

3.5 AIR QUALITY

Air pollution levels in Hawai'i generally are low due to the small size and isolated location of the state. The state's isolated location means that upwind areas do not contribute significant background pollution levels. The state's small size means limited opportunities for locally generated air pollutants to accumulate or recirculate before being transported offshore and away from land areas. High concentrations of suspended particulate matter can occur in some areas, mostly due to agricultural burning or fireworks use during holiday celebrations. The entire state is classified as being in compliance with federal ambient air quality standards, or "in attainment".

3.5.1 Introduction/Region of Influence

The ROI for air quality issues depends on the pollutant and emission sources that are under consideration. The ROI for a regional secondary pollutant such as ozone generally will be island-wide. Secondary pollutants are not emitted directly, but form through chemical reactions in the atmosphere. The directly emitted compounds which react to form secondary pollutants are called precursors. The time required for chemical reactions allows precursor emissions to be mixed over relatively large geographic areas before significant quantities of secondary pollutants are produced. Peak concentrations of secondary pollutants may occur some distance from the major sources of precursor emissions. The ROI for primary pollutants will be the area potentially subject to measurable air quality impacts under unfavorable dispersion conditions. Transport of primary pollutants away from the emission source is accompanied by dispersion and dilution, resulting in lower pollutant concentrations at greater distances from the emission source. In most cases, the ROI for primary pollutants will be an area extending no more than a few miles from the emission source. The ROI for low magnitude emission sources may extend less than one mile from the source. Additional background information on air pollution is provided in Appendix G1.

3.5.2 Air Quality Standards

Ambient Air Quality Standards for Criteria Pollutants

Ambient air quality is the atmospheric concentration of a specific compound experienced at a particular geographic location which may be some distance from the source of the relevant pollutant emissions. The USEPA has established ambient air quality standards for several different pollutants, which often are referred to as criteria pollutants (ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, suspended particulate matter, and lead). The term "criteria pollutants" derives from the requirement that USEPA must describe the characteristics and potential health and welfare effects of these pollutants (USEPA 2002x). Suspended particulate matter is any solid or liquid that can remain suspended in the atmosphere for more than a few minutes. Standards for suspended particulate matter have been set for two size fractions—inhalable particulate matter (PM₁₀) and fine particulate matter (PM_{2.5}). Federal ambient air quality standards are based primarily on evidence of acute and chronic (or short-term and long-term) health effects. Federal ambient air quality standards apply to outdoor locations to which the general public has access.

Hawai'i, along with other States, has adopted ambient air quality standards that are in some areas more stringent than the comparable federal standards and addresses pollutants that are

not covered by federal ambient air quality standards. The state ambient air quality standards are based primarily on health effects data but can reflect other considerations, such as protection of crops, protection of materials, or avoidance of nuisance conditions (such as objectionable odors). Table 3-5 summarizes federal and state ambient air quality standards applicable in Hawai'i.

3.5.3 Hazardous Air Pollutants

Federal air quality management programs for hazardous air pollutants focus on setting emission limits for particular industrial processes rather than setting ambient exposure standards. Some states have established ambient exposure guidelines for various hazardous air pollutants and use those guidelines as part of the permit review process for industrial emission sources.

Hawai'i has adopted ambient concentration guidelines for hazardous air pollutants. Those guidelines are used as part of the permit review process for emission sources that require state or federal air quality permits. The Hawai'i ambient exposure guidelines for hazardous air pollutants (Hawai'i Administrative Rules Title 11 Chapter 60.1, Section 179) include the following:

- For noncarcinogenic compounds, an 8-hour average concentration equal to 1% of the corresponding 8-hour threshold level value (TLV) value adopted by the Occupational Safety and Health Administration (OSHA);
- For noncarcinogenic compounds, an annual average concentration equal to 1/420 (0.238%) of the 8-hour TLV value adopted by OSHA;
- For noncarcinogenic compounds for which there is no OSHA-adopted TLV, the Director of Health is authorized to set ambient air concentration standards on a case-by-case basis so as to avoid unreasonable endangerment of public health with an adequate margin of safety; and
- For carcinogenic compounds, any ambient air concentration that produces an individual lifetime excess cancer risk of more than 10 in 1 million assuming continuous exposure for 70 years.

3.5.4 Air Quality Planning Programs

The federal Clean Air Act requires each state to identify areas that have ambient air quality in violation of federal standards. States are required to develop, adopt, and implement a State Implementation Plan (SIP) to achieve, maintain, and enforce federal ambient air quality standards.

The status of areas with respect to federal ambient air quality standards is categorized as nonattainment, attainment (better than national standards), unclassifiable, or attainment/cannot be classified. Unclassified areas are treated as attainment areas for most regulatory purposes. All of Hawai'i is categorized as attainment or unclassified for each of the federal ambient air quality standards.

**Table 3-5
State and National Ambient Air Quality Standards Applicable in Hawai'i**

Pollutant	Averaging Time	Standards in Parts Per Million by Volume (ppm)		Standards in Micrograms Per Cubic Meter		Violation Criteria	
		Hawai'i	National	Hawai'i	National	Hawai'i	National
Ozone	8 Hours	0.08	0.08	157	157	If exceeded on more than 1 day per year	If exceeded by the mean of annual 4 th highest daily values for a 3-year period
Carbon Monoxide	8 Hours	4.5	9	5,000	10,000	If exceeded on more than 1 day per year	If exceeded on more than 1 day per year
	1 Hour	9	35	10,000	40,000	If exceeded on more than 1 day per year	If exceeded on more than 1 day per year
Inhalable Particulate Matter (PM ₁₀)	Annual Arithmetic Mean	Not applicable	not applicable	50	50	If exceeded	If exceeded as a 3-year single station average
	24 Hours	Not applicable	not applicable	150	150	If exceeded on more than 1 day per year	If exceeded by the mean of annual 99 th percentile values over 3 years
Fine Particulate Matter (PM _{2.5})	Annual Arithmetic Mean	Not applicable	not applicable	not applicable	15.0		If exceeded as a 3-year spatial average of data from designated stations
	24 Hours	Not applicable	not applicable	not applicable	65		If exceeded by the mean of annual 98 th percentile values over 3 years

Table 3.5 (continued)
State and National Ambient Air Quality Standards Applicable in Hawai'i

Pollutant	Averaging Time	Standards in Parts Per Million by Volume (ppm)		Standards in Micrograms Per Cubic Meter		Violation Criteria	
		Hawai'i	National	Hawai'i	National	Hawai'i	National
Nitrogen Dioxide	Annual Average	0.037	0.053	70	100	If exceeded	If exceeded
Sulfur Dioxide	Annual Average	0.03	0.03	80	80	If exceeded	If exceeded
	24 Hours	0.14	0.14	365	365	If exceeded on more than 1 day per year	If exceeded on more than 1 day per year
	3 Hours	0.5	0.5	1,300	1,300	If exceeded on more than 1 day per year	If exceeded on more than 1 day per year
Lead Particles (TSP sampler)	Calendar Quarter	Not applicable	not applicable	1.5	1.5	If exceeded	If exceeded
Hydrogen Sulfide	1 Hour	0.025	not applicable	35	not applicable	If exceeded on more than 1 day per year	

Notes:

All standards except the national PM₁₀ and PM_{2.5} standards are based on measurements corrected to 25 degrees C and 1 atmosphere pressure.
The national PM₁₀ and PM_{2.5} standards are based on direct flow volume data without correction to standard temperature and pressure.
The "10" in PM₁₀ and the "2.5" in PM_{2.5} are not particle size limits; these numbers identify the particle size class (aerodynamic diameter in microns) collected with 50% mass efficiency by certified sampling equipment. The maximum particle size collected by PM₁₀ samplers is about 50 microns. The maximum particle size collected by PM_{2.5} samplers is about 6 microns.

Data Sources:

40 CFR Parts 50, 53, and 58
Hawai'i Administrative Rules Chapter 11-59 (August 28, 2002)

3.5.5 Clean Air Act Conformity

The Clean Air Act requires federal agencies to ensure that actions they undertake in nonattainment and maintenance areas are consistent with federally enforceable air quality management plans for those areas. No portions of Hawai'i are classified as nonattainment or maintenance areas. Consequently, Clean Air Act conformity analysis procedures do not apply to Army actions in Hawai'i.

3.5.6 Existing Air Quality Conditions

Hawai'i currently operates nine ambient air quality monitoring stations on O'ahu, one station on Kaua'i, two stations on Maui, and five stations on the island of Hawai'i. All of the monitoring stations are located in coastal regions, with many of the monitoring stations located in or near urbanized areas. None of the monitoring stations are sited at or near Army training areas. The monitoring stations on Maui are located to monitor the air quality impacts

of sugar cane burning. The monitoring stations on the island of Hawai'i have been located primarily to monitor the impacts of emissions from volcanic eruptions and geothermal development. Based on available monitoring data and the locations of recognized emission sources, USEPA has concluded that no locations in Hawai'i exceed federal ambient air quality standards.

Most of the monitoring data collected in recent years show that ambient air quality levels are well below the values of the relevant state and federal ambient air quality standards. Only two pollutants (ozone and PM₁₀) have approached or exceeded state or federal air quality standards in recent years. Prior to September 2001, Hawai'i had a very stringent 1-hour standard for ozone (100 micrograms per cubic meter). That 1-hour standard was typically exceeded on several days each year in the Honolulu area. In September 2001 the state 1-hour ozone standard was replaced with an 8-hour ozone standard numerically identical to the federal 8-hour ozone standard. Available data show that ozone levels in the Honolulu area have not approached or exceeded the state or federal 8-hour ozone standards.

PM₁₀ concentrations at some locations have approached or exceeded the state and federal 24-hour standard of 150 micrograms per cubic meter. Maximum 24-hour PM₁₀ concentrations often exceed 100 micrograms per cubic meter at one or both monitoring stations on Maui and sometimes exceed 100 micrograms per cubic meter at the Pearl City and Kapolei monitoring stations on O'ahu. The high PM₁₀ concentrations at monitoring stations on Maui are associated with agricultural burning activities. The high PM₁₀ concentrations at Pearl City and Kapolei have been attributed to the use of fireworks during New Year's Day celebrations. Two episodes of 24-hour PM₁₀ concentrations over 150 micrograms per cubic meter were recorded at Pearl City in 2000, and one episode was recorded at Pearl City in 2001. Those two episodes in 2000 represent a violation of the state 24-hour PM₁₀ standard but did not constitute a violation of the federal 24-hour PM₁₀ standard. State and national violation criteria are summarized in Table 3-5.

3.5.7 Climate and Meteorology Conditions

The most prominent feature of the circulation of air across the tropical Pacific is the persistent trade wind flow in a general east-to-west direction. The trade winds blow across Hawai'i primarily from the northeast quadrant throughout the year, with the windiest months being from May through September. In addition to the trade winds, wind patterns are influenced by major storm systems and by topographic features that alter or channel prevailing wind directions. Topographic features have additional influences on local wind patterns in coastal areas, with upslope/downslope flow patterns often reinforcing sea breeze/land breeze patterns. Local winds tend to move inland from the coast during mid-morning to early evening periods, then reverse direction and flow off-shore during night and early morning hours. The on-shore sea breeze component tends to be stronger than the off-shore land breeze component. Sea/land breeze patterns are most common on the south and west coasts of the Hawaiian Islands.

The combination of a dominant trade wind pattern and limited seasonal changes in the length of day and night combine to limit seasonal variations in weather conditions in Hawai'i. Weather conditions in Hawai'i show a two season pattern, with a winter season of seven

months (October through April) and a summer season of five months (May through September). The summer months generally are warmer and drier than the winter months. Most major storms occur during the winter season. Seasonal variations in temperature conditions are mild at lower elevations, with daytime temperatures commonly between 75 and 85 degrees Fahrenheit (24 to 29 degrees Celsius) and nighttime temperatures between 65 and 75 degrees Fahrenheit (18 to 24 degrees Celsius).

Topographic features exert a strong influence on rainfall amounts and also influence temperature patterns at higher elevations. Rainfall amounts range from less than 20 inches (51 centimeters) per year on the southern and western coastal areas to over 300 inches (762 centimeters) per year on the windward slopes of the high mountains or near the summits of lower mountains on Kaua'i, O'ahu, and Maui.