State of Hawaii
Annual Summary
2016
Air Quality Data

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Department of Health
December 2016

2016
Hawaii Air Quality Data

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Section 1
INTRODUCTION

The Department of Health, Clean Air Branch, monitors the ambient air in the State of Hawaii for various gaseous and particulate air pollutants. The U. S. Environmental Protection Agency (EPA) has set national ambient air quality standards (NAAQS) for six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter (PM_{10} and $PM_{2.5}$). Hawaii has also established a state ambient air standard for hydrogen sulfide. The primary purpose of the statewide monitoring network is to measure ambient air concentrations of these pollutants and ensure that these air quality standards are met. The stations are maintained and the data are collected by the Air Surveillance and Analysis Section of the State Laboratories Division.

In addition to monitoring the ambient air for criteria pollutants, the State of Hawaii also participates in the NCore multi pollutant monitoring network; the NCore station in Hawaii is located at the Kapolei monitoring station. The NCore network addresses the following objectives:

- Timely reporting of data to public by supporting AIRNow, air quality forecasting, and other public reporting mechanisms;
- Support for development of emission strategies through air quality model evaluation and other observational methods;
- Accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors;
- Support for long-term health assessments that contribute to ongoing reviews of the NAAQS;
- Compliance through establishing nonattainment/attainment areas through comparison with the NAAQS;
- Support to scientific studies ranging across technological, health, and atmospheric process disciplines;
- Support to ecosystem assessments recognizing that national air quality networks benefit ecosystem assessments and, in turn, benefit from data specifically designed to address ecosystem analyses; and
- $PM_{2.5}$ speciation monitoring that EPA determined to be essential for establishing a relationship between particle concentrations and adverse health effects and would provide valuable information in characterizing aerosols, determining the effectiveness of control strategies, and understanding the effects of particle pollution on atmospheric and regional haze.

Air pollution is caused by many different man-made and natural sources. There are industrial sources of pollution, such as power plants and refineries; mobile sources, such as cars, trucks, and buses; agricultural sources, such as cane burning; and natural sources, such as windblown dust and volcanic activity. In 2016, for the most part, the state maintained 14 air monitoring stations on 4 islands. Most commercial, industrial,

and transportation activities and their associated air quality effects occur on Oahu, where 4 of the stations are located. The monitoring stations on Maui are mainly to measure the air quality impacts from agricultural activities. The majority of stations are located on the island of Hawaii to measure air quality impacts from the volcano and geothermal energy production. The monitoring station on Kauai is mainly to measure the air quality impacts from cruise ships. The state's ambient air monitoring network is reviewed annually and relocations, additions and/or discontinuations can occur in the future as the need arises.

This report summarizes the validated air pollutant data collected at the 14 monitoring stations during calendar year 2016. Tabular summaries are provided which compare the measured concentrations of criteria pollutants with federal ambient air quality standards and of hydrogen sulfide with the state standard. The 2016 speciation data is also included in this report. Trend summaries of criteria pollutants parameters are shown graphically.

The Department of Health has a web site that displays near real-time air quality data updated throughout the day from the air monitoring stations. The data has not been reviewed for quality assurance and is subject to change but provides the public with viewing access to current air pollutant and meteorological information. To view this data online, go to http://health.hawaii.gov/cab and link to "Hawaii Ambient Air Quality Data."

Additionally, because emissions from the Kilauea volcano are affecting communities on the island of Hawaii on a daily basis, the Department of Health has a website dedicated to displaying short term SO_2 data from stations located on the island. It provides near real-time 15-minute SO_2 averages and advisory level guidance to help individuals protect themselves against possible health effects. To view this data online, go to www.hiso2index.info

To view this entire book as well as books from 2014 and 2015 online, go to:
http://health.hawaii.gov/cab and link to "Hawaii Air Quality Data Book."

Questions or comments regarding data in this report and other air quality information should be addressed to:

Clean Air Branch
Department of Health
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Honolulu, Hawaii 96801-3378

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The Department of Health provides access to its programs and activities without regard to race, color, national origin (including language), age, sex, religion, or disability. Write our Affirmative Action Officer at P.O. Box 3378, Honolulu, Hawaii 96801-3378, or call (808)586-4616 (voice) within 180 days of a problem.

Section 2
DEFINITIONS

98th Percentile Value	The $PM_{2.5}$ 24-hour average or the maximum daily 1-hour NO_2 average in the year below which 98% of all values fall.
99th Percentile Value	The maximum daily 1-hour SO_2 value in the year below which 99% of all values fall.
Ambient Air	The general outdoor atmosphere, external to buildings, to which the general public has access.
Ambient Air Quality Standard	A limit in the quantity and exposure to pollutants dispersed or suspended in the ambient air. Primary standards are set to protect public health, including sensitive populations such as asthmatics, children, and the elderly. Secondary standards are set to protect public welfare including protection against visibility degradation, and damage to animals, crops, vegetation and buildings.
Carbon Monoxide	Carbon monoxide (CO) is a colorless, odorless, tasteless gas under atmospheric conditions. It is produced by the incomplete combustion of carbon fuels with the majority of emissions coming from transportation sources.
CFR	Code of Federal Regulations is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal government. Title 40 is the Protection of the Environment.
Collocated	This is a procedure required for a certain percentage of PM_{10} and $PM_{2.5}$ samplers in the monitoring network. Collocated samplers determine precision or variation in the PM_{10} or $PM_{2.5}$ concentration measurements of identical samplers run in the same location under the same sampling conditions.
Criteria Pollutants	These are the six pollutants for which the EPA has established national air quality standards. The pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead and particulate matter (PM_{10} and $PM_{2.5}$).
EPA	The U. S. Environmental Protection Agency; established to

protect human health and the natural environment.

Hydrogen Sulfide — Hydrogen sulfide (H_2S) is a toxic, colorless gas with a characteristic "rotten egg" odor detectable at very low levels. It occurs naturally during the decomposition of organic matter, near geothermal sources and is also produced during certain industrial processes, including wastewater treatment facilities.

Micron — One micron is one millionth of a meter or approximately 1/25,000 of an inch.

$\mu g/m^3$ — Micrograms per cubic meter. This is the measurement of air quality expressed as mass per unit volume.

NAAQS — National Ambient Air Quality Standards. These are pollutant standards that the EPA has established to protect public health and welfare. NAAQS have been set for carbon monoxide, nitrogen dioxide, PM_{10}, $PM_{2.5}$, ozone, sulfur dioxide, and lead. These are commonly referred to as criteria pollutants.

NCore — A multi-pollutant network that integrates several advanced measurement systems for particles, pollutant gases and meteorology. Most NCore stations have been operating since the formal start of the network on January 1, 2011, including Hawaii's.

Nitrogen Dioxide — Nitrogen dioxide (NO_2) is a brownish, highly corrosive gas with a pungent odor. It is formed in the atmosphere from emissions of nitrogen oxides (NO_x). Sources of nitrogen oxides include electric utilities, industrial boilers, motor vehicle exhaust and combustion of fossil fuels. NO_2 is also a component in the atmospheric reaction that produces ground-level ozone.

Ozone — Ozone (O_3) is the main constituent in photochemical air pollution. It is formed in the atmosphere by a chemical reaction of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. In the upper atmosphere, O_3 shields the earth from harmful ultraviolet radiation; however, at ground level, it can cause harmful effects in humans and plants.

Particulate Matter — This refers to any solid or liquid matter dispersed in the air. Particulate matter (PM) includes dust, soot, smoke, and

	liquid droplets from sources such as factories, power plants, motor vehicles, construction, agricultural activities, and fires.
PM_{10}	Particulate matter that is 10 microns or less in aerodynamic diameter. These are considered "coarse" particles, generally from sources such as road and windblown dust, and crushing and grinding operations.
$PM_{2.5}$	Particulate matter that is 2.5 microns or less in aerodynamic diameter. Considered "fine" particles, these are generally a result of fuel combustion such as from motor vehicles, utility generation and industrial facilities. Fine particles can also be formed when gases, such as sulfur dioxide and nitrogen dioxide, are chemically transformed into particles.
ppm	Parts per million is one particle in 1,000,000 other particles. It is approximately one drop in 13 gallons.
SLAMS	State and Local Air Monitoring Stations. The Clean Air Act requires that every state establish a network of air monitoring stations for criteria pollutants.
SPM	Special Purpose Monitoring stations. These are stations established to provide data for special studies in support of air program interests and activities. SPM stations supplement the SLAMS network as special circumstances require and adequate resources permit.
Sulfur Dioxide	Sulfur dioxide (SO_2) is a colorless gas that easily combines with water vapor forming sulfuric acid. Emissions of sulfur dioxide are largely from sources that burn fossil fuels such as coal and oil. In Hawaii, another major source of sulfur dioxide emissions is from the eruption of Kilauea Volcano on the Big Island.
Vog	Vog is a local term used to express volcanic smog. Vog occurs when volcanic gas and particles combine with air and sunlight to produce atmospheric haze.

Table 2-1 **State and Federal Ambient Air Quality Standards**

Sources: State standards HAR §11-59; Federal standards 40 CFR Part 50

Air Pollutant	Averaging Time	Standards		
		Hawaii State Standard	Federal Primary Standard [a]	Federal Secondary Standard [b]
Carbon Monoxide (CO)	1-hour 8-hour	9 ppm 4.4 ppm	35 ppm 9 ppm	None
Nitrogen Dioxide (NO_2)	1-hour Annual	--- 0.04 ppm	0.100 ppm 0.053 ppm	--- 0.053 ppm
PM_{10}	24-hour Annual [c]	150 µg/m^3 50 µg/m^3	150 µg/m^3 ---	--- ---
$PM_{2.5}$	24-hour Annual	---	35 µg/m^3 12 µg/m^3	35 µg/m^3 15 µg/m^3
Ozone (O_3)	8-hour	0.08 ppm	0.070 ppm	0.070 ppm
Sulfur Dioxide (SO_2)	1-hour 3-hour 24-hour Annual	--- 0.5 ppm 0.14 ppm 0.03 ppm	0.075 ppm --- --- ---	--- 0.5 ppm --- ---
Lead (Pb)	Rolling 3-month	1.5 µg/m^3 [d]	0.15 µg/m^3	0.15 µg/m^3
Hydrogen Sulfide	1-hour	0.025 ppm	None	None

[a] ***Primary Standards*** set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children and the elderly.

[b] ***Secondary Standards*** set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

[c] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard effective December 17, 2006. However, the state still has an annual standard.

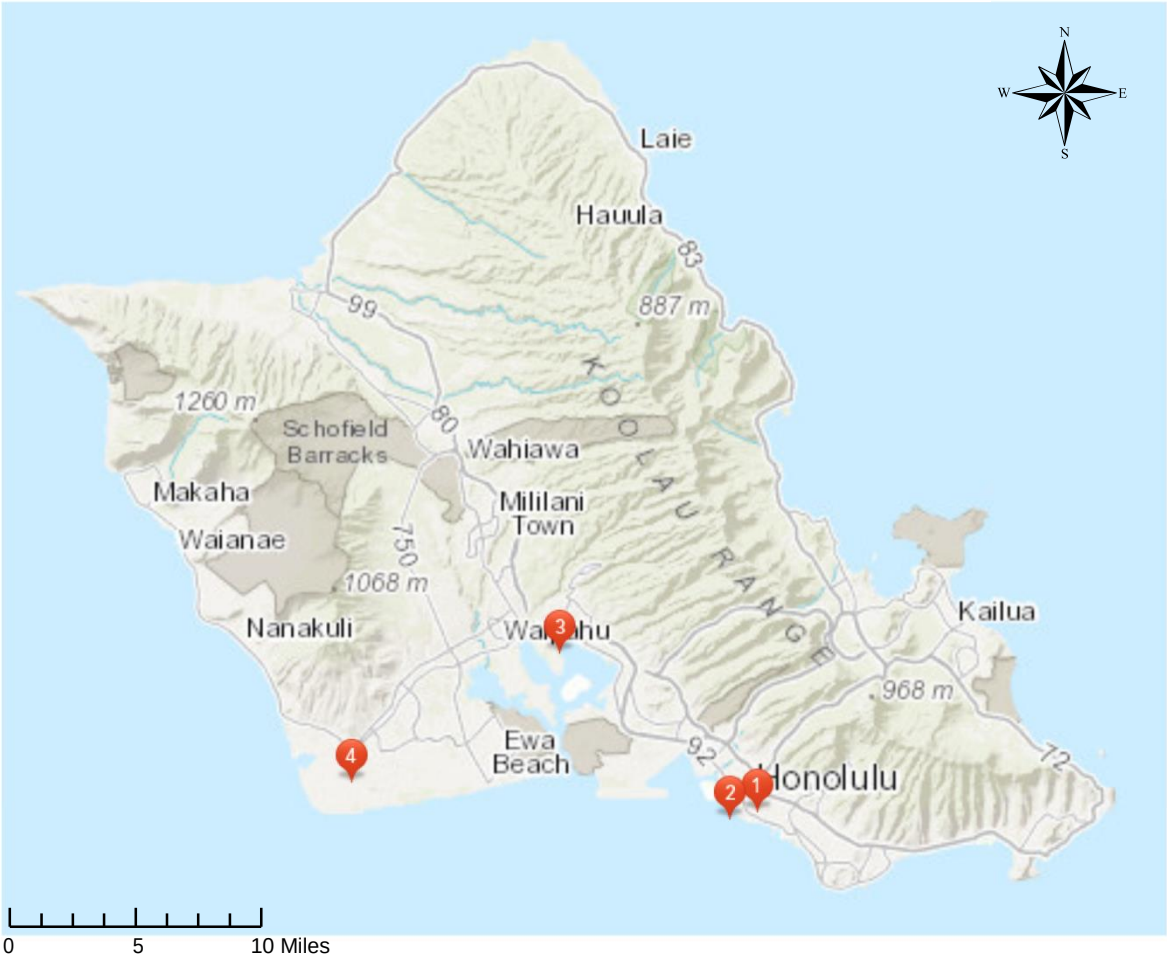
[d] The state standard is based on calendar quarter.

Compliance with the National Ambient Air Quality Standards

CO 1-hour: May not be exceeded more than once per year.
CO 8-hour: May not be exceeded more than once per year.
NO_2 1-hour: The 3-year average of the 98th percentile daily maximum 1-hour averages must not exceed the standard.
NO_2 Annual: Average of all 1-hour values in the year may not exceed the level of the standard.
PM_{10} 24-hour: Must not be exceeded more than one day per year, after compensating for days when monitoring did not occur (estimated number of exceedances)
$PM_{2.5}$ 24-hour: The 3-year average of the 98th percentile 24-hour concentrations must not exceed the level of the standard.
$PM_{2.5}$ Annual: The 3-year average of 24-hour values must not exceed the level of the standard.
Ozone 8-hour: The 3-year average of the fourth highest daily maximum value must not exceed the level of the standard.
SO_2 1-hour: The 3-year average of the 99th percentile daily maximum 1-hour averages must not exceed the standard.
SO_2 3-hour: Not be exceeded more than once per year.
SO_2 24-hour: Not be exceeded more than once per year.
SO_2 Annual: Average of all 1-hour values in the year may not exceed the level of the standard.
Lead: Average of all 24-hour values in any rolling 3-month period may not exceed the level of the standard.

Section 3
SITE LOCATIONS AND DESCRIPTIONS

Figure 3-1: Island of Oahu – Air Monitoring Stations



Station	Name	Location	Pollutants/Parameters Monitored
1	Honolulu	1250 Punchbowl St.	CO, SO_2, $PM_{2.5}$, PM_{10}
2	Sand Island	1039 Sand Island Pkwy.	O_3, $PM_{2.5}$
3	Pearl City	860 4th St.	$PM_{2.5}$, PM_{10}
4	Kapolei	2052 Lauwiliwili St.	CO, SO_2, NO_2
	Kapolei NCore	2052 Lauwiliwili St.	CO $_{trace}$, $SO_{2\ trace}$, NO/NO_y , Pb, O_3, $PM_{2.5}$, $PM_{2.5}$ speciation, PM_{10}, $PM_{10-2.5}$, WS/WD

The following station descriptions include latitude and longitude in decimal degrees and altitude in meters above mean sea level.

Honolulu (DH)

Location:	1250 Punchbowl St., Honolulu
Latitude:	21.30758
Longitude:	-157.85542
Altitude:	20 m
Parameters:	SO_2, CO, PM_{10}, $PM_{2.5}$
Established:	February 1971
Brief Description:	
Located in downtown Honolulu on the roof of the Department of Health building, across from the Queen's Medical Center, in a busy commercial, business and government district.	

Kapolei (KA)

Location:	2052 Lauwiliwili St., Kapolei
Latitude:	21.32374
Longitude:	-158.08861
Altitude:	17.9 m
Parameters:	SO_2, CO, NO_2, PM_{10}, $PM_{2.5}$, $PM_{2.5}$ speciation, NCore
Established:	July 2002
Brief Description:	
Located in Kapolei Business Park, southeast of Kapolei Fire Station, next to a drainage canal that separates the park from Barber's Point. Approximately 1.5 miles from Malakole Street in Campbell Industrial Park.	

Pearl City (PC)

Location:	860 4th St., Pearl City
Latitude:	21.39283
Longitude:	-157.96913
Altitude:	23.1 m
Parameters:	PM_{10}, $PM_{2.5}$
Established:	May 1979
Brief Description:	
Located on the roof of the Leeward Health Center in a commercial, residential and light industrial area approximately 1.5 miles northwest of the Waiau power plant and near the Pearl Harbor Naval Complex.	

Sand Island (SI)

Location:	1039 Sand Island Pkwy., Honolulu
Latitude:	21.30384
Longitude:	-157.87117
Altitude:	5.3 m
Parameters:	O_3, $PM_{2.5}$
Established:	February 1981
Brief Description:	
Located in a light industrial, commercial and recreational area approximately two miles downwind of downtown Honolulu near the entrance to the Sand Island State Recreation Area.	

Figure 3-2: Island of Maui – Air Monitoring Stations

Station	Name	Location	Pollutants Monitored
1	Kihei	Hale Piilani Park	$PM_{2.5}$
2	Paia	TMK (2)-2-5-005-05	$PM_{2.5}$
3	Kahului	TMK (2)-3-8-007-153	$PM_{2.5}$

Kihei (KH)

Location:	Hale Piilani Park, Kihei
Latitude:	20.780997
Longitude:	-156.44637
Altitude:	46.5 m
Parameters:	$PM_{2.5}$
Established:	February 1999

Brief Description:

Located in a residential community park, next to agricultural land.

Paia (PI)

Location:	TMK (2)-2-5-005-05, Paia
Latitude:	20.902031
Longitude:	-156.370344
Altitude:	80.8 m
Parameters:	$PM_{2.5}$
Established:	March 2013

Brief Description:

Located within a fenced area that contains a County of Maui water supply tank. The area is surrounded by residential and agricultural land with sugar cane fields north of the monitor.

Kahului (KL)

Location:	TMK (2)-3—8-007-153, Kahului
Latitude:	20.869444
Longitude:	-156.492417
Altitude:	55.5 m
Parameters:	$PM_{2.5}$
Established:	January 2016

Brief Description:

Located within a fenced area off of Mauilani Parkway, TMK 2-3-8-007-153. The area is surrounded primarily by residential land.

Figure 3-3: Island of Hawaii – Air Monitoring Stations

Station	Name	Location	Pollutants Monitored
1	Hilo	1099 Waianuenue Ave.	SO_2, $PM_{2.5}$
2	Mountain View	18-1235 Volcano Rd.	SO_2, $PM_{2.5}$
3	Puna E	TMK (3)-1-3-28-37 (Leilani)	H_2S, SO_2
4	Pahala	96-3150 Pikake St.	SO_2, $PM_{2.5}$
5	Ocean View	92-6091 Orchid Mauka Circ.	SO_2, $PM_{2.5}$
6	Kona	81-1043 Konawaena School Rd.	SO_2, $PM_{2.5}$

Hilo (HL)

Location:	1099 Waianuenue Ave., Hilo
Latitude:	19.71756
Longitude:	-155.11053
Altitude:	136.8 m
Parameters:	SO_2, $PM_{2.5}$
Established:	January 1997

Brief Description:

Located near the Hilo Medical Center, this station was established to monitor vog during “Kona” or southerly wind conditions.

Kona (KN)

Location:	81-1043 Konawaena School Rd., Kona
Latitude:	19.50978
Longitude:	-155.91342
Altitude:	517.2 m
Parameters:	SO_2, $PM_{2.5}$
Established:	September 2005

Brief Description:

Located on the upper campus of Konawaena High School, this station monitors for vog on the west side of the island of Hawaii.

Mt. View (MV)

Location:	18-1235 Volcano Rd., Mt. View
Latitude:	19.57002
Longitude:	-155.08046
Altitude:	436.5 m
Parameters:	SO_2, $PM_{2.5}$
Established:	December 2010

Brief Description:

Located on the grounds of the Mt. View Elementary School, this station was established to monitor vog during southerly wind conditions.

Ocean View (OV)

Location:	92-6091 Orchid Mauka Circle, Ocean View
Latitude:	19.11756
Longitude:	-155.77814
Altitude:	862.6 m
Parameters:	SO_2, $PM_{2.5}$
Established:	April 2010

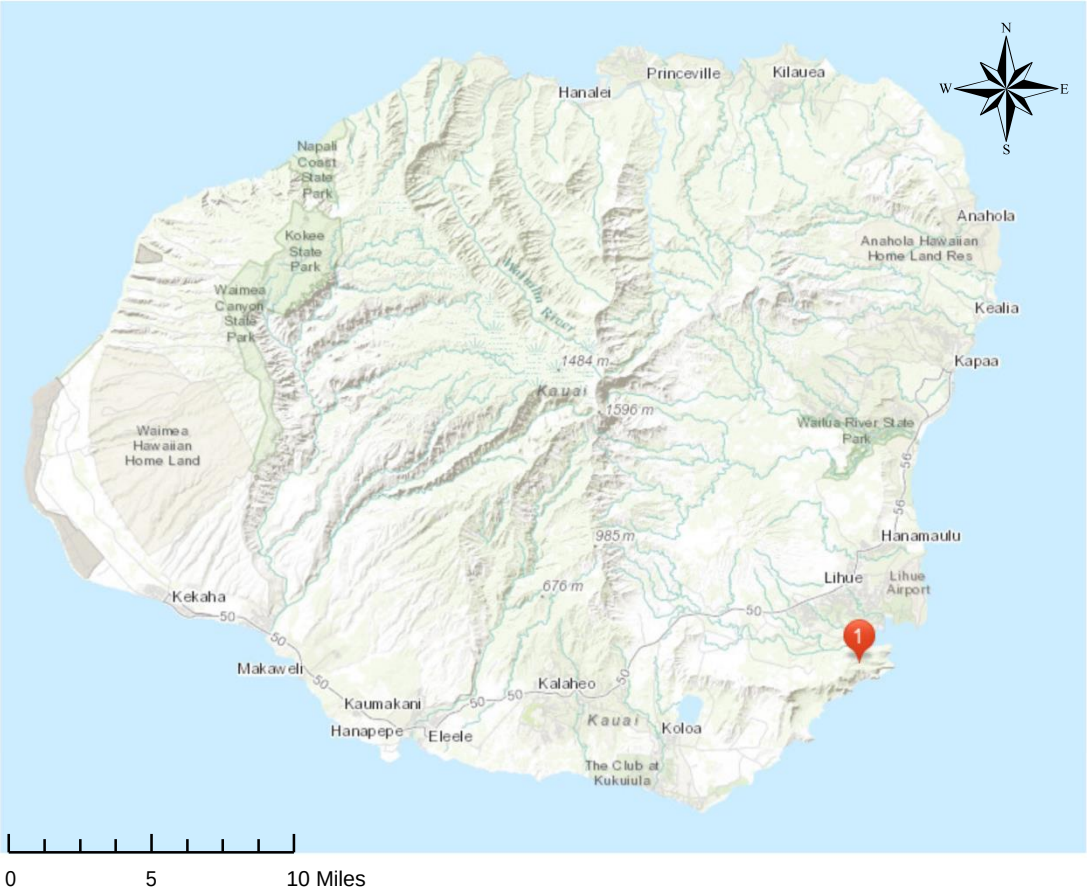
Brief Description:

This station is located in Hawaii Ocean View Estates at the Ocean View fire station and monitors for volcanic emissions.

Pahala (PA)		
	Location:	96-3150 Pikake St., Pahala
	Latitude:	19.2039
	Longitude:	-155.48018
	Altitude:	320 m
	Parameters:	SO_2, $PM_{2.5}$
	Established:	August 2007
	Brief Description:	
	The station is on the grounds of the Kau High and Pahala Elementary School, monitoring for volcanic emissions.	

Puna E (PE)		
	Location:	13-763 Leilani Ave., Pahoa
	Latitude:	19.46399
	Longitude:	-154.89871
	Altitude:	207.9 m
	Parameters:	SO_2, H_2S
	Established:	March 1991
	Brief Description:	
	Located in the Leilani Estates residential subdivision, this station monitors for emissions from the geothermal energy facility approximately 1 mile to the northeast. The station also monitors for SO_2 emissions from the volcano during southwesterly wind conditions.	

Figure 3-4: Island of Kauai – Air Monitoring Station



Station	Name	Location	Pollutants Monitored
1	Niumalu	2342 Hulemalu Road	SO_2, NO_2, $PM_{2.5}$

Niumalu (NI)		
	Location:	2342 Hulemalu Road, Lihue
	Latitude:	21.9495
	Longitude:	-159.365
	Altitude:	11 m
	Parameters:	SO_2, NO_2, $PM_{2.5}$
	Established:	April 2011
	Brief Description:	
	Located in the Niumalu residential subdivision, this station monitors for emissions from the cruise ships in Nawiliwili Harbor approximately 1.0 mile upwind.	

Table 3-1 **State of Hawaii Ambient Air Monitoring Network**

	Pollutants Monitored and Station Type									
SITE	**PM_{10}**	**$PM_{2.5}$**	**CO**	**O_3**	**SO_2**	**NO_2**	**H_2S**	**Lead**	**MONITORING OBJECTIVE**	**LOCATION SETTING**
OAHU										
Honolulu	S	S	S	-	S	-	-	-	Population Exposure	Urban and Center City
Kapolei [1]	S	S,C	S	S	S	S	-	S,C	Population Exposure	Suburban
Pearl City	S	S	-	-	-	-	-	-	Population Exposure	Urban and Center City
Sand Island	-	S	-	S	-	-	-	-	Maximum Concentration (O_3) Transport ($PM_{2.5}$)	Urban and Center City
MAUI										
Kihei	-	S	-	-	-	-	-	-	Source Impact (cane burning)	Suburban
Paia [2]	-	SPM	-	-	-	-	-	-	Source Impact (cane burning)	Neighborhood
Kahului [3]		SPM	-	-	-	-	-	-	Source Impact (cane burning)	Neighborhood
HAWAII										
Hilo	-	SPM	-	-	S	-	-	-	Population Exposure	Suburban
Kona	-	SPM	-	-	S	-	-	-	Population Exposure (SO_2)/ Maximum concentration ($PM_{2.5}$)	Suburban
Mountain View	-	SPM	-	-	SPM	-	-	-	Source Impact	Suburban
Ocean View	-	SPM	-	-	SPM	-	-	-	Welfare Impact (SO_2)/ Source Impact ($PM_{2.5}$)	Rural
Pahala	-	SPM	-	-	SPM	-	-	-	Maximum concentration (SO_2)/ Source Impact ($PM_{2.5}$)	Rural
Puna E	-	-	-	-	SPM	-	SPM	SPM	Source Impact (geothermal and volcano)	Suburban
KAUAI										
Niumalu	-	SPM		-	SPM	SPM	-	-	Source Impact (cruise ships)	Suburban

C = Collocated Site
S = (SLAMS) State and Local Air Monitoring Station
SPM = Special Purpose Monitoring Station (for monitoring vog, geothermal energy production and cruise ships)
[1] Includes NCore station
[2] Paia began operating 3/1/13
[3] Kahului began operating 1/13/15

Table 3-2 **Sampling Equipment at Each Monitoring Station**

Monitoring Station	PM_{10} Continuous Ambient Particulate Monitor	$PM_{2.5}$ Manual Particulate Monitor	$PM_{2.5}$ Continuous Monitor	CO Continuous Gas Filter Correlation Analyzer	SO_2 Continuous Pulsed Fluorescence Ambient Air Analyzer	O_3 Continuous UV Photometric Analyzer	NO_2 Continuous Chemiluminescence Analyzer	H_2S Continuous Pulsed Fluorescence Ambient Air Analyzer	Lead 1 in 6 Days Total Suspended Particulate Monitor
OAHU									
Honolulu	■		■	■	■				
Kapolei	■	■	■	■	■	■	■		■
Pearl City	■		■						
Sand Island			■			■			
MAUI									
Kihei			■						
Paia			■						
Kahului			■						
HAWAII									
Hilo			■		■				
Kona			■		■				
Mt. View			■		■				
Ocean View			■		■				
Pahala			■		■				
Puna E					■			■	
KAUAI									
Niumalu			■		■		■		

Section 4
2016 AIR QUALITY DATA

To protect the state's air quality from degradation, the Department of Health's Clean Air Branch is responsible for regulating and monitoring pollution sources to ensure that the levels of criteria pollutants remain well below the state and federal ambient air quality standards. Data collected from the ambient air network is validated by the Air Surveillance and Analysis Section to ensure that the reported data is of good quality and meets all quality control and assurance requirements.

The monitoring stations in communities near the volcano record higher levels of SO_2 and $PM_{2.5}$, with regular exceedances of the NAAQS for SO_2 and occasional exceedances of the NAAQS for $PM_{2.5}$. The EPA considers the volcano a natural, uncontrollable event and therefore the state is requesting exclusion of these NAAQS exceedances from attainment/non-attainment determination.

Excluding the exceedances due to the volcano, in 2016 the State of Hawaii was in attainment of all NAAQS.

Explanation of Summary Tables 4-1 through 4-18:

- Summaries are by pollutant and averaging period, with the number of occurrences exceeding the NAAQS or, in Table 4-17, the number of exceedances of the state H_2S standard (there is no federal H_2S standard);
- The "Maximum" is the highest and second highest valid values recorded in the year for the averaging period. For $PM_{2.5}$, the maximum and 98th percentile concentrations are provided and for O_3, the 4th highest daily maximum value is also displayed;
- The "Annual Mean" is the arithmetic mean of all valid values recorded in the year;
- "Possible Periods" is the total number of possible sampling periods in the year for the averaging period;
- "Valid Periods" is the total number of acceptable sampling periods after data validation;
- "Percent Recovery" represents the amount of quality data reported;
- Attainment with the NAAQS is determined according to 40 CFR 50.

Explanation of Tables 4-19 through 4-29:

- For each pollutant and averaging period, the highest concentration for each month is presented;
- The month with the highest value recorded in the year for each site is highlighted.

Table 4-1. 2016 Summary of the 24-Hour PM_{10} Averages

	Maximum		Annual Mean	No. of 24-hour Averages Greater than 150 µg/m^3														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU																		
Honolulu	33	29	13.8	0	0	0	0	0	0	0	0	0	0	0	0	366	335	91.5
Kapolei	35	32	14.0	0	0	0	0	0	0	0	0	0	0	0	0	366	331	95.3
Pearl City	41	39	19.9	0	0	0	0	0	0	0	0	0	0	0	0	366	361	98.6

Table 4-2. Attainment Determination of the 24-Hour PM_{10} NAAQS

Station	Exceedances in 2014	Exceedances in 2015	Exceedances in 2016	Sites in violation of the NAAQS
Honolulu	0	0	0	0
Kapolei	0	0	0	0
Pearl City	0	0	0	0
Attainment: The standard not to be exceeded more than once per year on average over 3 years. **In 2016, Hawaii was in attainment with the 24-hour PM_{10} NAAQS.**				

Table 4-3. 2016 Summary of the 24-Hour $PM_{2.5}$ Averages: SLAMS Stations

	Maximum		Annual Mean	No. of 24-hour Averages Greater than 35 µg/m³														
	1st High	98th %	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU																		
Honolulu	16.2	10.5	2.1	0	0	0	0	0	0	0	0	0	0	0	0	366	335	91.5
Kapolei[1]	15.6	11.0	4.0	0	0	0	0	0	0	0	0	0	0	0	0	366	287	78.4
Pearl City	15.1	11.7	2.6	0	0	0	0	0	0	0	0	0	0	0	0	366	365	99.7
Sand Island	14.7	12.7	4.0	0	0	0	0	0	0	0	0	0	0	0	0	366	358	97.8
MAUI																		
Kihei	47.2	12.1	3.7	0	0	1	0	0	0	0	0	0	0	0	0	366	356	97.3

[1] Does not meet summary criteria, <75% data recovery in one or more quarters

Table 4-4. Attainment Determination of the 24-Hour $PM_{2.5}$ NAAQS: SLAMS Stations

Station	2014 98th value	2015 98th value	2016 98th value	3-Year Average	Sites in violation of the NAAQS
Honolulu	10	10	11	10	0
Kapolei	11	14	11[1]	12	0
Pearl City	10	11	12	11	0
Sand Island	10	12	13	12	0
Kihei	10	13	12	12	0
Attainment: The 3-year average of the 98th percentile values must be less than or equal to 35 µg/m³. **In 2016, Hawaii was in attainment with the 24-hour $PM_{2.5}$ NAAQS.**					

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

Table 4-5. Attainment Determination of the Annual $PM_{2.5}$ NAAQS: SLAMS Stations

Station	2014 Ann. Avg.	2015 Ann. Avg.	2016 Ann. Avg.	3-Year Average	Sites in violation of the NAAQS
Honolulu	4.4	3.7	2.1	3.4	0
Kapolei	3.9	4.1	4.0[1]	4.0	0
Pearl City	3.9	5.2	2.6	3.9	0
Sand Island	4.5	5.4	4.0	4.7	0
Kihei	3.9	4.7	3.7	4.1	0
Attainment: The 3-year average of annual mean values must be less than 15 µg/m³. **In 2016, Hawaii was in attainment with the annual $PM_{2.5}$ NAAQS.**					

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

Table 4-6. 2016 Summary of the 24-Hour $PM_{2.5}$ Averages: SPM Stations

	Maximum		Annual Mean	No. of 24-hour Averages Greater than 35 µg/m³														
	1st High	98th%	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
HAWAII																		
Hilo	27.5	21.0	8.7	0	0	0	0	0	0	0	0	0	0	0	0	366	341	93.2
Kona[1]	33.1	23.9	13.2	0	0	0	0	0	0	0	0	0	0	0	0	366	323	88.3
Mt. View[1]	32.7	22.0	7.0	0	0	0	0	0	0	0	0	0	0	0	0	366	229	62.6
Ocean View	42.1	31.2	14.6	0	0	3	1	0	0	0	0	0	0	0	0	366	363	99.2
Pahala	24.2	17.4	5.8	0	0	0	0	0	0	0	0	0	0	0	0	366	358	97.8
KAUAI																		
Niumalu	13.3	9.0	3.5	0	0	0	0	0	0	0	0	0	0	0	0	366	350	95.6
MAUI																		
Kahului	18.2	10.7	2.7	0	0	0	0	0	0	0	0	0	0	0	0	366	339	92.6
Paia	15.8	12.4	4.5	0	0	0	0	0	0	0	0	0	0	0	0	366	353	96.4

The special purpose stations on Hawaii island were established to monitor ambient air concentrations of $PM_{2.5}$ from volcanic emissions. The special purpose station on Kauai was established to monitor emissions from cruise ships. The special purpose stations on Maui were established to monitor emissions from cane burning.

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

Table 4-7. 2016 Summary of the 8-Hour O_3 Averages

	Maximum			Annual Mean	No. of Daily Maximum 8-Hour Averages Greater than 0.070 ppm[1]														
	1st High	2nd High	4th High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU																			
Sand Island	0.052	0.050	0.048	0.004	0	0	0	0	0	0	0	0	0	0	0	0	8779	7734	88.1
Kapolei	0.052	0.054	0.048	0.030	0	0	0	0	0	0	0	0	0	0	0	0	8779	7698	87.7

[1] The national air quality standard for O_3 is 0.070 effective October 1, 2015.

Table 4-8. Attainment Determination of the 8-Hour O_3 NAAQS

Station	2014 4th highest	2015 4th highest	2016 4th highest	3-Year Average	Site in violation of the NAAQS
Sand Island	0.057	0.049	0.048	0.051	0
Kapolei	0.046 [1]	0.049	0.048	0.048[2]	0
Attainment: The 3-year average of the annual 4th highest daily maximum 8-hour average must be less than or equal to 0.070 ppm. **In 2016, Hawaii was in attainment with the 8-hour O_3 NAAQS.**					

[1] Does not meet summary criteria, <75% data recovery in year [2] 3-year design value not valid as 2014 did not meet summary criteria: <75% completeness.

Table 4-9. 2016 Summary of the 1-Hour and Annual NO_2 Averages

	Maximum 1-hr		Annual Mean	No. of Daily Maximum 1-Hour Averages Greater than 0.100 ppm														
	1st High	98th%	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU	**SLAMS stations**																	
Kapolei[1]	0.036	0.029	0.004	0	0	0	0	0	0	0	0	0	0	0	0	8784	6853	78.0
KAUAI	**SPM Station**																	
Niumalu[1]	0.037	0.034	0.003	0	0	0	0	0	0	0	0	0	0	0	0	8784	4820	54.9[1]
Attainment of the annual NO_2 NAAQS: The annual mean shall not exceed 0.053 ppm. **In 2016, Hawaii was in attainment with the annual NO_2 NAAQS.**																		

[1] Does not meet summary criteria, <75% data recovery in one or more quarters

Table 4-10. Attainment Determination of the 1-Hour NO2 NAAQS

Station	2014 98th value	2015 98th value	2016 98th value	3-Year Average	Site in violation of the NAAQS
Kapolei	0.025	0.022	0.029[1]	0.025	0
Attainment: The 3-year average of the 98th percentile values must be less than or equal to 0.100 ppm. **In 2016, Hawaii was in attainment with the 1-hour NO_2 NAAQS.**					

[1] Does not meet summary criteria, <75% data recovery in one or more quarters

4-11. 2016 Summary of the 1-Hour SO_2 Averages

	Maximum		Annual Mean	No. of 1-hour Averages Greater than 0.075 ppm														
	1st High	99th%	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU	**SLAMS Stations**																	
Honolulu	0.009	0.007	0.000	0	0	0	0	0	0	0	0	0	0	0	0	8784	8060	91.8
Kapolei	0.026	0.013	0.000	0	0	0	0	0	0	0	0	0	0	0	0	8784	8021	91.3
HAWAII	**SPM Stations (see NOTE)**																	
Hilo	0.403	0.313	0.003	8	0	5	0	0	0	0	0	0	0	0	2	8784	8276	94.2
Kona[1]	0.101	0.044	0.004	1	0	0	0	0	0	0	0	0	0	0	0	8784	7502	85.4
Mt. View[1]	0.615	0.251	0.005	10	6	9	0	0	1	1	0	0	0	0	0	8784	5640	64.2
Ocean View	1.447	0.532	0.018	22	12	16	18	9	12	6	3	7	16	18	7	8784	8563	97.5
Pahala	0.748	0.558	0.035	24	23	19	23	14	19	19	19	17	25	29	15	8784	8525	97.1
Puna E	0.058	0.041	0.002	0	0	0	0	0	0	0	0	0	0	0	0	8784	8552	97.4
KAUAI	**SPM Station**																	
Niumalu[1]	0.013	0.008	0.001	0	0	0	0	0	0	0	0	0	0	0	0	8784	6480	73.8

Attainment: The 3-year average of the 99th percentile values must be less than or equal to 0.075 ppm. Effective June 2, 2010.
In 2016, Hawaii was in attainment with the 1-hour SO_2 NAAQS (SLAMS stations only).

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 1-hour NAAQS from attainment determinations. The SPM station on Kauai was established to monitor emissions from cruise ships.

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

Table 4-12. Attainment Determination of the 1-Hour SO_2 NAAQS: SLAMS Stations

	2014 99th value	2015 99th value	2016 99th value	3-Year Average	Violation of the NAAQS
OAHU SLAMS stations					N= NO Y= YES
Honolulu	0.006	0.010	0.007	0.008	N
Kapolei	0.021 [1]	0.013	0.013	0.016	N
HAWAII SPM stations (SEE note)					
Hilo	0.144 [1]	0.236	0.313	0.231	Y
Kona[1]	0.035	0.031	0.044	0.037	N
Mt. View	0.312	0.276	0.251 [1]	0.280	Y
Ocean View	0.379	0.382	0.532	0.431	Y
Pahala	0.444	0.496	0.558	0.499	Y
Puna E	0.034	0.015	0.041	0.030	N
KAUAI SPM station					
Niumalu[2]	0.036	0.014	0.008	0.019	N

Attainment: The 3-year average of the 99th percentile values must be less than or equal to 0.075 ppm. Effective June 2, 2010.
In 2016, Hawaii was in attainment with the 1-hour SO_2 NAAQS (SLAMS stations only).

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 1-hour NAAQS from attainment determinations. The SPM station on Kauai was established to monitor emissions from cruise ships.

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

Table 4-13. 2016 Summary of the 3-Hour SO_2 Averages

	Maximum		Annual Mean	No. of 3-hour Averages Greater than 0.5 ppm														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU	**SLAMS stations**																	
Honolulu	0.007	0.006	0.000	0	0	0	0	0	0	0	0	0	0	0	0	2928	2607	89.0
Kapolei	0.009	0.007	0.000	0	0	0	0	0	0	0	0	0	0	0	0	2928	2536	86.6
HAWAII	**SPM stations (see NOTE)**																	
Hilo	0.316	0.303	0.003	0	0	0	0	0	0	0	0	0	0	0	0	2928	2665	91.0
Kona[1]	0.076	0.038	0.004	0	0	0	0	0	0	0	0	0	0	0	0	2928	2401	82.0
Mt. View[1]	0.517	0.237	0.005	0	0	0	0	0	0	0	0	0	0	0	0	2928	1801	61.5
Ocean View	0.600	0.413	0.018	0	1	0	0	0	0	0	0	0	0	0	0	2928	2744	93.7
Pahala	0.590	0.428	0.035	0	0	0	0	0	0	0	0	0	0	0	0	2928	2739	93.5
Puna E	0.045	0.035	0.002	0	0	0	0	0	0	0	0	0	0	0	0	2928	2707	92.5
KAUAI	**SPM station**																	
Niumalu[1]	0.008	0.006	0.001	0	0	0	0	0	0	0	0	0	0	0	0	2928	2108	72.0

Attainment: 3-hour values not to exceed 0.5 ppm more than once per year.
In 2016, Hawaii was in attainment with the 3-hour SO_2 NAAQS (SLAMS stations only).

NOTE: The SPM stations on Hawaii island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 3-hour NAAQS from attainment determinations.

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

Table 4-14. 2016 Summary of the 24-Hour and Annual SO_2 Averages

	Maximum		Annual Mean	No. of 24-hour Averages Greater than 0.140 ppm														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU	**SLAMS Stations**																	
Honolulu	0.002	0.002	0.000	0	0	0	0	0	0	0	0	0	0	0	0	366	339	92.6
Kapolei	0.004	0.002	0.000	0	0	0	0	0	0	0	0	0	0	0	0	366	346	94.5
HAWAII	**SPM Stations (see NOTE)**																	
Hilo	0.103	0.102	0.003	0	0	0	0	0	0	0	0	0	0	0	0	366	354	96.7
Kona[1]	0.021	0.016	0.004	0	0	0	0	0	0	0	0	0	0	0	0	366	316	86.3
Mt. View[1]	0.090	0.058	0.005	0	0	0	0	0	0	0	0	0	0	0	0	366	240	65.6
Ocean View	0.155	0.126	0.018	0	0	1	0	0	0	0	0	0	0	0	0	366	364	99.5
Pahala	0.174	0.158	0.035	0	0	1	0	0	0	0	0	0	0	1	0	366	365	99.7
Puna E	0.010	0.008	0.002	0	0	0	0	0	0	0	0	0	0	0	0	366	364	99.5
KAUAI	**SPM Station**																	
Niumalu[3]	0.003	0.005	0.001	0	0	0	0	0	0	0	0	0	0	0	0	366	268	73.2

Attainment: 24-hour values not to exceed 0.14 ppm more than once per year.
In 2016, Hawaii was in attainment of the state 24-hour SO_2 standard (SLAMS stations only).

NOTE: The SPM stations on Hawaii island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 24-hour NAAQS from attainment determinations.

Attainment: Annual average (from SLAMS stations only) not to exceed 0.03 ppm.
In 2016, Hawaii was in attainment of the state annual SO_2 standard.

NOTE: The SPM stations on Hawaii island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the annual NAAQS from attainment determinations.

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

Table 4-15. 2016 Summary of the 1-Hour CO Averages

	Maximum		Annual Mean	No. of 1-hour Averages Greater than 35 ppm														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU	**SLAMS stations**																	
Honolulu	1.6	1.5	0.6	0	0	0	0	0	0	0	0	0	0	0	0	8784	7732	88.0
Kapolei	1.3	1.3	0.4	0	0	0	0	0	0	0	0	0	0	0	0	8784	7977	90.8

Attainment: 1-hour values not to exceed 35 ppm more than once per year.
In 2016, Hawaii was in attainment with the 1-hour CO NAAQS.

Table 4-16. 2016 Summary of the 8-Hour CO Averages

	Maximum		Annual Mean	No. of 8-hour Averages Greater than 9 ppm														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU	**SLAMS stations**																	
Honolulu	1.2	1.1	0.6	0	0	0	0	0	0	0	0	0	0	0	0	8779	7708	87.8
Kapolei	1.2	1.2	0.5	0	0	0	0	0	0	0	0	0	0	0	0	8774	7659	87.3

Attainment: 8-hour values not to exceed 9 ppm more than once per year.
In 2016, Hawaii was in attainment with the 8-hour CO NAAQS.

Table 4-17. 2016 Summary of the 1-Hour H_2S Averages (State Standard)

	Maximum		Annual Mean	No. of 1-hour Averages Greater than 0.025 ppm														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
HAWAII																		
Puna E	0.002	0.002	0.001	0	0	0	0	0	0	0	0	0	0	0	0	8341	8552	95.0

Attainment of the state standard: 1-hour values not to exceed 0.025 ppm.
In 2016, Hawaii was in attainment of the state 1-hour H_2S standard.

Table 4-18. 2016 Summary of the Rolling 3-Month Lead Averages

	Maximum		Annual Mean	No. of 3-Month Averages Greater than 0.15 µg/m³														
				Rolling 3-Month period ending in the month of														
	1st High	2nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
HAWAII																		
Kapolei	0.002	0.002	0.001	0	0	0	0	0	0	0	0	0	0	0	0	61	56	91.8

Attainment: Maximum 3-month average concentration for a 3-year period must be less than or equal to 0.15 µg/m³.
Note: Sampling for lead conducted 1 in 6 days. Sampling began 1/1/2012.

Table 4-19. 2016 Monthly Maximum of 24-Hour PM_{10} Values (µg/m³)

The month with the highest value in the year is highlighted *The state and federal 24-hr PM_{10} standard is 150 µg/m³*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Honolulu	23	24	33	24	18	17	19	16	17	22	29	20
Kapolei	29	25	35	32	20	20	26	23	26	24	25	28
Pearl City	32	34	38	42	22	21	29	19	24	37	41	38

Table 4-20. 2016 Monthly Maximum of 24-Hour $PM_{2.5}$ Values ($\mu g/m^3$)

The month with the highest value in the year is highlighted *The federal 24-hr $PM_{2.5}$ standard is 35 $\mu g/m^3$*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SLAMS Stations												
Honolulu	13	10	11	16	4	2	5	2	3	4	8	8
Kapolei	14	7	11	16	5	7	10	6	7	7	7	6
Pearl City	14	7	15	11	5	3	6	3	4	5	6	8
Sand Island	15	11	15	14	6	7	9	4	5	5	7	5
Kihei	15	12	47	11	5	7	9	17	14	12	11	9
SPM Stations												
Niumalu (cruise ships)	13	7	11	8	6	8	10	5	6	7	8	7
Hilo (volcano)	17	23	28	11	15	12	16	13	18	15	22	24
Kahului	16	11	11	10	6	7	7	7	5	7	5	18
Kona (volcano)[1]	27	17	25	33	16	17	18	19	18	15	29	15
Mt. View (volcano)	24	25	33	9	14	13	10	7	-	-	-	-
Ocean View (volcano)	31	24	42	37	20	25	21	21	20	21	28	17
Pahala (volcano)	17	19	24	11	6	9	11	8	15	8	20	16
Paia (cane burning)	15	13	16	12	8	6	7	5	5	7	9	11

[1] Does not meet summary criteria, < 75% data recovery in one or more quarters.

Table 4-21. 2016 Monthly Maximum of 1-Hour NO_2 Values (ppm)

The month with the highest value in the year is highlighted *The federal 1-hour standard for NO_2 is 0.100 ppm*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kapolei[1]	0.030	0.030	0.024	0.021	0.017	-	0.011	0.018	0.011	0.017	0.031	0.036
Niumalu[1]	-	-	0.018	0.037	0.018	0.023	0.022	0.018	0.019	0.027	0.036	0.034

[1] Does not meet summary criteria, < 75% data recovery in one or more quarters.

Table 4-22. 2016 Monthly Maximum of 1-Hour CO Values (ppm)

The month with the highest value in the year is highlighted *The federal 1-hr CO standard is 35 ppm, the state standard is 9 ppm*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Honolulu	1.6	1.3	1.1	1.2	0.9	0.9	1	0.6	0.8	0.9	1.2	1.2
Kapolei	1.3	1.3	1.3	1.1	1	1	1	0.3	0.2	0.4	0.8	0.8

Table 4-23. 2016 Monthly Maximum of 8-Hour CO Values (ppm)

The month with the highest value in the year is highlighted *The federal 8-hr CO standard is 9 ppm, the state standard is 4.4 ppm*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Honolulu	1.1	0.8	0.9	1	0.7	0.8	1	1	0.7	0.8	1.2	0.8
Kapolei	1.2	1	1	0.9	0.8	0.9	0.9	0.2	0.1	0.4	0.5	0.5

4-24. 2016 Monthly Maximum of 8-Hour O_3 Values (ppm)

The month with the highest value in the year is highlighted *The federal 8-hr O_3 standard is 0.070 ppm*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sand Island	0.040	0.047	0.049	0.053	0.042	0.042	0.029	0.027	0.028	0.040	0.044	0.046
Kapolei NCore	0.043	0.048	0.052	0.054	-	0.042	0.030	0.028	0.030	0.042	0.044	0.047

Table 4-25. 2016 Monthly Maximum of 1-Hour SO_2 Values (ppm)

The month with the highest value in the year is highlighted *The federal 1-hr SO_2 standard is 0.075 ppm (75 ppb)*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SLAMS Stations												
Honolulu	0.009	0.006	0.009	0.002	0.003	0.001	0.003	0.004	0.001	0.001	0.002	0.004
Kapolei	0.010	0.012	0.008	0.006	0.004	0.002	0.003	0.001	0.001	0.002	0.004	0.014
SPM Stations (see NOTE)												
Niumalu (cruise ships)	-	-	0.008	0.013	0.001	0.001	0.002	0.002	0.003	0.011	0.002	0.002
Hilo (volcano)	0.397	0.050	0.403	0.009	0.010	0.012	0.046	0.005	0.013	0.004	0.021	0.164
Kona (volcano)[1]	0.101	0.034	0.019	0.016	0.002	0.003	0.005	0.024	0.007	0.010	0.009	0.009
Mt. View (volcano)	0.615	0.160	0.176	0.034	0.054	0.080	0.282	0.018	-	-	-	-
Ocean View (volcano)	0.557	1.447	0.034	0.313	0.364	0.250	0.134	0.366	0.227	0.329	0.532	0.408
Pahala (volcano)	0.703	0.558	0.524	0.342	0.237	0.239	0.517	0.270	0.212	0.423	0.748	0.446
Puna E (volcano)	0.051	0.058	0.054	0.001	0.001	0.002	0.002	0.002	0.006	0.002	0.006	0.014

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 1-hour NAAQS from attainment determinations. [1] Does not meet summary criteria, < 75% data recovery in one or more quarters.

Table 4-26. 2016 Monthly Maximum of 3-Hour SO_2 Values (ppm)

The month with the highest value in the year is highlighted *The state and federal 3-hr SO_2 standard is 0.5 ppm*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SLAMS Stations												
Honolulu	0.005	0.005	0.007	0.001	0.002	0.000	0.002	0.001	0.000	0.001	0.002	0.003
Kapolei	0.005	0.009	0.005	0.004	0.003	0.001	0.002	0.001	0.001	0.001	0.003	0.007
SPM Stations (see NOTE)												
Niumalu (cruise ships)	-	-	0.004	0.008	0.001	0.001	0.001	0.002	0.002	0.006	0.002	0.002
Hilo (volcano)	0.316	0.034	0.303	0.007	0.006	0.011	0.040	0.003	0.010	0.002	0.015	0.143
Kona (volcano)[1]	0.076	0.022	0.016	0.038	0.015	0.020	0.014	0.016	0.038	0.018	0.030	0.008
Mt. View (volcano)	0.517	0.106	0.089	0.025	0.031	0.056	0.237	0.011	-	-	-	-
Ocean View (volcano)	0.413	0.600	0.227	0.218	0.165	0.135	0.097	0.262	0.160	0.189	0.226	0.168
Pahala (volcano)	0.590	0.364	0.366	0.165	0.141	0.186	0.256	0.238	0.176	0.266	0.315	0.210
Puna E (volcano)	0.032	0.035	0.041	0.001	0.001	0.002	0.002	0.002	0.003	0.002	0.005	0.008

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 3-hour NAAQS from attainment determinations. [1] Does not meet summary criteria, < 75% data recovery in one or more quarters.

Table 4-27. 2016 Monthly Maximum of 24-Hour SO_2 Values (ppm)

The month with the highest value in the year is highlighted *The state and federal 24-hr SO_2 standard is 0.14 ppm*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SLAMS Stations												
Honolulu	0.001	0.002	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.001	0.001	0.001
Kapolei	0.002	0.002	0.002	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.004
SPM Stations (see NOTE)												
Niumalu (cruise ships)	-	-	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002
Hilo (volcano)	0.103	0.011	0.102	0.003	0.003	0.003	0.007	0.001	0.002	0.001	0.004	0.055
Kona (volcano)[1]	0.021	0.011	0.007	0.015	0.007	0.009	0.006	0.009	0.011	0.007	0.013	0.004
Mt. View (volcano)	0.090	0.040	0.030	0.006	0.008	0.015	0.045	0.004	-	-	-	-
Ocean View (volcano)	0.155	0.113	0.067	0.078	0.038	0.050	0.029	0.036	0.034	0.047	0.051	0.039
Pahala (volcano)	0.148	0.101	0.158	0.074	0.050	0.056	0.102	0.060	0.069	0.088	0.174	0.089
Puna E (volcano)	0.006	0.008	0.010	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.004

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of SO_2 from volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 24-hour NAAQS from attainment determinations. [1] Does not meet summary criteria, < 75% data recovery in one or more quarters.

Table 4-28. 2016 Monthly Maximum of 1-Hour H_2S Values (ppm)

The month with the highest value in the year is highlighted *The state 1-hour H_2S standard is 0.025 ppm*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Puna E	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.002

Table 4-29. 2016 Monthly Maximum of Rolling 3-Month Lead Values ($\mu g/m^3$)

The month with the highest value in the year is highlighted *The federal rolling 3-month lead standard is 0.15 $\mu g/m^3$*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kapolei NCore (1 in 6 days)	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001

Section 5
2016 $PM_{2.5}$ SPECIATION DATA

Atmospheric aerosols are solid or liquid particles suspended in air that come directly from a variety of sources (primary) or are formed by chemical reactions (secondary). Primary and secondary particles tend to have long lifetimes in the atmosphere and can travel long distances, up to hundreds or perhaps thousands of miles. Sources include dust from roads, construction, and agriculture; combustion particles from motor vehicles, electric utilities and agricultural burning; and particles from natural sources such as the ocean or volcano.

Most of the $PM_{2.5}$ is a combination of the following components: sulfates, nitrates, ammonium, elemental carbon, organic compounds, water and metals. The EPA selected target particulates of interest based on data use objectives, primary constituents of $PM_{2.5}$, and the capability and availability of current analytical methods.

The filter-based speciation sampler collects samples once every 3 days for analyses performed by an EPA contract laboratory. The speciation sampler is located at the Kapolei NCore monitoring station.

Table 5-1 lists the parameters measured, highest and second highest values recorded in the year, the annual arithmetic mean of all valid samples and the total number of samples collected in the year. Table 5-2 lists the analysis methods for each parameter.

With the exception of lead, there are no ambient air quality standards for the individual components of speciated $PM_{2.5}$.

For more information on EPA's speciation program, go to:
www.epa.gov/ttn/amtic/speciepg.html

Table 5-1. Annual Summary of $PM_{2.5}$ Speciation Data

Parameter	1st High (µg/m³)	2nd High (µg/m³)	Annual Mean (µg/m³)	No. of Samples	Percent Recovery
CARBON					
Organic Carbon	0.831	0.822	0.3249	85	70
Elemental Carbon	0.371	0.345	0.0823	85	70
METALS					
Aluminum	0.220	0.126	0.0153	102	84
Antimony	0.046	0.045	0.0026	102	84
Arsenic	0.005	0.004	0.0004	102	84
Barium	0.148	0.081	0.0060	102	84
Bromine	0.006	0.005	0.0009	102	84
Cadmium	0.023	0.017	0.0009	102	84
Calcium	0.215	0.161	0.0407	102	84
Cerium	0.128	0.101	0.0125	102	84
Cesium	0.064	0.054	0.0067	102	84
Chlorine	1.31	1.92	0.3953	102	84
Chromium	0.051	0.015	0.0013	102	84
Cobalt	0.004	0.003	0.0003	102	84
Copper	0.026	0.014	0.0024	102	84
Indium	0.030	0.026	0.0014	102	84
Iron	0.205	0.803	0.0229	102	84
Lead	0.017	0.014	0.0010	102	84
Magnesium	0.157	0..134	0.0364	102	84
Manganese	0.005	0.004	-0.0002	102	84
Nickel	0.023	0.019	0.0034	102	84
Phosphorus	0.007	0.006	0.0003	102	84
Potassium	1.54	0.082	0.0401	102	84
Rubidium	0.010	0.008	0.0002	102	84
Selenium	0.005	0.005	0.0005	102	84
Silicon	0.226	0.156	0.0340	102	84
Silver	0.019	0.017	-0.0005	102	84
Sodium	1.22	0.97	0.2998	102	84
Strontium	0.026	0.007	0.0010	102	84
Sulfur	2.10	1.86	0.2888	102	84
Tin	0.061	0.039	0.0038	102	84
Titanium	0.010	0.010	0.0026	102	84
Vanadium	0.008	0.005	0.0013	102	84
Zinc	0.028	0.011	0.0019	102	84
Zirconium	0.027	0.026	0.0017	102	84

Table 5-1 Continued

Parameter	1st High (µg/m³)	2nd High (µg/m³)	Annual Mean (µg/m³)	No. of Samples	Percent Recovery
IONS					
Ammonium Ion	1.84	1.29	0.080	103	84
Potassium Ion	1.62	0.06	0.028	103	84
Sodium Ion	1.73	1.18	0.350	103	84
Total Nitrate	0.49	0.45	0.125	103	84
Sulfate	5.83	5.70	0.814	103	84

Table 5-2. Speciation Collection and Analysis Methods

Parameter	Collection Method	Analysis Method
Carbon	URG 300N Quartz Filter	Thermal Optical Transmittance
Metals	Met-One SASS Teflon Filter	Energy Dispersive X-Ray Fluorescence
Ions	Met-One SASS Nylon Filter	Ion Chromatography

Section 6
AMBIENT AIR QUALITY TRENDS

The following graphs illustrate 5-year trends for PM_{10}, $PM_{2.5}$, SO_2, NO_2, O_3, and CO from 2012 to 2016 at all SLAMS stations monitoring for those pollutants.

Figures 6-1 and 6-2 are graphs of the PM_{10} annual and maximum 24-hour averages.

Figure 6-3 is the graph of the $PM_{2.5}$ annual averages. Attainment of the $PM_{2.5}$ 24-hour standard is based on the 98th percentile value at each station, which is depicted in Figure 6-4.

Figures 6-5 and 6-6 are graphs of the SO_2 annual and maximum 24-hour averages.

Figure 6-7 and 6-8 shows the annual and maximum 1-hour averages of NO_2 compared to the federal NAAQS.

Attainment of the 8-hour ozone standard is achieved by averaging 3 years of the fourth highest daily maximum 8-hour average concentrations, which must not exceed 0.070 ppm (standard effective October 1, 2016). Figure 6-9 is a graph of the fourth highest daily maximum values recorded at the Sand Island and Kapolei (since 2011) ozone monitoring stations in the past five years.

The graphs for 1-hour and 8-hour carbon monoxide (figures 6-10 and 6-11, respectively) represent the maximum 1-hour or 8-hour values recorded in the year.

Criteria pollutant levels remain below state and federal ambient air quality standards at all SLAMS stations in the state.

Figure 6-1. PM_{10} Annual Average: 2012-2016

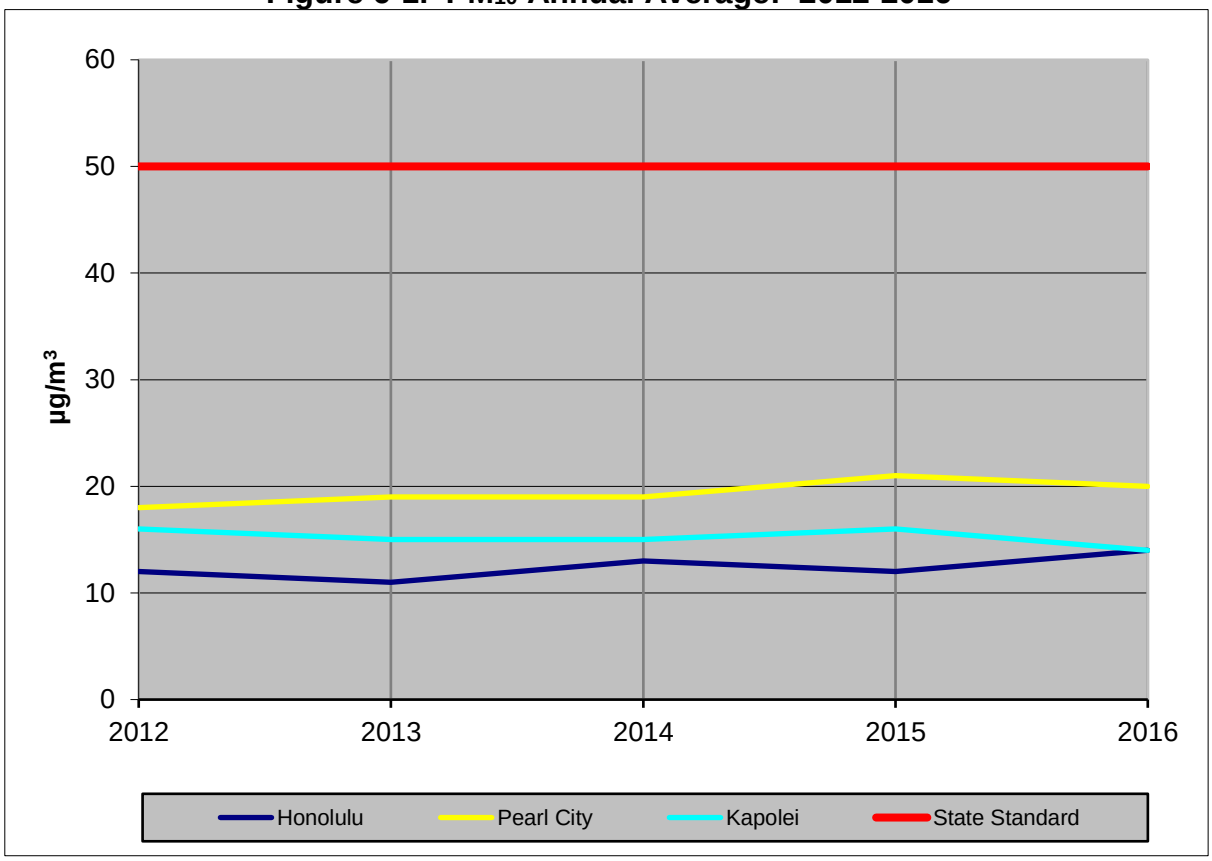


Figure 6-2. PM_{10} Maximum 24-Hour Average: 2012-2016

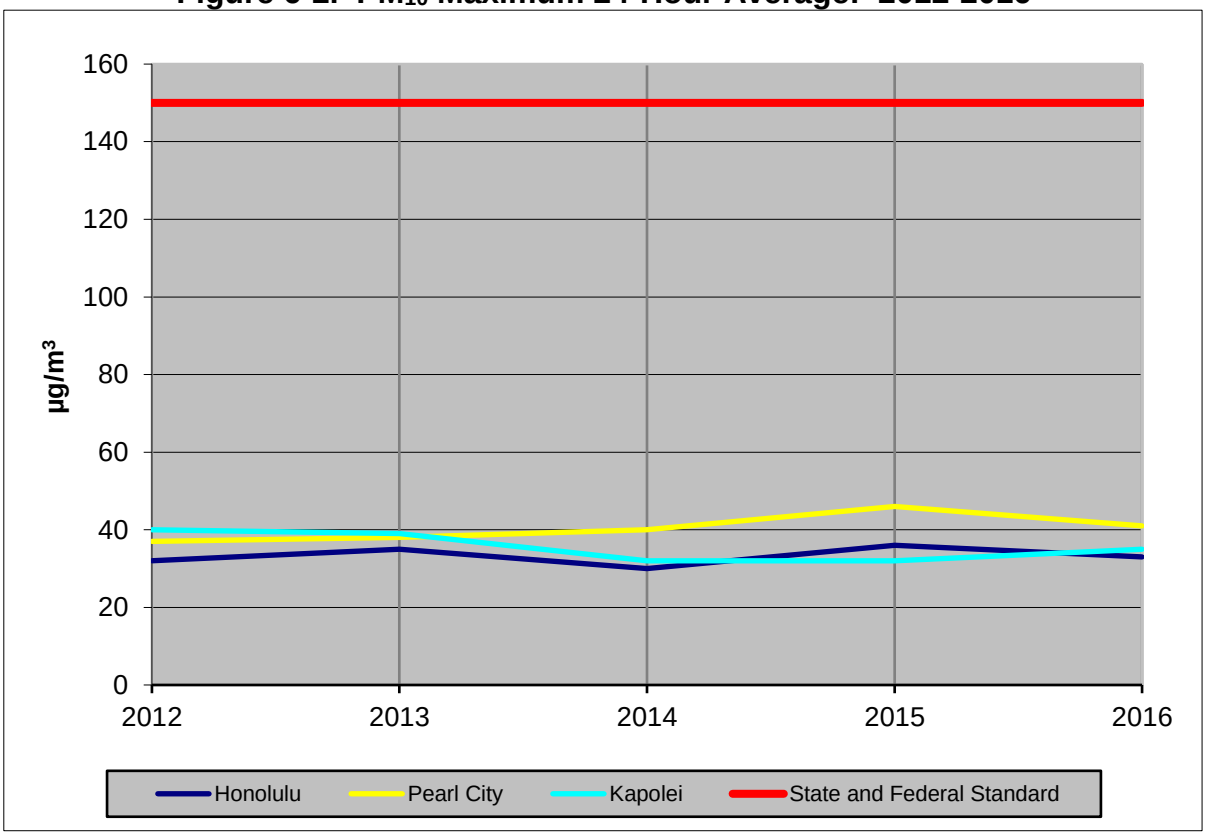


Figure 6-3. $PM_{2.5}$ Annual Average: 2012-2016

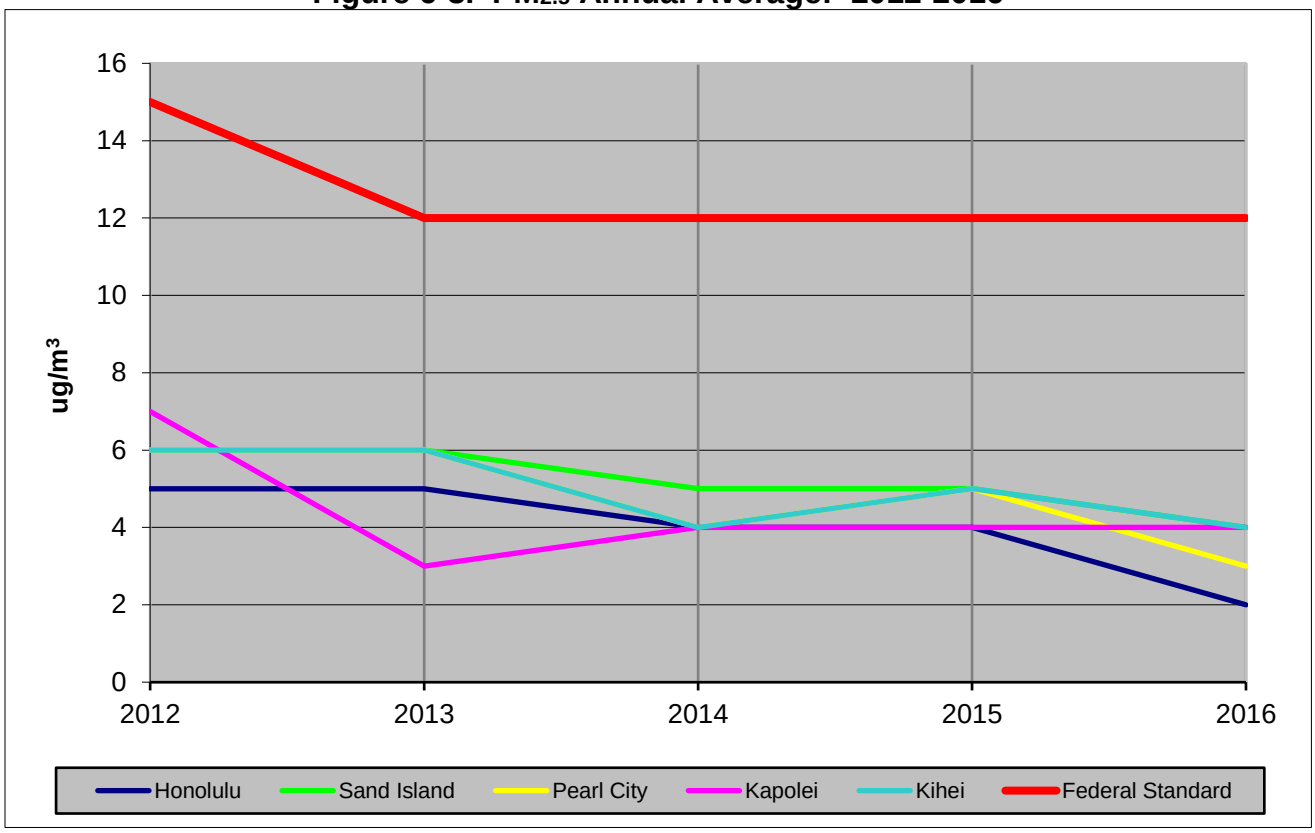


Figure 6-4. $PM_{2.5}$ 98th Percentile 24-Hour Average: 2012-2016

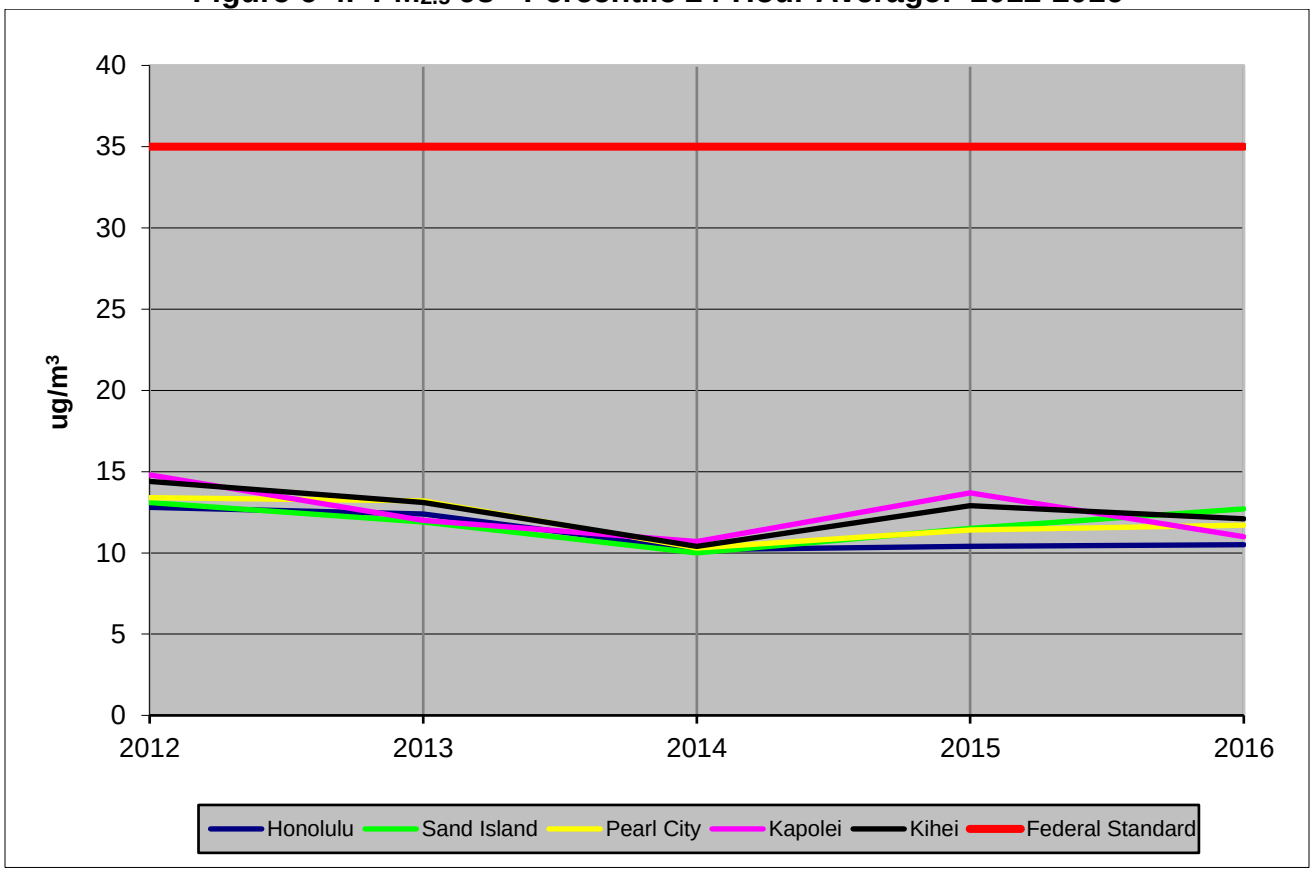


Figure 6-5. SO_2 Annual Average: 2012-2016

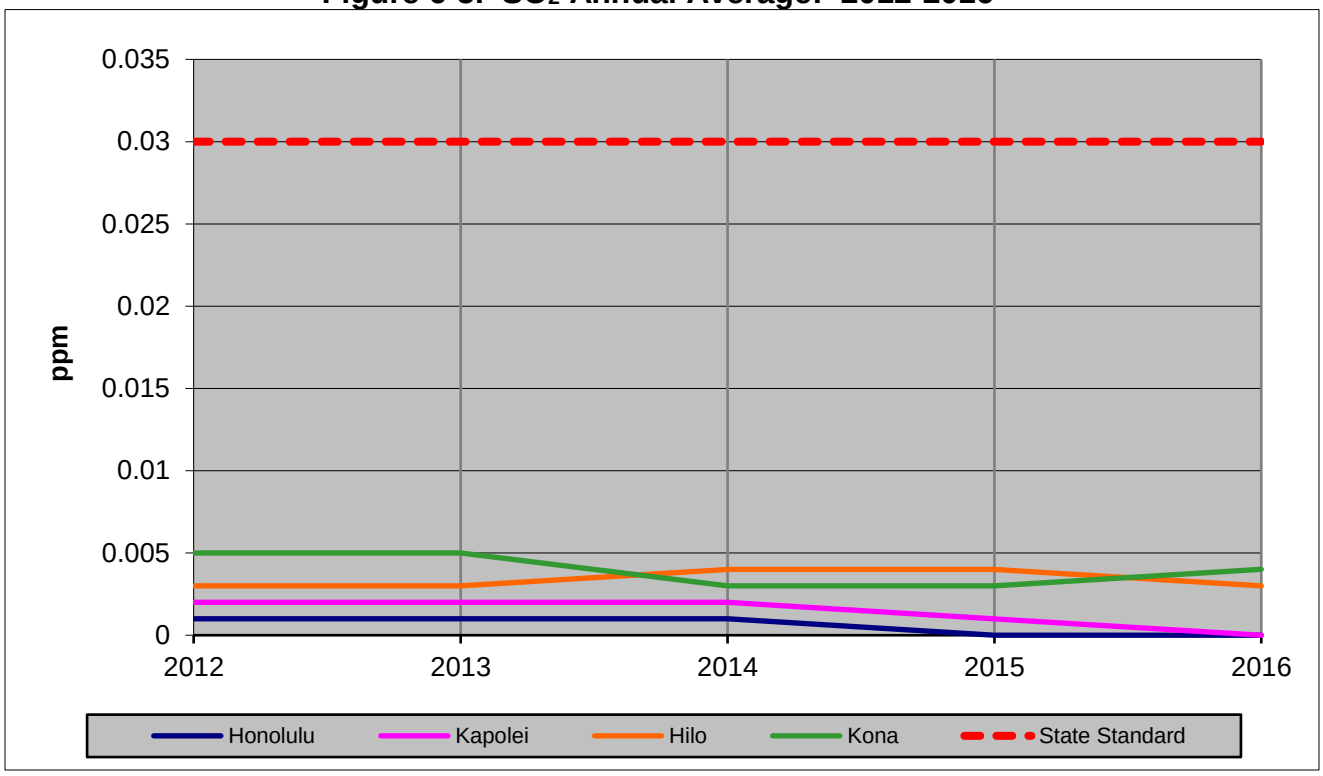


Figure 6-6. SO_2 Maximum 24-Hour Average: 2012-2016

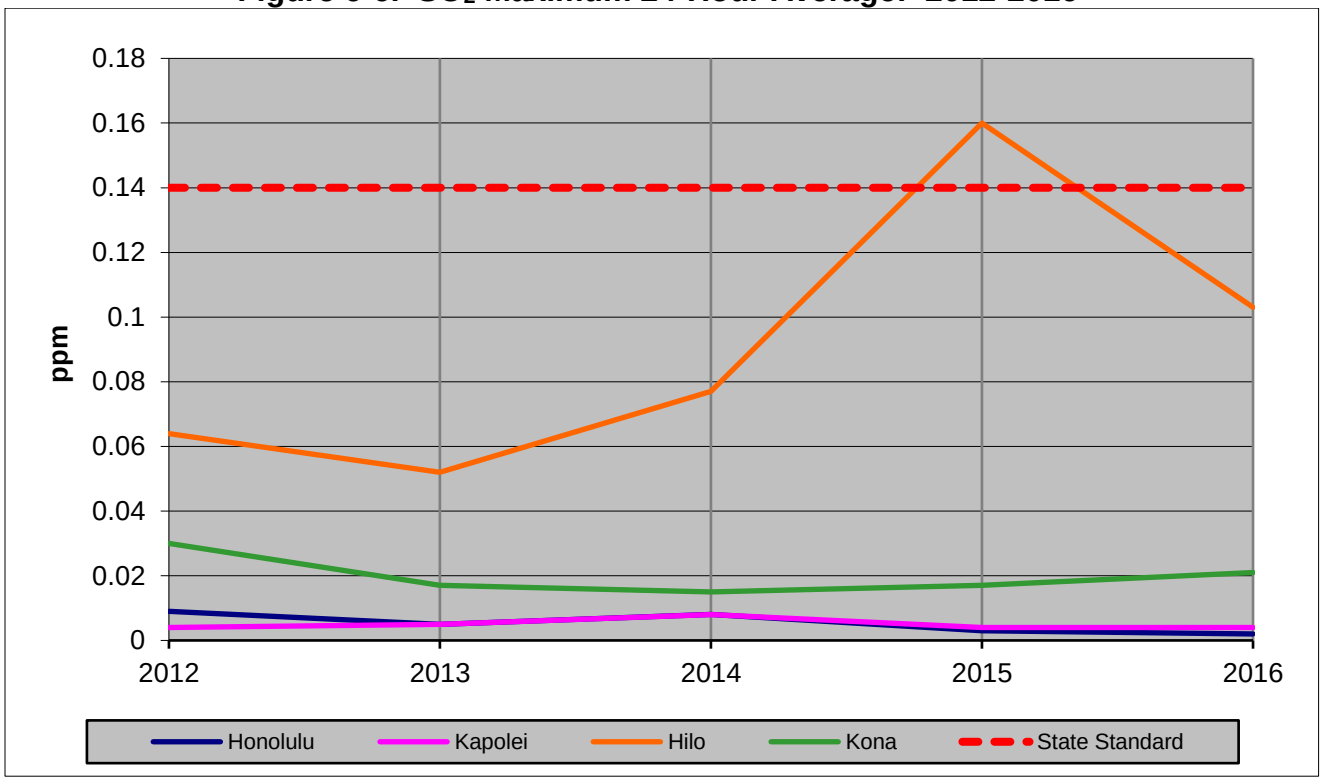


Figure 6-7. NO_2 Annual Average: 2012-2016

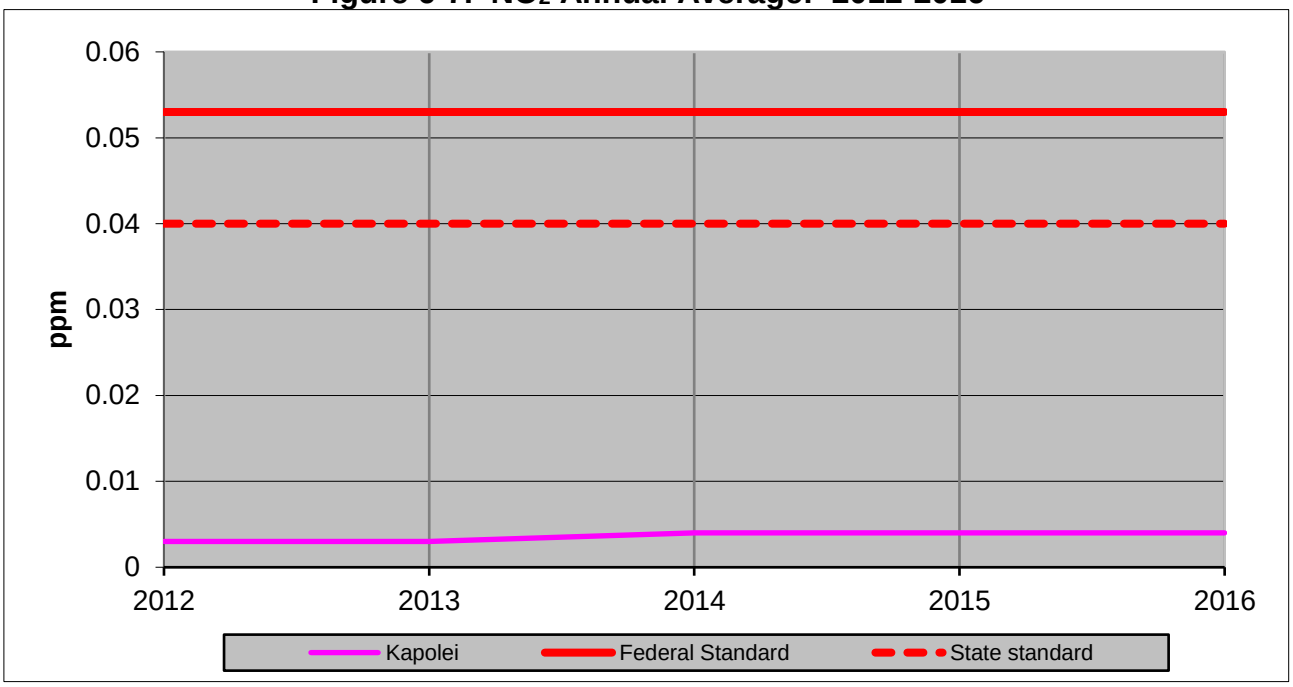


Figure 6-8. NO_2 Maximum 1-Hour Average: 2012-2016

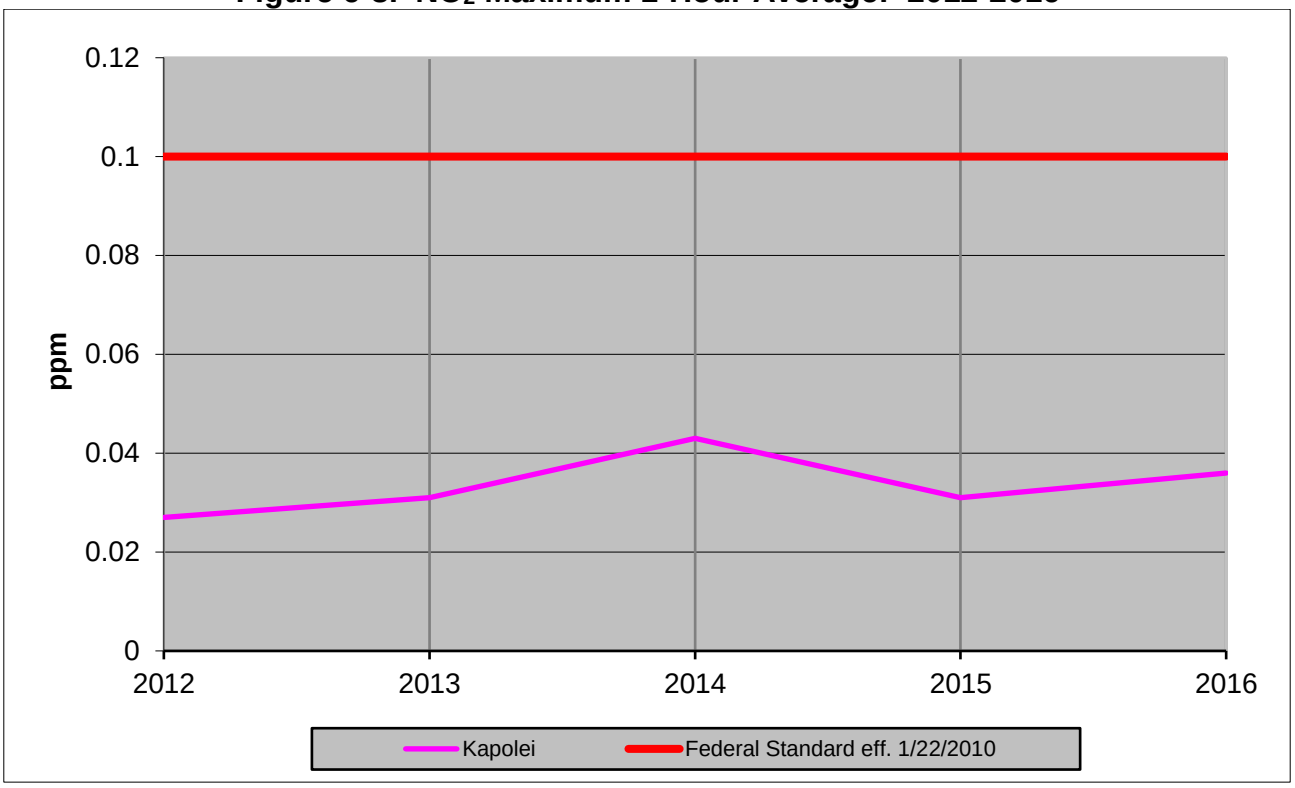


Figure 6-9. O_3 Fourth Highest Daily Maximum 8-Hour Average: 2012-2016

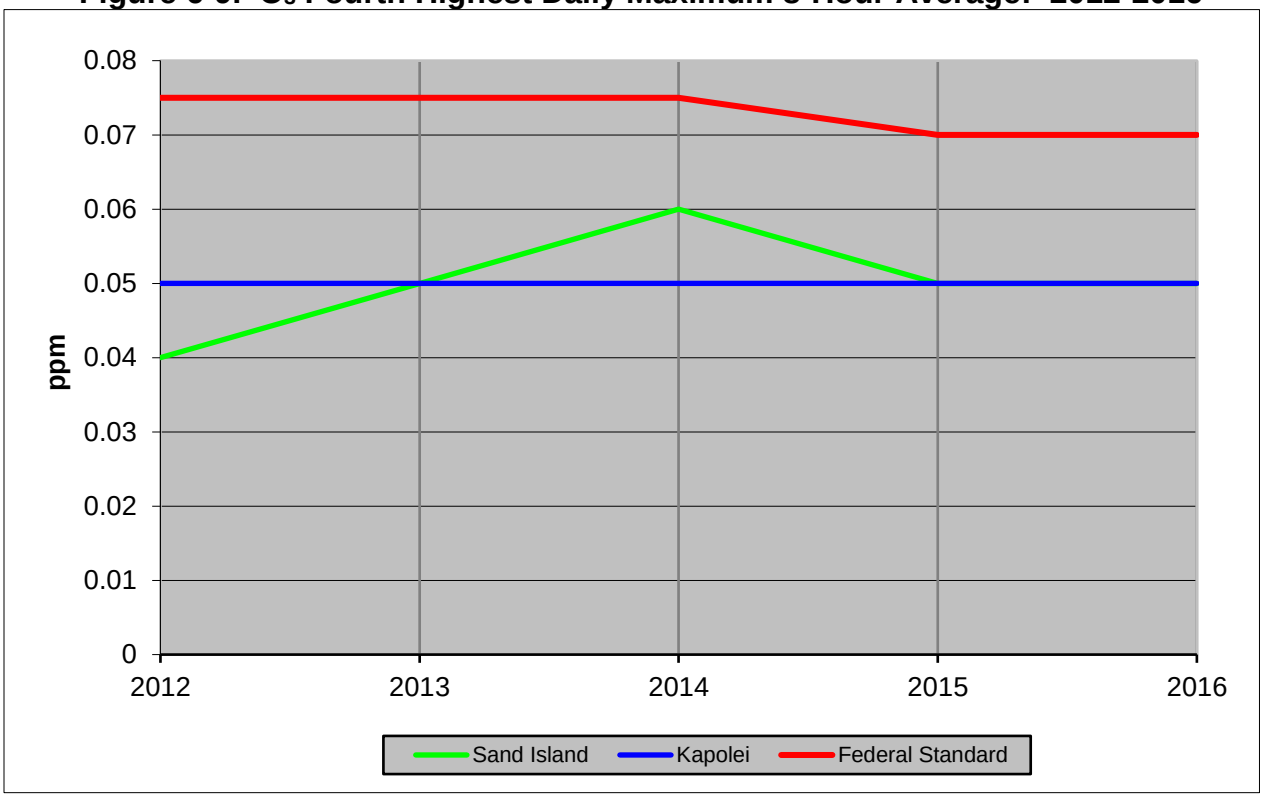


Figure 6-10. CO Maximum 1-Hour Average: 2012-2016

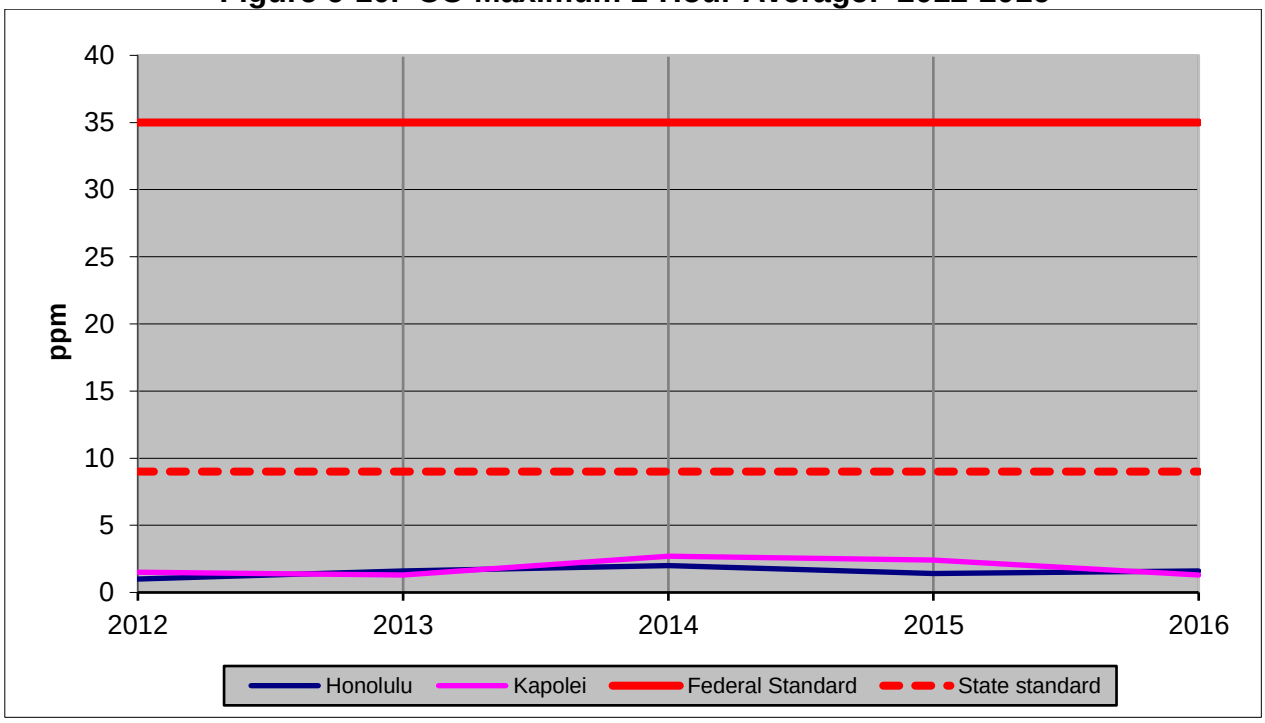
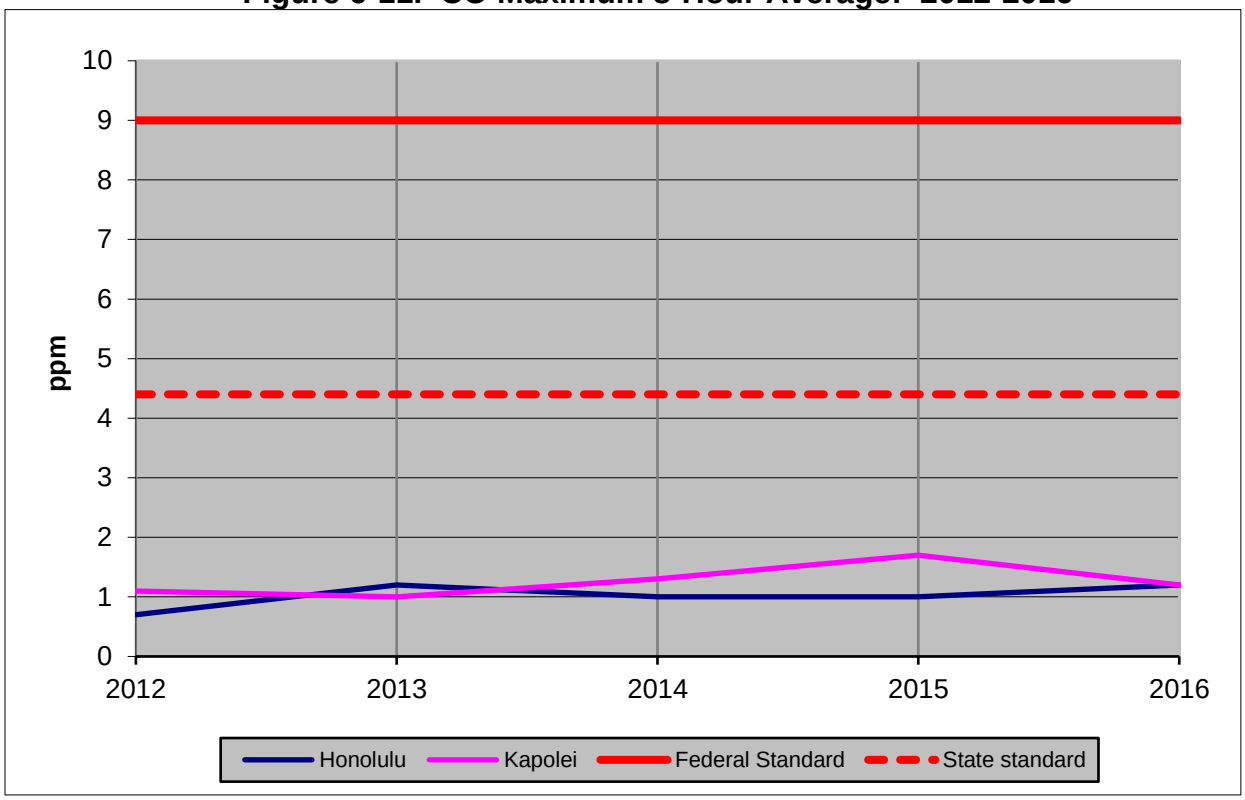



Figure 6-11. CO Maximum 8-Hour Average: 2012-2016