or severity of any existing violations of an air quality standard or delayed the attainment of a standard, required interim emissions reductions, or delayed any other air quality milestone. To ensure that federal activities do not impede local efforts to control air pollution, Section 176(c) of the CAA (42 U.S. Code [U.S.C.] § 7506(c)) prohibits federal agencies from engaging in or approving actions that do not conform to an approved State Implementation Plan. The emissions thresholds that trigger the conformity requirements are called *de minimis* thresholds.

Federal agency compliance with the General Conformity Rule can be demonstrated in several ways. The requirement can be satisfied by a determination that the Proposed Action is not subject to the General Conformity Rule, by a Record of Non-Applicability, or by a Conformity Determination. Compliance is presumed if the net increase in emissions from a federal action would be less than the relevant *de minimis* threshold. If net emissions increases exceed the *de minimis* thresholds, then a formal Conformity Determination must be prepared. *De minimis* thresholds are shown in Table 3.2-2.

Table 3.2-2: *De Minimis* Thresholds for Conformity Determinations

Pollutant	Nonattainment or Maintenance Area Type	*De Minimis* Threshold (TPY)
Ozone (VOC or NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
CO, SO_2 and NO_2	All nonattainment & maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$	All nonattainment & maintenance	100
Lead (Pb)	All nonattainment & maintenance	25

Notes: NO_X = nitrogen oxides; Pb = lead; PM_{10} = particulate matter under 10 microns; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

Source: EPA 2011a

Certain U.S. Department of the Navy (Navy) training and testing activities occur in nonattainment or maintenance areas. These nonattainment and maintenance areas are identified by Air Basin or by Air Quality Control Region (federally designated areas within which communities share common air pollution problems). Two Air Basins in California (South Coast and San Diego; Figure 3.2-1) may be affected by Proposed Action training or testing activities. Coastal waters within 3 nautical miles (nm) of the coast are under the same air quality jurisdiction as the contiguous land area.

South Coast Air Basin (California)

The Proposed Action includes activities in South Coast Air Basin, which is classified as an extreme non-attainment area for the federal 8-hour ozone standard, as a maintenance area for CO and NO_2, as a serious nonattainment area for PM_{10}, and as a nonattainment area for $PM_{2.5}$. The Proposed Action is required to demonstrate conformity with the approved State Implementation Plan. However, the General Conformity Rule states that a federal action is exempt from the requirements of a full conformity demonstration for those criteria air pollutants for which emissions increases are below specific *de minimis* emissions thresholds. The *de minimis* thresholds for nonattainment and maintenance pollutants in South Coast Air Basin under the General Conformity Rule are shown in Table 3.2-2.

San Diego Air Basin (California)

The Proposed Action includes activities that occur in San Diego Air Basin, which is designated a nonattainment area for the federal 8-hour O_3 standard and as a maintenance area for CO. The Proposed Action is required to demonstrate conformity with the approved State Implementation Plan. However, the General Conformity Rule states that a federal action is exempt from the requirements of a full conformity demonstration for those criteria air pollutants for which emissions increases are below

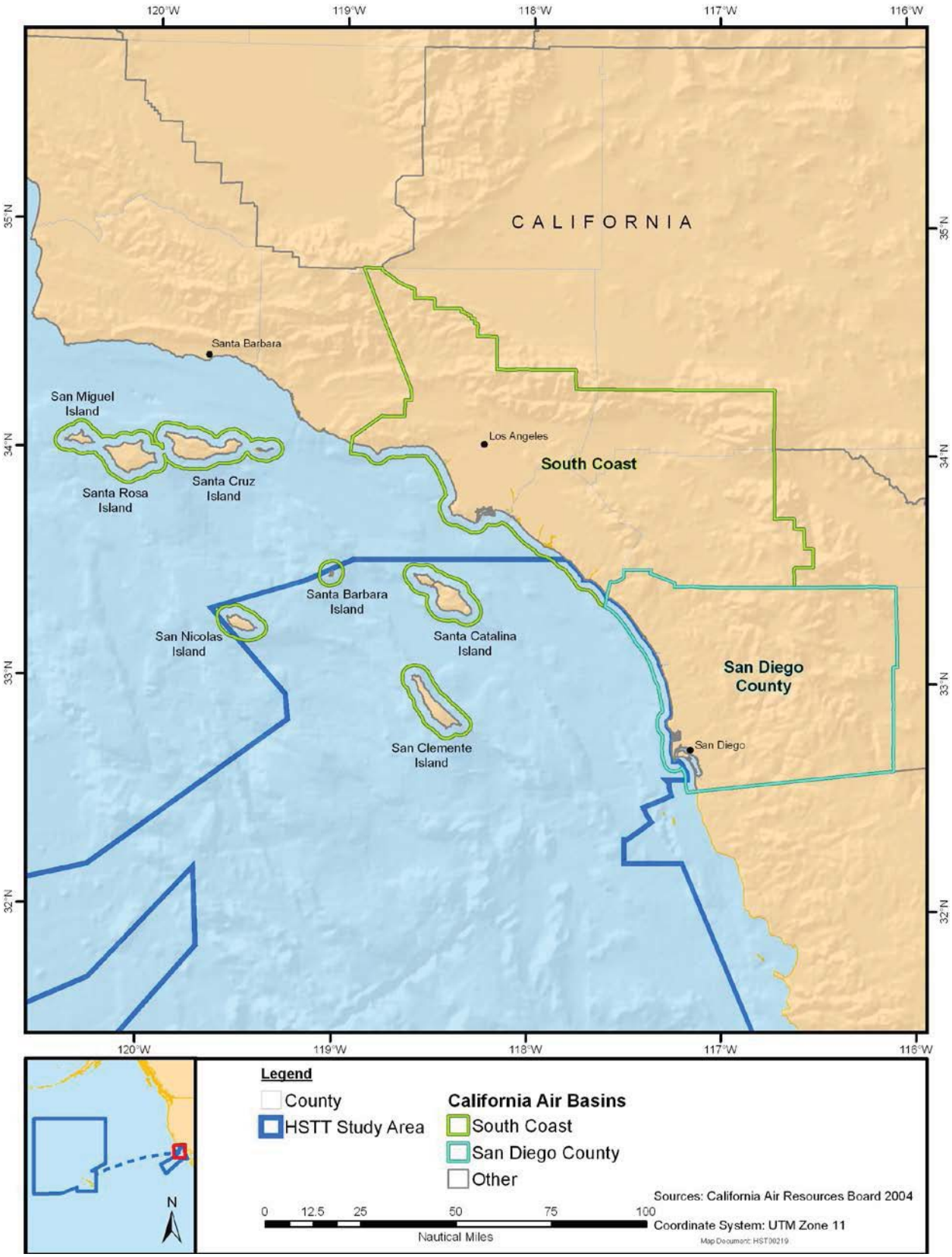

Figure 3.2-1: Southern California Air Basins Adjacent to the Study Area

specific de minimis emissions levels. The de minimis levels for nonattainment and maintenance pollutants in the San Diego Air Basin under the General Conformity Rule are shown in Table 3.2-2.

Other Air Basins Adjacent to the Study Area

As mentioned, the conformity review can be satisfied by a determination that the Proposed Action is not subject to the General Conformity Rule, by a Record of Non-Applicability, or by a Conformity Determination. Actions not subject to the Rule include actions that occur in attainment areas, and that do not generate emissions in nonattainment areas. If National Environmental Policy Act (NEPA) documentation is prepared for an agency action, the determination that the Proposed Action is not subject to the General Conformity Rule is described in that documentation. Otherwise, no documentation is required. This Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) includes the determination that actions in attainment areas that do not emit air pollutants in nonattainment areas are not subject to the General Conformity Rule.

With the exception of activities in California's South Coast and San Diego Air Basins, training and testing in the Study Area take place either within an attainment area (e.g., State of Hawaii waters) or they take place more than 3 nm from shore in unclassified portions of the Study Area. Although some Operating Areas and special use airspace are adjacent to Air Basins in California classified as nonattainment areas for O_3, training and testing in these offshore sea and air spaces are conducted beyond state waters (at least 3 nm offshore and typically more than 12 nm) within areas whose attainment status is unclassified. The CAA does not provide for any classification of waters beyond the boundaries of state waters.

3.2.1.2.1.3 Prevention of Significant Deterioration

Class I areas are defined by the CAA as federally owned properties for which air quality-related values are highly prized and for which very little decrease in air quality, including visibility, can be tolerated. The Proposed Action does not include any stationary sources constructed or modified after enactment of the CAA regulations, so the Prevention of Significant Deterioration Class I requirements do not apply.

On 13 May 2010, the EPA issued a final rule that established a commonsense approach to addressing greenhouse gas emissions from stationary sources under the CAA permitting programs (U.S. Environmental Protection Agency 2010a). This final rule sets thresholds for greenhouse gas emissions that define when permits under the New Source Review Prevention of Significant Deterioration and Title V Operating Permit programs are required for new and existing industrial facilities. The Navy aircraft, vessel, system, and munitions training and testing included in the Proposed Action do not involve any new or existing industrial facilities or stationary sources subject to the greenhouse gas tailoring rule.

3.2.1.2.2 Approach to Analysis

The air quality impact evaluation requires two separate analyses: (1) impacts of air pollutants emitted by Navy training and testing in U.S. territorial seas (i.e., within 12 nm of the coast) are assessed under NEPA, and (2) impacts of air pollutants emitted by Navy training and testing activities outside of U.S. territorial seas are evaluated under Executive Order (EO) 12114. State waters are within the jurisdiction of the respective state and, because each state has a distinct State Implementation Plan, the air quality evaluation separately analyzes those activities that emit air pollutants within each state's jurisdiction. Portions of the Study Area that lie within 3 nm of the coastline are within state air quality jurisdictions.

The analysis of health-based air quality impacts under NEPA includes estimates of criteria air pollutants for all training and testing activities where aircraft, missiles, or targets operate at or below 3,000 feet (ft.) (914 meters [m]) above ground level or which involve vessels in U.S. territorial seas. The analysis of

health-based air quality impacts under EO 12114 includes emissions estimates of only those training and testing activities in which aircraft, missiles, or targets operate at or below 3,000 ft. (914 m) above ground level, or that involve vessels outside of U.S. territorial seas. Air pollutants emitted more than 3,000 ft. (914 m) above ground level are considered to be above the atmospheric inversion layer and, therefore, do not affect ground-level air quality (U.S. Environmental Protection Agency 1992). These emissions thus do not affect the concentrations of air pollutants in the lower atmosphere, measured at ground-level monitoring stations, upon which federal, state, and local regulatory decisions are based. For the analysis of the impacts on global climate change, however, all emissions of greenhouse gases from aircraft and vessels participating in training and testing activities, as well as targets and ordnance expended, are included regardless of altitude (see Chapter 4).

Criteria air pollutants are generated by the combustion of fuel by surface vessels and by fixed-wing and rotary-wing aircraft. They also are generated by the combustion of explosives and propellants in various types of munitions. Propellants used in small-, medium-, and large-caliber projectiles generate criteria pollutants when detonated. Nonexplosive practice munitions contain spotting charges and propellants that generate criteria air pollutants when they function. Powered targets require fuel, generating criteria air pollutants during their operation, and towed targets generate criteria air pollutants secondarily because another aircraft or vessel is required to provide power. Targets may generate criteria air pollutants if portions of the item burn in a high-order detonation. Chaff cartridges used by ships and aircraft are launched by an explosive charge that generates small quantities of criteria air pollutants. Countermeasure flares, parachute flares, and smoke floats are designed to burn for a prescribed period, emitting criteria pollutants in the process.

The air quality analysis also includes estimating the amounts of hazardous air pollutants emitted by the proposed activities and assessing their potential impacts on air quality. Trace amounts of hazardous air pollutants would be emitted by combustion sources and use of ordnance. Hazardous air pollutants, such as rocket motor exhaust and unspent missile fuel vapors, may be emitted during missile and target use. Hazardous air pollutants are generated, in addition to criteria air pollutants, by combustion of fuels, explosives, propellants, and the materials of which targets, munitions, and other training and testing materials are constructed (e.g., plastic, paint, wood). Fugitive volatile and semi-volatile petroleum compounds also may be emitted whenever mechanical devices are used. These emissions are typically one or more orders of magnitude smaller than concurrent emissions of criteria air pollutants, and only become a concern when large amounts of fuel, explosives, or other materials are consumed during a single activity or in one location.

Emissions of hazardous air pollutants are intermittent and dispersed over a vast ocean area. Because only small quantities of hazardous air pollutants are emitted into the lower atmosphere, which is well mixed over the ocean, the potential for exposure is very low and the risk presented by the emissions is similarly very low. The primary emissions from many munition types are carbon dioxide (CO_2), CO, and particulate matter; hazardous air pollutants are emitted at low levels (U.S. Environmental Protection Agency 2008). A quantitative evaluation of hazardous air pollutant emissions is thus not warranted and was not conducted.

Electronic warfare countermeasures generate emissions of chaff, a form of particulate not regulated under the federal Clean Air Act as a criteria air pollutant (virtually all radio frequency chaff is 10 to 100 times larger than particulate matter under PM_{10} and $PM_{2.5}$ [Spargo et al. 1999]). The types of training and testing that produce these other emissions may take place throughout the Study Area but occur primarily within special use airspace. Chaff emissions during training and testing primarily occur 3

nm or more from shore and at altitudes over 3,000 ft. (914 m) (above the mixing layer). Chaff released over the ocean would disperse in the atmosphere and then settle onto the ocean surface. The air quality impacts of chaff were evaluated by the Air Force in *Environmental Effects of Self-Protection Chaff and Flares* (U.S. Air Force 1997). The study concluded that most chaff fibers maintain their integrity after ejection. Although some fibers are likely to fracture during ejection, it appears this fracturing does not release particulate matter. Tests indicated that the explosive charge in the impulse cartridge results in minimal releases of particulate matter. A later study at Naval Air Station Fallon found that the release of 50,000 cartridges of chaff per year over 10,000 square miles would result in an annual average PM_{10} or $PM_{2.5}$ concentration of 0.018 $\mu g/m^3$ (far below the then National Ambient Air Quality Standard of 50 $\mu g/m^3$ for PM_{10} and 15 $\mu g/m^3$ for $PM_{2.5}$ [Agency for Toxic Substances and Disease Registry 2003]).[1] Therefore, chaff is not further evaluated as an air quality stressor in this EIS/OEIS.

The NEPA analysis includes a CAA General Conformity Analysis to support a determination pursuant to the General Conformity Rule (40 C.F.R. Part 93B). This analysis focuses on training and testing activities that could impact nonattainment or maintenance areas within the region of influence. To evaluate the conformity of the Proposed Action with the State Implementation Plan elements for each California Air Basin, air pollutant emissions within these regions are estimated, based on an assumed distribution of the proposed training and testing activities within the respective portions of the Study Area.

Air pollutant emissions outside of U.S. territorial seas are estimated and their potential impacts on air quality are assessed under EO 12114. The General Conformity Rule does not apply to activities outside of U.S. territorial seas because the CAA does not apply to actions outside of the United States.

Data for the air quality analysis are based, wherever possible, on information from Navy subject matter experts and established training requirements. These data were used to estimate the numbers and types of aircraft, surface ships and vessels, submarines, and munitions (i.e., potential sources of air emissions) that would be involved in training and testing activities under each alternative. Emissions sources and the approach used to estimate emissions under the No Action Alternative, Alternative 1, and Alternative 2 are presented herein.

3.2.1.2.3 Emissions Estimates

3.2.1.2.3.1 Aircraft Activities

To estimate aircraft emissions, the operating modes (e.g., “cruise” mode), number of hours of operation, and types of engine for each type of aircraft were evaluated. All aircraft are assumed to travel to and from training ranges at or above 3,000 ft. (914 m) above ground level and, therefore, their transits to and from the ranges do not affect surface air quality. Air combat maneuvers and air-to-air missile exercises are primarily conducted at altitudes well in excess of 3,000 ft. (914 m) above ground level and, therefore, are not included in the estimated emissions of criteria air pollutants. Activities or portions of those training or testing activities occurring below 3,000 ft. (914 m) are included in emissions estimates. Examples of activities typically occurring below 3,000 ft. (914 m) include those involving helicopter platforms such as mine warfare, anti-surface warfare, and anti-submarine warfare training and testing activities. The list of all training and testing activities and the estimated time spent above or below 3,000 ft. (914 m) for calculation purposes is included in the air quality emissions estimates presented in Appendix D-1.

[1] The current standard for PM_{10} is 150 $\mu g/m^3$ over a 24-hour average time (See Table 3.2-1).

The types of aircraft used and the numbers of flights flown under the No Action Alternative are derived from historical data. The types of aircraft identified include the typical aircraft platforms that conduct a particular training or testing exercise (or the closest surrogate when information is not available), including range support aircraft (e.g., non-Navy commercial air services). For Alternatives 1 and 2, estimates of future aircraft sorties are based on evolutionary changes in the Navy's force structure and mission assignments. Where there are no major changes in types of aircraft, future activity levels are estimated from the distribution of baseline activities. The types of aircraft used in each training or testing activity and numbers of sorties flown by such aircraft are presented in Appendix D-1.

Time on range (activity duration) under the No Action Alternative was calculated from average times derived from range records and Navy subject matter experts. To estimate time on range for each aircraft activity in Alternatives 1 and 2, the average flight duration approximated in the baseline data was used in the calculations. Estimated altitudes of activities for all aircraft were obtained from aircrew members in operational squadrons. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of aircraft type, altitude, and flight duration. Table 2.8-2 lists Naval Air Systems Command testing activities similar to certain training activities. Where aircraft testing activities were dissimilar to training activities, assumptions for time on range were derived from Navy subject matter experts.

Air pollutant emissions were estimated based on the Navy's Aircraft Environmental Support Office Memorandum Reports for individual aircraft categories (Aircraft Emission Estimates: Mission Operations). For aircraft for which Aircraft Environmental Support Office emission factors were not available, emission factors were obtained from other published sources.

The emissions calculations for each alternative conservatively assume that each aircraft activity listed in Tables 2.8-1 to 2.8-5 is separately conducted. In practice, a testing activity may be conducted during a training flight. Two or more training activities also may be conducted during one flight (e.g., chaff or flare exercises may occur during electronic warfare operations; or air-to-surface gunnery and air-to-surface bombing activities may occur during a single flight operation). Using conservative assumptions may produce elevated aircraft emissions estimates, but accounts for the possibility (however remote) that each aircraft training and testing activity is separately conducted.

3.2.1.2.3.2 Surface Ship Activities

Marine vessel traffic in the Study Area includes military ship and boat traffic, unmanned surface vessels, and range support vessels providing services for military training and testing activities. Nonmilitary commercial vessels and recreational vessels also are regularly present. These commercial vessels are not evaluated in the air quality analysis because they are not part of the Proposed Action. The methods of estimating marine vessel emissions involve evaluating the type of activity, the number of hours of operation, the type of propulsion, and the type of onboard generator for each vessel type.

The types of surface ships and numbers of activities for the No Action Alternative are derived from range records and Navy subject matter experts regarding vessel participant data. For Alternatives 1 and 2, estimates of future ship activities are based on anticipated evolutionary changes in the Navy's force structure and mission assignments. Where there are no major changes in types of ships, estimates of future activities are based on the historical distribution of ship use. Navy aircraft carriers and submarines are nuclear-powered, and have no air pollutant emissions associated with propulsion.

For surface ships, the durations of activities were estimated by taking an average over the total number of activities for each type of training and testing. Emissions for baseline activities and for future activities were estimated based on discussions with exercise participants. In addition, information provided by subject-matter experts was used to develop a breakdown of time spent at each operational mode (i.e., power level) used during activities in which marine vessels participated. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of vessel type, power level, and activity duration.

Emission factors for marine vessels were obtained from the database developed for Naval Sea Systems Command by John J. McMullen Associates, Inc. (John J. McMullen Associates 2001). Emission factors were provided for each marine vessel type and power level. The resulting calculations provided information on the time spent at each power level in each part of the Study Area, emission factors for that power level (in pounds of pollutant per hour), and total emissions for each marine vessel for each operational type and mode.

The pollutants for which calculations are made include exhaust total hydrocarbons, CO, NO_x, PM, CO_2, and SO_2. For non-road engines, all particulate matter emissions are assumed to be smaller than PM_{10}, and 92 percent of the particulate matter from gasoline and diesel-fueled engines is assumed to be smaller than $PM_{2.5}$ (U.S. Environmental Protection Agency 2002). For gaseous-fueled engines (liquefied petroleum gas/compressed natural gas), 100 percent of the particulate matter emissions are assumed to be smaller than $PM_{2.5}$ (U.S. Environmental Protection Agency 2002).

The emissions calculations for each alternative conservatively assume that each vessel activity listed in Chapter 2, Tables 2.8-1 to 2.8-5 is separately conducted and separately produces vessel emissions. In practice, one or more testing activities may take advantage of an opportunity to travel at sea aboard and test from a vessel conducting a related or unrelated training activity. It is also probable that two or more training activities may be conducted during one training vessel movement (e.g., a ship may conduct large-, medium-, and small-caliber surface-to-surface gunnery exercises during one vessel movement). Furthermore, multiple unit level training activities may be conducted during a larger composite training unit exercise. Using conservative assumptions may produce elevated vessel emissions estimates, but accounts for the possibility (however remote) that each training or testing activity is separately conducted.

3.2.1.2.3.3 Submarine Activities

No U.S. submarines burn fossil fuel under normal operating conditions (they are nuclear-powered); therefore, no air pollutants are emitted during submarine training or testing activities.

3.2.1.2.3.4 Naval Gunfire, Missiles, Bombs, Other Munitions and Military Expended Material

Naval gunfire, missiles, bombs, and other types of munitions used in training and testing activities emit air pollutants. To estimate the amounts of air pollutants emitted by ordnance during their use, the numbers and types of munitions used during training or testing activities are first totaled. Then generally accepted emissions factors (AP-42, Compilation of Air Pollutant Emission Factors, Chapter 15: Ordnance Detonation ([U.S. Environmental Protection Agency 1995]) for criteria air pollutants are applied to the total amounts. Finally, the total amounts of air pollutants emitted by each munition type are summed to produce total amounts of each criteria air pollutant under each alternative.

3.2.1.2.4 Sensitive Receptors

Identifying sensitive receptors is part of describing the existing air quality environment. Sensitive receptors are individuals in residential areas, schools, parks, hospitals, and other sites for whom there is a reasonable expectation of continuous exposure during periods of peak ambient air pollutant concentrations. In the Study Area, crews of vessels and recreational users of the ocean may encounter air pollutants generated by the Proposed Action. Few such individuals are typically present, however, and the durations of their exposures to substantial concentrations of these pollutants are limited because the areas are cleared of nonparticipants before activities commence. These potential receptors within the Study Area are thus not considered sensitive.

3.2.1.3 Climate Change

Greenhouse gases are compounds that contribute to the greenhouse effect—a natural phenomenon in which gases trap heat in the lowest layer of the earth's atmosphere (surface-troposphere system), causing heating (radiative forcing) at the surface of the earth. The primary long-lived greenhouse gases directly emitted by human activities are CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF_6). CO_2, CH_4, and N_2O occur naturally in the atmosphere. However, their concentrations have increased from the preindustrial era (1750) to 2007 to 2008: CO_2 (38 percent), CH_4 (149 percent), and N_2O (23 percent) (U.S. Environmental Protection Agency 2009b). These gases influence global climate by trapping heat in the atmosphere that would otherwise escape to space. The heating effect of these gases is considered the probable cause of the global warming observed over the last 50 years (U.S. Environmental Protection Agency 2009b). Climate change can affect many aspects of the environment. Not all impacts of greenhouse gases are related to climate. For example, elevated concentrations of CO_2 can lead to ocean acidification and stimulate terrestrial plant growth, and CH_4 emissions can contribute to higher O_3 levels.

The administrator of the EPA determined that six greenhouse gases taken in combination endanger both the public health and the public welfare of current and future generations. The U.S. Environmental Protection Agency specifically identified CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and SF_6 as greenhouse gases (U.S. Environmental Protection Agency 2009d; 74 Federal Register 66496, 15 December 2009).

To estimate the global warming potential, the United States quantifies greenhouse gas emissions using the 100-year timeframe values established in the Intergovernmental Panel on Climate Change Second Assessment Report (Intergovernmental Panel on Climate Change 1995), in accordance with United Nations Framework Convention on Climate Change (United Nations Framework Convention on Climate Change 2004) reporting procedures. All global warming potentials are expressed relative to a reference gas, CO_2, which is assigned a global warming potential equal to 1. The five other greenhouse gases have a greater global warming potential than CO_2, ranging from 21 for CH_4, 310 for N_2O, 140 to 6,300 for hydrofluorocarbons, 6,500 to 9,200 for perfluorocarbons, and up to 23,900 for sulfur hexafluoride. To estimate the CO_2 equivalency of a non-CO_2 greenhouse gas, the appropriate global warming potential of that gas is multiplied by the amount of the gas emitted. All six greenhouse gases are multiplied by their global warming potential and the results are added to calculate the total equivalent (Eq) emissions of CO_2 (CO_2 Eq). The dominant greenhouse gas emitted is CO_2, mostly from fossil fuel combustion (85.4 percent) (U.S. Environmental Protection Agency 2009c). Weighted by global warming potential, CH_4 is the second largest component of emissions, followed by N_2O. Global warming potential -weighted emissions are presented in terms of equivalent emissions of CO_2, using units of teragrams (1 million metric tons or 1 billion kilograms [Tg]) of CO_2 equivalents (Tg CO_2 Eq). The Proposed Action is anticipated

to release greenhouse gases to the atmosphere. These emissions are quantified for the proposed Navy training and testing in the Study Area, and estimates are presented in Chapter 4.

The potential impacts of proposed greenhouse gas emissions are by nature global; individual sources of greenhouse gas emissions are not large enough to have any noticeable effect on climate change but may have cumulative impacts. Therefore, the impact of proposed greenhouse gas emissions on climate change is discussed in the context of cumulative impacts in Chapter 4.

3.2.1.4 Other Compliance Considerations, Requirements, and Practices

3.2.1.4.1 Executive Order 12088

Executive Order 12088, *Federal Compliance with Pollution Control Standards*, requires each federal agency to comply with applicable pollution control standards, defined as, "the same substantive, procedural, and other requirements that would apply to a private person." The EO further requires federal agencies to cooperate with EPA, state, and local environmental regulatory agencies.

3.2.1.4.2 Chief of Naval Operations Instruction 5090.1

The Navy developed Chief of Naval Operations Instruction (OPNAVINST) 5090.1 series, which contains guidance for environmental evaluations. Chapter 7 and Appendix F of this series contain guidance for air quality analysis and General Conformity determinations. The analysis in this EIS/OEIS was performed in compliance with this instruction.

3.2.1.4.3 Current Requirements and Practices

Equipment used by military units in the Study Area, including ships and other marine vessels, aircraft, and other equipment, are properly maintained and fueled in accordance with applicable Navy requirements. Operating equipment meets federal and state emission standards, where applicable. For example, in accordance with the OPNAVINST 5090.1 series, Chapter 7, Navy commands shall comply with Navy and regulatory requirements for composition of fuels used in all motor vehicles, equipment, and vessels. To prevent misfueling, installations shall enforce appropriate controls to ensure that any fuel that does not meet low-sulfur requirements is not dispensed to commercial motor vehicles, equipment, or vessels that are not covered under a national security exemption.

3.2.2 AFFECTED ENVIRONMENT

3.2.2.1 Region of Influence

The region of influence for air quality is a function of the type of pollutant, emission rates of the pollutant source, proximity to other emission sources, and local and regional meteorology. For inert pollutants (all pollutants other than O_3 and its precursors), the region of influence is generally limited to a few miles downwind from the source. For a photochemical pollutant such as O_3, however, the region of influence may extend much farther downwind. O_3 is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors (volatile organic compounds and NO_X). The maximum impacts of precursors on O_3 levels tend to occur several hours after the time of emission during periods of high solar load, and may occur many miles from the source. O_3 and O_3 precursors transported from other regions can also combine with local emissions to produce high local O_3 concentrations. Therefore, the region of influence for air quality includes the Study Area as well as adjoining land areas several miles inland, which may from time to time be downwind from emission sources associated with the Proposed Action.

3.2.2.2 Climate of the Study Area

The climate of the Study Area influences air quality. The climate of the Pacific Ocean and adjacent land areas is influenced by the temperatures of the surface waters and water currents as well as by wind blowing across the water. Offshore climates are moderate, and seldom have extreme seasonal variations because the ocean is slow to change temperature. Ocean currents influence climate by moving warm and cold water between regions. Adjacent land areas are affected by the wind that is cooled or warmed when blowing over these currents. In addition to its influence on temperature, the wind moves evaporated moisture from the ocean to adjacent land areas and is a major source of rainfall.

Atmospheric stability and mixing height provide measures of the amount of vertical mixing of pollutants. Over water, the atmosphere tends to be neutral to slightly unstable. Over land, atmospheric stability is more variable, being unstable during the day, especially in summer due to rapid surface heating, and stable at night, especially under clear conditions in winter. The mixing height over water typically ranges from 1,640 to 3,281 ft. (500 to 1,000 m) with a slight diurnal (daytime) variation (EPA 1972). The air quality analysis presented in this EIS/OEIS assumes that 3,000 ft. (914 m) above ground level is the typical maximum afternoon mixing height, and thus air pollutants emitted above this altitude do not affect ground-level air pollutant concentrations.

3.2.2.2.1 Hawaii

The climate of the Pacific Ocean offshore of the Hawaiian Islands is subtropical. Offshore winds are predominantly from the north, northeast, and east at 10 to 20 miles per hour (5 to 10 meters/second [m/s]). Air temperatures are moderate, and vary slightly by season, ranging from about 70 to 80 degrees Fahrenheit (°F) (21 to 27 degrees Celsius [°C]). Estimated annual rainfall in ocean areas offshore of Hawaii is estimated at about 25 inches (in.) (64 centimeters [cm]), with most rainfall during the winter season (Western Regional Climate Center 2010).

The climate of Hawaii influences air quality in several ways. The prevailing trade winds provide strong, regular regional ventilation that quickly disperses air pollutants and breaks up inversion layers. Frequent rainfall on windward sides of the islands washes dust and other air pollutants out of the atmosphere. During mild Kona (i.e., absence of daily trade winds) weather, local air pollutant concentrations may temporarily increase and volcanic organic gases emissions from the Island of Hawaii may temporarily affect the other islands in the Main Hawaiian Islands.

3.2.2.2.2 Southern California

The climate of coastal Southern California and adjacent offshore Pacific Ocean waters consists of warm, dry summers and cool, wet winters. One of the main influences on the climate is a semi-permanent high-pressure system (the Pacific High) in the eastern Pacific Ocean. This high-pressure cell maintains clear skies in Southern California for much of the year. When the Pacific High moves south during the winter, this pattern changes and low-pressure centers migrate into the region, causing widespread precipitation.

The Pacific High influences the large-scale wind patterns of California. The predominant regional wind directions are westerly and west-southwesterly during all four seasons. Surface winds typically are from the west (onshore) during the day and from the east (offshore) at night; this diurnal wind pattern is dominant in winter but is weak or absent in summer, when onshore winds may occur both day and

night. Along the coast, average wind speeds are low at night, increase during morning hours to a midday peak, then decrease through the afternoon.

Precipitation in coastal Southern California falls almost exclusively as rain. Most of this precipitation falls from late fall through early spring. No measurements are available for the open ocean; rainfall in coastal San Diego County averages about 9.9 in. (25 cm) per year (San Diego County Water Authority 2010).

3.2.2.3 Regional Emissions

Unknown quantities of air pollutants are emitted by commercial and recreational aircraft and vessels operating in the Study Area. The types of air pollutants emitted from vessels operating in the Study Area can include CO, NO_x, SO_x and PM from diesel fuel combustion (Markle and Brown 1995) and CO, NO_x, sulfur oxides (SO_x), polycyclic aromatic hydrocarbons, and formaldehyde from Jet Propellant-8 combustion (Ritchie et al. 2001). Other common fuels combusted by recreational aircraft and vessels include 100-Low-Lead (resulting in lead emissions in addition to those previously listed) and gasoline.

3.2.2.3.1 Hawaii

No major stationary sources of air pollutant emissions exist within the Hawaii portion of the Study Area. However, air pollutants generated in adjacent land areas may be transported into the Study Area.

The largest point sources of air pollutants in the Hawaiian Islands are power-generating stations, petroleum refining, and agriculture. Most stationary air pollutant sources are located on Oahu. Maui County emissions total about one-third of Oahu emissions, Kauai emissions are about one-half of Maui County emissions, and the Island of Hawaii accounts for less than 10 percent of total emissions. Heavy volumes of automobile traffic during commute hours in urban areas may occasionally cause concentrations of primary pollutants to exceed short-term air quality standards. The small number of major sources, dispersed population centers, and generally good ventilation from daily trade winds combine, however, to assure that air quality in Hawaii is good to excellent. Volcanic organic gases from volcanic eruptions on the Island of Hawaii are a major natural source of air pollution in Hawaii. Volcanic organic gases have an especially strong influence on air quality in the Hawaiian Islands during Kona weather, when winds are from the south.

3.2.2.3.2 Southern California

The Southern California ranges lie partly within South Coast Air Basin and partly within San Diego Air Basin (Figure 3.2-1). Stationary sources of air pollutants within the California region of the Study Area are limited to terrestrial emissions sources on the Channel Islands, which are not included in the at-sea training and testing activities addressed in this EIS/OEIS. Mobile sources of air pollutants in this region include commercial, recreational, institutional, governmental, and scientific vessel and aircraft traffic. Air pollutants generated in adjacent land areas (e.g., coastal Southern California) may be transported into the Study Area and thus may adversely affect its air quality.

3.2.2.3.2.1 South Coast Air Basin

South Coast Air Basin includes Orange County and portions of Los Angeles, Riverside, and San Bernardino Counties, as well as some marine areas (e.g., San Clemente Island and its adjacent waters within 3 nm). With 15 million inhabitants, South Coast Air Basin encompasses about 43 percent of California's population, accounts for 40 percent of all vehicle miles traveled, and is responsible for 28 percent of all air pollutant emissions in the State (California Air Resources Board 2010). Motor vehicles are the largest sources of CO, NO_x, and volatile organic compounds in the Air Basin. The Air Basin has a

heavy concentration of industrial facilities, several major airports, two major shipping ports, and a dense freeway and surface street network.

3.2.2.3.2.2 San Diego Air Basin

San Diego Air Basin, consisting of San Diego County, encompasses about 8 percent of the State of California's population. San Diego Air Basin accounts for about 9 percent of vehicle miles traveled in California. It includes industrial facilities, an international airport, and a large seaport. Seven percent of California's air pollutant emissions are generated in San Diego Air Basin (California Air Resources Board 2010).

3.2.2.3.2.3 Regional Transport of Air Pollutants

Air pollutant emissions from offshore coastal areas may affect onshore air quality. Over the past decade, the California Air Resources Board has prepared a series of technical assessments of transport relationships among air basins in California. The assessments identify transport couples, consisting of an upwind and a downwind area. The studies characterize the contributions of transported air pollutants as overwhelming, significant, or inconsequential. The influence of transport on a downwind air basin can vary widely depending on the weather. Transport from the South Coast Air Basin to the San Diego Air Basin has been identified as a transport couple.

In 1997, California Air Resources Board established that transport from the South Coast Air Basin to the San Diego Air Basin contributes to pollutants in the latter basin. Meteorological data indicate that pollutants are transported southeasterly, so emissions in offshore areas do not contribute to pollutant concentrations in the South Coast Air Basin. Air emissions in the California offshore ranges are transported to the east and south, affecting the San Diego Air Basin and Baja California (Mexico). In particular, air pollutants emitted in the southern portion of Warning Area 291 (W-291), including the Tactical Maneuvering areas, Fleet Training Area Hot, and Missile Range areas, could affect air quality in Mexico.

The California Air Resources Board and the South Coast Air Quality Management District have determined that emissions of air pollutants on and around San Clemente Island have no effect on the attainment status of South Coast Air Basin, and thus have exempted both stationary and mobile sources of air pollutants on and around San Clemente Island (within 3 nm) from air quality control measures designed to reduce air pollutant emissions (U.S. Department of the Navy 2008).

3.2.2.4 Existing Air Quality

Air quality in offshore ocean areas is generally higher than the air quality of adjacent onshore areas because there are few or no large sources of criteria air pollutants offshore. Much of the air pollutants found in offshore areas are transported there from adjacent land areas by low-level offshore winds, so concentrations of criteria air pollutants generally decrease with increasing distance from land. No criteria air pollutant monitoring stations are located in offshore areas, so air quality in the Study Area must be inferred from the air quality in adjacent land areas where air pollutant concentrations are monitored.

3.2.2.4.1 Hawaii

Air quality in Hawaii is generally good to excellent, because of the small number of major sources and strong ventilation provided by frequent trade winds. Monitored air pollutant concentrations are generally well below State of Hawaii or federal air quality standards. Between 2001 and 2005, none of

the air quality monitoring stations in Hawaii recorded criteria air pollutant concentrations that exceeded the annual average ambient air quality standards. The entire State of Hawaii is in attainment of the National Ambient Air Quality Standards and State Ambient Air Quality Standards for all criteria air pollutants. Therefore, a Conformity Determination is not required for those elements of the Proposed Action that occur in Hawaii state waters.

3.2.2.4.2 Southern California

3.2.2.4.2.1 South Coast Air Basin

Air quality in South Coast Air Basin is generally fair to poor, relative to other regions. South Coast Air Basin is classified as an extreme non-attainment area for O_3 (8-hour average concentration) under the National Ambient Air Quality Standards, a CO maintenance area, a maintenance area for NO_2, a serious non-attainment area for PM_{10}, and a non-attainment area for $PM_{2.5}$.

3.2.2.4.2.2 San Diego Air Basin

Coastal waters in San Diego Air Basin are classified as a non-attainment area for O_3 (8-hour average concentration) under the National Ambient Air Quality Standards, and are classified as a maintenance area for CO. U.S. Environmental Protection Agency is redesignating the County's 8-hour ozone attainment status from "basic nonattainment" to "serious nonattainment." If approved, this redesignation will reduce the General Conformity *de minimis* levels of volatile organic compounds and NO_x from 100 tons (90,719 kilograms [kg]) per year to 50 tons (45,359 kg) per year.

3.2.2.4.3 Transit Corridor

Air quality in the Transit Corridor, which is more remote from major sources of air pollutants than either the SOCAL or the Hawaii Range Complex, is unknown but is expected to be of higher quality than either of these areas.

3.2.3 ENVIRONMENTAL CONSEQUENCES

This section evaluates how and to what degree the activities described in Chapter 2 could impact air quality within the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of activities and ordnance expended). The air quality stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to air quality in the Study Area that are analyzed below include the following:

- Criteria air pollutants
- Hazardous air pollutants

In this analysis, criteria air pollutant emissions were estimated for vessels, aircraft, and ordnance. For each alternative, emissions were estimated by sub-region of the Study Area and by type of activity (training or testing). Details of the emission estimates are provided in Appendix D-1. Hazardous air pollutants are analyzed qualitatively in relation to the prevalence of the sources emitting hazardous air pollutants during training and testing activities.

3.2.3.1 Criteria Air Pollutants

The potential impacts of criteria air pollutants are evaluated by first estimating the emissions from training and testing activities in the Study Area for each alternative. These estimates are then used to determine the potential impact of the emissions on the attainment status of the adjacent Air Quality Control Region. Emissions of criteria air pollutants may affect human health directly by degrading local

or regional air quality or indirectly by their impacts on the environment. Air pollutant emissions may also have a regulatory effect separate from their physical effect, if additional air pollutant emissions change the attainment status of an Air Quality Control Region.

The estimates of criteria air pollutant emissions for each alternative are organized by activity (i.e., either training or testing). These emissions are further categorized by region (e.g., by range complex) so that differences in background air quality, atmospheric circulation patterns, regulatory requirements, and sensitive receptors can be addressed. Total air pollutant emissions for Navy training and testing activities in the Study Area under each alternative are also estimated.

3.2.3.1.1 No Action Alternative

3.2.3.1.1.1 Training

Table 3.2-3 lists training-related criteria air pollutant and precursor emissions in the Study Area. Emissions are totaled for each major training region of the Study Area (e.g., Hawaii, Southern California). Total emissions for each of the major training regions are then summed to arrive at the total emissions within the Study Area. Totals include aircraft and vessel emissions based on estimated numbers of vessels and aircraft involved in training activities. The air pollutants emitted in the greatest quantity are NO_x, SO_x, and CO.

Under the No Action Alternative, the annual numbers of Navy training activities in the Study Area would remain at baseline (existing) levels. The criteria pollutant that would be emitted in the greatest quantities by aircraft is NO_x, followed by CO and PM (PM_{10} and $PM_{2.5}$). These emissions are associated with aircraft involvement in a variety of training activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant emitted in the greatest quantities by surface vessels is NO_x, followed by CO and SO_x. These emissions are associated with vessel involvement in a variety of training activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant emitted in the greatest quantity by munitions is CO, which would be emitted under the No Action Alternative by a variety of munitions, including bombs, rockets, missiles, smokes, flares, and gun rounds.

Training activities in Southern California generate approximately 87 percent (4,046 tons / 4,666 tons [3,678 metric tons /4,241 metric tons]) of training-related criteria pollutant emissions in the Study Area under the No Action Alternative, while Southern California ranges constitute less than 4 percent (120,000 square nautical miles [nm^2]/2.84 million nm^2, not including the Transit Corridor) of the Study Area. The other approximately 13 percent of training-related criteria air pollutants are emitted in the waters around Hawaii (the Transit Corridor is not included in the No Action Alternative). The spatial distribution of emissions reflects the locations where Navy training most regularly occurs.

Table 3.2-3: Annual Criteria Air Pollutant Emissions from Training under the No Action Alternative

Source	Air Pollutant Emissions (TPY)					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Hawaii						
Aircraft	36	65	4	3	35	32
Vessels	178	146	15	112	19	17
Ordnance	6	1	0	0	0	0
Total	**220**	**212**	**19**	**115**	**54**	**49**
Southern California						
Aircraft	50	75	5	4	41	38
Vessels	975	1,486	507	766	109	101
Ordnance	27	1	0	0	0	0
Total	**1,052**	**1,562**	**512**	**770**	**150**	**139**
Study Area Total	**1,272**	**1,774**	**531**	**885**	**204**	**188**

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; So_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds.

Air pollutants emitted in the Study Area may be carried ashore by prevailing winds; 55 percent of training activity would occur within 3 nm of shore under the No Action Alternative. However, natural atmospheric mixing would substantially disperse these pollutants before they reached the coast. The contributions of air pollutants generated in the Study Area to the air quality in adjacent Air Basins (California) or Air Quality Control Region (Hawaii) are minimal, and unlikely to measurably add to existing onshore pollutant concentrations because of the large areas over which they are emitted, the distances these offshore pollutants would be transported, and their substantial dispersion during transport.

3.2.3.1.1.2 Testing

Table 3.2-4 lists testing-related criteria air pollutant and precursor emissions in the Study Area. Emissions are totaled for each major testing region of the Study Area (e.g., Southern California, Hawaii). Total emissions for each region are then summed to arrive at the total testing emissions within the Study Area. Totals include aircraft and vessel emissions based on estimated numbers of vessels and aircraft involved in tests. The air pollutants emitted in the greatest quantity are NO_x and CO.

Under the No Action Alternative, the annual numbers of Navy testing activities in the Study Area would remain at baseline (existing) levels. Criteria pollutants emitted in the Study Area may be transported ashore by periodic changes in prevailing winds, but would not affect the air quality in air basins along the coast for the reasons described in Section 3.2.3.1.1.1. The air pollutant that would be emitted in the greatest quantities by aircraft is NO_x, followed by particulate matter (PM_{10} and $PM_{2.5}$) and CO. These emissions are associated with aircraft involvement in a variety of testing activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutants that would be emitted in the greatest quantities by surface vessels are CO and NO_x. These emissions are associated with vessel involvement in a variety of testing activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which is emitted by a variety of munitions, including bombs, rockets, missiles, smokes, flares, and gun rounds.

Table 3.2-4: Annual Criteria Air Pollutant Emissions from Testing under the No Action Alternative

Source	Air Pollutant Emissions (TPY)					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Hawaii						
Aircraft	3	10	1	1	5	5
Vessels	5	3	0	1	0	0
Ordnance	0	0	0	0	0	0
Total	8	13	1	2	5	5
Southern California						
Aircraft	6	23	1	1	11	10
Vessels	9	6	1	2	0	0
Ordnance	0	0	0	0	0	0
Total	15	29	2	3	11	10
Study Area Total	**23**	**42**	**3**	**5**	**16**	**15**

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; So_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

As shown in Table 3.2-4, testing activities in Southern California account for about 68 percent of the Study Area testing emissions, while Southern California ranges constitute less than about 4 percent of the Study Area. The remaining approximately 32 percent of testing-related air pollutants are generated in Hawaii. The spatial distribution of emissions reflects the locations where Navy testing most regularly occurs. Approximately 80 percent of criteria air pollutants from testing activities would be emitted at least 12 nm from shore.

The contributions of testing-related air pollutants generated in the Study Area to the air quality in adjacent Air Basins (California) or Air Quality Control Region (Hawaii) would be minimal, and unlikely to measurably add to existing onshore pollutant concentrations because of the large areas over which they are emitted, the distances these offshore pollutants would be transported, and their substantial dispersion during transport.

3.2.3.1.1.3 Criteria Pollutant Emissions in Nonattainment or Maintenance Areas

The amounts of criteria air pollutants that would be emitted under the No Action Alternative by Navy aircraft, vessels, targets, and munitions during training and testing activities in the two Southern California air basins of the Study Area are presented in Table 3.2-5. Portions of the Study Area along the San Diego coast lie within San Diego Air Basin while the waters around San Clemente Island lie within South Coast Air Basin (San Clemente Island is part of Los Angeles County); air pollutants that would be generated in these two Air Basins were separately estimated. The largest source of air pollutants associated with the proposed Navy training and testing activities in the Southern California region is vessels and the smallest source is ordnance.

South Coast Air Basin

The amounts of criteria air pollutants that would be emitted under the No Action Alternative by Navy training and testing activities in South Coast Air Basin are presented in Table 3.2-5. NO_x, SO_x, and volatile organic compounds (VOC), primarily from Navy vessels, account for most of the emissions.

Table 3.2-5: California Estimated Annual Criteria Air Pollutant Emissions by Air Basin, No Action Alternative

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$
South Coast Air Basin						
Aircraft	9	8	1	1	5	5
Vessels	217	532	284	264	37	34
Ordnance	3	0	0	0	0	0
Total	**229**	**540**	**285**	**265**	**42**	**39**
San Diego Air Basin						
Aircraft	17	16	1	1	10	9
Vessels	152	530	174	203	26	24
Ordnance	8	1	0	0	0	0
Total	**177**	**547**	**175**	**204**	**36**	**33**

Notes: TPY = tons per year; CO = carbon monoxide; NO_X = nitrogen oxides; VOC = volatile organic compounds; SO_x = sulfur oxides; PM_{10} = particulate matter under 10 microns; $PM_{2.5}$ = particulate matter under 2.5 microns; nm = nautical mile

San Diego Air Basin

The amounts of criteria air pollutants that would be emitted under the No Action Alternative by Navy training and testing activities within San Diego Air Basin are presented in Table 3.2-5. NO_x, SO_x, and CO account for most of the emissions.

Summary of Non-Attainment Area Emissions Within the Study Area

The air pollutants expected to be emitted under the No Action Alternative would have no measurable impact on air quality over coastal waters or adjacent land areas because of the large areas over which they are generated, the distances from land at which the pollutants are emitted, and the generally strong ventilation resulting from regional meteorological conditions. Air pollutant emissions under the No Action Alternative would not result in violations of state or federal air quality standards because they would not have a measurable impact on air quality in land areas.

3.2.3.1.1.4 Summary – No Action Alternative

Criteria air pollutant emissions under the No Action Alternative are summarized in Table 3.2-6. While criteria air pollutants emitted within the territorial waters of the Study Area may be transported ashore, they would not affect the attainment status of coastal air quality control regions. The amounts of air pollutants emitted in the Study Area and subsequently transported ashore would have no substantial effect on air quality because (1) emissions from Navy training and testing activities are small compared to the amounts of air pollutants emitted by sources ashore, (2) the pollutants are emitted over large areas (i.e., the Study Area is an area source), (3) the distances the air pollutants would be transported are often large, and (4) the pollutants are substantially dispersed during transport. The criteria air pollutants emitted over nonterritorial waters within the Study Area would be dispersed over vast areas of open ocean and thus would not cause significant harm to environmental resources in those areas.

Estimates of air pollutant emissions under the No Action Alternative are a projection into the future of existing baseline emissions. Under the No Action Alternative, the annual numbers of Navy training and testing activities in the Study Area would remain at baseline levels. Emissions rates would remain constant for those pollutant sources that are not affected by other federal requirements to reduce air emissions. Any impacts of the No Action Alternative on regional air quality are reflected in the current ambient criteria air pollutant concentrations in air quality control regions ashore. The No Action

Alternative is exempt from the federal General Conformity Rule because training and testing activities under the No Action Alternative would not increase criteria pollutant emissions above baseline levels.

Table 3.2-6: Estimated Annual Criteria Air Pollutant Emissions in HSTT Study Area, No Action Alternative

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$
Training Activities	1,272	1,774	531	885	204	188
Testing Activities	23	42	3	5	16	15
Total HSTT Study Area	**1,295**	**1,816**	**534**	**890**	**220**	**203**

Notes: Table includes criteria pollutant precursors (e.g., VOC). CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds.

3.2.3.1.2 Alternative 1

3.2.3.1.2.1 Training

Under Alternative 1, the annual number of Navy training activities in the Study Area would increase in comparison to the No Action Alternative (baseline) levels. Emissions of criteria pollutants from training activities would increase relative to emissions under the No Action Alternative, or remain about the same (e.g., SO_x). Table 3.2-7 lists the estimated training-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 1. About 34 percent of training emissions would be produced more than 12 nm from shore.

Table 3.2-7: Annual Criteria Air Pollutant Emissions from Training under Alternative 1

Source	Air Pollutant Emissions (TPY)					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Hawaii						
Aircraft	38	59	4	3	33	31
Vessels	238	178	22	129	22	20
Ordnance	7	0	0	0	0	0
Total	**283**	**237**	**26**	**132**	**55**	**51**
Southern California						
Aircraft	77	100	7	5	56	52
Vessels	1,057	1,505	515	816	121	111
Ordnance	17	1	0	0	1	1
Total	**1,151**	**1,606**	**522**	**821**	**178**	**164**
Transit Corridor						
Aircraft	0	0	0	0	0	0
Vessels	9	6	1	3	0	0
Ordnance	0	0	0	0	0	0
Total	**9**	**6**	**1**	**3**	**0**	**0**
Study Area Total- Alternative 1	**1,443**	**1,849**	**549**	**956**	**233**	**215**
No Action Alternative	**1,272**	**1,774**	**531**	**885**	**204**	**188**
Net Change (TPY)	171	75	18	71	29	27
Net Change (%)	13	4	3	8	14	14

Notes: Table includes criteria pollutant precursors (e.g., VOC). CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

The air pollutant emitted in the greatest quantity by aircraft under Alternative 1 (see Table 3.2-7) is NO_x, followed by CO and PM. These pollutants are emitted by aircraft involved in a variety of training activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant emitted in the greatest quantities by surface vessels (see Table 3.2-7) is NO_x, followed by CO and SO_x. These pollutants are emitted by vessels involved in a variety of training activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 1 by the same variety of munitions as under the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds. Under Alternative 1, training emissions would increase by up to 14 percent (depending on the pollutant) in the Study Area compared to the No Action Alternative. About 48 percent of these training emissions would be produced at least 3 nm from shore.

3.2.3.1.2.2 Testing

Under Alternative 1, the annual number of Navy testing activities in the Study Area would increase in comparison to No Action Alternative (baseline) levels. Under Alternative 1, emissions of all criteria pollutants would increase within the Study Area relative to emissions under the No Action Alternative. Table 3.2-8 lists the estimated testing-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 1, and compares them to emissions under the No Action Alternative. Over 90 percent of testing emissions would be produced 3 nm or more from shore. Over 50 percent of these emissions would be produced at least 12 nm from shore.

Table 3.2-8: Annual Criteria Air Pollutant Emissions from Testing under Alternative 1

Source	Air Pollutant Emissions (TPY)					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Hawaii						
Aircraft	5	13	1	1	7	6
Vessels	442	246	34	94	14	13
Ordnance	0	0	0	0	0	0
Total	**447**	**259**	**35**	**95**	**21**	**19**
Southern California						
Aircraft	10	33	1	1	16	15
Vessels	817	462	64	171	25	23
Ordnance	2	0	0	0	0	0
Total	**829**	**495**	**65**	**172**	**41**	**38**
Study Area Total	**1,276**	**754**	**100**	**267**	**62**	**57**
No Action Alternative	23	42	3	5	16	15
Net Change (#)	**1,253**	**712**	**97**	**262**	**46**	**42**

Notes: Table includes criteria pollutant precursors (e.g., VOC). CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

As shown in Table 3.2-8, the air pollutant that would be emitted in the greatest quantity by aircraft under Alternative 1 is NO_x, followed by particulate matter (PM_{10} and $PM_{2.5}$) and CO. These emissions are associated with aircraft involvement in a variety of testing activities, including anti-air warfare, electronic warfare, and mine warfare. As shown in Table 3.2-8, the air pollutant that would be emitted in the greatest quantities by surface vessels is CO, followed by NO_x and SO_x. These emissions are associated with vessel involvement in a variety of testing activities, including anti-submarine warfare,

anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 1 by the same variety of munitions as under the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds. Testing activities that expend ordnance would primarily occur 12 nm or more from shore, thus reducing the likelihood that offshore emissions under the Proposed Action would affect regional air quality and receptors ashore.

3.2.3.1.2.3 General Conformity Threshold Determinations

To address the requirements of the federal General Conformity Rule, the net changes in criteria pollutant emissions associated with the Proposed Action in nonattainment and maintenance areas within the Study Area under Alternative 1 were estimated, relative to their corresponding emissions under the No Action Alternative (Table 3.2-9). As shown in Tables 3.2-10 and 3.2-11, the increases in criteria pollutant emissions would be below the *de minimis* thresholds for a full Conformity Determination. The General Conformity Rule, therefore, is satisfied under Alternative 1. Representative air pollutant emissions calculations and a Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-9: California State Estimated Annual Criteria Air Pollutant Emissions by Air Basin, Alternative 1

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$
South Coast Air Basin						
Aircraft	10	8	1	1	5	5
Vessels	234	527	282	265	37	34
Ordnance	2	0	0	0	0	0
Total	**246**	**535**	**283**	**266**	**42**	**39**
San Diego Air Basin						
Aircraft	28	22	2	1	14	13
Vessels	213	555	182	232	31	29
Ordnance	5	0	0	0	1	0
Total	**246**	**577**	**184**	**233**	**46**	**42**

Notes: Individual values may not add exactly to total values due to rounding. TPY = tons per year; CO = carbon monoxide; NO_X = nitrogen oxides; VOC = volatile organic compounds; SO_x = sulfur oxides; PM_{10} = particulate matter under 10 microns; $PM_{2.5}$ = particulate matter under 2.5 microns; nm = nautical mile

South Coast Air Basin

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the South Coast Air Basin portion of the Study Area under Alternative 1 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-10, the emissions increases for nonattainment pollutants would be below the *de minimis* thresholds for a full Conformity Determination. The General Conformity Rule, therefore, is satisfied under Alternative 1. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-10: South Coast Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 1

Parameter	Emissions by Air Pollutant (TPY)				
	CO	NO_X	VOC	PM_{10}	$PM_{2.5}$
No Action Alternative	229	540	285	42	39
Alternative 1	246	535	283	42	39
Net Change	**17**	**-5**	**-2**	**0**	**0**
De Minimis Threshold	100	10	10	70	100
Exceeds Threshold?	No	No	No	No	No

Notes: Table includes criteria pollutant precursors (e.g., VOC). CO = carbon monoxide; NO_X = nitrogen oxides; TPY = tons per year; VOC = volatile organic compounds

San Diego Air Basin

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the San Diego Air Basin portion of the Study Area under Alternative 1 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-11, the emissions increases for nonattainment pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 1. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-11: San Diego Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 1

Parameter	Emissions by Air Pollutant (TPY)		
	CO	NO_X	VOC
No Action Alternative	177	547	175
Alternative 1	246	577	184
Net Change	**69**	**30**	**9**
De Minimis Threshold	100	100	100
Exceeds Threshold?	No	No	No

Notes: Table includes criteria pollutant precursors (e.g., VOC). CO = carbon monoxide; NO_X = nitrogen oxides; TPY = tons per year; VOC = volatile organic compounds

3.2.3.1.2.4 Summary –Alternative 1

Total criteria air pollutant emissions under Alternative 1 are summarized in Table 3.2-12. Under Alternative 1, the annual numbers of Navy training and testing activities in the Study Area would increase. Emissions of all criteria pollutants would increase. Criteria air pollutants emitted in the Study Area within territorial waters could be transported ashore, but would not affect the attainment status of the relevant air quality control regions. The amounts of air pollutants emitted in the Study Area and subsequently transported ashore would be minor because (1) emissions from Navy training and testing activities would be small compared to the amounts of air pollutants emitted by sources ashore, (2) the pollutants are emitted over large areas (i.e., the Study Area is an area source), (3) the distances the air pollutants would be transported are often large, and (4) the pollutants would be substantially dispersed during transport. The criteria air pollutants emitted over nonterritorial waters within the Study Area would be dispersed over vast areas of open ocean and thus would not cause significant harm to environmental resources in those areas.

Table 3.2-12: Estimated Annual Criteria Air Pollutant Emissions in the Hawaii-Southern California Testing and Training Study Area, Alternative 1

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$
Training Activities	1,443	1,849	549	956	233	215
Testing Activities	1,276	754	100	267	62	57
Total HSTT Study Area	**2,719**	**2,603**	**649**	**1223**	**295**	**272**
No Action Alternative	1,295	1,816	534	890	220	203
Net Change (#)	**1,424**	**787**	**115**	**333**	**75**	**69**
Net Change (%)	110	43	22	37	34	34

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

3.2.3.1.3 Alternative 2

3.2.3.1.3.1 Training

Under Alternative 2, the annual number of Navy training activities in the Study Area would increase in comparison to the No Action Alternative (baseline) levels. Emissions of all criteria pollutants would increase relative to emissions under the No Action Alternative. Table 3.2-13 lists the estimated training-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 2. About 49 percent of training-related emissions would be produced at least 3 nm from shore. Over 35 percent of training-related emissions would be produced at least 12 nm from shore.

Table 3.2-13: Annual Criteria Air Pollutant Emissions from Training under Alternative 2

Source	Air Pollutant Emissions (TPY)					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Hawaii						
Aircraft	42	80	5	4	43	40
Vessels	254	188	23	132	22	20
Ordnance	7	0	0	0	0	0
Total	**303**	**268**	**28**	**136**	**65**	**60**
Southern California						
Aircraft	80	108	8	6	62	57
Vessels	1,066	1,513	515	820	121	112
Ordnance	18	1	0	0	1	1
Total	**1,164**	**1,622**	**523**	**826**	**184**	**170**
Transit Corridor						
Aircraft	0	0	0	0	0	0
Vessels	9	6	1	3	0	0
Ordnance	0	0	0	0	0	0
Total	9	6	1	3	0	0
Study Area Total – Alternative 2	**1,476**	**1,896**	**552**	**965**	**249**	**230**
No Action Alternative	1,272	1,774	531	885	204	188
Net Change (#)	**204**	**122**	**21**	**80**	**45**	**42**
Net Change (%)	16	7	4	9	22	22

Notes: Table includes criteria pollutant precursors (e.g., VOC). CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

The air pollutant that would be emitted in the greatest quantity by aircraft under Alternative 2 (see Table 3.2-13) is NO_x, followed by co and PM (PM_{10} and $PM_{2.5}$). These pollutants are emitted by aircraft involved in a variety of training activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant that would be emitted in the greatest quantities by surface vessels (see Table 3.2-13) is NO_x, followed by co and SO_x. These pollutants are emitted by vessels involved in a variety of training activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 2 by the same variety of munitions as the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds.

3.2.3.1.3.2 Testing

Under Alternative 2, the annual number of Navy testing activities in the Study Area would increase in comparison to the No Action Alternative (baseline) levels. Emissions of all criteria pollutants would increase relative to emissions under the No Action Alternative. Table 3.2-14 lists the estimated testing-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 2. About 88 percent of testing-related emissions would be produced at least 3 nm from shore. Over 60 percent of these emissions would be produced at least 12 nm from shore.

Table 3.2-14: Annual Criteria Air Pollutant Emissions from Testing under Alternative 2

Source	Air Pollutant Emissions (TPY)					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Hawaii						
Aircraft	4	8	1	0	5	5
Vessels	488	272	38	104	15	14
Ordnance	0	0	0	0	0	0
Total	**492**	**280**	**39**	**104**	**20**	**19**
Southern California						
Aircraft	11	33	1	1	17	16
Vessels	916	517	72	191	28	25
Ordnance	2	0	0	0	0	0
Total	**929**	**550**	**73**	**192**	**45**	**41**
Study Area Total	**1,421**	**830**	112	**296**	65	**60**
No Action Alternative	**23**	**42**	**3**	**5**	**16**	**15**
Net Change (#)	**1,398**	**788**	**109**	**291**	**49**	**45**

Notes: Table includes criteria pollutant precursors (e.g., VOC). CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

The air pollutant that would be emitted in the greatest quantity by aircraft under Alternative 2 (see Table 3.2-14) is NO_x, followed by particulate matter (PM_{10} and $PM_{2.5}$) and CO. These pollutants are emitted by aircraft involved in a variety of testing activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant that would be emitted in the greatest quantities by surface vessels (see Table 3.2-14) is CO, followed by NO_x and SO_x. These pollutants are emitted by vessels involved in a variety of testing activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 2 by the same variety of munitions as the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds. Testing activities that

expend ordnance primarily would occur 12 nm or more from shore, thus reducing the likelihood that offshore emissions under the Proposed Action would affect regional air quality and receptors ashore.

3.2.3.1.3.3 General Conformity Threshold Determinations

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions associated with the Proposed Action in nonattainment and maintenance areas within the Study Area under Alternative 2 were estimated, relative to their corresponding emissions under the No Action Alternative (Table 3.2-15). As shown in Tables 3.2-16 and 3.2-17, the increases in emissions of nonattainment and maintenance pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 2. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-15: California State Estimated Annual Criteria Air Pollutant Emissions by Air Basin, Alternative 2

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$
South Coast Air Basin						
Aircraft	10	9	1	1	5	5
Vessels	240	531	283	267	37	34
Ordnance	2	0	0	0	0	0
Total	**252**	**540**	**284**	**268**	**42**	**39**
San Diego Air Basin						
Aircraft	28	23	2	2	14	13
Vessels	221	558	183	233	31	29
Ordnance	5	0	0	0	0	0
Total	**254**	**581**	**185**	**235**	**45**	**42**

Notes: TPY = tons per year; CO = carbon monoxide; NO_X = nitrogen oxides; VOC = volatile organic compounds; SO_x = sulfur oxides; PM_{10} = particulate matter under 10 microns; $PM_{2.5}$ = particulate matter under 2.5 microns; nm = nautical mile

South Coast Air Basin

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the South Coast Air Basin portion of the Study Area under Alternative 2 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-16, the increases in emissions of nonattainment pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 2. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-16: South Coast Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 2

Parameter	Emissions by Air Pollutant (TPY)				
	CO	NO_X	VOC	PM_{10}	$PM_{2.5}$
No Action Alternative	229	540	285	42	39
Alternative 2	252	540	284	42	39
Net Change	**23**	**0**	**-1**	**0**	**0**
De Minimis Threshold	100	10	10	70	100
Exceeds Threshold?	No	No	No	No	No

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; PM_{10} = particulates under 10 microns; $PM_{2.5}$ = particulates under 2.5 microns; TPY = tons per year; VOC = volatile organic compounds

San Diego Air Basin

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the San Diego Air Basin portion of the Study Area under Alternative 2 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-17, the increases in emissions of nonattainment pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 2. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-17: San Diego Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 2

Parameter	Emissions by Air Pollutant (TPY)		
	CO	NO_X	VOC
No Action Alternative	177	547	175
Alternative 2	254	581	185
Net Change	**77**	**34**	**10**
De Minimis Threshold	100	100	100
Exceeds Threshold?	No	No	No

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; TPY = tons per year; VOC = volatile organic compounds

3.2.3.1.3.4 Summary –Alternative 2

Criteria air pollutant emissions under Alternative 2 are summarized in Table 3.2-18. Under Alternative 2, the annual numbers of Navy training and testing activities in the Study Area would increase. Emissions of all criteria pollutants would increase. Criteria air pollutants emitted in the Study Area within territorial waters could be transported ashore, but would not affect the attainment status of the relevant air quality control regions. The amounts of air pollutants emitted in the Study Area and subsequently transported ashore would be minimal because (1) emissions from Navy training and testing activities would be small compared to the amounts of air pollutants emitted by sources ashore, (2) the air pollutants would be emitted over a large area, (3) the distances the air pollutants would be transported are often large, and (3) the pollutants would be substantially dispersed during transport. The criteria air pollutants emitted over nonterritorial waters within the Study Area would be dispersed over vast areas of open ocean, and thus would not cause significant harm to environmental resources in those areas.

Table 3.2-18: Estimated Annual Criteria Air Pollutant Emissions in HSTT Study Area, Alternative 2

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$
Training Activities	1,476	1,896	552	965	249	230
Testing Activities	**1,421**	**830**	112	**296**	65	**60**
Total HSTT Study Area	**2,897**	**2,726**	**664**	**1261**	**314**	**290**
No Action Alternative	**1,295**	**1,816**	**534**	**890**	**220**	**203**
Net Change (#)	**1,602**	**910**	**130**	**371**	**94**	**87**
Net Change (%)	124	50	24	42	43	43

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter; PM_{10} = particulate matter ≤ 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

3.2.3.1.4 Impact Conclusions for Criteria Air Pollutants

Based on the estimated levels of air pollutant emissions presented in Tables 3.2-3 through 3.2-18, (1) most of the air pollutants from training and testing activities would be released to the environment in a remote area with few other sources of air pollutants and (2) training and testing emissions would rapidly disperse over a large ocean area where few individuals would be exposed to them.

3.2.3.2 Hazardous Air Pollutants

3.2.3.2.1 No Action Alternative

The EPA has designated 188 substances as hazardous air pollutants under Title III (Hazardous Air Pollutants), Section 112(g) of the CAA. Hazardous air pollutants are emitted by several processes associated with Navy training and testing activities, including fuel combustion. Trace amounts of hazardous air pollutants are emitted by combustion sources participating in training and testing activities, including aircraft, vessels, targets, and munitions. The amounts of hazardous air pollutants emitted are small compared to the emissions of criteria pollutants; emission factors for most hazardous air pollutants from combustion sources are roughly three or more orders of magnitude lower than emission factors for criteria pollutants (California Air Resources Board 2007). Emissions of hazardous air pollutants from munitions use are smaller still, with emission factors ranging from roughly 10^{-5} to 10^{-15} lb. of individual hazardous air pollutants per item for cartridges to 10^{-4} to 10^{-13} lb. of individual hazardous air pollutants per item for mines and smoke cartridges (EPA 2009a). As an example, 10^{-5} is equivalent to 0.0001 and 10^{-15} is equivalent to 0.00000000000001. To generate 1 lb. of hazardous air pollutants would require the expenditure of 10,000 to 10,000,000,000,000 lb. of munitions, respectively.

3.2.3.2.1.1 Training

Human health would not be impacted by training emissions of hazardous air pollutants in the Study Area under the No Action Alternative because (1) hazardous air pollutant emissions from training activities would be released to the environment in a remote area (the ocean) with few existing sources of air pollutants, (2) hazardous air pollutant emissions of training activities would be distributed over the entire Study Area and rapidly dispersed over a large ocean area where few individuals would be exposed to them, and (3) hazardous air pollutant emissions from training activities would be diluted through mixing in the atmosphere to a much lower ambient concentration. Residual hazardous air pollutant impacts when training is not being conducted would not be detectable. Therefore, hazardous air pollutant emissions from training for the Proposed Action will not be quantitatively estimated in this EIS/OEIS.

3.2.3.2.1.2 Testing

Human health would not be impacted by testing emissions of hazardous air pollutants in the Study Area under the No Action Alternative because (1) hazardous air pollutant emissions from testing activities would be released to the environment in a remote area (the ocean) with few existing sources of air pollutants, (2) hazardous air pollutant emissions of testing activities would be distributed over the entire Study Area and rapidly dispersed over a large ocean area where few individuals would be exposed to them, and (3) hazardous air pollutant emissions from testing activities would be diluted through mixing in the atmosphere to a much lower ambient concentration. Residual hazardous air pollutant impacts when testing is not being conducted would not be detectable. Therefore, hazardous air pollutant emissions from testing for the Proposed Action will not be quantitatively estimated in this EIS/OEIS.

3.2.3.2.2 Alternative 1

3.2.3.2.2.1 Training

Trace amounts of hazardous air pollutants would be emitted from sources participating in Alternative 1 training activities, including aircraft, vessels, targets, and munitions. Hazardous air pollutant emissions would increase under Alternative 1 relative to emissions under the No Action Alternative. As noted for the No Action Alternative in Section 3.2.3.2.1, hazardous air pollutant emissions are not quantitatively estimated, but the increase in hazardous air pollutant emissions under Alternative 1 would be roughly proportional to the increase in emissions of criteria air pollutants. Therefore, the amounts that would be emitted as a result of Alternative 1 activities would be somewhat greater than those emitted under the No Action Alternative, but would remain very small compared to the emissions of criteria air pollutants. The potential health impacts of training-related hazardous air pollutant emissions under Alternative 1 would be the same as those discussed under the No Action Alternative.

3.2.3.2.2.2 Testing

Trace amounts of hazardous air pollutants would be emitted from sources participating in Alternative 1 testing activities, including aircraft, vessels, targets, and munitions. Hazardous air pollutant emissions would increase under Alternative 1 relative to emissions under the No Action Alternative. As noted for the No Action Alternative in Section 3.2.3.2.1, hazardous air pollutant emissions are not quantitatively estimated, but the increase in hazardous air pollutant emissions under Alternative 1 would be roughly proportional to the increase in emissions of criteria air pollutants. Therefore, the amounts that would be emitted as a result of Alternative 1 testing activities would be somewhat greater than those emitted under the No Action Alternative, but would remain very small compared to the emissions of criteria air pollutants. The potential health impacts of testing-related hazardous air pollutant emissions under Alternative 1 would be the same as those discussed under the No Action Alternative.

3.2.3.2.3 Alternative 2

3.2.3.2.3.1 Training

The amounts and distribution of training-related hazardous air pollutants emitted under Alternative 2 would be similar to those described under Alternative 1. The potential health impacts of training--related hazardous air pollutants emitted under Alternative 2 would be the same as those discussed under the No Action Alternative.

3.2.3.2.3.2 Testing

The amounts and distribution of testing-related hazardous air pollutants emitted under Alternative 2 would be similar to those described under Alternative 1. The potential health impacts of testing-related

hazardous air pollutants emitted under Alternative 2 would be the same as those discussed under the No Action Alternative.

3.2.4 Summary of Potential Impacts (Combined Impacts of All Stressors) on Air Quality

3.2.4.1 No Action Alternative

As discussed in Sections 3.2.3.1 and 3.2.3.2, emissions associated with Study Area training and testing primarily occur offshore, with 30 percent of emissions occurring 12 nm or more from shore. Fixed-wing aircraft emissions typically occur above the 3,000-ft. (914 m) mixing layer. Even though these stressors can co-occur in time and space, atmospheric dispersion would assure that the impacts would be short term. Changes in criteria and hazardous air pollutant emissions are not expected to be detectable, so air quality is expected to fully recover before a subsequent activity. For these reasons, impacts on air quality from combinations of these resource stressors are expected to be similar to the impacts on air quality for any stressor taken individually, with no additive, synergistic, or antagonistic interactions.

3.2.4.2 Alternative 1

As discussed in Sections 3.2.3.1 and 3.2.3.2, emissions associated with Study Area training and testing under Alternative 1 primarily occur offshore, with 37 percent of emissions occurring at least 12 nm offshore. Fixed-wing aircraft emissions typically occur above the 3,000-ft. (914 m) mixing layer. Even though these stressors can co-occur in time and space, atmospheric dispersion would assure that the impacts would be short term. Air quality is expected to fully recover before a subsequent activity. For these reasons, the impacts on air quality from combinations of these resource stressors are expected to be similar to the impacts on air quality for any stressor taken individually, with no additive, synergistic, or antagonistic interactions. Emissions of most criteria pollutants and hazardous air pollutants are expected to increase under Alternative 1.

3.2.4.3 Alternative 2

As discussed in Sections 3.2.3.1 and 3.2.3.2, emissions associated with Study Area training and testing under Alternative 2 primarily would occur at least 12 nm offshore. Fixed-wing aircraft emissions typically occur above the 3,000-ft. (914 m) mixing layer. Even though these stressors can co-occur in time and space, atmospheric dispersion would assure that the impacts would be short term. Air quality is expected to fully recover before a subsequent activity. For these reasons, impacts on air quality from combinations of these resource stressors are expected to be similar to the impacts on air quality for any stressor taken individually, with no additive, synergistic, or antagonistic interactions. Emissions of most criteria pollutants and hazardous air pollutants are expected to increase under Alternative 2.

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