

Appendix F: Applicability to Contingency Plan for Emergency Episodes

After analyzing the most recent 3-year period of complete monitoring data (2021 – 2023) against the U.S. Environmental Protection Agency’s (EPA’s) priority region thresholds, it was determined that the State of Hawaii is classified as a Priority II Region. Hawaii’s maximum 24-hour sulfur dioxide SO₂ concentration recorded at the Pahala monitoring station was 0.13 ppm in 2021, which is within the 0.10 – 0.17 ppm Priority Region II threshold. In accordance with 40 Code of Federal Regulations (CFR) §51.150, Priority I and II Regions are required to have a SIP-approved emergency episode contingency plan. Below is an explanation of Hawaii’s applicability to the EPA’s contingency plans for emergency episodes.

Under the Clean Air Act (CAA), the EPA establishes National Ambient Air Quality Standards (NAAQS) to safeguard public health and welfare from the harmful effects of air pollutants. When the EPA sets or updates these standards, the CAA mandates that states submit revised infrastructure state implementation plans (SIPs). This requirement, outlined in Section 110(a)(1) and (2) of the CAA, ensures that states demonstrate their capability to enforce, implement, and uphold the new or revised standards. These submissions detail the state’s resources and authority concerning air pollution control. The State of Hawaii’s Infrastructure SIP outlines the current air quality laws, regulations, resources, and programs. It describes how the state implements, achieves, maintains, and enforces federal air quality standards.

According to the EPA’s 40 CFR, Part 51 Subpart H – Prevention of Emergency Episodes, §51.150, each region in a state with Priority I, Priority IA, or Priority II Regions must establish an episode plan. EPA’s criteria for Priority I, IA, and II Regions are as follows:

Priority I Region is any area with greater ambient concentrations than the following:

- (1) Sulfur dioxide (SO₂)—100 µg/m³ (0.04 ppm) annual arithmetic mean; 455 µg/m³ (0.17 ppm) 24-hour maximum.
- (2) Particulate matter (PM₁₀)—95 µg/m³ annual geometric mean¹; 325 µg/m³ 24-hour maximum.
- (3) Carbon monoxide (CO)—55 mg/m³ (48 ppm) 1-hour maximum; 14 mg/m³ (12 ppm) 8-hour maximum.
- (4) Nitrogen dioxide (NO₂)—100 µg/m³ (0.06 ppm) annual arithmetic mean.
- (5) Ozone (O₃)—195 µg/m³ (0.10 ppm) 1-hour maximum.

Priority IA Region means any area which is Priority I primarily because of emissions from a single point source.

¹ The geometric mean is different than an arithmetic mean and is often used to find the mean of a data set which inherently has large proportions of outliers. As opposed to an arithmetic mean where numbers are added up and divided by the total amount of numbers, the geometric mean is found by taking the product of each data point and then taking the nth root of that product for “n” number of values being analyzed.

Priority II Region is any area which is not a Priority I region and has ambient concentrations between the following:

- (1) Sulfur Dioxide (SO₂)—60-100 µg/m³ (0.02-0.04 ppm) annual arithmetic mean; 260-445 µg/m³ (0.10-0.17 ppm) 24-hour maximum; any concentration above 1,300 µg/m³ (0.50 ppm) 3-hour average.
- (2) Particulate matter (PM₁₀)—60-95 µg/m³ annual geometric mean; 150-325 µg/m³ 24-hour maximum.²

Fine Particulate Matter (PM_{2.5}) Region I, IA, and II concentration thresholds are as follows:

- (1) **Priority I Region** – 225.5 µg/m³ 24-hour average
- (2) **Priority IA Region** – 225.5 µg/m³ 24-hour average
- (3) **Priority II Region** – 125.5-225.4 µg/m³ 24-hour average

PM_{2.5} thresholds are based on the most current air quality index (AQI) concentrations following the methodology from EPA's memorandum "Guidance on Infrastructure State Implementation Plan Elements Required Under CAA Sections 110(a)(1) and (2) for the 2006 24-Hour Fine Particle (PM_{2.5}) National Ambient Air Quality Standard (NAAQS)".³ Tables 1a and 1b on pages 3 of 6 and 4 of 6, respectively, show the 2024 AQI category breakpoints. Since 40 CFR §51.150 does not specify PM_{2.5} thresholds for priority regions, the EPA memorandum suggests using AQI breakpoint values to determine thresholds between the priority regions. In EPA's 2009 guidance memo, the breakpoint between the Unhealthy and Very Unhealthy categories were under consideration to be 140.5 ug/m³. In 2012, when the annual PM_{2.5} NAAQS changed from 15 ug/m³ to 12 ug/m³, the AQI breakpoint between "Unhealthy" and "Very Unhealthy" was updated to 150.5 µg/m³. The most current AQI breakpoint between Unhealthy and Very Unhealthy is 125.4 ug/m³ after the EPA updated the AQI to further strengthen the annual PM_{2.5} NAAQS in 2024 from 12 ug/m³ to 9 ug/m³. Table 1a on page 3 of 6 highlights the 2024 changes to the AQI Fine Particle Pollution breakpoints while Table 1b on page 4 of 6 compares the Priority Region breakpoints and EPA recommended EEP Priority Region classifications.

² Per telephone conversation with EPA Region 9, the particulate matter threshold specified in 40 CFR §51.150 refers to PM₁₀.

³ PM_{2.5} threshold is from the EPA's memorandum: "Guidance on SIP Elements Required Under Sections 110(a)(1) and (2) for the 2006 24-Hour Fine Particulate (PM_{2.5}) National Ambient Air Quality Standards (NAAQS)".

2024 AQI for Fine Particle Pollution
(Breakpoints are in micrograms per cubic meter)

AQI Category and Index Value	Previous AQI Category Breakpoints	Updated AQI Category Breakpoints	What changed?
Good (0 – 50)	0.0 to 12.0	0.0 to 9.0	EPA updated the breakpoint between Good and Moderate to reflect the updated annual standard of 9 micrograms per cubic meter
Moderate (51 – 100)	12.1 to 35.4	9.1 to 35.4	
Unhealthy for Sensitive Groups (101 – 150)	35.5 to 55.4	35.5 to 55.4	No change, because EPA retained the 24-hour fine PM standard of 35 micrograms per cubic meter.
Unhealthy (151 – 200)	55.5 to 150.4	55.5 to 125.4	EPA updated the breakpoints at the upper end of the unhealthy, very unhealthy, and hazardous categories based on scientific evidence about particle pollution and health. The Agency also combined two sets of breakpoints for the Hazardous category into one.
Very Unhealthy (201 – 300)	150.5 to 250.4	125.5 to 225.4	
Hazardous (301+)	250.5 to 350.4 and 350.5 to 500	225.5+	

Table 1a: EPA's 2024 AQI for Fine Particle Pollution (PM_{2.5})^{See note 3}

Table 1b		
2024 AQI for Fine Particle Pollution (PM_{2.5})^{see note 3}		
AQI Category and (Index Values)	AQI Category Breakpoints	Recommended EEP Priority Region Classification
Good (0-50)	0.0 to 9.0	-
Moderate (51-100)	9.1 to 35.4	-
Unhealthy for Sensitive Groups (101-150)	35.5 to 55.4	-
Unhealthy (151-200)	55.5 to 125.4	-
Very Unhealthy (201-300)	125.5 to 225.4	Priority Level II
Hazardous (301+)	225.5+	Priority Level I and IA

After analyzing data from the most recent 3-year period of complete monitoring data (2021 – 2023) against the priority region thresholds, it was determined that the State of Hawaii has not exceeded any of the Priority I thresholds. For SO₂, however, the maximum 24-hour concentration of 0.13 ppm recorded at the Pahala monitoring station in 2021 is within the 0.10 – 0.17 ppm Priority Region II threshold. In accordance with 40 CFR §51.150, Priority I and II Regions are required to have a SIP-approved emergency episode contingency plan. Please refer to the Table 2 below for a comparison of Priority I and II Region thresholds to maximum measured SO₂, PM_{2.5}, CO, NO₂, and O₃ concentrations.

Table 2			
Priority I and II Region Thresholds Versus Maximum Monitoring Measurements			
Priority Region Threshold (Hawaii Measurement)	SO₂ - 40 CFR §51.150(b)(1) & §51.150(d)(1)		
	Annual Arithmetic Mean	24-hour Maximum	3-hour Average
Priority I Region SO ₂ Threshold	0.04 ppm	0.17 ppm	-
Priority II Region SO ₂ Threshold	0.02 – 0.04 ppm	0.10 – 0.17 ppm	0.50 ppm
(Maximum SO ₂ Monitoring Measurement 2021 – 2023)	0.009 ppm	0.130 ppm ^{see note 4}	0.463 ^{see note 4}
Priority Region Threshold (Hawaii Measurement)	PM₁₀ - 40 CFR §51.150(b)(2) & §51.150(d)(2)		
	Annual Geometric Mean ^{see note 5}	24-hour Maximum	
Priority I Region PM ₁₀ Threshold	95 µg/m ³	325 µg/m ³	
Priority II Region PM ₁₀ Threshold	60 – 95 µg/m ³	150 – 325 µg/m ³	

⁴ Elevated values due to emissions from Sep. 29, 2021, eruption at Halemaumau crater on the summit of Kilauea volcano.

⁵ Geometric mean definition: https://www.epa.gov/sites/default/files/2017-03/documents/ags_data_dictionary.pdf, page 4-147. For maximum monitoring data, arithmetic mean data is used for this report, since arithmetic mean is always greater than geometric mean. Therefore, the use of arithmetic mean is conservative.

Table 2		
Priority I and II Region Thresholds Versus Maximum Monitoring Measurements		
(Maximum PM ₁₀ Monitoring Measurement 2021 – 2023)	16.7 µg/m ³	76 µg/m ³ see note 6
Priority Region Threshold (Hawaii Measurement)	PM _{2.5} - 40 CFR §51.150(b)(2) & §51.150(d)(2)	
	Annual Geometric Mean see note 5	24-hour Maximum
Priority II Region PM _{2.5} Threshold	-	125.4 µg/m ³
(Maximum PM _{2.5} Monitoring Measurement 2021 – 2023)	5.3 µg/m ³	57.2 µg/m ³
Priority Region Threshold (Hawaii Measurement)	CO - 40 CFR §51.150(b)(1) & §51.150(d)(1)	
	1-hour Maximum	8-hour Maximum
Priority I Region CO Threshold	48 ppm	12 ppm
(Maximum CO Monitoring Measurement 2021 – 2023)	9.5 ppm see note 7	1.3 ppm
Priority Region Threshold (Hawaii Measurement)	NO ₂ - 40 CFR §51.150(b)(4)	
	Annual Arithmetic Mean	1-hour Maximum
Priority I Region NO ₂ Threshold	0.06 ppm	-
(Maximum NO ₂ Monitoring Measurement 2021 – 2023)	0.0033 ppm	0.0362 ppm
Priority Region Threshold (Hawaii Measurement)	O ₃ - 40 CFR §51.150(b)(5)	
	Annual Arithmetic Mean	1-hour Maximum
Priority I Region O ₃ Threshold	-	0.10 ppm
(Maximum O ₃ Monitoring Measurement 2021 – 2023)	0.029 ppm	0.080 ppm

EPA designates Hawaii as unclassifiable/attainment for the 2010 1-hour SO₂ NAAQS. This determination was based on an exceptional event package submitted on December 17, 2015, by HDOH Clean Air Branch to EPA demonstrating that exceedances of the standard at monitoring stations in Hawaii County (Big Island of Hawaii) resulted from volcanic activity. Please refer to the following link for the demonstration:

<https://health.hawaii.gov/cab/exceptional-event-data/>. Based on Hawaii Air Quality Data Books from 2021 to 2023, there was only one maximum 24-hour SO₂ concentration of 0.13 ppm within the 0.10 – 0.17 ppm threshold range to classify Hawaii County as a Priority II Region. The data books are available at: <https://health.hawaii.gov/cab/>. The 0.13 ppm SO₂ concentration was measured at the Pahala Monitoring Station in 2021 due to a September 29, 2021, eruption in the Halemaumau crater on the summit of Kilauea volcano. Pahala is approximately 19 miles from the Kilauea summit crater as shown in Figure 1 below.

⁶ Due to New Year's fireworks celebration.

⁷ Elevated values due to a brush fire right next to the monitoring station.

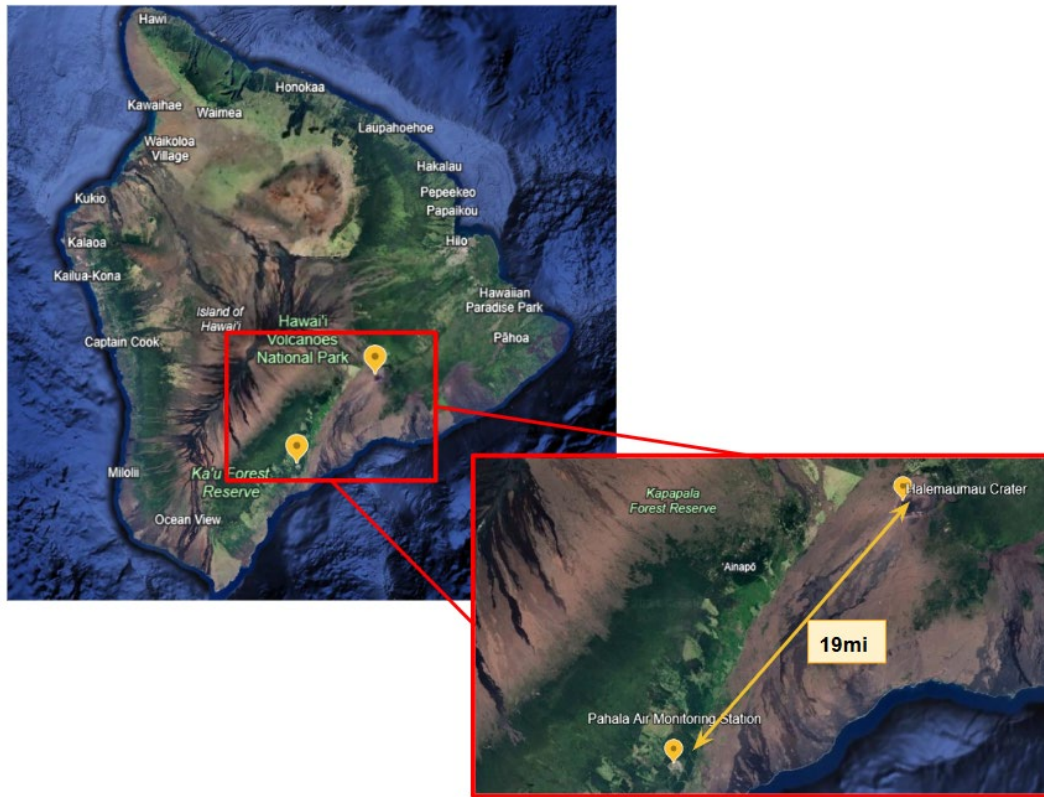


Figure 1: Location of Halemaumau crater in relation to Pahala air monitoring station.

In 2016 the Exceptional Events Rule was revised to require mitigation plans for all states with historically documented or known seasonal events. Pursuant to the rule revision and in accordance with 40 CFR §51.930, EPA identified Hawaii County as subject to mitigation requirements for $\text{PM}_{2.5}$ and SO_2 due to historically documented volcanic eruptions. For satisfying EPA's requirements, the HDOH Clean Air Branch prepared an exceptional events mitigation plan to set forth actions for protecting the public health from exceedances of the SO_2 and $\text{PM}_{2.5}$ NAAQS in Hawaii County. Please refer to Hawaii's Exceptional Event Mitigation Plan in Appendix G. The mitigation plan specifies procedures for providing information to the public through websites including the HDOH Clean Air Branch Ambient Air Quality Data website (<https://air.doh.hawaii.gov/home/map>) displaying near real-time air quality data from air monitoring stations statewide for SO_2 and other pollutants including PM_{10} , $\text{PM}_{2.5}$, CO, O_3 , and NO_2 . Information is also provided by the Hawaii Short Term SO_2 Advisory website (<http://mkwc.ifa.hawaii.edu/vmap/new/>) with a forecast dashboard displaying near-surface SO_2 and sulfate (SO_4) air quality from volcanic gas emissions.

Notwithstanding the requirement for an emergency episode contingency plan, the EPA may exempt those portions of Priority II Regions which have been designated attainment or unclassifiable for primary and secondary national standards in accordance with 40 CFR §51.152. Because Hawaii County is unclassifiable/attainment for SO_2 and HDOH Clean Air Branch has an exceptional event mitigation plan to provide procedures for alerting the public on SO_2 air quality, the HDOH Clean Air Branch is requesting an exemption from the contingency plan requirements of CAA §110(a)(2)(G).