



Resource Management (National Environmental Standards for Air Quality) Regulations 2004 – Regulation 16A Exceptional Circumstances

APPLICATION FORM

Before completing this form please read section 3.8 of the [2011 User's Guide to the revised National Environmental Standards for Air Quality](#).

Need more help? If you have any questions email air@mfe.govt.nz.

Please send your completed application form and all attachments to air@mfe.govt.nz.

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Air Quality NES Exceptional Circumstances
Ministry for the Environment
PO Box 10362
Wellington 6143

1. Applicant details	
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Postal address	Auckland Council, Level 22, 135 Albert Street, Private Bag 92300, Auckland 1142
2. Details of exceedance event	
Contaminant	24 Hour PM ₁₀
Date of exceedance <i>(must not be >3 months from date this application is received)</i>	6 December 2019
Relevant airshed	Auckland Urban Airshed, Auckland Rural Airshed

Monitoring station and technical specifications of monitor	<p>Penrose monitoring station (Auckland Urban Airshed) BAM PM10 Beta Gauge - FH62-C14 Make THERMO, Model FH62C14, Number E-1295, Age 12 years</p> <p>Papatoetoe monitoring station (Auckland Urban Airshed) BAM PM10 Beta Gauge - FH62-C14 Make THERMO, Model FH62C14, Number E-2057, Age 10 years</p> <p>Patumahoe monitoring station (Auckland Rural Airshed) BAM PM10 Beta Gauge - FH62-C14 Make THERMO, Model FH62C14, Number 802, Age 15 years</p>			
Summary of monitoring reading showing exceedance event	<p>Continuous PM₁₀ monitoring data at Penrose, Papatoetoe and Patumahoe stations showed elevated levels from mid-day 5 December through to afternoon 6 December. This resulted in 24-hour averages of 56 µg m⁻³ at the Penrose station, 54 µg m⁻³ at the Papatoetoe station and 58 µg m⁻³ at the Patumahoe station on 6 December. These exceeded the national 24-hour PM₁₀ standard of 50 µg m⁻³.</p> <p>See attached documentation 1 for details.</p>			
Analysis of baseline data	<p>An analysis of baseline data shows that PM₁₀ levels met the national standard at Penrose and Patumahoe stations (from 2014 to 2019) and at the Papatoetoe station (from 2018 to 2019 when data available), except for the exceedances on 6 December 2019.</p> <p>See attached documentation 3 for details.</p>			
Source speciation or other analysis	<p>See attached documentation 5.</p>			
Explanation of any previous exceedance event/s from this monitoring station in the past 5 years	<p>There was no exceedance event at Penrose and Papatoetoe stations in the past 5 years (from 2014 to 2018) and at the Patumahoe station in the past year (2018 when data available).</p> <p>See attached documentation 3 for details.</p>			
Monitoring readings covering exceedance event	<input checked="" type="checkbox"/> Attached	<input type="checkbox"/> Not attached		
3. Details of exceptional circumstances				
Exceptional circumstances leading to exceedance	<input type="checkbox"/> Localised impact on a monitor	<input type="checkbox"/> Anthropogenic extreme event	<input checked="" type="checkbox"/> Natural disaster or natural extreme event	<input type="checkbox"/> Other
Explanation of circumstances leading to exceedance event	<p>The plume of Australian dust storms and bushfires was blown to New Zealand in early December 2019. It dispersed over Auckland on 6 December 2019 and caused the PM₁₀ exceedances at Penrose, Papatoetoe and Patumahoe stations.</p> <p>See attached documentations 1 and 2 for details.</p>			

<p>Reasons why these circumstances were beyond the reasonable control of the regional council</p>	<p>The plume of Australian dust storms and bushfires, blown to Auckland from several thousand kilometres away, was beyond the reasonable control of Auckland Council, when all attempts in Australia had not extinguished the fires.</p> <p>In addition, Australian dust storms and bushfires, are considered as exceptional circumstances beyond the reasonable control of a Local Authority in the NES AQ Users' Guide (2014) (Section 3.8.1, page 45).</p> <p>See attached documentation 4 for details.</p>	
<p>Supporting evidence (eg, meterological report)</p>	<p><input checked="" type="checkbox"/> Attached</p>	<p><input type="checkbox"/> Not attached</p>

24 February 2020

Xc Shanjia

Dated

Signed

PM₁₀ exceedances and analysis

PM₁₀ is continuously monitored at nine sites in Auckland (see Figure 1.1). The Penrose site is in a central Auckland suburb, in the Auckland urban airshed, about 100m away from State Highway 1, surrounded by industrial premises and residential houses. The Papatoetoe site is in south Auckland, in the Auckland urban airshed, surrounded by residential houses and industrial premises. The Patumahoe site is in south-west Auckland, in the Auckland rural airshed. Surrounding area is used for horticulture and agriculture.



Figure 1.1. PM₁₀ monitoring sites (○) with the PM₁₀ NESAQ exceedance recorded on 6 December 2019 at (●)

Continuous PM₁₀ monitoring data at Penrose, Papatoetoe and Patumahoe stations showed elevated levels from mid-day 5 December through to afternoon 6 December (Figure 1.2). This resulted in 24-hour averages of 56 $\mu\text{g m}^{-3}$ at the Penrose station, 54 $\mu\text{g m}^{-3}$ at the Papatoetoe station and 58 $\mu\text{g m}^{-3}$ at the Patumahoe station on 6 December. These exceeded the national 24-hour PM₁₀ standard of 50 $\mu\text{g m}^{-3}$. There were also spikes of PM₁₀ levels in the afternoon on 7 December.

During this time of the year (i.e., in summer), PM₁₀ levels normally show early morning and late afternoon peaks, corresponding to road traffic rush hours. The PM₁₀ levels elevated above normal ranges from mid-day 5 December to afternoon 6 December across all nine monitoring sites (Figure 1.3), rather than the normal morning and afternoon peaks. This indicates that the sources were from outside Auckland and affected the whole region.

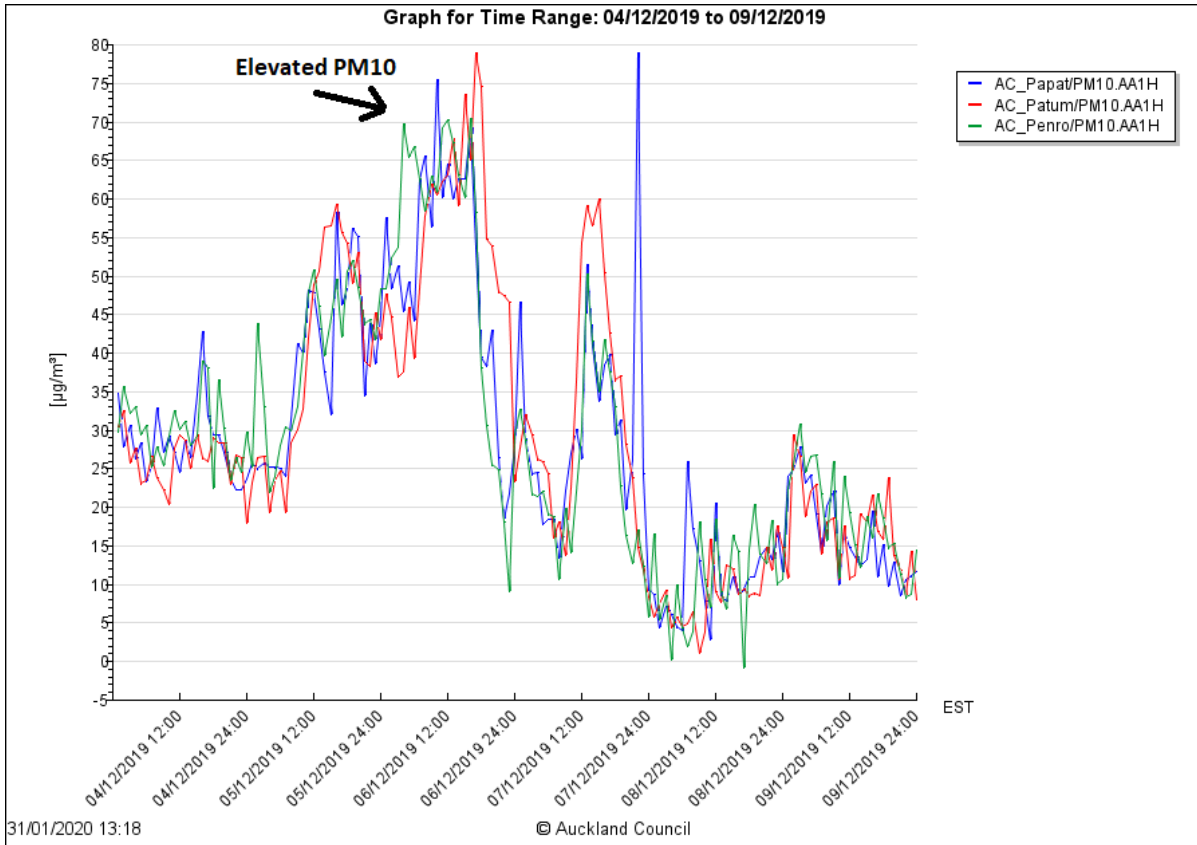


Figure 1.2. Hourly PM₁₀ levels at Penrose, Papatoetoe and Patumahoe stations from 4 to 9 December 2019.

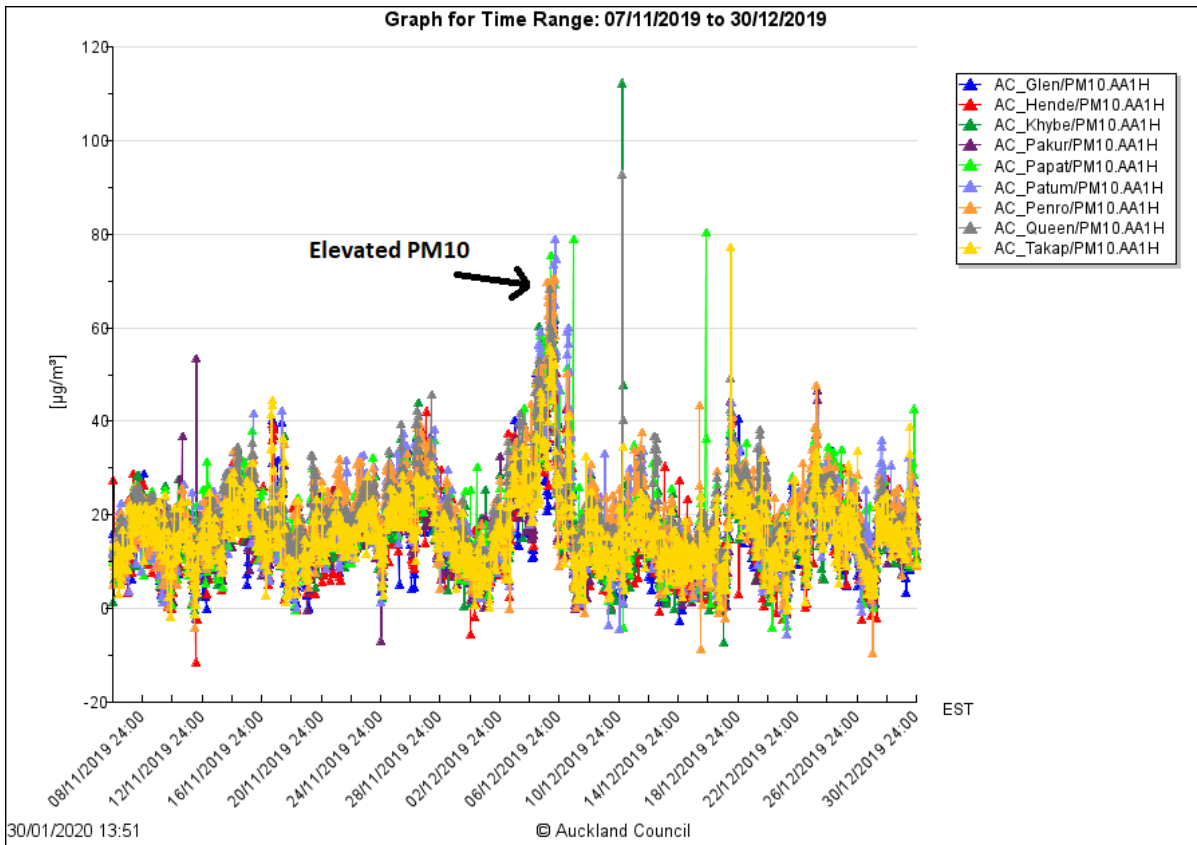


Figure 1.3. Hourly PM₁₀ levels at all nine monitoring stations from 7 November to 30 December 2019.

In summary, the elevated PM₁₀ levels leading to the exceedances show that the sources were from outside Auckland and affected the whole region. Further analysis (see the GNS report in attached documentation 5) indicates that:

- Elevated PM₁₀ levels were mainly due to contributions from coarse particles (PM_{10-2.5}), with a PM_{2.5}/PM₁₀ ratio around 30%-35%.
- Elevated PM₁₀ was largely composed of crustal material (75%), based on the compositional analysis of filter PM₁₀ samples at Penrose and Patumahoe immediately before, during and after the exceedance event.
- Satellite images visually showed events of Australian dust storms and bushfires, and their plumes blown across the Tasman Sea to New Zealand in early December 2019.

Therefore, it is believed that the plume from Australian dust storms and bushfires, dispersed to Auckland and caused the PM₁₀ exceedances at Penrose, Papatoetoe and Patumahoe stations on 6 December 2019.

Information about plumes of Australian dust storms and bushfires and the impact on Auckland's air quality

1. Australian dust storms and bushfire in early December 2019

In early December 2019, there were a number of dust storms in the Australian desert around the same time as the bushfires generated by the hot northwest winds that were fanning the flames of the bushfires. Figure 2.1 presents a satellite image for 2 December 2019 showing a large area dust storm in northern New South Wales. NASA satellite images show plumes of dust and smoke visibly dispersed from Australia to New Zealand from 3 to 7 December 2019. Figure 2.2 presents a satellite image for 6 December 2019 showing plumes of dust mixed with bushfire smoke being carried across the Tasman Sea to New Zealand.

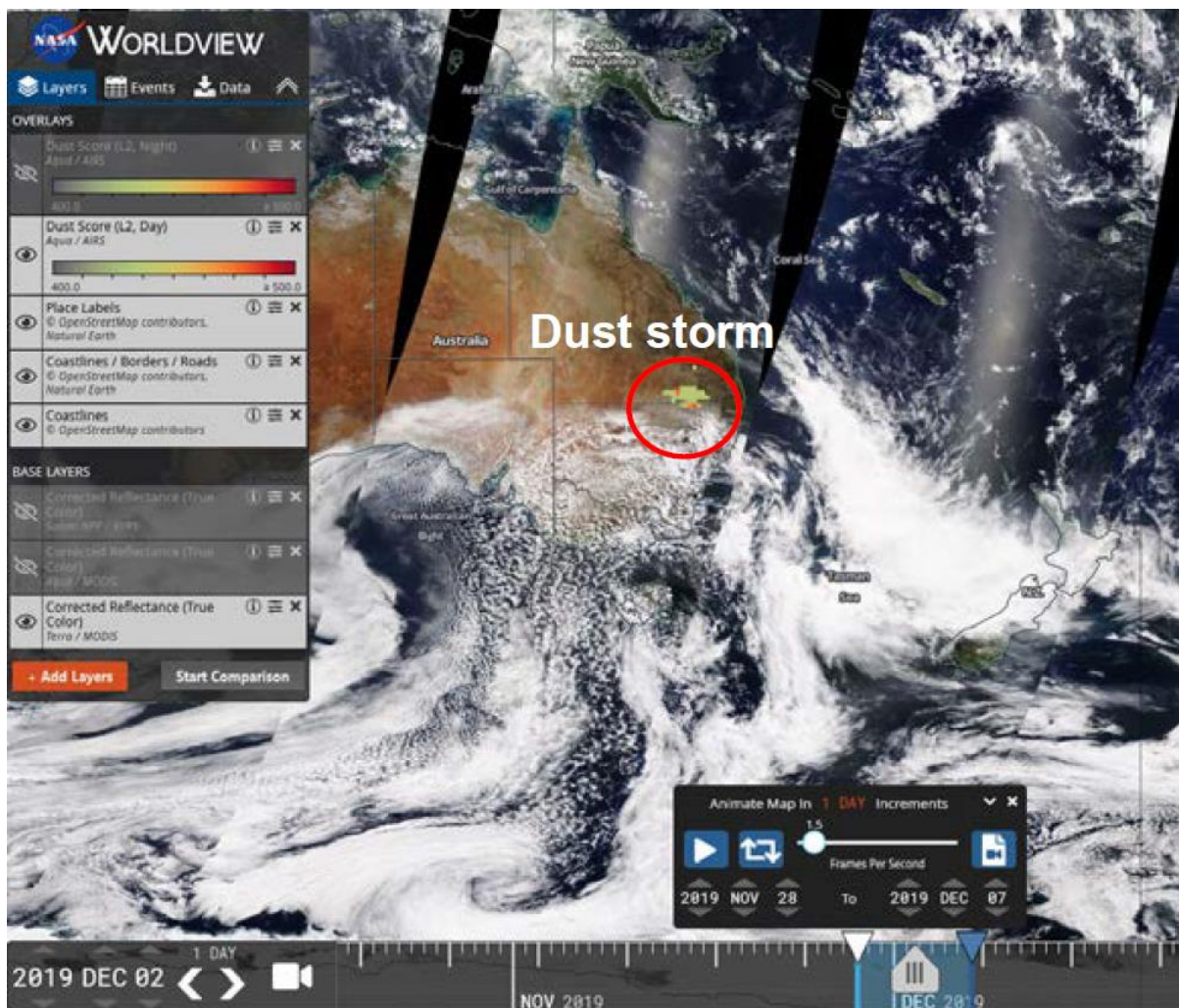


Figure 2.1. Satellite image for 2 December 2019 showing a large area dust storm in northern New South Wales. Source <https://worldview.earthdata.nasa.gov> (taken from Figure 3.8 of the GNS report in attached documentation 5)

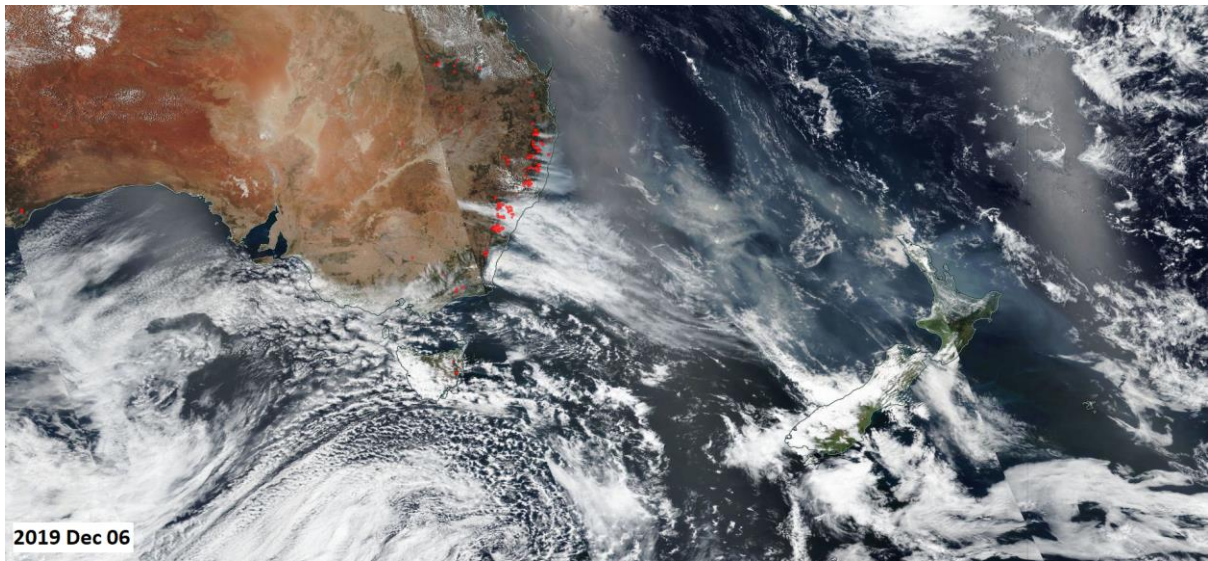


Figure 2.2. The satellite image on 6 December 2019 showing plumes of dust mixed with bushfire smoke being carried across the Tasman Sea to Auckland (<https://worldview.earthdata.nasa.gov/>).

2. Media articles: smoke and dust from Australia affect our sky lines and turn the glaciers red

From time to time, media reported the impact of smoke and dust from Australia on our sky lines.

- “*Smoke and dust from Australian wildfires turns New Zealand skies red*” (<https://www.stuff.co.nz/national/117302542/smoke-and-dust-from-australian-wildfires-affects-new-zealand>) (November 10, 2019).
- “*Australia's drought may be causing New Zealand's glaciers to turn red*” (<https://www.abc.net.au/news/2019-12-06/glaciers-in-new-zealand-turn-red-from-australian-dust/11773458>) (December 6, 2019).
- “*Australia bushfires: 'Unprecedented' plumes turn skies orange as smoke hits NZ*” (<https://www.stuff.co.nz/national/118593619/australia-bushfires-more-smoke-on-its-way-to-new-zealand>) (January 05, 2020).



Figure 2.3. Auckland's sky turned orange on January 5, 2020 as the Australian bushfires smoke rolled in. (source: <https://www.stuff.co.nz/national/118593619/australia-bushfires-more-smoke-on-its-way-to-new-zealand>).

3. Media article reported exceedances of national standards in Auckland on 6 December 2019

A Newshub article reported exceedances of national air quality standards in Auckland on Friday 6 December 2019 due to smoke from the bushfires across the Tasman Sea (<https://www.newshub.co.nz/home/new-zealand/2019/12/australia-bushfires-measurements-show-effect-on-auckland-air-quality.html>).

Recently, GNS has undertaken the composition analysis of filter PM_{10} samples at Penrose and Patumahoe immediately before, during and after the exceedance event. This data, coupled with the orange colour of the samples, analysis of meteorological and air mass transport mechanisms and reference to a previously recorded incursion (a PM_{10} exceedance event for the Auckland region on 24 and 25 September 2009 with the orange-colour filter samples due to an Australian dust storm), have led to the conclusion that the PM_{10} exceedances on 6 December 2019 at Penrose, Patumahoe and Papatoetoe sites was largely due to an Australian dust (crustal matter) event with some (lesser) impact also from Australian bushfire smoke. See the GNS report in attached documentation 5 for details.

Analysis of baseline data

The Penrose station is in the Auckland urban airshed (see Figure 1.1 of attached documentation 1). Air pollution sources are mainly from vehicle emissions, industrial activities and residential home heating (during winter).

Table 3.1 shows an analysis of PM₁₀ data from 2014 to 2019 (annual maximum and 2nd highest 24-hour averages). PM₁₀ levels met the national standard (a 24-hour average of 50 µg m⁻³) except for the exceedance on 6 December 2019 (24-hour average 56 µg m⁻³).

Table 3.1 Analysis of PM₁₀ data at the Penrose station (24-hour average, µg m⁻³).

Year	2014	2015	2016	2017	2018	2019
Maximum	36.6	38.6	40.0	30.1	38.1	55.7
2 nd highest	31.9	33.6	36.0	29.9	36.9	47.5
Valid data	98%	96%	93%	98%	98%	98%

The Papatoetoe station is in the Auckland urban airshed (see Figure 1.1 of attached documentation 1). Air pollution sources are mainly from industrial activities, vehicle emissions and residential home heating (during winter). PM₁₀ monitoring started from 13/12/2017. Table 3.2 shows an analysis of PM₁₀ data from 2018 to 2019 (annual maximum and 2nd highest 24 hour-averages). PM₁₀ levels met the national standard (a 24-hour average of 50 µg m⁻³) except for the exceedance on 6 December 2019 (24-hour average 54 µg m⁻³).

Table 3.2 Analysis of PM₁₀ data at the Papatoetoe station (24-hour average, µg m⁻³).

Year	2014	2015	2016	2017	2018	2019
Maximum	No data	No data	No data	23.5	36.2	54.0
2 nd highest	No data	No data	No data	19.9	33.6	47.7
Valid data	No data	No data	No data	5%	99%	100%

The Patumahoe station is in the Auckland rural airshed (see Figure 1.1 of attached documentation 1). Air pollution sources are mainly from rural activities. Table 3.3 shows an analysis of PM₁₀ data from 2014 to 2019 (annual maximum and 2nd highest 24-hour averages). PM₁₀ levels met the national standard (a 24-hour average of 50 µg m⁻³) except for the exceedance on 6 December 2019 (24-hour average 58 µg m⁻³).

Table 3.3 Analysis of PM₁₀ data at the Patumahoe station (24-hour average, µg m⁻³).

Year	2014	2015	2016	2017	2018	2019
Maximum	31.1	36.3	45.2	28.2	39.3	58.4
2 nd highest	30.5	32.9	29.1	27.2	29.7	39.3
Valid data	98%	94%	91%	100%	100%	100%

Overall, the analysis of baseline data shows that PM₁₀ levels met the national standard at Penrose and Patumahoe stations (from 2014 to 2019), and at the Papatoetoe station (from 2018 to 2019 when data available), except for the exceedances on 6 December 2019.

Reasons why these circumstances were beyond the reasonable control of the regional council

The exceedances at Penrose, Papatoetoe and Patumahoe stations on 6 December 2019 are considered to meet the five criteria used to assess applications for exceptional events.

1. Causation – whether the exceedance was caused by the events being assessed. The exceedance is believed to be caused by the plume of Australian dust storms and bushfires. The plume was dispersed by the westerly winds and caused the PM₁₀ exceedances at Penrose, Papatoetoe and Patumahoe stations on 6 December 2019.

2. Control –the circumstances must be beyond the reasonable control of the regional council. The plume of Australian dust storms and bushfires, blown to Auckland from several thousand kilometres away, was beyond the reasonable control of Auckland Council, when all attempts in Australia had not extinguished the fires. “Generally, unforeseeable emergencies and natural disasters cannot be prevented or controlled and are likely to satisfy this criterion”, as stated in the NES AQ Users’ Guide (2014) (Section 3.8.1, page 43).

3. Foreseeability – an assessment of whether the circumstances were able to be reasonably predicted and/or planned for. The breakout of the Australian dust storms and bushfires, intensity and scale were not able to be reasonably predicted and/or planned for by Auckland Council.

4. Frequency and likelihood of reoccurrence – an assessment of how unusual the events were. The events of dust storms or bushfires occur in Australia every year. The location, intensity, scale and timing vary year to year. “Dust storms have been occurring with record-breaking frequency in 2019, according to data collected from a citizen-science DustWatch program” (<https://www.abc.net.au/news/rural/2019-12-06/dust-storms-happening-with-record-breaking-frequency/11768306>). The scale of the bushfires in 2019/2020 is unprecedented anywhere in the world (<https://www.science.org.au/news-and-events/news-and-media-releases/statement-regarding-australian-bushfires>). Wind flows played an important role to disperse the plume of dust storms and bushfire smoke to Auckland and caused the exceedances on 6 December 2019. As shown in the analysis of baseline data (see attached documentation 3), there was no PM₁₀ exceedance due to Australian dust storms and bushfires for many years before 6 December 2019.

Dust storm and wild bushfires are considered as exceptional circumstances beyond the reasonable control of a Local Authority in the NES AQ Users’ Guide (2014) (Section 3.8.1, page 45).

5. Purpose of the RMA – whether a determination that circumstances were exceptional is consistent with the purpose of the RMA. Regional councils and unitary authorities are tasked with managing air quality under the RMA and given powers to control discharges to air from anthropogenic sources. The circumstances associated with the exceedances (i.e., the Australian dust storms and bushfires) were exceptional, unusual and beyond the reasonable control of Auckland Council. Therefore, a determination that unmanageable circumstances (i.e., the Australian dust storms and bushfires) were exceptional is consistent with the purpose of the RMA.

Attached documentation 5

Source speciation and other analysis

See another attached file: 3 GNS Science_report.pdf.