State of Hawaii
Annual Summary
2019
Air Quality Data

Kaneohe Bay, Hawaii

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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 Quality Monitoring 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 agricultural burning; and natural sources, such as windblown dust and volcanic activity. In 2019, for the most part, the state maintained 20 air monitoring stations on 4 islands. Most commercial, industrial, and transportation activities and their associated air quality effects occur on Oahu, where 6 of

the stations are located. The monitoring stations on Maui measure the air quality impacts from commercial, industrial, transportation and 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 20 monitoring stations during calendar year 2019. 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 2019 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 may affect 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 2017 and 2018 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:

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Pearl City, HI, 96782

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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 $PM_{2.5}$).
DRR	Data Requirements Rule for 1-hour SO_2 NAAQS.

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 possible major source of sulfur dioxide emissions is from any active 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 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 / NCore	2052 Lauwiliwili St.	CO, SO_2, NO_2 / CO trace, SO_2 trace, NO/NO_y, O_3, $PM_{2.5}$, $PM_{2.5}$ speciation, PM_{10}, $PM_{10-2.5}$, WS/WD
5	Kahe	Palehua Road	SO_2
6	Waiau	689 Kamehameha Hwy.	SO_2

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.

Kahe (KE) (Data Requirements Rule)

Location:	Palehua Road, Makakilo
Latitude:	21.3678
Longitude:	-158.103
Altitude:	388 m
Parameters:	SO_2
Established:	January 2017

Brief Description:

Located on the hillside south of Palehua Road, approximately 2.7 kilometers northeast of the Kahe Generating Station. The area around the station is undeveloped and is currently used for cattle grazing. The city of Makakilo is located to the east and southeast. The areas immediately to the west through north are undeveloped.

Waiau (WI) (Data Requirements Rule)

Location:	689 Kamehameha Hwy., Pearl City
Latitude:	21.3909
Longitude:	-157.9653
Altitude:	7 m
Parameters:	SO_2
Established:	January 2017

Brief Description:

Located in an urban area approximately 400 meters northwest of the Waiau Power Generating Station in Pearl City, Oahu. The station is surrounded by a residential area to the north, the H-1 Freeway from the east to southwest and the business district to the west.

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

Station		Name	Location	Pollutants Monitored
1		Kihei	Hale Piilani Park	$PM_{2.5}$
2		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 a recent residential development on what was once agricultural land.

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	Keeau (temporary)	16-714 Volcano Rd.	SO_2, $PM_{2.5}$
3	Mountain View	18-1235 Volcano Rd.	SO_2, $PM_{2.5}$
4	Leilani	13-3441 Moku St.	H_2S, SO_2
5	Pahala	96-3150 Pikake St.	SO_2, $PM_{2.5}$
6	Naalehu-TP/S (temporary)	Naalehu Fire Station/Elem. School	SO_2, $PM_{2.5}$
7	Ocean View	92-6091 Orchid Mauka Circ.	SO_2, $PM_{2.5}$
8	Honaunau (temporary)	DWS Keei Well C, Painted Church Rd.	$PM_{2.5}$
9	Kona	81-1043 Konawaena School Rd.	SO_2, $PM_{2.5}$
10	Kailua-Kona (temporary)	DWS Puapua'a Reservoir	$PM_{2.5}$
11	Waikoloa (temporary)	68-1730 Hooko Street	$PM_{2.5}$

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.	

Honaunau – Temporary (HN)

Location:	DWS Keei Well C, Painted Church Rd., Honaunau
Latitude:	19.44276389
Longitude:	-155.88583333
Altitude:	274 m
Parameters:	$PM_{2.5}$
Established:	August 2018
Brief Description:	
This temporary station is located in a residential subdivision within a fenced area that contains a Hawaii County Department of Water Supply water tank and pump house, monitoring for volcanic emissions.	

KAILUA-KONA (KK)

Location:	DWS Puapua'a Reservoir, Kailua-Kona
Latitude:	19.61815833
Longitude:	-155. 9711111
Altitude:	92.4 m
Parameters:	$PM_{2.5}$
Established:	November 2018
Brief Description:	
This station is located in the middle Kailua-Kona town within a fenced area that contains a County of Hawaii water reservoir and pump house, monitoring for volcanic emissions.	

KEEAU - Temporary(KS-T)

Location:	Kamehameha Schools,16-714 Volcano Road, Keaau, HI 96749
Latitude:	19.60533889
Longitude:	-155.05138889
Altitude:	179.8 m
Parameters:	$PM_{2.5}$, SO_2
Established:	June 2018
Brief Description:	
This temporary station is located in the town of Keaau on the Kamehameha Schools Hawaii campus, monitoring for volcanic emissions during southerly wind conditions.	

Leilani (LE)

Location:	13-3441 Moku St., Pahoa
Latitude:	19.46555556
Longitude:	-154.91583333
Altitude:	229 m
Parameters:	H_2S, SO_2
Established:	September 2019
Brief Description:	
This station is located in a residential subdivision within a fenced area that contains the Leilani Community Association Center, monitoring emissions from the nearby geothermal energy facility.	

Naalehu – Temporary $PM_{2.5}$ (NA-TP)

Location:	Naalehu Volunteer Fire Station, Kaalaiki Road., Naalehu
Latitude:	19.061379
Longitude:	-155.586748
Altitude:	207.9 m
Parameters:	$PM_{2.5}$
Established:	June 2018
Brief Description:	
This temporary station is located at the Naalehu Volunteer Fire Station monitoring for volcanic emissions.	

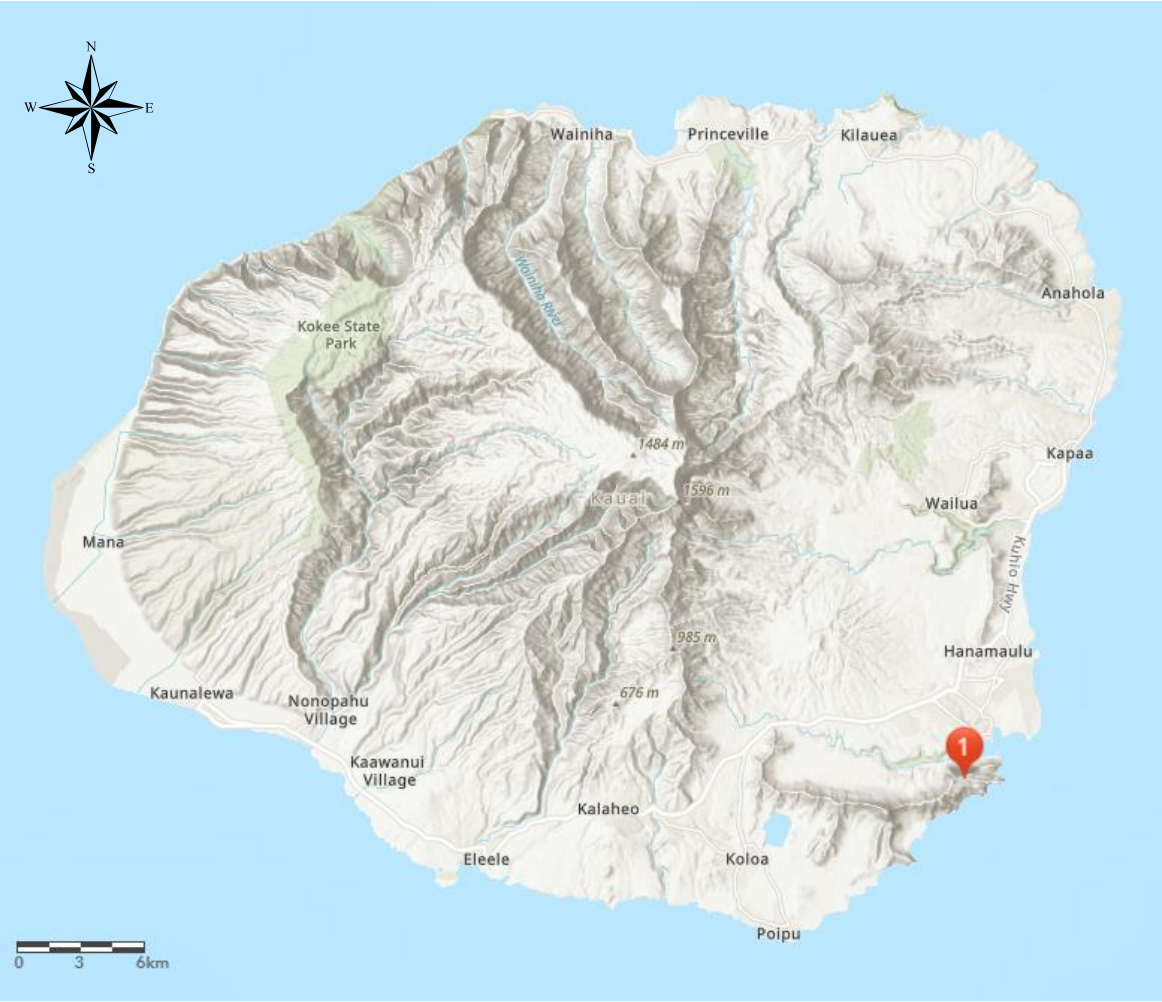
Naalehu – SO_2 (NA-S)

Location:	Naalehu Elementary School, 95-5547 Mamalahoa Hwy., Naalehu
Latitude:	19.060656
Longitude:	-155.579167
Altitude:	196.3 m
Parameters:	SO_2
Established:	August 2018
Brief Description:	
This station is located i inside the USGS Seismograph building on the campus of Naalehu Elementary School, monitoring for volcanic emissions.	

Waikoloa (WL-T)

Location:	68-1730 Hooko Street, Waikoloa
Latitude:	19.945325
Longitude:	-155.79138889
Altitude:	259.1 m
Parameters:	$PM_{2.5}$
Established:	June 2018
Brief Description:	
This temporary station is located at the Waikoloa Elementary School, monitoring for volcanic emissions.	

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**	**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	-	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
Kahe[2]	-	-	-	-	S	-	-	Source Impact (DRR)	Neighborhood
Waiau[2]	-	-	-	-	S	-	-	Source Impact (DRR)	Suburban
MAUI									
Kihei	-	S	-	-	-	-	-	Population Exposure	Suburban
Kahului	-	SPM	-	-	-	-	-	Population Exposure	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
Honaunau[3]	-	SPM	-	-	-	-	-	Source Impact	Rural
Kailua-Kona[3]	-	SPM	-	-	-	-	-	Source Impact	Suburban
Keeau[3]	-	SPM	-	-	SPM	-	-	Source Impact	Suburban
Leilani[3]	-	-	-	-	SPM	-	SPM	Source Impact (geothermal)	Rural
Naalehu[3, 4]	-	SPM	-	-	SPM	-	-	Source Impact	Rural
Waikoloa[3]	-	SPM	-	-	-	-	-	Source Impact	Rural
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] As required by the Data Requirements Rule;

[3] These temporary stations were in operation for all or part of 2019;

[4] Two closely located temporary stations, one $PM_{2.5}$ and one SO_2.

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
OAHU Honolulu	■		■	■	■			
Kapolei	■	■	■	■	■	■	■	
Pearl City	■		■					
Sand Island			■			■		
MAUI Kihei			■					
Kahului			■					
HAWAII Hilo			■		■			
Kona			■		■			
Mt. View			■		■			
Ocean View			■		■			
Pahala			■		■			
Honaunau			■					
Kailua-Kona			■					
Keeau			■		■			
Leilani					■			■
Naalehu-P			■					
Naalaehu-S					■			
Waikoloa ES			■					
KAUAI Niumalu			■		■		■	

Section 4
2019 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 Quality Monitoring Section to ensure that the reported data is of good quality and meets all quality control and assurance requirements.

In 2019 the State of Hawaii was in attainment of all NAAQS.

Explanation of Summary Tables 4-1 through 4-17:

- 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 98^{th} percentile concentrations are provided and for O_3, the 4^{th} 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 4-18 through 4-25:

- 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. 2019 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	35	27	10.7	0	0	0	0	0	0	0	0	0	0	0	0	365	355	97.3%
Kapolei	42	32	11.6	0	0	0	0	0	0	0	0	0	0	0	0	365	352	96.4%
Pearl City	15	10	3.3	0	0	0	0	0	0	0	0	0	0	0	0	365	359	98.4%

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

Station	Exceedances in 2017	Exceedances in 2018	Exceedances in 2019	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 2019, Hawaii was in attainment with the 24-hour PM_{10} NAAQS.**				

Table 4-3. 2019 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	15.1	6.7	3.2	0	0	0	0	0	0	0	0	0	0	0	0	365	348	95.3%
Kapolei	10.8	5.2	1.8	0	0	0	0	0	0	0	0	0	0	0	0	365	349	95.6%
Pearl City	14.7	6.3	3.3	0	0	0	0	0	0	0	0	0	0	0	0	365	359	98.4%
Sand Island	14.0	8.8	3.9	0	0	0	0	0	0	0	0	0	0	0	0	365	362	99.2%
MAUI																		
Kihei	84.5	16.9	4.1	0	0	0	0	0	0	2	1	0	0	0	0	365	357	97.8%

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

Station	2017 98th value	2018 98th value	2019 98th value	3-Year Average	Sites in violation of the NAAQS
Honolulu	9.8	7.5	6.7	8	0
Kapolei	9.6	8.7	5.2	7.8	0
Pearl City	14	9.1	6.3	9.8	0
Sand Island	10	7.3	7.7	8.3	0
Kihei	11	11	16.9	13	0

Attainment: The 3-year average of the 98th percentile values must be less than or equal to 35 µg/m³.
In 2019, Hawaii was in attainment with the 24-hour $PM_{2.5}$ NAAQS.

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

Station	2017 Ann. Avg.	2018 Ann. Avg.	2019 Ann. Avg.	3-Year Average	Sites in violation of the NAAQS
Honolulu	3.0	3.7	3.2	3.3	0
Kapolei	4.3	2.5	1.8	2.9	0
Pearl City	4.4	3.0	3.3	3.6	0
Sand Island	3.0	3.7	3.9	3.5	0
Kihei	4.1	4.5	4.1	4.2	0

Attainment: The 3-year average of annual mean values must be less than 15 µg/m³.
In 2019, Hawaii was in attainment with the annual $PM_{2.5}$ NAAQS.

Table 4-6. 2019 Summary of the 24-Hour $PM_{2.5}$ Averages: SPM Stations

	Maximum		Annual Mean	No. of 24-hour Averages Greater than 35 µg/m^3														
	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	9.6	5.8	3.2	0	0	0	0	0	0	0	0	0	0	0	0	365	348	95.3%
Kona	5.6	4.3	2.2	0	0	0	0	0	0	0	0	0	0	0	0	365	360	98.6%
Mt. View	13.2	7.3	1.7	0	0	0	0	0	0	0	0	0	0	0	0	365	357	97.8%
Ocean View	7.3	6.2	2.6	0	0	0	0	0	0	0	0	0	0	0	0	365	343	94.0%
Pahala	25.3	7.7	2.7	0	0	0	0	0	0	0	0	0	0	0	0	365	355	97.3%
Honaunau[1]	10.7	4.2	2.4	0	0	0	0	0	0	0	0	0	0	0	0	365	347	95.1%
Kailua-Kona[1]	5.2	4.4	2.4	0	0	0	0	0	0	0	0	0	0	0	0	365	340	93.2%
Keeau[1]	8.0	5.0	2.6	0	0	0	0	0	0	0	0	0	0	0	0	365	345	94.5%
Naalehu[1]	11.0	5.2	2.3	0	0	0	0	0	0	0	0	0	0	0	0	365	343	94.0%
Waikoloa[1]	9.9	5.5	2.8	0	0	0	0	0	0	0	0	0	0	0	0	365	343	94.0%
KAUAI																		
Niumalu	19.1	7.5	2.9	0	0	0	0	0	0	0	0	0	0	0	0	365	340	93.2%
MAUI																		
Kahului[2]	13.0	7.6	3.4	0	0	0	0	0	0	0	0	0	0	0	0	365	323	88.5%

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 station on Maui was established to monitor emissions from agricultural burning.

[1] Preliminary data – for information only. Temporary stations were established in response to the 2018 Kilauea East Rift Zone eruption.

[2] Does not meet summary criteria, <75% data recovery in 1st quarter, substitution test valid.

Table 4-7. 2019 Summary of the 8-Hour O_3 Averages

	Maximum			Annual Mean	No. of Daily Maximum 8-Hour Averages Greater than 0.070 ppm														
	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	0.059	0.055	0.053	0.028	0	0	0	0	0	0	0	0	0	0	0	0	8755	8502	97.1%
Kapolei	0.056	0.053	0.052	0.029	0	0	0	0	0	0	0	0	0	0	0	0	8755	8126	92.8%

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

Station	2017 4th highest	2018 4th highest	2019 4th highest	3-Year Average	Site in violation of the NAAQS
Sand Island	0.048	0.046	0.053	0.049	0
Kapolei	0.049	0.049	0.052	0.050	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 2019, Hawaii was in attainment with the 8-hour O_3 NAAQS.**					

Table 4-9. 2019 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 Station**																	
Kapolei	0.034	0.028	0.004	0	0	0	0	0	0	0	0	0	0	0	0	8760	8371	95.6%
KAUAI	**SPM Station**																	
Niumalu	0.046	0.038	0.004	0	0	0	0	0	0	0	0	0	0	0	0	8760	8390	95.8%
Attainment of the annual NO_2 NAAQS: The annual mean shall not exceed 0.053 ppm. **In 2019, Hawaii was in attainment with the annual NO_2 NAAQS.**																		

Table 4-10. Attainment Determination of the 1-Hour NO_2 NAAQS

Station	2017 98th value	2018 98th value	2019 98th value	3-Year Average	Site in violation of the NAAQS
OAHU	**SLAMS Station**				
Kapolei	0.033	0.027	0.028	0.029	0
Attainment: The 3-year average of the 98th percentile values must be less than or equal to 0.100 ppm. **In 2019, Hawaii was in attainment with the 1-hour NO_2 NAAQS.**					

4-11. 2019 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	0.006	0.006	0.000	0	0	0	0	0	0	0	0	0	0	0	0	8760	8013	91.5%
Kapolei	0.015	0.003	0.001	0	0	0	0	0	0	0	0	0	0	0	0	8760	7762	88.6%
OAHU	**SPM Stations (see NOTE)**																	
Kahe	0.070	0.062	0.001	0	0	0	0	0	0	0	0	0	0	0	0	8760	8520	97.3%
Waiau	0.024	0.016	0.000	0	0	0	0	0	0	0	0	0	0	0	0	8760	8587	89.0%
HAWAII	**SPM Stations (see NOTE)**																	
Hilo	0.013	0.011	0.002	0	0	0	0	0	0	0	0	0	0	0	0	8760	8105	92.5%
Kona	0.004	0.003	0.001	0	0	0	0	0	0	0	0	0	0	0	0	8760	8546	97.6%
Mt. View	0.013	0.008	0.002	0	0	0	0	0	0	0	0	0	0	0	0	8760	8473	96.7%
Ocean View	0.003	0.003	0.001	0	0	0	0	0	0	0	0	0	0	0	0	8760	7964	90.9%
Pahala	0.017	0.009	0.003	0	0	0	0	0	0	0	0	0	0	0	0	8760	8474	96.7%
Keeau[1]	0.017	0.006	0.001	0	0	0	0	0	0	0	0	0	0	0	0	8760	6128	70.0%
Naalehu[2]	0.094	0.003	0.002	-	-	0	0	0	0	0	0	0	0	0	0	8760	6741	76.9%
Leilani[3]	0.002	-	0.000	-	-	-	-	-	-	-	-	0	0	0	0	2601	2499	96.1%
KAUAI	**SPM Station**																	
Niumalu[1]	0.052	0.001	0.000	0	0	0	0	0	0	0	0	0	0	0	0	8760	7728	88.2%

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 2019, 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, substitution test valid.
[2] Does not meet summary criteria, <50% data recovery in 1st quarter, substitution test not allowed.
[3] Station began sampling on 9/13/2019.

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

	2017 99th value	2018 99th value	2019 99th value	3-Year Average	Violation of the NAAQS
OAHU SLAMS stations					N= NO Y= YES
Honolulu	0.004	0.003	0.006	0.004	N
Kapolei	0.008	0.006	0.003	0.006	N
OAHU SPM stations (see NOTE)					
Kahe	0.055	0.038	0.062	0.052	N
Waiau	0.015	0.016	0.016	0.016	N
HAWAII SPM stations (see NOTE)					
Hilo	0.359	0.191	0.011	0.187	Y
Kona	0.041	0.094	0.003	0.046	N
Mt. View	0.269	0.325	0.008	0.201	Y
Ocean View	0.480	0.887	0.003	0.457	Y
Pahala	0.674	0.686	0.009	0.456	Y
KAUAI SPM station					
Niumalu	0.002	0.003	0.001[1]	0.002	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 2019, 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 1st quarter, substitution test valid.

Table 4-13. 2019 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	0.001	0.001	0.000	0	0	0	0	0	0	0	0	0	0	0	0	2920	2638	90.3%
Kapolei	0.013	0.008	0.001	0	0	0	0	0	0	0	0	0	0	0	0	2920	2537	86.9%
OAHU	**SPM stations (see NOTE)**																	
Kahe	0.044	0.039	0.001	0	0	0	0	0	0	0	0	0	0	0	0	2920	2805	96.1%
Waiau	0.012	0.009	0.000	0	0	0	0	0	0	0	0	0	0	0	0	2920	2828	96.8%
HAWAII	**SPM stations (see NOTE)**																	
Hilo	0.008	0.007	0.002	0	0	0	0	0	0	0	0	0	0	0	0	2920	2621	89.8%
Kona	0.004	0.004	0.001	0	0	0	0	0	0	0	0	0	0	0	0	2920	2736	93.7%
Mt. View	0.009	0.008	0.002	0	0	0	0	0	0	0	0	0	0	0	0	2920	2690	92.1%
Ocean View	0.002	0.002	0.001	0	0	0	0	0	0	0	0	0	0	0	0	2920	2533	86.7%
Pahala	0.007	0.007	0.003	0	0	0	0	0	0	0	0	0	0	0	0	2920	2729	93.5%
Keeau[1]	0.010	0.009	0.001	0	0	0	0	0	0	0	0	0	0	0	0	2920	1777	60.9%
Naalehu[2]	0.003	0.002	0.000	-	-	0	0	0	0	0	0	0	0	0	0	2920	2192	75.1%
Leilani[3]	0.001	0.001	0.000	-	-	-	-	-	-	-	-	0	0	0	0	867	819	94.5%
KAUAI	**SPM station**																	
Niumalu[1]	0.018	0.002	0.000	0	0	0	0	0	0	0	0	0	0	0	0	2920	2428	83.2%

Attainment: 3-hour values not to exceed 0.5 ppm more than once per year.
In 2019, 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, substitution test valid.
[2] Does not meet summary criteria, <50% data recovery in 1st quarter, substitution test not allowed.
[3] Station began sampling on 9/13/2019.

Table 4-14. 2019 Summary of the 24-Hour and Annual SO_2 Averages

	Maximum		Annual Mean	No. of 24-hour Averages Greater than 0.14 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	0.001	0.001	0.000	0	0	0	0	0	0	0	0	0	0	0	0	365	339	92.9%
Kapolei	0.004	0.003	0.001	0	0	0	0	0	0	0	0	0	0	0	0	365	326	89.3%
OAHU	**SPM Stations (see NOTE)**																	
Kahe	0.014	0.011	0.001	0	0	0	0	0	0	0	0	0	0	0	0	365	361	98.9%
Waiau	0.004	0.002	0.000	0	0	0	0	0	0	0	0	0	0	0	0	365	363	99.5%
HAWAII	**SPM Stations (see NOTE)**																	
Hilo	0.004	0.004	0.002	0	0	0	0	0	0	0	0	0	0	0	0	365	360	98.6%
Kona	0.003	0.002	0.001	0	0	0	0	0	0	0	0	0	0	0	0	365	364	99.7%
Mt. View	0.005	0.005	0.002	0	0	0	0	0	0	0	0	0	0	0	0	365	365	100%
Ocean View	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	365	336	92.1%
Pahala	0.005	0.005	0.003	0	0	0	0	0	0	0	0	0	0	0	0	365	360	98.6%
Keeau[1]	0.002	0.002	0.001	0	0	0	-	0	0	0	0	0	0	0	0	365	207	56.7%
Naalehu[2]	0.001	0.001	0.000	-	-	0	0	0	0	0	0	0	0	0	0	365	284	77.8%
Leilani[3]	0.000	0.000	0.000	-	-	-	-	-	-	-	-	0	0	0	0	109	106	97.2%
KAUAI	**SPM Station**																	
Niumalu[1]	0.003	0.001	0.000	0	0	0	0	0	0	0	0	0	0	0	0	365	316	86.6%

Attainment: 24-hour values not to exceed 0.14 ppm more than once per year.
In 2019, 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 2019, 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, substitution test valid.
[2] Does not meet summary criteria, <50% data recovery in 1st quarter, substitution test not allowed.
[3] Station began sampling on 9/13/2019.

Table 4-15. 2019 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	1.4	1.3	0.4	0	0	0	0	0	0	0	0	0	0	0	0	8760	8035	91.7%
Kapolei	0.9	0.5	0.1	0	0	0	0	0	0	0	0	0	0	0	0	8760	8470	96.7%

Attainment: 1-hour values not to exceed 35 ppm more than once per year.
In 2019, Hawaii was in attainment with the 1-hour CO NAAQS.

Table 4-16. 2019 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	0.8	0.8	0.4	0	0	0	0	0	0	0	0	0	0	0	0	8755	7756	88.6%
Kapolei	0.3	0.3	0.1	0	0	0	0	0	0	0	0	0	0	0	0	8755	8327	95.1%

Attainment: 8-hour values not to exceed 9 ppm more than once per year.
In 2019, Hawaii was in attainment with the 8-hour CO NAAQS.

Table 4-17. 2019 Monthly Maximum of 24-Hour PM_{10} Values ($\mu g/m^3$)

The month with the highest value in the year is highlighted *The state and federal 24-hr PM_{10} standard is 150 $\mu g/m^3$*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Honolulu	23	20	35	27	18	14	18	14	15	16	21	23
Kapolei	42	29	32	23	17	15	19	17	18	19	23	22
Pearl City	26	23	36	29	19	18	19	17	19	21	24	22

Table 4-18. 2019 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 µg/m*

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SLAMS Stations												
Honolulu	6	5.7	15.1	9.7	5.6	5	5.6	4.9	4.5	5.3	6.5	6.7
Kapolei	4.1	6.3	10.6	5.2	4.6	4.9	4.9	4.7	4.7	4.1	4.2	10.8
Pearl City	21	10.5	8.2	10	5.8	10.3	7.4	8.8	4.3	6.2	4.7	7.1
Sand Island	8.1	7.7	14	8.8	5.7	4.8	6.1	6.7	5.3	5.2	7.6	7.4
Kihei	7.8	7.1	7.9	6.5	4.9	5	84.5	40.5	23.6	13.1	18.8	12.9
SPM Stations												
Niumalu (cruise ships)	8.1	8.4	19.1	5.5	3.9	3.8	5.4	4.8	4.8	6.8	7.5	8.1
Hilo (volcano)	4.7	4.8	9.6	4.8	5.5	5.9	6.2	6.2	5.5	4.6	4.3	4.8
Kahului	-	3.9	13	10	5.7	6.2	5.3	5.2	4.7	5.2	6.6	8.7
Kona (volcano)	4.9	3.2	4.4	5	3.6	4.9	4.5	3.9	5.6	2.4	3.2	3.3
Mt. View (volcano)	10.5	13.2	5.9	4.5	3.8	4.7	4.5	4.1	3.1	3.6	3.2	3.5
Ocean View (volcano)	5.9	5.5	6.2	7.3	4.8	3.1	3.8	3.5	3.6	2.8	3	3.2
Pahala (volcano)	17.2	3.5	8.9	5.6	3.8	7.5	6.9	8.2	3.9	5.6	3.6	25.3
Honaunau (volcano)	4	4.5	3.9	5.3	5.3	4.8	4.2	4.4	10.7	3.7	3.5	4
Kailua-Kona (volcano)	4	4	5.2	4.1	3.6	4.6	4.6	4.7	4.3	3.6	3.9	3.8
Keeau (volcano)	5.7	4.5	8	5.6	5	4.3	4.7	5	3.5	4.1	3.8	3.3
Naalehu (volcano)	5.9	4.2	11	5.4	4.3	5.2	5.7	4.8	3.4	3.4	3.5	8.4
Waikoloa (volcano)	5.1	6.8	9.9	6	5.6	5.4	5.5	4.2	3	4.6	3.8	4.5

Table 4-19. 2019 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	34.4	34.1	32.6	24.4	25.1	17.9	15.8	17.9	19.7	23.3	24.5	30.1
Niumalu	40	30.6	43.3	46.2	37.5	23.7	25.1	24.2	26.2	30.6	29.7	38.7

Table 4-20. 2019 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	1.1	0.9	0.6	1.4	0.7	0.7	0.8	0.8	0.9	0.5	1.2
Kapolei	0.4	0.3	0.5	0.4	0.4	0.1	0.2	0.4	0.5	0.5	0.4	0.9
Kapolei Ncore	0.7	0.6	0.5	0.5	0.4	0.3	0.2	0.4	0.4	0.4	0.4	1

Table 4-21. 2019 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	0.6	0.8	0.7	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.3	0.7
Kapolei	0.1	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.3
Kapolei Ncore	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.3	0.3

4-22. 2019 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	45	47	59	48	56	34	21	23	31	33	43	44
Kapolei NCore	46	53	54	46	56	38	27	28	29	32	42	42

Table 4-23. 2019 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	1	0.6	1	0.7	6.1	1.1	1.2	1.4	0.7	0.2	0.9	0.5
Kapolei	13.4	15.3	2.3	3.3	1.9	2.6	3.1	3.1	2.6	3.	1.3	2.8
Kapolei Ncore	15.8	14.8	5.7	4.8	11.2	2.8	6.6	5.3	7.7	2.3	4	7.7
Kahe	67.7	52.4	27.8	26.6	45.8	21.3	65.8	70	47.1	54.9	57.7	39.1
Waiau	7.1	12.6	8.8	15.5	11.7	1.8	7.3	0.2	0.4	4	5	5.7
SPM Stations (see NOTE)												
Niumalu (cruise ships)	52.3	0.7	0.8	1.3	1	2	1	0.9	0.6	0.5	0.2	0.1
Hilo (volcano)	6.8	8.9	7.7	11.9	8	12.6	7.1	10.6	7	7.3	7.7	11.2
Kona (volcano)	1.6	1.8	1.4	2	1.9	2.5	2.5	2.3	2.2	3.6	0.3	0.4
Mt. View (volcano)	12	8	12.8	4.2	3.5	2.3	4.7	2.7	3.6	4.1	5.2	6.3
Ocean View (volcano)	0.7	0.6	0.5	1.4	1.1	1.7	1.4	0.4	1.3	0.5	0.2	0.9
Pahala (volcano)	16.5	5.8	5.6	10	6.2	7.7	7.6	6.6	8.4	9	7.6	9.1
Keeau	0.7	6.5	3.6	0	3.8	3.5	46	4.8	5.3	3.1	6.8	3.3
Naalehu	-	-	0.5	0.2	0.8	0.7	1.1	9.4	2	2.8	3.4	2.4
Leilani[1]	-	-	-	-	-	-	-	-	1.5	1.1	1.5	1.6

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] Station began sampling on 9/13/2019.

Table 4-24. 2019 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	0.6	0.4	0.6	0.5	1.1	1.1	1.1	0.8	0.6	0.1	0.7	0.4
Kapolei	8	12.7	2	2.4	1.9	2.6	2.9	2.6	2.5	2.8	1	2.5
Kapolei Ncore	8.9	12.1	3.9	2.5	5.5	2	6.3	4.2	3.5	1.9	3	3.3
Kahe	44.3	22.6	18.7	17.6	30.1	15.1	33.7	37.8	27	36.3	38	18
Waiau	5.4	6.8	4.9	6.3	5.3	8	7.1	7.6	4.8	6.9	6.5	11.9
SPM Stations (see NOTE)												
Niumalu (cruise ships)	18.4	0.6	0.7	1	1	1.5	0.9	0.7	0.5	0.4	0.1	0.1
Hilo (volcano)	5.3	0.6	5.6	7.4	4.3	7.1	4.9	5.9	4.8	5.2	5.6	7.5
Kona (volcano)	1.4	1.4	1.2	1.7	1.8	2.4	2.1	2.1	2.2	3.5	0.3	0.3
Mt. View (volcano)	9.1	6.7	5.5	2.1	2.5	2	3.3	2.2	2.8	3	3.8	4.4
Ocean View (volcano)	2.4	1.6	1.7	1.2	1.6	1.4	1.7	1	1.1	1.3	2.2	1.1
Pahala (volcano)	6.1	4.5	3.7	6.6	4.4	6.3	5.4	5.4	6.2	6.7	6.5	7
Keeau	1.2	3.6	8.9	4	9.5	2.3	3.2	3.3	3.1	2.4	3.7	2.1
Naalehu	-	-	0.4	0	0.1	0.3	0.4	3.4	0.5	2	2.4	1.2
Leilani[1]	-	-	-	-	-	-	-	-	0.9	0.5	1	1

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] Station began sampling on 9/13/2019.

Table 4-25. 2019 Monthly Maximum of 24-Hour SO_2 Values (ppm)

The month with the highest value in the year is highlighted *The state 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	0.2	0.2	0.3	0.2	1	1	1.1	0.5	0.6	0	0.3	0
Kapolei	1.6	4.2	1.1	2.2	1.1	2.3	2.6	2.1	1.9	2.5	0.5	2.2
Kapolei NCore	1.8	3.8	1.1	1.1	1.6	1	5.6	1	1.1	0.7	1.1	0.9
Kahe	14.4	9.7	10.7	4.6	8.2	3.7	9.4	10.2	7.7	5.6	6.5	5.3
Waiau	1	1.1	1.4	1.2	1.3	1.5	1.3	1.8	1.2	1.4	1.6	4.4
SPM Stations (see NOTE)												
Niumalu (cruise ships)	2.6	0.6	0.6	0.9	0.8	1.2	0.7	0.6	0.2	0.3	0	0
Hilo (volcano)	1.9	2	2.4	3	3	4.1	3.6	4	3.6	4	3.9	2.6
Kona (volcano)	1.2	1.3	1.2	1.6	1.7	2.1	1.9	1.9	2	3.2	0.2	0.2
Mt. View (volcano)	5.1	4.6	3.8	1.3	1.4	1.5	1.9	1.8	1.9	2.1	2.3	2.7
Ocean View (volcano)	0.8	0.7	0.8	0.7	0.9	0.9	1	0.8	0.3	0.6	1.2	0.7
Pahala (volcano)	2.5	1.7	2.2	2.5	2.5	2.9	3.3	3.5	3.8	4.1	4.5	4.7
Keeau	0.4	1.7	1.6	-	2.2	1.9	2.3	2.4	1.1	1	1.2	1
Naalehu	-	-	0	0	0	0	0	1.4	0.2	0.5	0.8	0.8
Leilani[1]	-	-	-	-	-	-	-	-	0.3	0.1	0.2	0.3

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] Leilani Started on 9/15/2019

Section 5
2019 $PM_{2.5}$ 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	0.497	0.485	0.2622	106	88%
Elemental Carbon	0.553	0.440	0.1134	106	88%
METALS					
Aluminum	0.121	0.075	0.0069	111	92%
Antimony	0.028	0.027	0.0010	111	92%
Arsenic	0.000	0.000	0.0000	111	92%
Barium	0.043	0.043	0.0030	111	92%
Bromine	0.003	0.002	0.0002	111	92%
Cadmium	0.026	0.024	0.0020	111	92%
Calcium	0.115	0.086	0.0332	111	92%
Cerium	0.063	0.052	0.0010	111	92%
Cesium	0.049	0.048	0.0051	111	92%
Chlorine	1.485	1.470	0.4612	111	92%
Chromium	0.007	0.006	0.0006	111	92%
Cobalt	0.002	0.002	0.0002	111	92%
Copper	0.009	0.007	0.0005	111	92%
Indium	0.027	0.021	0.0024	111	92%
Iron	0.068	0.061	0.0208	111	92%
Lead	0.013	0.011	0.0011	111	92%
Magnesium	0.198	0.183	0.0354	111	92%
Manganese	0.009	0.007	0.0003	111	92%
Nickel	0.012	0.011	0.0021	111	92%
Phosphorus	0.003	0.002	0.0001	111	92%
Potassium	0.428	0.067	0.0252	111	92%
Rubidium	0.006	0.006	0.0003	111	92%
Selenium	0.005	0.005	0.0003	111	92%
Silicon	0.213	0.143	0.0166	111	92%
Silver	0.030	0.019	0.0017	111	92%
Sodium	1.172	1.075	0.3398	111	92%
Strontium	0.008	0.005	0.0006	111	92%
Sulfur	0.492	0.468	0.1803	111	92%
Tin	0.024	0.024	0.0017	111	92%
Titanium	0.009	0.008	0.0018	111	92%
Vanadium	0.009	0.006	0.0009	111	92%
Zinc	0.009	0.008	0.0020	111	92%
Zirconium	0.018	0.018	0.0022	111	92%

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	0.23	0.22	0.031	111	92%
Potassium Ion	0.44	0.05	0.020	111	92%
Sodium Ion	1.43	1.39	0.394	111	92%
Total Nitrate	0.54	0.41	0.165	111	92%
Sulfate	1.48	1.44	0.574	111	92%

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 2015 to 2019 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 98^{th} 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 26, 2015). 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: 2015-2019

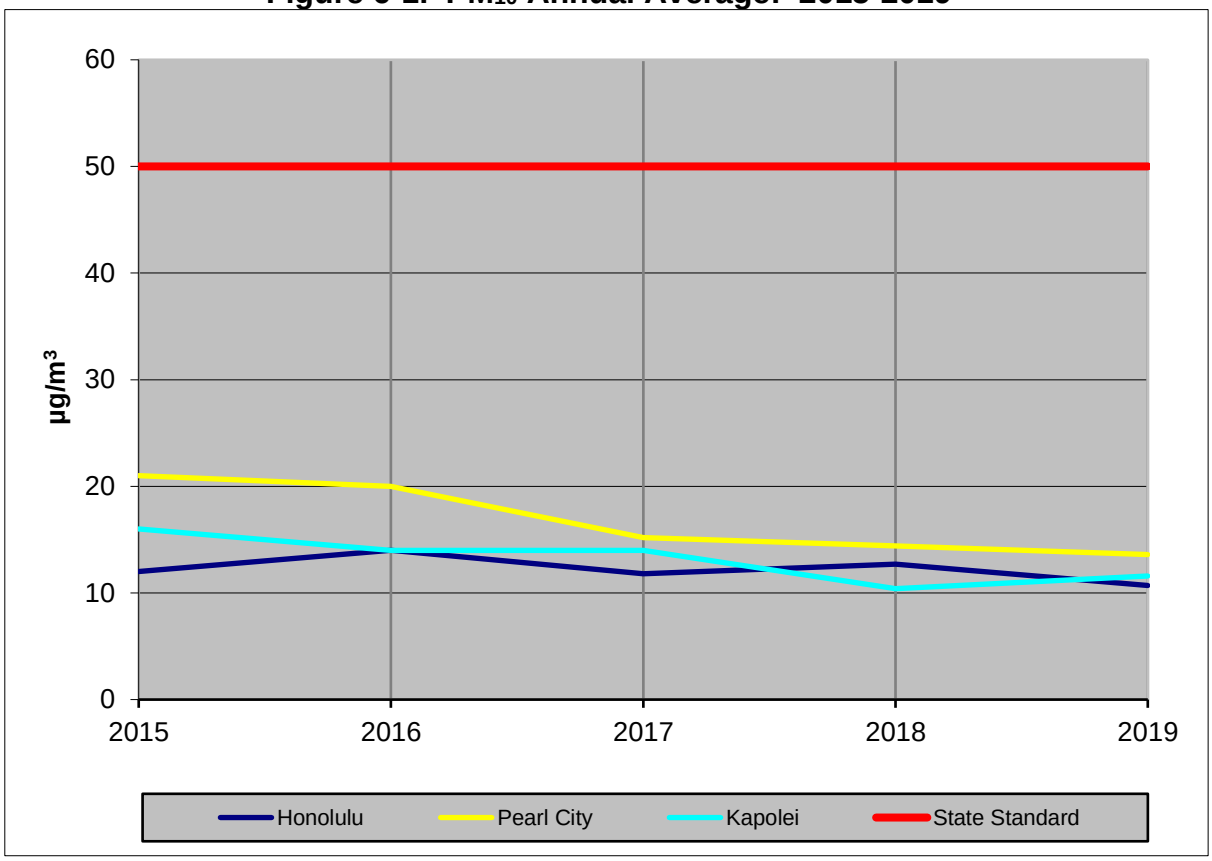


Figure 6-2. PM_{10} Maximum 24-Hour Average: 2015-2019

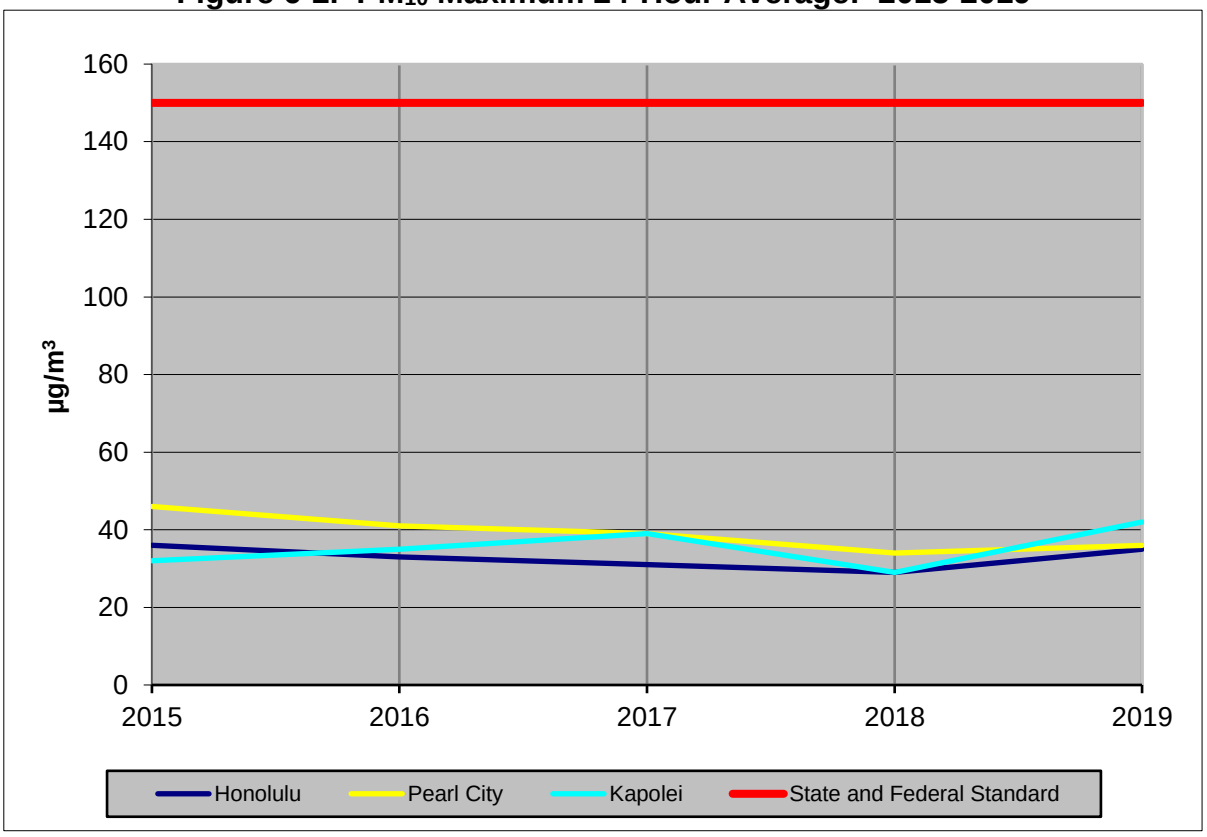


Figure 6-3. $PM_{2.5}$ Annual Average: 2015-2019

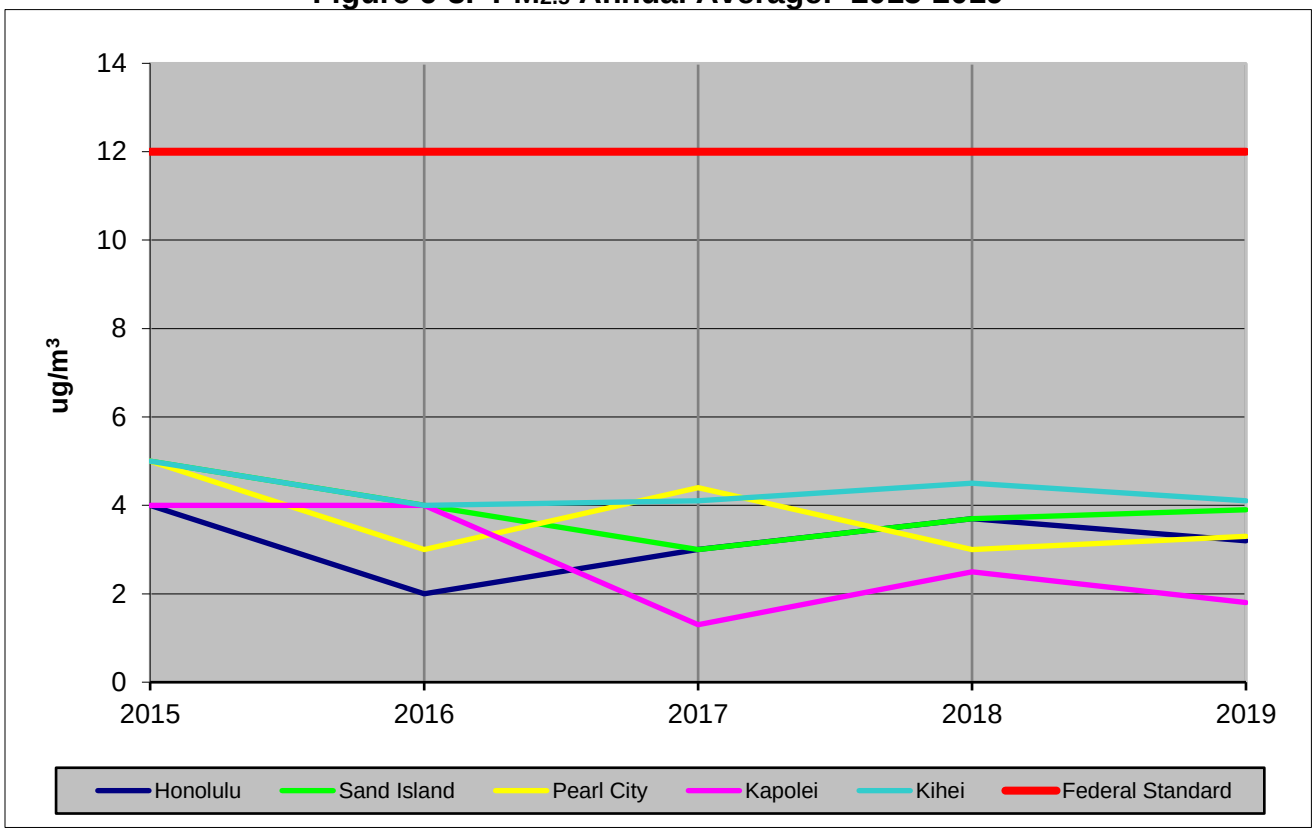


Figure 6-4. $PM_{2.5}$ 98th Percentile 24-Hour Average: 2015-2019

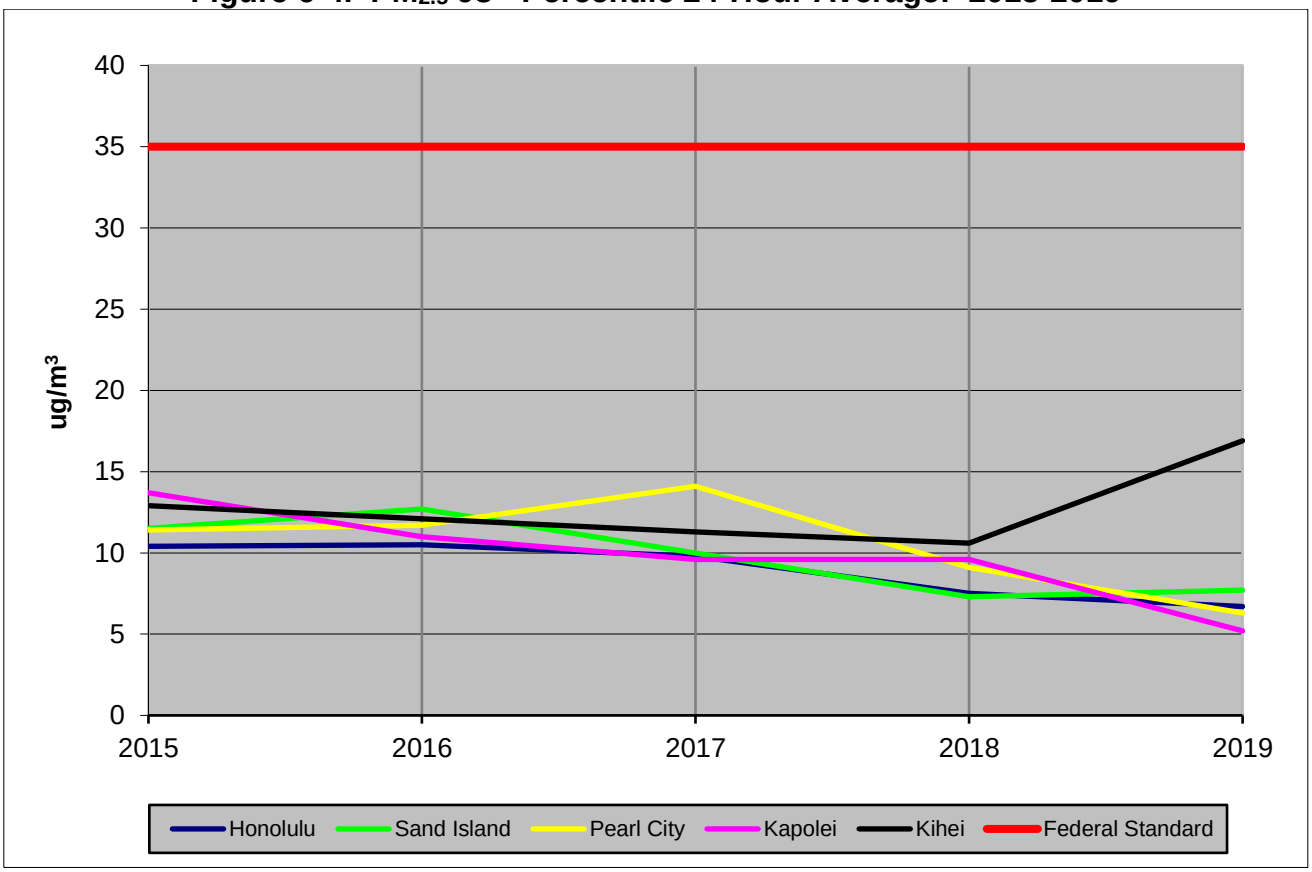


Figure 6-5. SO_2 Annual Average: 2015-2019

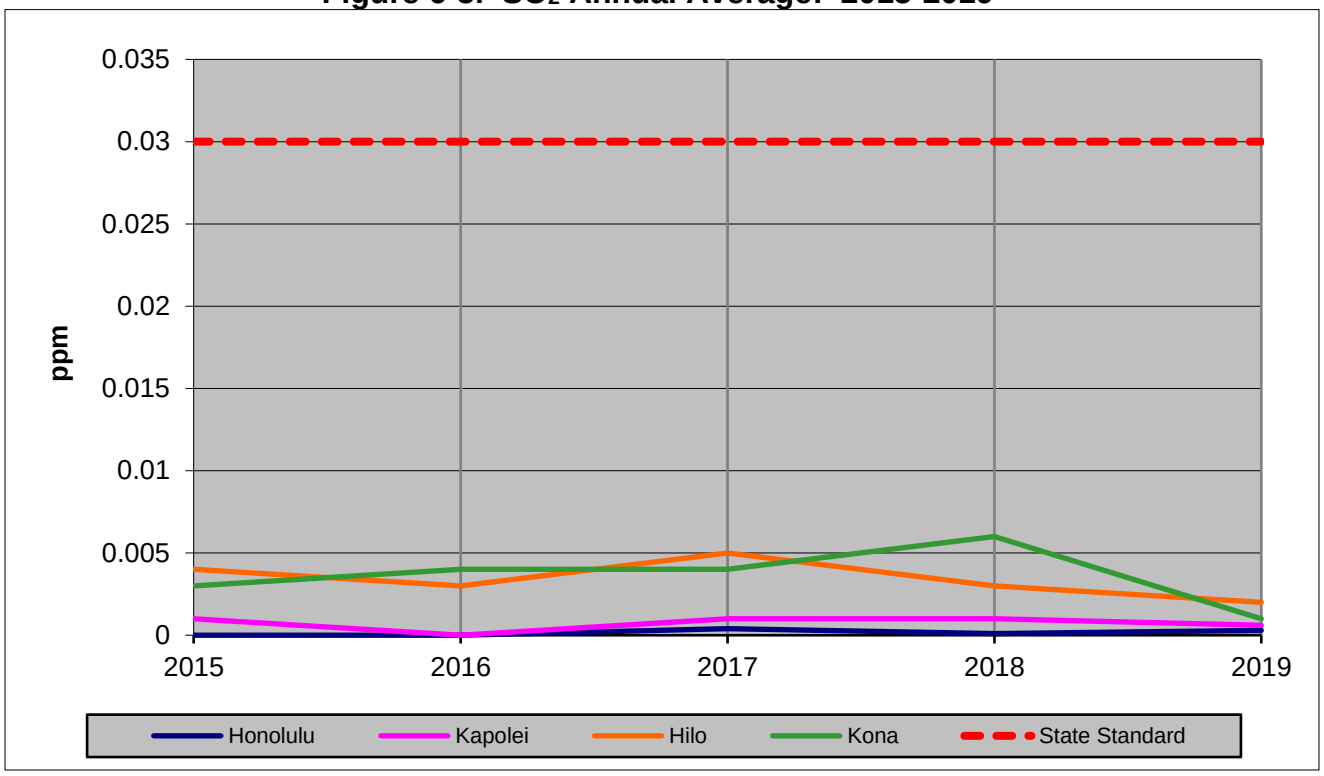


Figure 6-6. SO_2 Maximum 24-Hour Average: 2015-2019

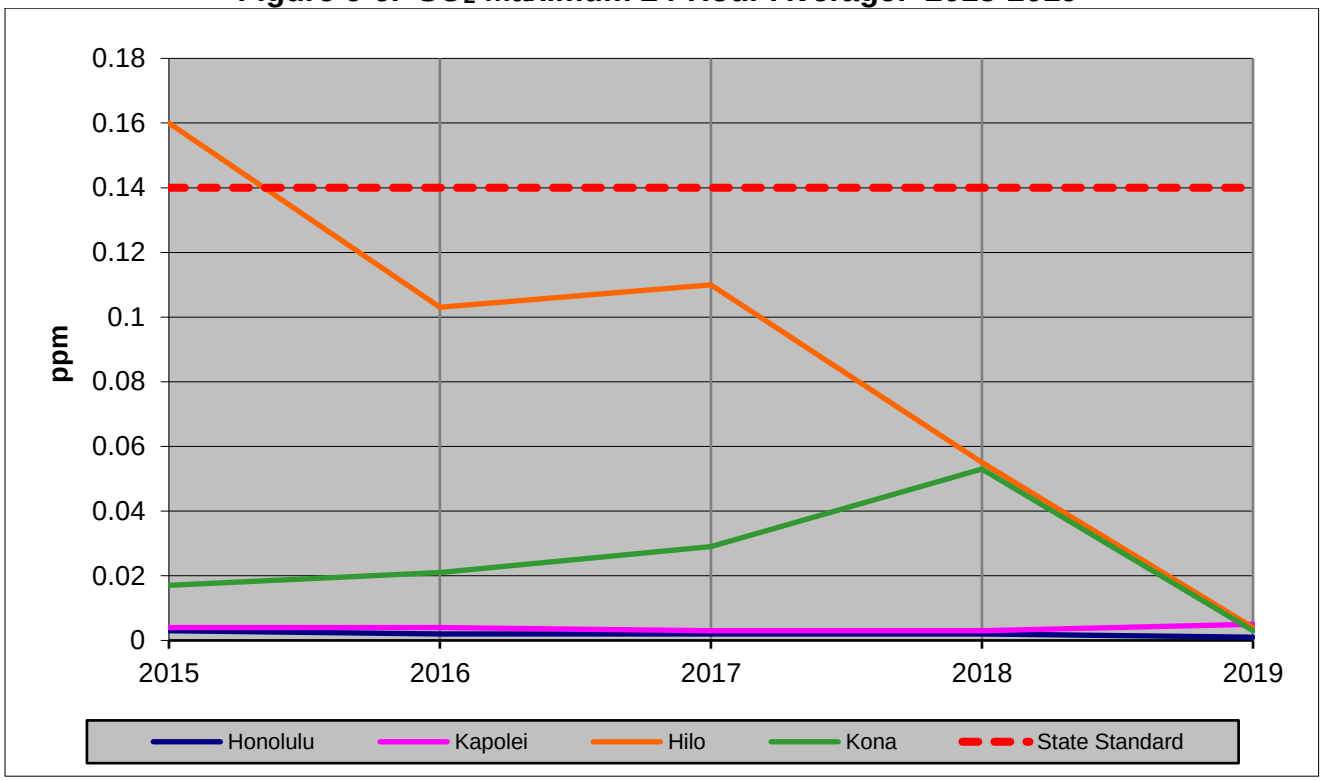


Figure 6-7. NO_2 Annual Average: 2015-2019

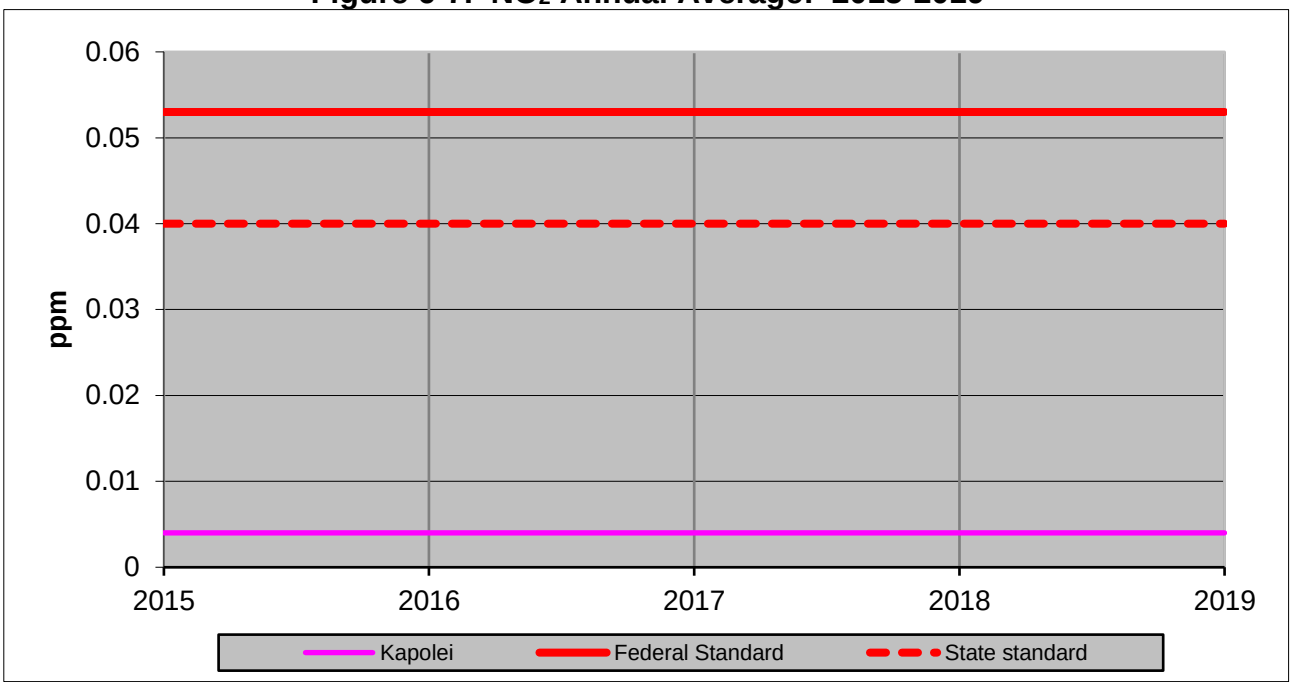


Figure 6-8. NO_2 Maximum 1-Hour Average: 2015-2019

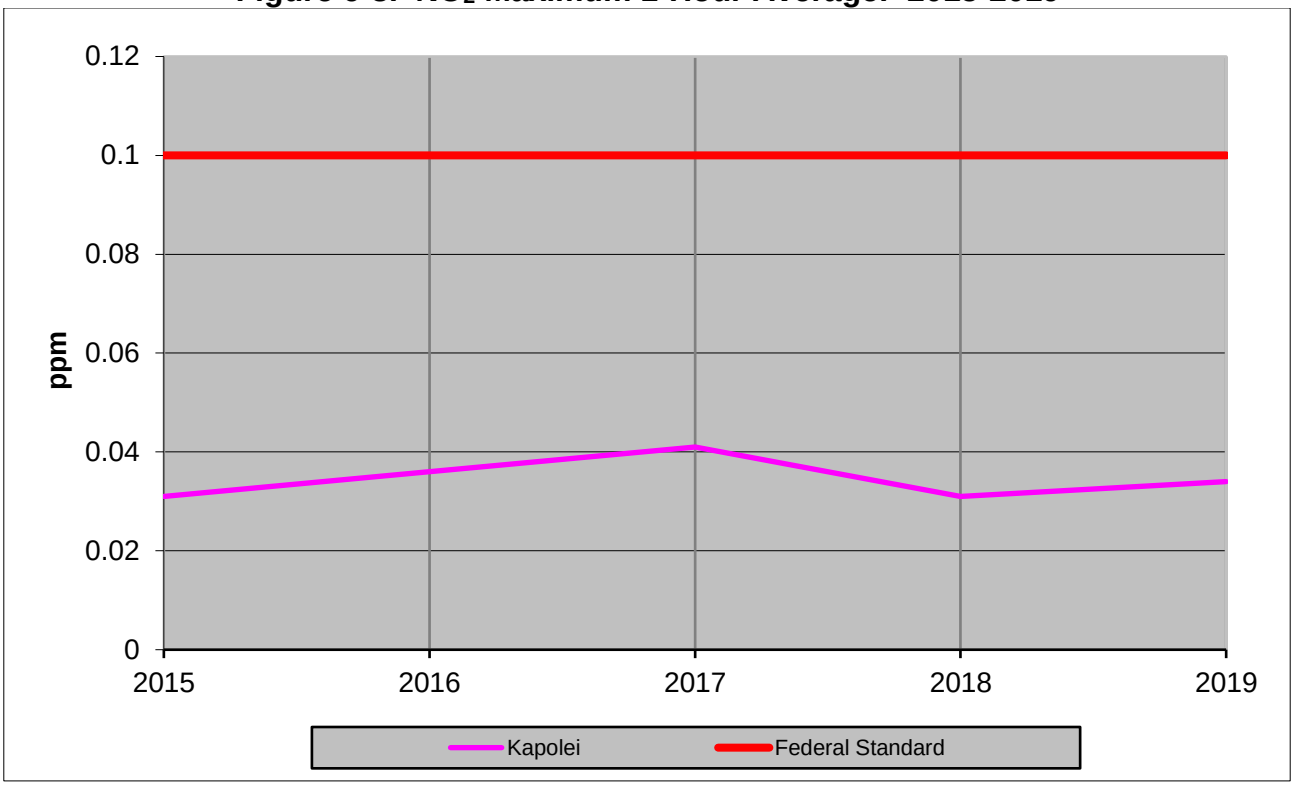


Figure 6-9. O_3 Fourth Highest Daily Maximum 8-Hour Average: 2015-2019

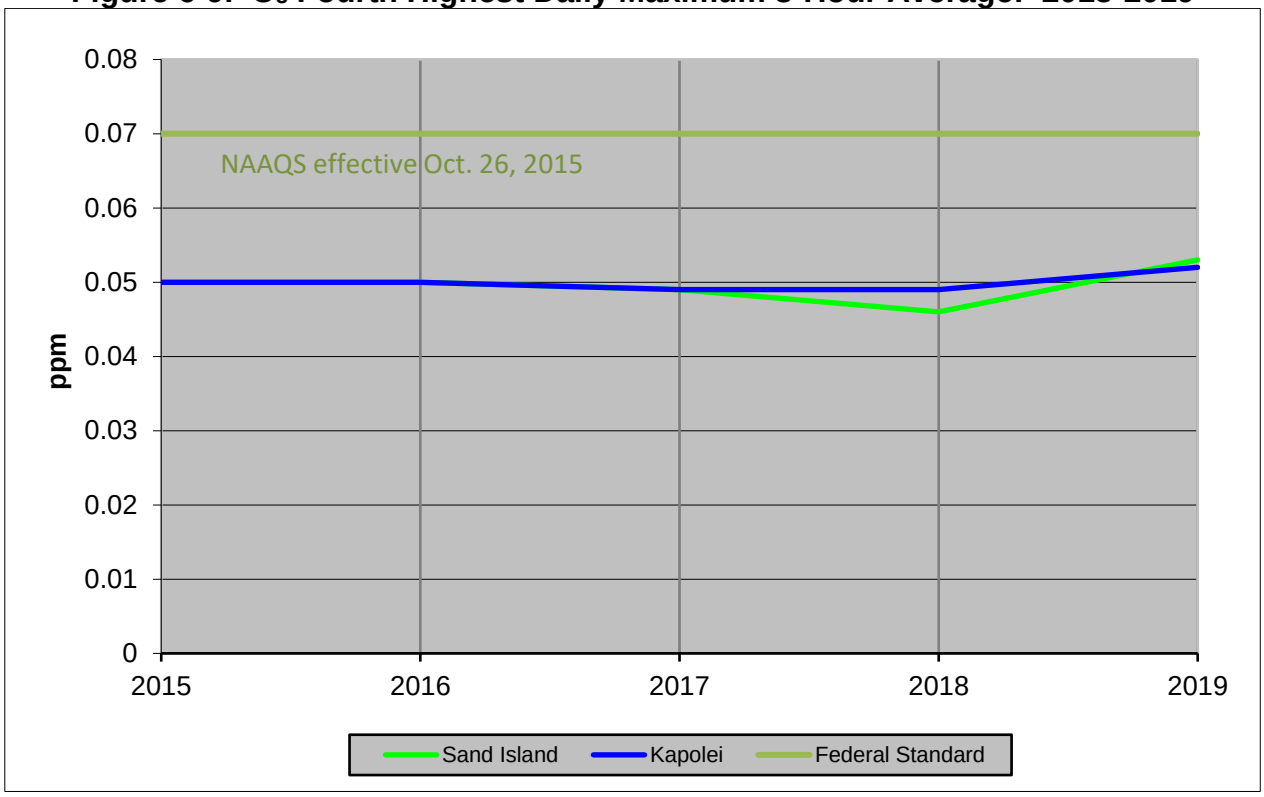


Figure 6-10. CO Maximum 1-Hour Average: 2015-2019

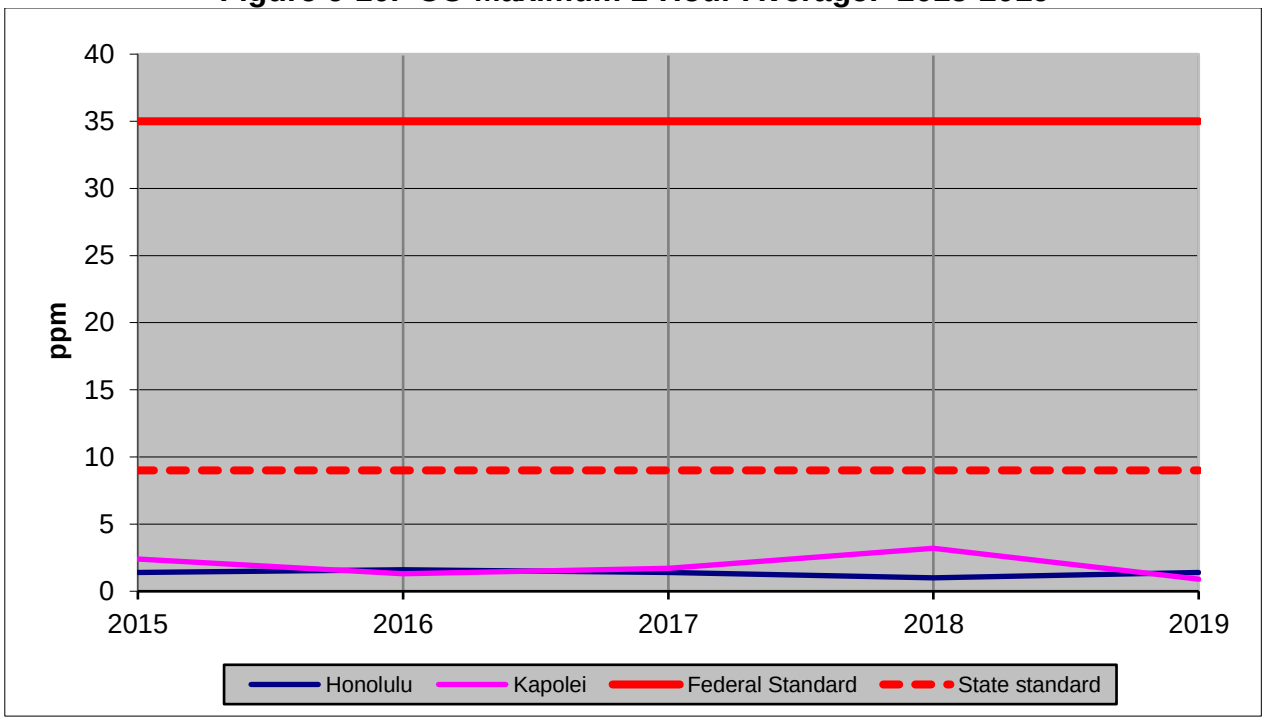


Figure 6-11. CO Maximum 8-Hour Average: 2015-2019