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| Standard for Smoke, Air Quality and Community Health –  Significant fires with fine particles as the primary smoke component of health concern | |
| January 2021  Version 3.0 |

The *Standard for Smoke, Air Quality and Community Health – Significant fires with fine particles as the primary smoke component of health concern* is authorised and endorsed by the following:

**Authorised by:**

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| Adj Clin Prof Brett Sutton | Dr Andrea Hinwood |
| Chief Health Officer | Chief Environmental Scientist |
| Department of Health and Human Services | Environment Protection Authority Victoria |

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| Mr Tim Eaton | Jason Heffernan |
| A/Chief Executive Officer | Chief Officer |
| Environment Protection Authority Victoria | Country Fire Authority |

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| Ken Block | Chris Hardman |
| Fire Rescue Commissioner | Chief Fire Officer |
| Fire Rescue Victoria | Forest Fire Management Victoria |

**Endorsed by:**

|  |
| --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_date\_\_\_\_\_\_\_\_\_\_\_ |
| Andrew Crisp |
| Emergency Management Commissioner |
| Emergency Management Victoria |

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Section 1 - Background

**Overview**

This *Standard for Smoke, Air Quality and Community Health – Significant[[1]](#footnote-2) fires with fine particles as the primary smoke component of health concern* (the Standard) outlines a graduated system for responding to the impacts of significant smoke events on air quality and risk management options for protecting community health.

The Victorian approach is informed by the US experience and approach for managing the public health impacts of smoke from wildfires, applied since 2007.[[2]](#footnote-3) Significant smoke events with the potential for community health impacts include fires in vegetation (bushfires), brown coal and peat bogs.

Smoke contains particles of differing size ranging from visible debris (large particles) to very small, invisible particles small enough to be breathed deeply into the lungs (fine particles). The amount and size of smoke particles is unique to each fire and depends on what is burning, at what temperature and for how long, and other factors. The exposure of communities to smoke is typically influenced by the meteorological conditions, for example, wind speed and direction and their variability.

The air quality measure for assessing the potential health risks of community exposure to smoke is PM2.5 fine particles – which have an aerodynamic diameter of less than 2.5 µm (one 30th the size of a human hair). The monitoring and estimation of PM2.5 fine particle concentrations in air informs the recommended level of cautionary advice and actions for people to follow to protect their health until air quality improves.

**Purpose**

The objectives of this Standard are to:

* Describe the air quality categories of the Victorian Environment Protection Authority (EPA), the 24-hour thresholds for smoke (as PM2.5) and air quality[[3]](#footnote-4), and the corresponding cautionary advice and actions for protecting community health during significant smoke events.
* Ensure communities receive the best available information on what to do to minimise smoke exposure to protect their health during significant smoke events.
* Protect the community from potential health impacts of smoke exposure, especially sensitive groups. Sensitive groups include those over 65 years, children 14 years and younger, pregnant women and people with heart or lung conditions, including asthma.
* Prevent sensitive groups being exposed to PM2.5 fine particle concentrations greater than 250 µg/m3 (24-hour rolling average) for three or more consecutive days. Prior to reaching this level, the Chief Health Officer will consider the need to issue an advisory strongly recommending sensitive groups consider temporarily relocating away from the smoke until air quality improves, and for others to also consider this advice.
* Support decision-making of agencies, Incident Controllers and Agency Commanders in responding to smoke events, minimising as much as possible the impacts of smoke exposure on community health.

The Standard is:

* not a step-by-step guide, however the content is operationalised in separate cross-government joint standard operating procedures, including SOP J03.18 and SOP J03.19.
* not designed for workplace-related exposures to extended smoke events for firefighters and other emergency personnel.

Most hazardous material fires have additional smoke components or emissions of health concern other than fine particles and are therefore complex fires with unique risks to responder and community health and safety. The [Protective Action Guide for Hazardous Outdoor Atmospheres](https://www.cfa.vic.gov.au/documents/20143/202133/sip_localgovt.pdf/8db1c5c9-65fc-6886-2fef-249081df5f0a) and the hierarchy for selecting community air values applies to hazardous outdoor emergencies where ‘shelter indoors’ is a first line option for protecting community health and safety during short-term (one hour to 24 hours up to a few days) hazardous materials fires.

This Standard contains important provisions for community health that will only be fully effective with the cooperation of all responders and agencies and the willingness of the community to follow cautionary advice and actions, and warnings issued by the Incident Controller.

**Strategic Intent**

Under Victoria’s emergency management arrangements, the Control agency for fire response is one of: Fire Rescue Victoria (FRV); Country Fire Authority (CFA); or the Department of Environment, Land Water and Planning (DELWP) [[4]](#footnote-5).

The Emergency Management Commissioner has an overarching management role during major emergencies to ensure that response is systematic and coordinated for both Class 1 (major fire) and Class 2 (all other except major fire and terrorism or hijack-related) emergencies.

State Emergency Management Priorities guide all decisions made during emergencies. The following priorities are relevant to fires resulting in extended smoke events:

* the protection and preservation of life is paramount. This includes the safety of emergency services personnel and safety of community members, including vulnerable community members and visitors/tourists located within the incident area.
* issuing community information and community warnings detailing incident information that is timely, relevant and tailored to assist community members make informed decisions about their safety.

The EPA is a technical support agency in Victoria’s emergency management arrangements. Technical advice is provided before, during and after emergencies to the Control agency and to relevant support agencies, government, industry and the community through scientific, engineering and regulatory expertise on the environmental and public health impacts of pollution and waste.

During emergencies, EPA response activities include:

* The provision of advice to the Control agency on risks to the environment and human health, and the practical measures to reduce environmental and public health impacts of pollution and waste from the emergency and response activities
* In cooperation with the Control agency, provision of advice to the community on the harmful effects of pollution and waste and recommended actions to protect human health.
* Supporting the Chief Health Officer with expert advice on the risks of pollution and waste to human health as required.

During emergencies involving significant pollution consequences, the Chief Environmental Scientist supports the Emergency Management Commissioner, State Controller and Chief Health Officer with expert advice on the risks to the environment and human health, and practical measures to protect the environment and public health from impacts of pollution and waste[[5]](#footnote-6). For significant smoke events this can be at any stage, particularly when air quality is in the Very Poor or Extremely Poor range (refer *Appendices 3 and 4*).

When air quality is heavily impacted, the Chief Health Officer can recommend additional health protection advice or cautionary actions for the community (as required). Advice is provided to the Incident Controller (and Regional/State Controllers) on the need for, and timing of, a strong recommendation for sensitive groups to consider temporary relocation until air quality improves. Relief and recovery arrangements are available to support people in sensitive groups who decide to temporarily relocate, if required.

**Governance and Authorising Framework**

The Standard is authorised in accordance with the statutory responsibilities of the:

* Emergency Management Commissioner and Emergency Management Victoria (EMV) with respect to responder and community safety under the *Emergency Management Act 2013*
* Heads of Victorian fire agencies in relation to Control responsibilities in fire response
* Chief Executive Officer, EPA with respect to the statutory objective of the *Environment Protection Act 2017 to* protect human health and the environment by reducing the harmful effects of pollution and waste
* Chief Health Officer with respect to the protection of public health in accordance with the *Public Health and Wellbeing Act 2008.*

The following legislation, other arrangements and documents inform this Standard:

* *Emergency* Management *Act 1986*; *Emergency Management Act 2013*
* Victorian State Emergency Management Plan (September 2020) and role statements for: Emergency Management Commissioner and EMV; DHHS; EPA; FRV and CFA
* State Health Emergency Response Plan (2017)
* State Smoke Framework 2016
* US EPA Wildfire Smoke (A Guide for Public Health Officials) Revised 2019
* JSOP3.18 - Incident Air Monitoring for Community Health (July 2017)
* JSOP3.19 - Managing Significant Community Exposure to Fine Particles and Carbon Monoxide in Smoke from Fires (December 2020)
* JSOP J04.01 Public Information and Warnings (October 2020)

**Latest review (December 2020)**

This Standard supersedes the *Community Smoke, Air quality and Health Standard – Air quality assessment, forecasting and health protection messaging for particulate matter* Version 2, December 2019 (DHHS, EPA and EMV) and earlier versions.

The Standard has been amended in line with:

* Changes approved by Australian Health Protection Principal Committee (AHPPC) in 2020 to achieve national consistency including:
  + Category names for air pollution levels
  + PM2.5 concentration ranges for 1-hour average and 24-hour rolling average air quality categories
  + Public health messaging for 1-hour PM2.5 air quality categories
  + Public health messaging for forecasted 24-hour PM2.5 air quality categories

Superseded documents are listed in *Appendix 7*.

Section 2 – Fine particles in smoke and community health

**Fine particles, smoke exposure and health**

Smoke from fires is a mixture of particles, also known as particulate matter, water vapour and gases, including carbon monoxide, carbon dioxide, hydrocarbons and other organic chemicals, nitrogen oxides, and other compounds depending on the type of fire.

Particulate matter (PM) in smoke can range in size from large, visible debris down to very small, invisible particles. It is the size of PM that determines how deep the particle can travel into the lungs when inhaled.

PM bigger than 10 micrometres in diameter generally only go as far as the nose and throat before being removed by the body. This particle size irritates the eyes, nose and throat and irritant effects usually resolve once smoke exposure ceases.

PM smaller than 10 micrometres in diameter or PM10 inhalable particles may settle in the bronchi and lungs when breathed in. PM less than 2.5 micrometres in diameter or PM2.5 respirable fine particles can penetrate deep into the lungs (ie into the gas exchange regions – alveolus).

The likelihood of health effects occurring from exposure to PM10 particles, or PM2.5 fine particles depends on: the concentration in air and duration of exposure; the person’s age; the level of activity (rest, running, heavy exertion); whether a person has existing medical conditions (particularly cardiorespiratory disease or asthma); and other individual susceptibilities.

The following groups are most sensitive to being exposed to particles and particularly exposure to PM2.5 fine particles during smoke events:

* unborn babies up to children of 14 years of age
* people over 65 years of age
* people with pre-existing heart or lung conditions, including asthma
* smokers
* pregnant women.

A contemporary summary of the evidence of health effects of smoke from vegetation fires (wildfires/bushfires) and impacts on population health is available in the USEPA publication, [Wildfire Smoke – A Guide for Public Health Officials (2019)](https://www.airnow.gov/sites/default/files/2020-10/wildfire-smoke-guide-revised-2019_0.pdf).

Although PM10[[6]](#footnote-7) particles and PM2.5 fine particles can be inhaled and affect health to different degrees, PM2.5 is the preferred air quality indicator for air monitoring and assessment of the potential health impacts of community exposure to smoke.

Section 3 – Ambient (outdoor) air quality monitoring for fine particles

**Air quality standards**

The National Environment Protection Measure (Ambient Air Quality) (NEPM AAQ 2016) outlines national reporting standards for the management of ambient air quality in each state or jurisdiction. Standards are set to be protective of population health from day to day (ie common) air pollutants including particulate matter (PM2.5, PM10) carbon monoxide, sulfur dioxide and nitrogen dioxide.

These standards are adopted in the Victorian State Environment Protection Policy (Ambient Air Quality) (to 30 June 2021) and the future Environmental Reference Standard (intended to commence from 1 July 2021).

These air quality standards are applied to air measurements collected at permanent, fixed-location air monitoring stations in locations across the state.

For PM2.5[[7]](#footnote-8)fine particles,the daily and annual Victorian air quality standards are:

* 25 µg/m3 averaged over 24 hours
* 8 µg/m3 averaged over one year.

Ambient air monitoring trends for PM are influenced by many sources including, but not limited to roads, vehicle emissions, industries, dust and smoke from personal wood heater use as well as vegetation fires (burn-offs, planned fuel reduction burns or bushfires).

**EPA AirWatch and ambient air quality**

The EPA AirWatch webpage provides real-time (ie continuous) hourly reporting of common air pollutants including PM10 and PM2.5.

The air quality category at each EPA monitoring station is based on the highest hourly measurement for a common air pollutant. Hourly values inform general health messaging for air quality over the five air quality categories: which are Good, Fair, Poor, Very Poor and Extremely Poor. The associated health protection advice and recommended actions are in *Appendix 2*.

For PM2.5, the EPA AirWatch webpage reports 24-hour averages in addition to 1-hour values.

Health protection advice and recommended actions for forecasted 24-hour PM2.5 air quality categories are in *Appendix 3.*

Section 4 – Community air quality guideline values and air monitoring during extended smoke events

**Graduated smoke advisory system**

Fine particles are ‘non-threshold’ pollutants, which means no threshold has been identified below which no damage to health is observed[[8]](#footnote-9).The higher the level of population exposure, the greater likelihood of sensitive groups experiencing health effects. When exposure levels are very high, health effects may occur in everyone.

Smoke events can affect outdoor air quality and sometimes this can be at levels higher than day-to-day measurements.

This Standard is informed by an internationally recognised graduated smoke advisory system developed in the US[[9]](#footnote-10), which links monitored PM2.5 levels to corresponding cautionary health protection advice and recommended actions for the community to follow until air quality improves. At each increasing air quality category, recommended health protection messages and actions change to reflect an increase (or decrease) in potential public health risk during an extended smoke event.

In Victoria, PM2.5, 24-hour averages and hourly real-time (ie continuous) measurements are available on EPA’s [AirWatch](https://www.epa.vic.gov.au/for-community/airwatch) service.

The US EPA approach to fine particles and smoke and the Victorian air quality category system (ie smoke advice and action levels) is summarised in *Appendix 1*.

**Air quality monitoring and** **smoke advice for PM2.5 (24-hour)**

In addition to hourly air monitoring on EPA AirWatch from the standard monitoring sites, an Incident Controller (or Agency Commander) may request that EPA deploy Incident Air Monitoring equipment to assess the impacts of smoke on air quality to understand the level of potential community health effects[[10]](#footnote-11).

Air monitoring requires interpretation and scientific advice to determine the impacts on current air quality and to also forecast air quality over the next day or days. Trends and predictions in atmospheric fine particle concentrations over time are also important for decision making.

The concentration of fine particles in smoke fluctuates continuously with frequent spikes depending on local conditions such as wind speed and direction. This occurs during vegetation fires such as planned fuel reduction burns (ie short-term smoke events) or bushfires (ie short-term to long-term events).

Information issued to the community is based on both measured air quality data and forecast weather and fire data, which includes:

* measured results, some adjusted to 24-hourly averages from monitoring
* forecast models
* fire behaviour – both actual and forecast
* the predicted duration of prevailing conditions and elevated PM2.5 levels
* the size of the affected community
* the proximity of the community to the fire.

Average values (rolling 24-hour averages) are considered against the air quality categories (Good, Fair, Poor, Very Poor, Extremely Poor) with an understanding of the likely duration of the fire, the fire suppression strategy and predictions of weather conditions.

Air monitoring (from standard EPA monitoring sites and EPA incident monitoring) informs the air quality category and corresponding level of cautionary health protection advice and actions for people to follow to minimise impacts on their health – refer to*Appendices 3 and 4*. The latter is issued by the Incident Controllers and other agencies. AirWatch displays health messaging for hourly PM2.5 levels.

Section 5 - Key considerations - risk management decisions to protect public health

Tactical decisions during fires require sufficient time to communicate and implement on a whole-of-population basis.

During fires that threaten life, property and community safety such as bushfires, the Incident Controller also makes informed, balanced judgements in tactical decision-making about smoke.

Tactical options for protecting community health from fine particles during smoke events include:

* Informing the community of the level of impact on air quality and the potential health risks associated with exposure to fine particles
* Ongoing provision of advice and cautionary actions people can take to protect their health and the health of those in their care (eg advice to reduce activity and minimise exposure)
* Steps to protect all sensitive groups such as closing some or all schools or early childhood centres and temporary relocation, and rescheduling outdoor events in smoke-affected areas
* Balancing the need for sensitive groups to temporarily relocate against the potential risks associated with moving highly vulnerable people out into smoky conditions (eg high-level aged care residents).

For Incident Controllers (or Agency Commanders) and other agencies, the most important reference point in this Standard is *Appendix 4* (ie Air quality categories for PM2.5 (rolling 24-hr) and cautionary health protection advice/actions).

**Concept of operations**

In Victoria, the following Joint Standard Operating Procedures operationalise the intent of this Standard:

* [*SOP J03.18 - Incident Air Monitoring for Community Health*](https://files-em.em.vic.gov.au/public/JSOP/SOP-J03.18.pdf) (July 2017)
* [*SOP J03.19 - Managing Significant Community Exposures to Fine Particles and Carbon Monoxide in Smoke from Fires*](https://files-em.em.vic.gov.au/public/JSOP/SOP-J03.19.pdf) (December 2020)

Joint Standard Operating Procedures apply to any event that generates significant or prolonged smoke where PM2.5 fine particles are the primary health hazard and detail the arrangements between relevant agencies for providing air-quality monitoring and the process for communicating health protection messages to smoke impacted communities.

Section 6 - Community information

**Information about smoke and health for the community**

Before a major smoke event occurs, the following information is available to help people plan:

* EPA provides air quality information and general health protection advice about smoke and health at: <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>
* The EPA AirWatch webpage provides real-time (continuous) air monitoring and health messages at: <https://www.epa.vic.gov.au/for-community/airwatch>
* Better Health Channel also provides community information on smoke and health: [www.betterhealth.vic.gov.au/](http://www.betterhealth.vic.gov.au/)

People with heart or lung conditions, including asthma should maintain the treatment plan advised by their doctor. For example, making sure asthma is well-managed before a smoke event is something that can reduce the impacts of smoke exposure on individuals’ health.

**Community actions to protect health during smoky conditions**

Members of the community must remain vigilant during any emergency to receive and act on emergency warnings and information in a timely way.

During a major smoke event people can get information from:

* VicEmergency website at: [www.emergency.vic.gov.au/respond/](http://www.emergency.vic.gov.au/respond/) for cautionary advice and recommendation actions to protect health during any emergency.
* The EPA AirWatch webpage provides real-time (continuous) air monitoring and health messages at: <https://www.epa.vic.gov.au/for-community/airwatch>
* EPA provides air quality information and general health protection advice about smoke and health at: <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>
* Better Health Channel also provides community information on smoke and health: [www.betterhealth.vic.gov.au/](http://www.betterhealth.vic.gov.au/)

Advice for people with pre-existing health conditions should include:

* Anyone with a heart or lung condition should follow the treatment plan advised by their doctor and keep at least a five-day supply of medication available.
* Anyone with asthma should ensure their personal asthma plan is up-to-date and followed.
* Anyone who needs to leave their home due to a fire or very smoky conditions should take prescriptions and medication with them.

Advice to help people prepare for and avoid smoky conditions should include:

* whenever possible, stay out of the smoke
* stay indoors when practical and safe to do so (ie if smoke is due to bushfire)
* close all doors and windows
* keep cool in hot weather – use a fan or air conditioner (split system) and keep hydrated
* seal gaps under doors or around windows and wall vents with towels, blankets or plastic
* avoid other sources of indoor air pollution (such as smoking, burning candles, using woodstoves, or stirring up fine dust by sweeping or vacuuming)
* consider bringing pets inside away from the smoke or heat
* take the opportunity during breaks in smoky conditions to air out homes to improve indoor air quality
* when safe to do so, take air-conditioned breaks at a local community library, shopping centre or respite centre under circumstances where homes become too smoky or hot to be comfortable.

When air quality is impacted by smoke everyone should consider the following:

| **Advice and cautionary actions for community exposure to smoke** |
| --- |
| **Everyone should minimise the time spent in smoky conditions whenever practical to do so.**  People over 65 years, children 14 years and younger, pregnant women and those with existing heart or lung conditions, should **reduce** prolonged or heavy physical activity. Where possible (and not under direct threat from bushfires), also **limit** the time spent outdoors.  Anyone with a heart or lung condition should take their medication as prescribed. Asthmatics should follow their personal asthma action plan, continue to take preventer medication as prescribed and keep reliever medication on hand.  If you or anyone in your care is experiencing symptoms that may be due to smoke exposure, call [NURSE-ON-CALL](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on [1300 60 60 24](tel:%201300%2060%2060%2024) or seek medical advice.  Anyone experiencing difficulty breathing or tightness in the chest should seek urgent medical assistance – call [000](tel:%20000).  For regular updates on what you should do, listen to your local emergency radio station or visit [www.emergency.vic.gov.au](http://www.emergency.vic.gov.au/) |

During smoky conditions, and if air quality monitoring data is not available nearby, an approximate self-assessment of air quality based on visibility (ie how far you can see clearly) can be done to inform health protection actions. Refer to *Appendix 5* for the air quality self-assessment guide.

# Appendix 1 – Australian and US EPA approaches for fine particles in smoke

The US EPA Air Quality Index (AQI) for air quality is on a normalised scale from 0 to 500, where an AQI of 100 is equivalent to the US national 24-hour PM2.5 standard of 35 µg/m3.

AQI categories reflect the degree of deviation (i.e. increasing PM2.5 levels) from the 24-hour ambient air quality standard. At each increasing AQI category, recommended health protection messages and actions change to reflect an increase (or decrease) in potential public health risk during an extended smoke event.

**Table 1: Comparison of US and Australian action levels for fine particles in outdoor air during extended smoke events**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **US Environmental Protection Agency**  **(US EPA)** | | **US EPA action level**  **24-hr average**  **PM2.5 (µg/m3)** | **Percentage of**  **US EPA**  **national 24-hr ambient air quality standard**  **PM2.5** | **Australian**  **Air Quality Categories**  **24-hr average PM2.5 (µg/m3)**  **Smoke advice and action levels** | |
| **Health-based category** | **Air Quality Index Value)** |
| Good | 0 - 50 | At or below ≤ 35  US air quality standard | ≤ 100 | Good | 0 - 12.5 |
| Moderate | 51 - 100 | Fair | 12.5 - 25 |
| Unhealthy for Sensitive Groups | 101 - 150 | 35.5 - 55.4 | 100 - 156 | Poor | 25 - 50 |
| Unhealthy | 151 - 200 | 56 - 150 | 156 - 424 | Very Poor | 50 - 150 |
| Very Unhealthy | 201 - 300 | 151 - 250 | 424 - 705 |
| Hazardous | 301 - 500 | 251 - 500 | 706 - 1408 | Extremely Poor | >150 |
|  | Extremely Poor  Chief Health Officer involved | >250 |

# Appendix 2 – Health messages for PM2.5 1-hour averages

**Standard message**: Follow directions from emergency services and advice from your doctor at all times.

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **PM2.5**  **1-hour average (µg/m3)** | [**Sensitive groups**](https://www.epa.vic.gov.au/for-community/monitoring-your-environment/about-epa-airwatch/air-pollution-sensitivity)  People with a heart or lung condition, including asthma; people over the age of 65; infants and children 14 years and younger; pregnant women | **Everyone else** |
| **Good** | 0-25 | No change needed to your normal outdoor activities. | No change needed to your normal outdoor activities. |
| **Fair** | 25-50 | Reduce outdoor physical activity if you develop symptoms like cough or shortness of breath.  Consider closing windows and doors until outdoor air quality is better.  Follow the treatment plan recommended by your doctor.  If you are concerned about symptoms call [Nurse on Call](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on 1300 60 60 24 or see your doctor.  If you or anyone in your care has trouble breathing or tightness in the chest, call 000 for an ambulance. | No change needed to your normal outdoor activities. |
| **Poor** | 50-100  The air is likely to be dusty or smoky | Avoid outdoor physical activity if you develop symptoms like cough or shortness of breath.  When indoors, close windows and doors until outdoor air quality is better.  Follow the treatment plan recommended by your doctor.  If you are concerned about symptoms call [Nurse on Call](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on 1300 60 60 24 or see your doctor.  If you or anyone in your care has trouble breathing or tightness in the chest, call 000 for an ambulance. | Reduce outdoor physical activity if you develop symptoms like cough or shortness of breath. |
| **Very poor** | 100-300  The air is very dusty or smoky | Stay indoors as much as possible with windows and doors closed until outdoor air quality is better.  If you feel that the air in your home is uncomfortable, consider going to a place with cleaner air (such as an air-conditioned building like a library or shopping centre) if it is safe to do so.  Actively monitor symptoms and follow any treatment plan recommended by your doctor.  If you are concerned about symptoms call [Nurse on Call](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on 1300 60 60 24 or see your doctor.  If you or anyone in your care has trouble breathing or tightness in the chest, call 000 for an ambulance.  Listen to your local [emergency radio station](https://www.abc.net.au/local/) or visit [Emergency Vic](http://www.emergency.vic.gov.au/respond) for advice | Avoid outdoor physical activity if you develop symptoms like cough or shortness of breath.  When indoors, close windows and doors until outdoor air quality is better  If you are concerned about symptoms call [Nurse on Call](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on 1300 60 60 24 or see your doctor.  If you or anyone in your care has trouble breathing or tightness in the chest, call 000 for an ambulance.  Listen to your local [emergency radio station](https://www.abc.net.au/local/) or visit [Emergency Vic](http://www.emergency.vic.gov.au/respond) for advice |
| **Extremely poor** | > 300  The air is very dusty or smoky | Stay indoors with windows and doors closed until outdoor air quality is better and reduce indoor activity.  If you feel that the air in your home is uncomfortable, consider going to a place with cleaner air (such as an air-conditioned building like a library or shopping centre) if it is safe to do so.  Actively monitor symptoms and follow the treatment plan recommended by your doctor.  If you are concerned about symptoms call [Nurse on Call](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on 1300 60 60 24 or see your doctor.  If you or anyone in your care has trouble breathing or tightness in the chest, call 000 for an ambulance.  Listen to your local [emergency radio station](https://www.abc.net.au/local/) or visit [Emergency Vic](http://www.emergency.vic.gov.au/respond) for advice | Stay indoors as much as possible with windows and doors closed until outdoor air quality is better.  If you feel that the air in your home is uncomfortable, consider going to a place with cleaner air (such as an air-conditioned building like a library or shopping centre) if it is safe to do so.  If you are concerned about symptoms call [Nurse on Call](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on 1300 60 60 24 or see your doctor.  If you or anyone in your care has trouble breathing or tightness in the chest, call 000 for an ambulance.  Listen to your local [emergency radio station](https://www.abc.net.au/local/) or visit [Emergency Vic](http://www.emergency.vic.gov.au/respond) for advice |

\* The messaging in red font may need to be excluded or adjusted based on COVID-19 advice.

# Appendix 3 – 24-hour PM2.5 forecast categories and messaging

**Standard message**: Follow directions from emergency services and advice from your doctor at all times.

**Optional messaging:** (to be displayed on a day that is forecast to be poor or worse):

If you are concerned about symptoms call [Nurse on Call](https://www.ambulance.vic.gov.au/campaigns/nurse-on-call/) on 1300 60 60 24 or see your doctor.

If you or anyone in your care has trouble breathing or tightness in the chest, call 000 for an ambulance.

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **PM2.5**  **24-hour average (µg/m3)** | [**Sensitive groups**](https://www.epa.vic.gov.au/for-community/monitoring-your-environment/about-epa-airwatch/air-pollution-sensitivity)  People with a heart or lung condition, including asthma; people over the age of 65; infants and children 14 years and younger; pregnant women | **Everyone else** |
| **Good** | 0 - 12.5 | No need to change your plans. | No need to change your plans. |
| **Fair** | 12.5 - 25 | There may be periods when air quality is worse in your area. Check <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>for changes to air quality throughout the day and follow the advice provided. | No need to change your plans. |
| **Poor** | 25 - 50 | Air quality is forecast to be poor.  Check <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>for changes to air qualitythroughout the day and follow the advice provided.  Consider actions to reduce your exposure:   * reconsider planned outdoor activity. * close windows and doors before air quality gets worse and open them when it improves.   Follow your health management plan recommended by your doctor. | Air quality is forecast to be poor.  Check <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>for changes to air qualitythroughout the day and follow the advice provided. |
| **Very poor** | 50 - 150 | Air quality is forecast to be very poor.  Check <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>for changes to air quality throughout the day and follow the advice provided.  Plan to take actions to reduce your exposure:   * Avoid outdoor activity. * Close windows and doors and open them when air quality improves. * Consider spending time in spaces where there is cleaner air (such as an air-conditioned building like a library or shopping centre).   Actively monitor symptoms and follow your health management plan recommended by your doctor. | Air quality is forecast to be very poor.  Check <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>for changes to air quality throughout the day and follow the advice provided.  Consider actions to reduce your exposure:   * Reconsider planned outdoor activity * Close windows and doors and open them when air quality improves. |
| **Extremely poor** | > 150 | Air quality is forecast to be extremely poor.  Check <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke> for changes to air quality throughout the day and follow the advice provided.  Plan to take actions to reduce your exposure:   * Stay indoors. * Close windows and doors and open them when air quality improves. * Consider spending time in spaces where there is cleaner air (such as an air-conditioned building like a library or shopping centre). * If practical, consider temporarily going to areas where the air quality is forecast to be better.   Actively monitor symptoms and follow your health management plan recommended by your doctor. | Air quality is forecast to be extremely poor.  Check <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/smoke>for changes to air qualitythroughout the day and follow the advice provided.  Plan to take actions to reduce your exposure:   * Stay indoors as much as practicable. * Close windows and doors and open them when air quality improves. * Consider spending time in spaces where there is cleaner air (such as an air-conditioned building like a library or shopping centre). |

\* The messaging in red font may need to be excluded or adjusted based on current COVID-19 related advice.

# Appendix 4 – Cautionary health protection advice and actions for prolonged smoke events for PM2.5[[11]](#footnote-12) (rolling 24-hr)

| **Air Quality Categories[[12]](#footnote-13)** | **PM2.5**  **(24 hour) µg/m3**  **(rolling average)** | **Potential health effects without following advice or actions** | **Cautionary health protection advice and actions based on 24-hr rolling average PM2.5 for prolonged smoke events** |
| --- | --- | --- | --- |
| **Good** | 0-12.5 |  | None |
| **Fair** | 12.5-25 |  | None |
| **Poor** | 25-50 | **Increasing likelihood** of health effects in sensitive groups: People over 65, children 14 years and younger, pregnant women and those with existing heart or lung conditions.  Health effects **may occur** in some people not in sensitive groups | People in sensitive groups should **minimise or avoid** prolonged or heavy physical activity and where possible, **limit** the amount of time spent outdoors. Those with a health condition, follow the treatment plan as prescribed.  Everyone else should **reduce** prolonged or heavy physical outdoor activity if they develop health effects. |
| **Very Poor** | 50-150 | **Significant aggravation** of health effects in sensitive groups.  **Significant increase** in respiratory and other effects in everyone else | People in sensitive groups should **avoid** outdoor physical activity (exercise) and where possible, stay indoors. Those with a health condition, follow the treatment plan as prescribed and seek medical advice if symptoms worsen.  Everyone else should **minimise or avoid** prolonged or heavy physical outdoor activity and where possible spend more time indoors.  Consider spending time in spaces where there is cleaner air (such as an air-conditioned building like a library or shopping centre.  Consider closing some or all schools or early childhood centres and rescheduling outdoor events (such as concerts and competitive sports) until air quality improves. |
| **Extremely Poor** | >150 | **Serious aggravation** of health effects in sensitive groups.  **Serious risk** of respiratory effects in everyone else. | Sensitive groups consider **temporarily relocating** to stay with a friend or relative living outside the smoke-affected area. If this is not possible and there is no direct threat from bushfires, **stay indoors** and keep **activity levels as low as possible**  Everyone should **avoid** outdoor physical activity as much as possible and where possible, stay indoors (if not under threat from bushfires). Consider spending time in spaces where there is cleaner air (such as an air-conditioned building like a library or shopping centre.  Anyone with symptoms should seek medical advice and take regular breaks out of smoky conditions.  Consider closing some or all schools or early childhood centres and reschedule outdoor events (such as concerts and competitive sports) until air quality improves. |
| **Extremely Poor**  **(Chief Health Officer)** | >250[[13]](#footnote-14) | As for Extremely Poor (above) | Cautionary health advice/actions are for above (Extremely Poor)  **and**  if PM2.5 levels (ie rolling 24-hour average) are predicted to be or they are at or above 250µg/m3 for two consecutive days and are predicted to continue at or above this level, sensitive groups are **strongly recommended** to **temporarily relocate** away from smoky conditions until there is a sustained improvement in air quality.  Everyone else should **consider** this advice. |

# Appendix 5 - Air quality self-assessment guide

Visual assessments are based on the USEPA visual range and actions to take to reduce smoke exposure during smoky conditions. They may be useful in deciding what to do when local air is smoky and air quality monitoring information is not available.

This procedure provides good estimates of visibility only when:

* It is daylight hours (avoid sunset and sunrise)
* The relative humidity is less than 65% because moisture in the air (fog or rain) reduces visibility
* Focusing on dark objects (black is better than green).

Follow this procedure:

1. When there is no smoke (or fire) in the landscape, identify landmarks that are visible from home. Look for dark landmarks (such as buildings, sheds or large trees) that are at distances of 1.5, 2, 5, 10 kilometres.
2. Each of these distances corresponds to an air quality category in the table below and associated health protection advice and recommended actions in Appendix 2.
3. Use the landmarks as a guide to estimate air quality in the area when smoke is present.
4. When the landmark can no longer be clearly seen, air quality has deteriorated. Visibility is the distance to the nearest landmark that is just obscured (hard to see clearly) due to smoky conditions.

| **Air Quality Category** | **Landmark visible from home** |
| --- | --- |
| **Good** | >20km |
| **Fair** | >10 km and <20 km |
| **Poor** | >5 km and <10 km |
| **Very Poor** | >1.5 km and < 5 km |
| **Extremely Poor** | 1.5km or less |

# Appendix 6 – Development of the Standard

The integrated smoke, air quality and public health protection messaging approach in this Standard was originally developed by the Chief Health Officer (DHHS) and EPA Victoria during the 2006/2007 summer bushfires - informed by California’s[[14]](#footnote-15) experience in managing the public health impacts of wildfire smoke.

During the 2006/2007 summer, approximately 1.2 million hectares were burnt by extended, large area bushfires in the North East and Gippsland (Bairnsdale). Local air quality and Melbourne metropolitan areas were affected by smoke. Smoke from large fires in Tasmania and King Island also impacted Victoria’s air quality[[15]](#footnote-16).

Further information in relation to the 2006/07 summer bushfires includes:

* EPA publication 1187 (December 2007) *Air Quality During the 2006-07 Victorian bushfires*
* EPA Information Bulletin 1200 (January 2008) *Bushfires and Air Quality*
* Dennekamp et al (2015) *Forest fire smoke and out-of-hospital cardiac arrests in Melbourne,* Australia*: a case crossover study.* Environmental Health Perspectives*, 123 (10)* 959 – 964
* Haikerwal et al (2016) *PM2.5 exposure during a prolonged wildfire period and emergency department visits for asthma.* Respirology 21 85-94.

Until 2014, Victoria’s experience of large-area fires with extended smoke events were major bushfires with PM10 fine particles as the smoke component of health concern.

In 2014, a bushfire travelled into an open cut brown coal field at the Hazelwood Mine in Morwell. This fire and the learnings and recommendations from this extended smoke event informed many changes including creation of the State Smoke Framework for Victoria, this Standard, and Joint (all agency) Standard Operating Procedures to ensure the community receives the best available information in the best possible way to help to protect their health. The approach and science behind this Standard (Version 1 – December 2015) underwent independent expert review in 2015.

Unprecedented fires burned across south-eastern Australia over the 2019-20 bushfire season. About one-fifth of the NSW and Victorian section of Australia’s temperate broadleaf and mixed forests biome burned. Following these bushfires, enHealth (standing committee to AHPPC) worked with jurisdictional health and environment agencies to develop nationally consistent air quality categories and public health messaging for 1-hour and 24-hour air quality categories for fine particles in smoke.

The January 2021 version of the Standard has been updated in line with the following endorsements made by AHPPC in 2020:

* 1-hour categories for PM2.5 (300 µg/m3 being the 1-hour concentration threshold for the Extremely Poor air quality category) and public health messaging on 30/9/20
* 24-hour categories for PM2.5 (150 µg/m3 being the 24-hour (rolling average) concentration for the Extremely Poor air quality category) on 27/10/20; and
* 24-hour PM2.5 forecast public health messaging on 8/12/20.

These are consistent with recommendations 14.1 and 14.2 in the Royal Commission into [*National Natural Disaster Arrangements Report*](https://naturaldisaster.royalcommission.gov.au/)*,* 28 October 2020 (sometimes referred to as the Bushfires Royal Commission).

# Appendix 7 – Superseded versions

This January 2021 Standard Version 3.0 supersedes the following documents:

* *Standard for Smoke, Air Quality and Community Health – Significant fires with fine particles as the primary smoke component of health concern* Version 2.0 November 2019 (DHHS, EPA, MFB, CFA, FFMV, EMV)
* *Community smoke, air quality and health standard* *– Air quality assessment, forecasting and health protection messaging for particulate matter* Version 1, December 2015 (DHHS, EPA, EMV)
* *Community smoke, air quality and health protocol* July 2015 (DHHS, EPA, EMV)
* *Rapid deployment of air quality monitoring for community health guideline* 2015 *(*EPA, DHHS, EMV)
* *Hazelwood coal mine fire PM2.5 health protection protocol* 2014 (Department of Health/EPA)
* *Bushfire smoke, air quality and health protocol* 2014 (Department of Health/EPA 2014)

# Appendix 8 - References

**International:**

Adetona O et al (2016), *Review of the health effects of wildland fire smoke on wildland firefighters and the public*, Inhalation Toxicology, 28(3): 95-139.

JR Balmes (2018), *Where there’s Wildfire, There’s Smoke*, The New England Journal of Medicine 378 (1): 881-883

WE Casio (2018), *Wildland fire smoke and human health*, Science of the Total Environment 624: 586-595

Royal Society of Chemistry UK (2016) *Toxicology, Survival and Health Hazards of Combustion Products (Issues in Toxicology)*, ed. D Purser, R Maynard and J Wakefield.

US Environment Protection Agency (August 2019, EPA-452/R-19-901) - *Wildfire smoke: A guide for public health officials (Revised 2019)*.US Environmental Protection Agency, U.S Forest Service, U.S. Centers for Disease Control and Prevention, California Air Resources Board,

**Australian:**

*National Environment Protection (Ambient Air Quality) Measure*, Australian Department of the Environment and Energy, 25 February 2016

**Victorian:**

*VicEmergency website at:* [*www.emergency.vic.gov.au/respond/*](http://www.emergency.vic.gov.au/respond/)

*EPA Victoria Air Watch website:* [*www.epa.vic.gov.au/for-community/airwatch*](http://www.epa.vic.gov.au/for-community/airwatch)

*State Environment Protection Policy (Ambient Air Quality),* EPA Victoria (July 2016) until 1 July 2020, followed by the Victorian Environmental Reference Standard *(in progress)*

*State Smoke Framework*, Version 3.0, EMV (November 2016)

[JSOP J03.18 - *Incident Air Monitoring for Community Health*, EMV](https://files-em.em.vic.gov.au/public/JSOP/SOP-J03.18.pdf) (July 2017)

[JSOP J03.19 - *Managing Significant Community Exposures to Fine Particles and Carbon Monoxide in Smoke from Fires*, EMV](https://files-em.em.vic.gov.au/public/JSOP/SOP-J03.19.pdf) (December 2020)

[JSOP J04.01](https://files-em.em.vic.gov.au/public/JSOP/SOP-J04.01.pdf) *[Public Information and Warnings](https://files-em.em.vic.gov.au/public/JSOP/SOP-J04.01.pdf)* (October 2020)

EPA Publication 1187 (December 2007) *Air Quality During the 2006-07 Victorian bushfires* at [www.epa.vic.gov.au](http://www.epa.vic.gov.au)

EPA Information Bulletin 1200 (January 2008) *Bushfires and Air Quality* at [www.epa.vic.gov.au](http://www.epa.vic.gov.au)

Dennekamp et al (2015) *Forest fire smoke and out-of-hospital cardiac arrests in Melbourne, Australia: a case crossover study.* *Environmental Health Perspectives, 123 (10)* 959 – 964

Haikerwal et al (2016) *PM2.5 exposure during a prolonged wildfire period and emergency department visits for asthma.* Respirology 21 85-94.

1. Significant fires – are fires that are complex, or large-scale, or prolonged, or produce large amounts of smoke or emissions, or a combination of any of these factors, and that may affect community health. In this Standard, ‘prolonged’ means *medium* term (days to a few weeks) to *long term* (greater than a few weeks). In comparison, *short term* is one hour to 24 hours up to a few days. [↑](#footnote-ref-2)
2. Appendix 1 Australian and US EPA approaches for fine particles in smoke. [↑](#footnote-ref-3)
3. 3 Appendix 4 Cautionary health protection advice and actions for prolonged smoke events for PM2.5 (rolling 24-hr). [↑](#footnote-ref-4)
4. From July 2020 onwards, Fire Rescue Victoria encompassed CFA and Metropolitan Fire Brigade (MFB). [↑](#footnote-ref-5)
5. Environment Protection Authority Victoria Role Statement ([SEMP Roles and Responsibilities)](https://www.emv.vic.gov.au/responsibilities/semp/roles-and-responsibilities/printable-documents)  [↑](#footnote-ref-6)
6. The US EPA recommends that when PM10 measurements are only available during smoky conditions, it can be assumed that the PM10 is composed primarily of fine particles (PM2.5), and therefore the air quality categories and associated cautionary statements and advisories for PM2.5 may be used. [↑](#footnote-ref-7)
7. For PM10 the air quality standards applied in Victoria are 50 µg/m3 averaged over 24 hours and 20µg/m3 averaged over one year. [↑](#footnote-ref-8)
8. [https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health (accessed 30 December 2020](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)) [↑](#footnote-ref-9)
9. This is described in the [US Wildfire Smoke: A Guide for Public Health Officials (revised 2019)](https://www.airnow.gov/sites/default/files/2020-10/wildfire-smoke-guide-revised-2019_0.pdf) and informed by the Technical Assistance Document for the Reporting of Daily Air Quality – the Air Quality Index (AQI) (USEPA, September 2018). [↑](#footnote-ref-10)
10. JSOP3.18 - Incident air monitoring for community health (July 2017) [↑](#footnote-ref-11)
11. Note this table will be updated following completion of further work by enHealth to achieve national consistency in public health advice for consideration by health agencies for prolonged smoke events. [↑](#footnote-ref-12)
12. The Extremely Poor category has a threshold point for consideration of additional health protection advice and actions by the Chief Health Officer. [↑](#footnote-ref-13)
13. Refer to JSOP 3.19 for implementation. [↑](#footnote-ref-14)
14. Victoria, Australia and California have a shared history of major bushfire events [↑](#footnote-ref-15)
15. Bushfire smoke, air quality and health protocol (Department of Health and EPA Victoria 2014). [↑](#footnote-ref-16)