UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

JUL 10 2014

OFFICE OF THE
REGIONAL ADMINISTRATOR

Mr. Nolan Hirai
Manager, Clean Air Branch
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Hirai:

This letter responds to Hawaii Department of Health's (HDOH) December 11, 2013 and July 1, 2014 submittals regarding exceedances of the 2012 annual $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) that occurred at the Kona monitoring station (AQS ID: 15-001-1012) in 2011 – 2013. Specifically, these documents address 2 days in 2011, 200 days in 2012, and 66 days in 2013 as listed in Table A-1 of the enclosed document *EPA Review of HDOH's "Documentation for Natural Events Excluded Data, Kona Air Monitoring Station" Regarding Exceedances of Annual PM2.5 NAAQS in 2011-2013*.

HDOH's submittals included documentation that these exceedances were caused by exceptional events due to volcanic emissions. EPA has reviewed the documentation provided by HDOH to demonstrate that the exceedances on these days meet the criteria for an exceptional event in the Exceptional Events Rule (EER). Based on the weight of evidence, EPA concurs that the exceedances were caused by volcanic exceptional events and finds that HDOH has successfully made the demonstrations referred to in 40 CFR §50.14. In addition, HDOH has met the schedule and procedural requirements in section 50.14(c) with respect to the same data. EPA's detailed assessment of HDOH's submittals is enclosed. My staff will enter "concurrence flags" for these data into EPA's AQS data system.

Based on our review of the HDOH's submittals, EPA will exclude these data from the following types of calculations and activities:

- EPA's Air Quality System (AQS) will not count these days as exceedances when generating user reports, or include them in design values estimates, unless the AQS user specifically indicates that they should be included.
- EPA will accept the exclusion of these data for the purpose of selecting appropriate background concentrations for New Source Review air quality analyses.[1]

[1] If we are the permitting authority, we will propose permits on this basis. If we are commenting on another permitting authority's proposed action, our comments will be consistent with the concurrences in this letter.

- EPA will accept the exclusion of these data for the purpose of selecting appropriate background concentrations for transportation conformity hot spot analyses.[2]
- The data will continue to be publicly available, but EPA's publications and public information statements on the status of air quality in the affected area will not reflect these data in any summary statistic of potential regulatory application, unless such inclusion is specifically noted.[3]

In addition, EPA will rely on calculated values that exclude these data in proposed regulatory actions, such as a proposed designation, classification, or attainment demonstration related to the 2012 annual $PM_{2.5}$ NAAQS. These regulatory actions require EPA to provide an opportunity for public comment prior to taking a final Agency action. If EPA is pursuing one of these actions using $PM_{2.5}$ data from the Kona station, EPA will open a new comment period during which EPA may receive comments on the exceptional event submission you have made and the concurrences conveyed in this letter. If so, we must consider and respond to those comments before taking final regulatory action. Accordingly, the concurrences conveyed in this letter do not constitute final EPA action regarding any matter on which EPA is required to provide an opportunity for public comment. In particular, this applies to determinations regarding the attainment status or classification of the area. Final actions will take place only after EPA completes notice and comment rulemaking on those determinations. As an additional clarification, the concurrences conveyed in this letter are applicable only to determinations incorporating the submitted data relative to the 2012 annual $PM_{2.5}$ NAAQS.

In August 2014, EPA anticipates transmitting our intended designations for Hawaii for the 2012 annual $PM_{2.5}$ NAAQS to Governor Abercrombie. We will also publish the intended designations in the Federal Register and accept public comments. Our intended designations for Hawaii will take into consideration today's concurrences regarding exceedances of the 2012 annual $PM_{2.5}$ NAAQS that occurred in 2011 - 2013.

If you have any questions or wish to discuss this matter further, please contact Deborah Jordan, Director of the Air Division at (415) 947-8715.

Sincerely,

for Jared Blumenfeld 10 July 2014

Enclosure

cc: Lisa Young, HDOH

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[2] Applicable only to $PM_{10}$ and $PM_{2.5}$.

[3] These data may be included in statistics intended to describe trends in actual air quality in the area.

# EPA Review of HDOH's "Documentation for Natural Events Excluded Data, Kona Air Monitoring Station" Regarding Exceedances of Annual $PM_{2.5}$ NAAQS in 2011-2013

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Kona Air Monitoring Station (AQS ID: 15-001-1012)
2011-2013 Exceedances

US Environmental Protection Agency, Region 9
July 2014

**Table of Contents**

## 1.0 Introduction

On March 22, 2007, EPA adopted a final rule, *Treatment of Data Influenced by Exceptional Events*[1] (EER) to govern the review and handling of certain air quality monitoring data for which the normal planning and regulatory processes are not appropriate. Under the rule, EPA may exclude data from use in determinations of National Ambient Air Quality Standard (NAAQS) exceedances and violations if a state demonstrates that an "exceptional event" caused the exceedances. Before EPA can exclude data from these regulatory determinations, the state must flag the data in EPA's Air Quality System (AQS) database and, after notice and opportunity for public comment, submit a demonstration to justify the exclusion. After considering the weight of evidence provided in the demonstration, EPA decides whether or not to concur with each flag.

On December 11, 2013 and July 1, 2014, Hawaii Department of Health (HDOH) submitted documentation to demonstrate that exceedances of the 2012 Annual $PM_{2.5}$ standard that occurred in 2011-2013 at the Kona monitoring station (AQS ID: 15-001-1012), located on the west coast of the island of Hawaii (Figure 1) resulted from volcanic-related exceptional events. Specifically, on December 11, 2013, HDOH submitted "Documentation for Natural Events Excluded Data, Kona Air Monitoring Station, AQS ID 15-001-1012, 2011-2012 $PM_{2.5}$ Exceedances, Final Report, December 2013" ("Demonstration for 2011-2012Events"). On July 1, 2014, HDOH submitted "Documentation for Natural Events Excluded Data, Kona Air Monitoring Station, AQS ID 15-001-1012, 2013 $PM_{2.5}$ Exceedance, Final Report, June 2014" ("Demonstration for 2013 Events") and "Documentation for Natural Events Excluded Data, Kona Air Monitoring Station, AQS ID 15-001-1012, 2011-2012 $PM_{2.5}$ Exceedances, Addendum to the Final Report, May 2014" ("2011-2012 Addendum").

This document sets forth the basis for EPA's concurrence with HDOH's claim that exceedances of the 2012 Annual $PM_{2.5}$ standard in 2 days in 2011, 200 days in 2012, and 66 days in 2013 as listed in Appendix A, Table A-1 were the result of volcanic-related exceptional events.

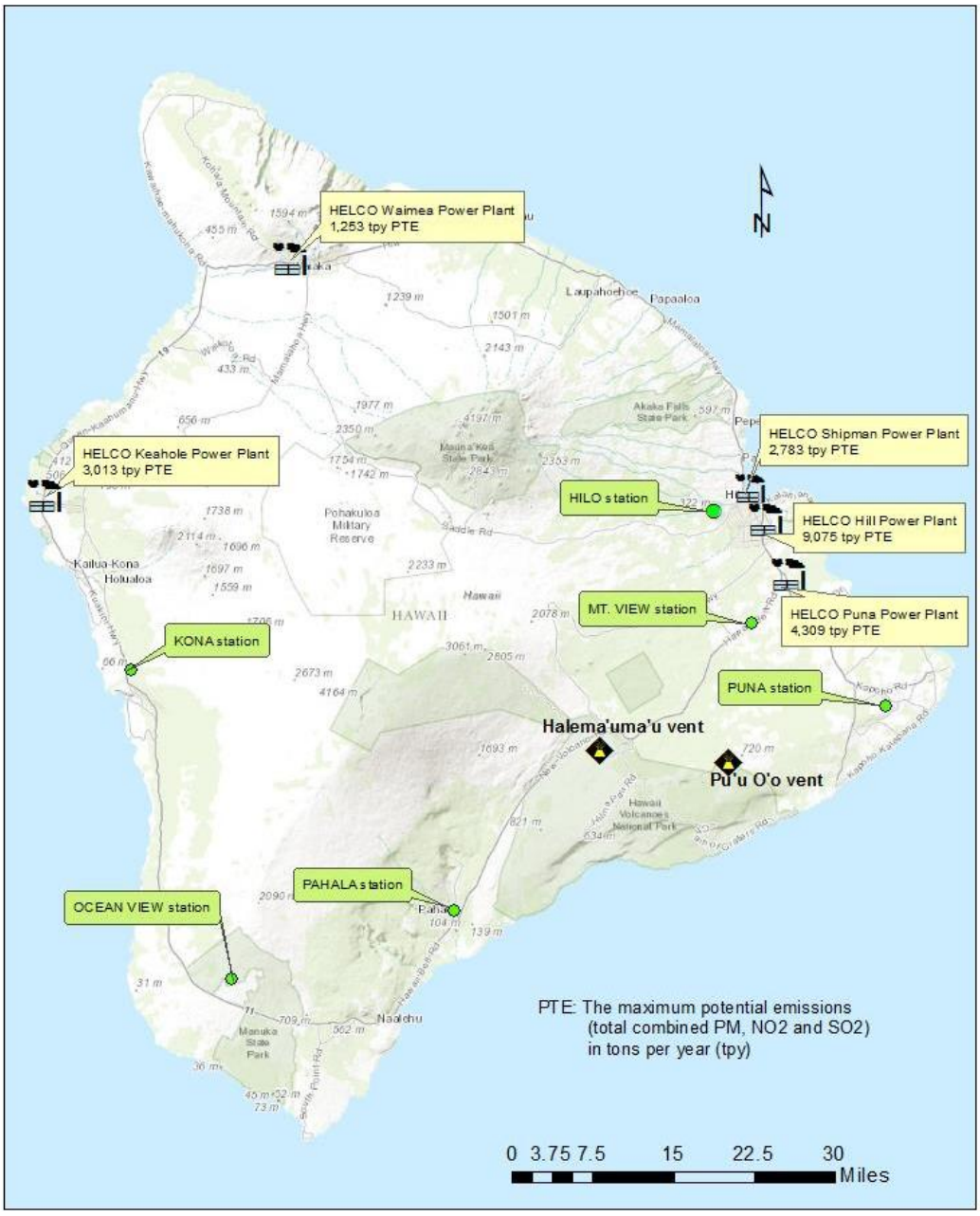
## 2.0 Summary of the Events

Volcanic emissions primarily consist of water vapor, carbon dioxide and $SO_2$. $SO_2$ reacts with constituents in the air in the presence of sunlight to form secondary sulfate $PM_{2.5}$ aerosol. The Kilauea volcano, located on the southeastern shore of Hawaii, has been erupting continuously since 1983 from two vents located at the Halema'uma'u and Pu'u' O'o craters (Figure 1). HDOH explains, "$SO_2$ emissions emanating from the Kilauea volcano are transported by prevailing winds around the southern edge of the island toward Kona, are transformed enroute to sulfate $PM_{2.5}$ aerosol, then are caught in the wake of the island in a land-sea breeze circulation."[2] Figure 2 illustrates the direction of prevailing trade winds, which transports emissions from the Kilauea volcano, and the land-sea breeze off shore of Kona which traps pollutants. On March 13, 2008, a new gas vent opened at Halema'uma'u, increasing emissions from this location by a factor of 10. HDOH asserts that the Halema'uma'u vent emissions, being situated at higher elevation and further inland, have a greater impact on air quality in Kona than emissions from

[1] 72 FR 13560, March 22, 2007.
[2] *See* 2013 Demonstration, p.3.

the Pu'u O'o vent.[3] $PM_{2.5}$ monitoring started on Hawaii after the vent opened in 2008, necessitated by the increased emissions. However, data are available for $SO_2$ concentrations on Hawaii prior to 2008. Annual average $SO_2$ concentrations at Kona, which HDOH states can serve as a proxy for $PM_{2.5}$, increased by 50% when comparing 2000-2007 and 2009-2013.[4]

HDOH provided the exceptional events demonstration packages to show that emissions emanating from the Kilauea volcano are natural volcanic exceptional events which caused the flagged exceedances listed in this review at Appendix A, Table A-1 at the Kona station.




[3] *See* 2013 Demonstration, pp.17, 24-26.
[4] *See* 2013 Demonstration, p.62.

**Figure 1**. Topographical map of Hawaii with locations of the Halema'uma'u and Pu'u O'o vents, air monitoring stations, and power plants (from 2013 Demonstration, Figure 2-6).


**Figure 2.** Hawaii wind patterns (from 2013 Demonstration, Figure 2-2).

### 3.0 Requirements of the Exceptional Events Rule (EER)

Pursuant to 40 Code of Federal Regulations (CFR) §50.14(c)(3)(iv), a request for EPA's concurrence on an exceptional event flag must be accompanied by a demonstration that:

A. The event satisfies all of the criteria set forth in 40 CFR §50.1(j). It affects air quality; is not reasonably controllable or preventable; and is caused by human activity that is unlikely to recur at a particular location, or is a natural event; and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event; and

B. There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;

C. The event is associated with a measured concentration in excess of normal historical fluctuations, including background; and

D. There would have been no exceedance or violation but for the event.

The EER also has procedural requirements. 40 CFR §50.14(c)(2)(iii) requires that data claimed to be due to an exceptional event be flagged in the AQS database, and that an initial description

of the event be provided to EPA; both must occur by July 1 of the year following the event. In addition, 40 CFR §50.14(c)(3)(i) requires that the State:

- submit a demonstration to EPA within three years of the calendar quarter of the event or 12 months prior to an EPA regulatory decision;
- provide notice and opportunity for public comment; and
- submit any public comments along with the demonstration.

The following sections evaluate HDOH's demonstration for the days and events in question with respect to these requirements.

## 4.0 Criteria Set Forth in 40 CFR §50.1(j)

### 4.1 Affects Air Quality (AAQ)

As stated in the preamble to the EER, the event in question is considered to have affected air quality if it can be shown that there is a clear causal relationship between the monitored exceedance and the event, and that the event is associated with a measured concentration in excess of normal historical fluctuations.[5] The criteria and the evidence supporting this criterion are discussed in detail in Sections 5.0 and 6.0 below and allow us to reasonably conclude that the volcanic events in question affected air quality.

### 4.2 Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, HDOH provided detailed information on the current set of required controls for each significant source in the Kona area: facility name, distance from the Kona monitoring station, equipment type, emission totals, applicable regulatory measures, and compliance information during exceedance days.[6] Air pollution control measures for minimizing $PM_{2.5}$ and $PM_{2.5}$ precursors from permitted sources include Hawaii Administrative Rules, Prevention of Significant Deterioration/Best Available Control Technology, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants.

There are three power plants with combined potential emissions ($PM + NO_2 + SO_2$) ranging from 2,783 – 9,075 tons per year located on the eastern, Hilo, side of Hawaii as illustrated in Figure 1. HDOH shows that emissions affecting Kona on flagged days follow a transport pathway around the southern edge of the island.[7] Emissions emanating from Hilo-area facilities would rarely follow the identical transport path as those from Kilauea due to diurnal heating effects of Mauna Kea and Mauna Loa, located to the north/northwest of Kilauea (Figure 2), which force a predominately southerly wind (wind blows from south to north) at Hilo.[8] Therefore, Hilo sources were not included in the analysis.

Permitted sources are regularly inspected, with Title V sources inspected each year and minor sources inspected at least every three to five years to ensure equipment is operated within the

[5] 72 FR 13569, March 22, 2007.
[6] 2011-2012 Demonstration, Chapter 4; 2013 Demonstration, Chapter 4.
[7] *See* Section 5 of this TSD; 2011-2012 Demonstration, Chapter 3; 2013 Demonstration, Chapter 3.
[8] *See* 2013 Demonstration, Section 3.2.E and Figure 3-14.

terms of the permits. Complaints are also investigated that may involve Title V or minor sources. Inspection reports and correspondence were reviewed from 2011 to 2013 which found no indication of source noncompliance with standards involving $PM_{2.5}$ (including fugitive dust), $NO_2$, and $SO_2$ emissions.

HDOH cites United States Geological Survey (USGS) estimates of $SO_2$ emissions from the Kilauea volcano, which transform to sulfate $PM_{2.5}$ aerosol, as 447,566 tons, 438,958 tons and 426,728 per year for 2011, 2012 and 2013, respectively. A comparison of volcanic emissions to those from significant anthropogenic sources in Kona found that $PM_{2.5}$ and $PM_{2.5}$ precursors, $NO_2$, and $SO_2$ from anthropogenic sources were only 1% of the total emissions (anthropogenic $PM_{2.5}$, $NO_2$, and $SO_2$ + volcanic $SO_2$).

The State of Hawaii, including Hawaii County, is currently designated "unclassifiable/attainment" for the 1997 annual $PM_{2.5}$ NAAQS, the 2006 24-hour $PM_{2.5}$ NAAQS, and the 2010 1-hour $NO_2$ NAAQS. EPA did not promulgate initial area designations for either the State of Hawaii or Hawaii County in its first round of designations for the 2010 1-hour $SO_2$ NAAQS.[9] EPA intends to address the area designations for Hawaii and all other currently undesignated areas of the country in future actions. The magnitude of the volcanic source and existing, implemented controls on the Kona area anthropogenic sources at the time of exceedances sufficiently establish that the events meet the nRCP criteria.

### 4.3 Natural Event

The EER states that "[a]mbient concentrations of particulate matter for which volcanic or seismic activity caused or significantly contributed to high levels of particulate matter in an affected area will be treated as natural events"[10]. Therefore, ambient particulate matter concentrations due to volcanic emissions will be considered for treatment as an exceptional event. HDOH asserts that the exceedances were a direct result of the Kilaeua volcano emissions, which EPA should consider to be a natural event.

## 5.0 Clear Causal Relationship

EPA considers a variety of evidence when evaluating whether there is a clear causal relationship between the measurements under consideration and the event that an air agency claims affected the air quality in the area. Demonstrations typically include documentation showing that the events in fact occurred and that emissions related to the event were transported in the direction of the monitor(s) where elevated concentrations measurements were recorded; the size of the area affected by the transported emissions; the relationship in time between the event, transport of emissions, and recorded concentrations; and, as appropriate, pollutant species-specific information supporting a causal relationship between the event and the measured concentration.

Chapter 2 of the 2013 Demonstration includes a comprehensive conceptual model of the events, including details of the Kona monitoring station, description of the topography and climate of Hawaii, prevailing wind patterns that allow for efficient transport of Kilauea influenced air

[9] 78 FR 47191, August 5, 2013.
[10] 72 FR 13565, March 22, 2007.

masses to Kona, a discussion of $SO_2$ conversion to sulfate $PM_{2.5}$, and a summary of additional analyses presented. (HDOH also notes that "the background narrative presented here also applies to the 2011-2012 exceptional events documented in the [2011-2012 Demonstration], and should be considered as supplemental information to that report.")

Chapter 3 of both the 2011-2012 and 2013 Demonstrations present HDOH's analysis to demonstrate a CCR. We summarize this analysis below and provide citations solely to the 2013 Demonstration where the analysis in the 2011-2012 and the 2013 Demonstrations are substantially similar. Chapter 6 of both Demonstrations also summarizes the CCR element.

Volcanic emissions primarily consist of water vapor, carbon dioxide and $SO_2$. $SO_2$ reacts with constituents in the air in the presence of sunlight to form secondary sulfate $PM_{2.5}$ aerosol (2013 Demonstration, Section 2.3, pp. 12-14). The hazy air pollution attributed to the volcano is often referred to as volcanic smog ("vog"). Trade winds blow the vog from its main source at the Kilauea volcano on the southeastern shore of Hawaii around the southern edge of the island and up the Kona coast. Vog becomes trapped along the Kona coast by daytime (onshore) and nighttime (offshore) breezes (2013 Demonstration, Section 2, p. 6 and Section 3, pp. 20-21 and 33-43).

Satellite-based measurements show elevated concentrations of $SO_2$ emissions emanating from the Kilauea volcano and high aerosol concentrations downwind to the south and west peaking off shore of the Kona area (2013 Demonstration, Section 2.3, pp. 13-14). Satellite measurements of $NO_2$, an indicator of anthropogenic pollution, are high around the island of Oahu and low over the entire island of Hawaii. These measurements suggest that anthropogenic emissions are not the primary source of $PM_{2.5}$ that caused exceedances at the Kona air monitoring station (2013 Demonstration, Figure 2-12).

Two additional monitoring stations that measure $PM_{2.5}$ and $SO_2$ for 2011-2013 are located along the transport pathway of the volcanic plume: Pahala (AQS ID: 15-001-2016) and Ocean View (AQS ID: 15-001-2020) (Figure 1). 2011-2013 air monitoring data show that annual average $SO_2$ concentrations decrease from the Pahala to the Ocean View station and further decrease from the Ocean View to the Kona station (2013 Demonstration, Section 3.2.B, Tables 3-3a and 3-3b). Additionally, annual $PM_{2.5}$ concentrations continue to increase from the Pahala to the Ocean View station and from the Ocean View to the Kona station (2013 Demonstration, Section 3.2.B, Tables 3-2a and 3-2b). This is consistent with what would be expected as $SO_2$ is converted to sulfates in the wake of the volcano's plume as it drifts from Pahala to Ocean View to Kona. HDOH states that "this demonstrates a clear causal link between $SO_2$ released by the volcano, the time necessary to form sulfates in the presence of sunlight and atmospheric constituents, the volcanic plume transport path, and monitored concentrations" (2013 Demonstration, Section 3, pp. 24-26).

While the magnitudes of the concentrations differ at the sites, the concentrations are well correlated at Ocean View and Kona. HDOH presents a three-day centered average of $PM_{2.5}$ and $SO_2$ concentrations from the Kona and Ocean View stations. HDOH explains, "[t]his smoothing was performed to represent time lag associated with pollutant transport between Ocean View and Kona, as well as provide some smoothing of the large short scale concentration variations that

are characteristic of these datasets" (2013 Demonstration, Section 3.2.C, p. 26). The concentrations are well correlated in 2011, 2012, and 2013, indicating a large regional source with emissions that follow a southerly path and affects the air quality at both monitoring sites. Kilauea volcano is the only large point source following the trajectory described above. Large point source emissions on the Hilo side of Hawaii (Figure 1) would rarely follow the same transport path as emissions from either the Halema'uma'u or Pu'u O'o craters due to topographical effects from Mauna Kea and Mauna Loa (2013 Demonstration, Section 3.2.E, pp. 41-42). Days requested for exclusion for 2011-2013 were flagged during peak periods of $PM_{2.5}$ concentrations at the Kona and Ocean View monitoring stations.

Emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors, $NO_2$ and $SO_2$, from anthropogenic sources in the Kona area are only 1% of the total emissions (anthropogenic $PM_{2.5}$, $NO_2$, and $SO_2$ + volcanic $SO_2$). HDOH argues that, "therefore, anthropogenic sources cannot be the cause of correlation in pollutant concentrations measured at the Kona and Ocean View air monitoring sites." (2013 Demonstration, Section 4, pp. 55-59).

HDOH presents evidence that the Halema'uma'u vent, situated at a higher elevation and further inland, appears to have a greater impact on Kona than the Pu'u O'o vent, which is situated at a lower elevation and closer to the coast. Higher annual $PM_{2.5}$ concentrations are measured at the Kona air monitoring station in 2012 and 2013 than in 2011 (2013 Demonstration, Table 4-1, Section 4). This correlates with higher $SO_2$ emissions from the Halema'uma'u vent in 2012 and 2013 than in 2011. HDOH asserts that "the higher concentration measured in 2012 and 2013 is likely attributed to larger $SO_2$ emissions from the volcano's Halema'uma'u vent."

HDOH attempted to find a surrogate monitor with similar topography and meteorology for what the Kona monitor might read in the absence of the volcano. They note that except for the Kona station, all other state monitoring sites show compliance with the annual $PM_{2.5}$ NAAQS. The Campbell Industrial Park monitor (Kapolei AQS ID: 15-003-0010) on Oahu, with larger nearby anthropogenic sources than the Kona monitor, measures annual $PM_{2.5}$ concentrations of 5.2, 7.0, and 2.8 $\mu g/m^3$ for 2011, 2012, and 2013 respectively (2013 Demonstration, Section 3.2.F, p. 43).

Based on HDOH's analysis, EPA concurs that there was a clear causal relationship between uncontrollable emissions generated from the Kilauea volcano and the exceedances measured at the Kona monitoring station.

### 6.0 Concentrations in Excess of Normal Historical Fluctuations (HF)

Pursuant to 40 CFR § 50.14(c)(3)(iv)(C), the demonstration must show that "the event is associated with a measured concentration in excess of normal historical fluctuations." There is no "bright line" or specific threshold test for this requirement, but concentrations in the high percentiles can provide supporting evidence[11].

To demonstrate that this requirement was met, HDOH provided a 14-year time series plots of $SO_2$ at the Kona, Hilo, and Pahala stations as well as a daily 1-hour $SO_2$ cumulative probability distribution. $PM_{2.5}$ data were not available on Hawaii until after the vent opened in 2008,

[11] 72 FR 13569, March 22, 2007.

therefore HDOH presents $SO_2$ data as a surrogate. Annual average $SO_2$ concentrations at Kona increased by 50% when comparing 2000-2007 and 2009-2013 and also show increases in the greater than 90$^{th}$ percentile 1-hour $SO_2$ concentrations, indicating an increase in peak concentrations. Based on HDOH's analysis, EPA concurs that the $PM_{2.5}$ concentrations measured post Halema'uma'u vent opening were in excess of normal historical fluctuations prior to the vent opening.

### 7.0 No Exceedance But For the Event (NEBF)

The NEBF demonstration is similar to and informed by the demonstration of the nRCP and CCR requirements and is expected to show that the measured concentration would have been below the applicable NAAQS without the effect of the event.

HDOH provided a summary of the analyses and information regarding both the nRCP and CCR requirements and stated that, "on the basis of the weight of evidence described above, the exceedance of the federal annual $PM_{2.5}$ standard in 2013, in the Kona area would not have occurred but for the continuous volcanic emissions from Kilauea volcano and transport of sulfate aerosols…to the Kona area." A similar statement was made for the 2011 and 2012 exceedances.

EPA considered the previously-discussed analysis of volcanic emissions coupled with $SO_2$ concentrations over time, information presented concerning concentrations measured at other $PM_{2.5}$ monitors in Hawaii near anthropogenic sources with larger emissions than found on the island of Hawaii, satellite information regarding concentrations of $SO_2$ and $NO_2$, and HDOH's analysis of emission source locations and transport pathways, and concurs that the NEBF criterion has been met.

### 8.0 Procedural Requirements

The EER at 40 CFR §50.14(c) requires that data claimed to be due to an exceptional event must be flagged in the AQS database and an initial description of the event be provided to EPA by July 1 of the year following the event. The EER at 40 CFR §50.14(c)(3)(i) requires that the State submit a demonstration to EPA within three years of the event that has been subject to public notice and opportunity for comment, and that any public comments be submitted along with the demonstrations.

HDOH flagged the events in AQS in accordance with 40 CFR §50.14. On December 11, 2013 and on July 1, 2014 HDOH submitted a package for 2011-2012 and 2013 $PM_{2.5}$ events respectively. On July 1, 2014 HDOH also sent an Addendum to the 2011-2012 Demonstration with an updated NEBF section, detailed description of air monitoring stations, and full-sized figures from the 2011-2012 Demonstration, Section 3 and Appendix A. HDOH provided an opportunity for public comment on the 2011-2012 Demonstration from December 16, 2013 to January 14, 2014. HDOH provided an opportunity for public comment on the 2011-2012 Addendum and the 2013 Demonstration from May 30, 2014 to June 30, 2014. The packages were posted on the HDOH website. No public comments were received.

Immediate public notification of NAAQS exceedances is provided on the HDOH website at http://health.hawaii.gov/cab/notification-of-exceedance-of-a-national-ambient-air-quality-

standard. Notification of the 2011-2013 exceedances of the annual $PM_{2.5}$ NAAQS were posted once the data were validated (2012-2012 Demonstration Section 1, p.2 and 2013 Demonstration, Section 1, p.2).

## 9.0 Conclusion

Documentation submitted by HDOH claims that emissions emanating from the Kilauea volcano are natural volcanic exceptional events which caused the flagged exceedances listed in this review at Appendix A, Table A-1 at the Kona station. EPA finds that the weight of the evidence submitted by HDOH is sufficient for concurrence on the flagging of the data for the monitors identified in Table A-1. These concurrences do not constitute final EPA action to exclude these data from consideration for purposes of determining the attainment status of the area. Final actions will come only after EPA completes notice and comment rulemaking on any such determinations.

## 10.0 Additional Recommendations

The following recommendations do not currently affect our concurrence on these events, but are recommended for future Exceptional Event demonstration submittals:

- Pursuant to 40 CFR §50.14(c)(3)(iv)(D), the demonstration must show that "there would have been no exceedance or violation but for the event." The weight of evidence in a demonstration does not require a precise estimate of the estimated air quality impact from the event, though that could be useful.[12] While not currently available, we recommend that HDOH follow the development of the University of Hawaii at Manoa's Volcanic Measurement and Prediction Model which could be used in the future to provide an estimate of the air quality impact of the volcano.
- In the future, we suggest HDOH modify correlation plots (e.g., 2013 Demonstration, Figure 3-2, p.28) and wind rose plot (e.g., 2013 Demonstration, Figure 3-8, p. 34) to improve readability by increasing the font size, line weight and tick lengths, as well as remove extraneous text.

[12] 72 FR 13570, March 22, 2007.

## Appendix A

Table A-1. Days flagged for exclusion for each quarter in 2011-2013 (from Appendix B of the 2011-2012 and 2013 Demonstrations)[13]

| Kona (AQS ID 150011012): 2011 and 2012 24-hr $PM_{2.5}$ Flagged Data | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2011 | | 2012 | | | | | | | |
| Q1 | µg/m$^3$ | Q1 | µg/m$^3$ | Q1 (cont'd) | µg/m$^3$ | Q2 | µg/m$^3$ | Q2 (cont'd) | µg/m$^3$ |
| 2/13/11 | 27.5 | 1/1/2012 | 16.2 | 3/20/2012 | 21.6 | 4/1/2012 | 26.5 | 5/23/2012 | 23.3 |
| 3/9/11 | 24.5 | 1/2/2012 | 20.3 | 3/21/2012 | 26.7 | 4/2/2012 | 27.0 | 5/24/2012 | 21.9 |
| | | 1/3/2012 | 16.9 | 3/22/2012 | 19.2 | 4/3/2012 | 27.5 | 5/25/2012 | 24.7 |
| | | 1/4/2012 | 17.2 | 3/23/2012 | 18.2 | 4/4/2012 | 29.3 | 5/26/2012 | 22.4 |
| | | 1/5/2012 | 20.0 | 3/24/2012 | 16.4 | 4/5/2012 | 26.5 | 5/27/2012 | 15.2 |
| | | 1/6/2012 | 17.8 | 3/27/2012 | 16.6 | 4/6/2012 | 16.9 | 5/28/2012 | 13.7 |
| | | 1/7/2012 | 18.0 | 3/28/2012 | 24.3 | 4/7/2012 | 18.4 | 5/29/2012 | 17.1 |
| | | 1/8/2012 | 20.1 | 3/29/2012 | 24.2 | 4/8/2012 | 16.0 | 5/30/2012 | 21.8 |
| | | 1/10/2012 | 16.2 | 3/30/2012 | 25.8 | 4/9/2012 | 16.4 | 5/31/2012 | 16.8 |
| | | 1/11/2012 | 22.2 | 3/31/2012 | 24.7 | 4/10/2012 | 20.1 | 6/1/2012 | 15.4 |
| | | 1/12/2012 | 18.5 | | | 4/11/2012 | 21.5 | 6/2/2012 | 15.3 |
| | | 1/13/2012 | 17.2 | | | 4/12/2012 | 21.9 | 6/3/2012 | 13.3 |
| | | 1/21/2012 | 19.5 | | | 4/13/2012 | 24.7 | 6/4/2012 | 15.5 |
| | | 1/22/2012 | 18.8 | | | 4/14/2012 | 26.9 | 6/5/2012 | 15.0 |
| | | 1/23/2012 | 16.9 | | | 4/15/2012 | 20.3 | 6/6/2012 | 13.9 |
| | | 1/25/2012 | 20.2 | | | 4/16/2012 | 18.5 | 6/7/2012 | 15.2 |
| | | 1/26/2012 | 19.0 | | | 4/17/2012 | 18.8 | 6/8/2012 | 15.7 |
| | | 1/27/2012 | 17.7 | | | 4/18/2012 | 19.4 | 6/9/2012 | 16.8 |
| | | 1/28/2012 | 17.0 | | | 4/19/2012 | 21.5 | 6/10/2012 | 17.1 |
| | | 1/29/2012 | 23.3 | | | 4/20/2012 | 15.8 | 6/14/2012 | 17.6 |
| | | 2/3/2012 | 20.2 | | | 4/21/2012 | 15.8 | 6/15/2012 | 17.7 |
| | | 2/14/2012 | 16.4 | | | 4/22/2012 | 21.5 | 6/16/2012 | 13.9 |
| | | 2/16/2012 | 17.8 | | | 4/23/2012 | 17.7 | 6/17/2012 | 14.7 |
| | | 2/17/2012 | 20.0 | | | 4/24/2012 | 21.4 | 6/18/2012 | 16.0 |
| | | 2/18/2012 | 17.7 | | | 4/25/2012 | 19.0 | 6/19/2012 | 13.7 |
| | | 2/20/2012 | 16.7 | | | 4/26/2012 | 26.4 | 6/20/2012 | 12.8 |
| | | 2/21/2012 | 18.5 | | | 4/27/2012 | 21.9 | 6/21/2012 | 13.2 |
| | | 2/22/2012 | 17.0 | | | 4/28/2012 | 32.0 | 6/23/2012 | 15.0 |
| | | 2/23/2012 | 20.3 | | | 4/29/2012 | 32.3 | 6/24/2012 | 15.7 |
| | | 2/24/2012 | 18.6 | | | 4/30/2012 | 22.9 | 6/25/2012 | 18.5 |
| | | 2/25/2012 | 22.1 | | | 5/1/2012 | 21.6 | 6/26/2012 | 14.4 |
| | | 2/26/2012 | 26.0 | | | 5/2/2012 | 20.0 | 6/27/2012 | 17.3 |
| | | 2/27/2012 | 24.1 | | | 5/3/2012 | 24.8 | 6/28/2012 | 16.2 |
| | | 2/28/2012 | 25.5 | | | 5/4/2012 | 17.9 | 6/29/2012 | 16.6 |
| | | 2/29/2012 | 16.7 | | | 5/5/2012 | 16.0 | 6/30/2012 | 22.2 |
| | | 3/1/2012 | 20.8 | | | 5/6/2012 | 17.4 | | |
| | | 3/2/2012 | 25.6 | | | 5/7/2012 | 19.6 | | |
| | | 3/3/2012 | 19.0 | | | 5/8/2012 | 18.0 | | |
| | | 3/4/2012 | 22.7 | | | 5/9/2012 | 16.2 | | |
| | | 3/5/2012 | 24.1 | | | 5/10/2012 | 14.0 | | |
| | | 3/8/2012 | 19.6 | | | 5/11/2012 | 22.5 | | |
| | | 3/9/2012 | 19.4 | | | 5/12/2012 | 23.9 | | |
| | | 3/10/2012 | 18.9 | | | 5/13/2012 | 18.3 | | |
| | | 3/11/2012 | 19.6 | | | 5/14/2012 | 16.3 | | |
| | | 3/12/2012 | 22.9 | | | 5/15/2012 | 14.5 | | |
| | | 3/13/2012 | 19.3 | | | 5/16/2012 | 19.3 | | |
| | | 3/14/2012 | 21.2 | | | 5/17/2012 | 19.7 | | |
| | | 3/15/2012 | 23.5 | | | 5/18/2012 | 17.5 | | |
| | | 3/16/2012 | 28.2 | | | 5/19/2012 | 16.8 | | |
| | | 3/17/2012 | 29.3 | | | 5/20/2012 | 16.1 | | |
| | | 3/18/2012 | 28.2 | | | 5/21/2012 | 26.6 | | |
| | | 3/19/2012 | 21.3 | | | 5/22/2012 | 26.4 | | |

[13] On December 11, 2013, HDOH submitted "Documentation for Natural Events Excluded Data, Kona Air Monitoring Station, AQS ID 15-001-1012, 2011-2012 $PM_{2.5}$ Exceedances, Final Report, December 2013" ("2011-2012 Demonstration"). On July 1, 2014, HDOH submitted "Documentation for Natural Events Excluded Data, Kona Air Monitoring Station, AQS ID 15-001-1012, 2013 $PM_{2.5}$ Exceedance, Final Report, June 2014" ("2013 Demonstration").

Table A-1 (continued).

| Kona (AQS ID 150011012): 2011 and 2012 24-hr $PM_{2.5}$ Flagged Data | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2012 Continued | | | | | | | |
| | | Q3 | µg/m$^3$ | Q4 | µg/m$^3$ | | | | |
| | | 7/1/2012 | 21.3 | 10/1/2012 | 18.2 | | | | |
| | | 7/2/2012 | 22.2 | 10/2/2012 | 17.9 | | | | |
| | | 7/3/2012 | 17.9 | 10/3/2012 | 17.2 | | | | |
| | | 7/5/2012 | 25.4 | 10/5/2012 | 16.2 | | | | |
| | | 7/6/2012 | 24.3 | 10/6/2012 | 16.9 | | | | |
| | | 7/7/2012 | 18.3 | 10/8/2012 | 16.1 | | | | |
| | | 7/8/2012 | 19.7 | 10/9/2012 | 16.9 | | | | |
| | | 7/9/2012 | 18.1 | 10/10/2012 | 19.4 | | | | |
| | | 7/10/2012 | 16.7 | 10/11/2012 | 18.1 | | | | |
| | | 7/11/2012 | 16.7 | 10/16/2012 | 16.2 | | | | |
| | | 7/17/2012 | 19.1 | 11/3/2012 | 16.2 | | | | |
| | | 7/18/2012 | 21.9 | 11/28/2012 | 19.0 | | | | |
| | | 7/19/2012 | 21.0 | 11/29/2012 | 16.5 | | | | |
| | | 7/20/2012 | 16.7 | 11/30/2012 | 19.0 | | | | |
| | | 7/21/2012 | 18.2 | 12/1/2012 | 24.0 | | | | |
| | | 7/22/2012 | 18.0 | 12/2/2012 | 16.5 | | | | |
| | | 7/26/2012 | 16.5 | 12/5/2012 | 17.5 | | | | |
| | | 8/4/2012 | 16.4 | 12/6/2012 | 18.5 | | | | |
| | | 8/15/2012 | 21.9 | 12/7/2012 | 19.8 | | | | |
| | | 8/16/2012 | 21.2 | 12/8/2012 | 16.6 | | | | |
| | | 9/16/2012 | 16.1 | 12/9/2012 | 16.3 | | | | |
| | | 9/18/2012 | 16.0 | 12/12/2012 | 17.1 | | | | |
| | | 9/30/2012 | 16.9 | 12/13/2012 | 17.4 | | | | |
| | | | | 12/15/2012 | 16.3 | | | | |
| | | | | 12/22/2012 | 16.0 | | | | |
| | | | | 12/24/2012 | 17.5 | | | | |
| | | | | 12/27/2012 | 16.0 | | | | |
| | | | | 12/28/2012 | 17.2 | | | | |

Table A-1 (continued).

| KONA (KN) 150011012: 2013 24-hr $PM_{2.5}$ Flagged Data >12.04 ug/$m^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2013 | | | | | | | |
| Q1 | µg/$m^3$ | Q1 (cont'd) | µg/$m^3$ | Q2 | µg/$m^3$ | Q2 (cont'd) | µg/$m^3$ |
| 1/1/2013 | 16.3 | 3/7/2013 | 19.0 | 4/1/2013 | 12.1 | 6/29/2013 | 16.4 |
| 1/3/2013 | 12.4 | 3/8/2013 | 20.0 | 4/3/2013 | 13.7 | 6/30/2013 | 14.9 |
| 1/4/2013 | 12.9 | 3/14/2013 | 14.0 | 4/4/2013 | 21 | | |
| 1/5/2013 | 13.0 | 3/21/2013 | 15.3 | 4/5/2013 | 22.6 | | |
| 1/6/2013 | 14.2 | 3/22/2013 | 16.5 | 4/6/2013 | 28.8 | | |
| 1/7/2013 | 16.0 | 3/24/2013 | 12.6 | 4/7/2013 | 26.5 | | |
| 1/8/2013 | 17.5 | 3/25/2013 | 12.5 | 4/8/2013 | 22.6 | | |
| 1/9/2013 | 17.2 | 3/26/2013 | 13.5 | 4/9/2013 | 17.7 | | |
| 1/10/2013 | 19.9 | 3/27/2013 | 12.2 | 4/10/2013 | 15 | | |
| 1/11/2013 | 17.2 | 3/28/2013 | 12.5 | 4/11/2013 | 20.7 | | |
| 1/12/2013 | 19.5 | 3/29/2013 | 14.4 | 4/12/2013 | 24.6 | | |
| 1/13/2013 | 16.4 | 3/30/2013 | 12.4 | 4/13/2013 | 15.8 | | |
| 1/14/2013 | 12.8 | | | 4/14/2013 | 13.7 | | |
| 1/21/2013 | 16.9 | | | 4/16/2013 | 18.9 | | |
| 1/22/2013 | 21.1 | | | 4/17/2013 | 17.4 | | |
| 1/23/2013 | 20.5 | | | 4/18/2013 | 13.3 | | |
| 1/24/2013 | 22.5 | | | 4/19/2013 | 18.5 | | |
| 1/25/2013 | 21.9 | | | 4/20/2013 | 23.3 | | |
| 1/26/2013 | 20.8 | | | 4/21/2013 | 18.5 | | |
| 1/27/2013 | 18.0 | | | 4/25/2013 | 16.1 | | |
| 2/1/2013 | 20.7 | | | 4/26/2013 | 18.3 | | |
| 2/2/2013 | 19.8 | | | 4/27/2013 | 15 | | |
| 2/3/2013 | 21.8 | | | 4/28/2013 | 16.5 | | |
| 2/4/2013 | 21.0 | | | 4/29/2013 | 14.5 | | |
| 2/5/2013 | 23.5 | | | 5/1/2013 | 19.7 | | |
| 2/6/2013 | 21.7 | | | 5/2/2013 | 20.6 | | |
| 2/7/2013 | 21.0 | | | 5/3/2013 | 17.2 | | |
| 2/8/2013 | 19.0 | | | 5/4/2013 | 12.6 | | |
| 2/9/2013 | 16.5 | | | 5/5/2013 | 12.8 | | |
| 2/10/2013 | 20.2 | | | 5/11/2013 | 13.5 | | |
| 2/11/2013 | 21.0 | | | 5/15/2013 | 14.1 | | |
| 2/12/2013 | 23.5 | | | 5/16/2013 | 14.5 | | |
| 2/13/2013 | 20.1 | | | 5/17/2013 | 13.9 | | |
| 2/14/2013 | 20.6 | | | 5/23/2013 | 12.5 | | |
| 2/15/2013 | 21.2 | | | 5/29/2013 | 12.9 | | |
| 2/16/2013 | 16.5 | | | 5/30/2013 | 13.8 | | |
| 2/17/2013 | 17.6 | | | 5/31/2013 | 13.6 | | |
| 2/18/2013 | 15.5 | | | 6/1/2013 | 13 | | |
| 2/19/2013 | 20.0 | | | 6/6/2013 | 15.8 | | |
| 2/20/2013 | 16.7 | | | 6/7/2013 | 14.5 | | |
| 2/21/2013 | 16.5 | | | 6/8/2013 | 14.8 | | |
| 2/22/2013 | 14.7 | | | 6/11/2013 | 15 | | |
| 2/23/2013 | 16.3 | | | 6/12/2013 | 16.9 | | |
| 2/24/2013 | 17.1 | | | 6/13/2013 | 12.1 | | |
| 2/25/2013 | 15.9 | | | 6/17/2013 | 13 | | |
| 2/26/2013 | 18.5 | | | 6/18/2013 | 17.7 | | |
| 2/27/2013 | 19.7 | | | 6/19/2013 | 13 | | |
| 2/28/2013 | 18.2 | | | 6/20/2013 | 12.2 | | |
| 3/1/2013 | 18.8 | | | 6/22/2013 | 13.6 | | |
| 3/2/2013 | 16.7 | | | 6/23/2013 | 14 | | |
| 3/3/2013 | 17.1 | | | 6/24/2013 | 16.5 | | |
| 3/4/2013 | 21.3 | | | 6/25/2013 | 16.2 | | |
| 3/5/2013 | 21.4 | | | 6/26/2013 | 15.4 | | |
| 3/6/2013 | 16.6 | | | 6/28/2013 | 12.7 | | |
| | | | | | | | |