



CONDITIONS ON 7 FEBRUARY

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In the months leading up to 7 February 2009 a large amount of information about bushfires was made available to the Victorian public. Media releases, events and press conferences aimed at increasing public awareness of the extreme fire risk were released from November 2008 to January 2009. The coverage intensified in late January and early February.¹

Between 30 January and 5 February the Premier made a number of statements and gave public briefings asking Victorians to be vigilant in the light of the ‘tinder dry’ conditions throughout most of the state. A joint press release issued by the Country Fire Authority, the Department of Sustainability and Environment and the Metropolitan Fire and Emergency Services Board on 4 February warned of the continuing fire threat and the forecast extreme conditions for 6 and 7 February. At a press conference on 5 February the CFA and DSE issued a number of press releases warning of the severe conditions expected for 7 February. A plan DSE prepared for the period described the state as ‘predisposed to a catastrophic event’.²

In anticipation of the extreme weather conditions, the CFA and DSE Chief Fire Officers held a teleconference with key operational staff on 5 February. They emphasised the need for pre-formed task forces and pre-positioned incident management teams. The CFA Chief Officer envisaged that ‘the predesignated [incident control centres] would be ready to operate in what [the CFA] call a warm start or a hot start—that is, there are people there, all the facilities, the equipment is up and running and tested’.³

1.1 FACTORS AFFECTING FIRE BEHAVIOUR

A fire’s behaviour is determined by a combination of topography, fuel load, climate and weather.⁴

1.1.1 CLIMATE AND WEATHER

The Commission discussed climate and weather conditions in detail in its interim report. In summary, it noted the following:

- Central Australia has warmed by between 1.5 and 2.0°C during the past century.⁵
- In the 12 years to 2009 Victoria experienced warmer than average temperatures. The decade 1999–2009 was the warmest recorded in the 154 years of record keeping.⁶
- During the same period there was very little above-average rainfall: most of Victoria received either below-average or well-below-average rainfall. Some areas—notably those around Melbourne and in western Victoria—had received their lowest rainfall on record.⁷
- The early part of 2009 was exceptionally dry, the rainfall for January being below average to record low, especially in central and western Victoria.⁸
- During the final week of January Victorians experienced one of the most severe and prolonged heatwaves in south-east Australia’s recorded history. In much of central, southern and western Victoria, maximum temperatures reached their highest levels since at least 1939. Melbourne had three consecutive days over 43°C—a record.⁹
- The dry weather continued during February, and most of the western half of Victoria continued to experience well-below-average rainfall.¹⁰

Dr Mark Williams, Director of the Victorian Regional Office of the Bureau of Meteorology, concluded that ‘the whole of south-east Australia [had] suffered a severe and protracted drought which [was] without historical precedent’.¹¹ Figure 1.1 shows the extent of rainfall decline in Victoria between 1 February 1997 and 31 January 2009.

Figure 1.1 Rainfall deciles – Victoria, 1 February 1997 to 31 January 2009



Source: Exhibit 22 – Statement of Williams, Annexure 1.¹²

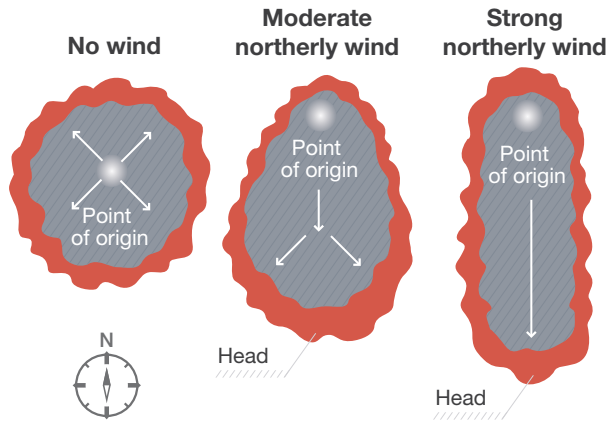
Prolonged drought combined with heatwave conditions are strong predictors of severe bushfire risk, the former leading to increases in plant deaths and the thinning of plant materials and the latter increasing the combustibility of plants. Warming temperatures and reduced rainfall diminish the available moisture and place greater stress on vegetation. When fires do occur these conditions generally mean that burning will be more severe.¹³

Weather is a major factor affecting the spread of a fire. The four basic elements of fire weather are air temperature, relative humidity, wind speed and direction, and atmospheric stability.¹⁴ Just before 7 February these elements were at their most extreme in Victoria, some setting records for the state.

Wind is one of the critical factors affecting the shape, direction, rate of spread and behaviour of a fire. It supplies oxygen to encourage burning; removes ash, smoke and moisture from fuels in the area; and angles the flames, hot air and gases over the unburnt fuel ahead of the fire, pre-heating the fuel and helping the fire spread more rapidly. Wind can also lift burning materials such as bark and other embers and carry them ahead of the main fire, where spot fires can start. The stronger the wind, the faster and further a fire will spread.¹⁵

Hot northerly or north-westerly winds are an indicator of the potential for critical fire weather. These winds originate from high pressure systems that enter the east of the Australian continent and travel across Australia, through the Central Australian desert. Here they dry out and eventually lead to a south-westerly wind change.¹⁶ Figure 1.2 shows the effect of wind strength on a fire's shape.

Figure 1.2 The effect of wind strength on fire shape



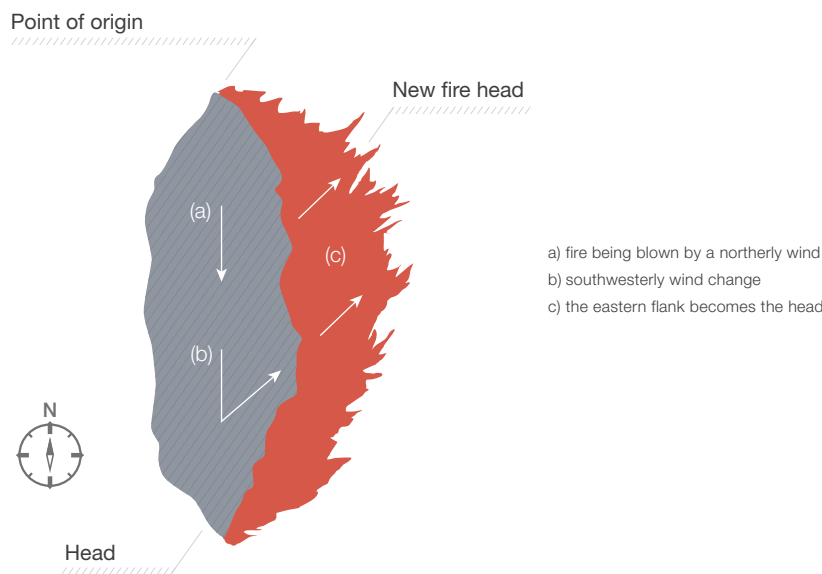
Source: Exhibit 269 – Statement of Russell, Annexure 1.¹⁷

A wind change is a common feature of bushfire disasters in Victoria. It usually turns the flank of a long, narrow, cigar-shaped fire pushed by strong northerly winds into a fire front several kilometres wide. Dr Kevin Tolhurst, a senior lecturer in fire ecology and management, noted that typically about 80 per cent of the total area burnt is burnt after a south-westerly wind change.¹⁸ Mr Russell Rees, CFA Chief Officer, explained:

Wind direction propels the growth of a fire. Changes in wind direction can rapidly increase the size of [a] fire, and the risks to firefighters and the general community. In Victoria hot dry winds often come from the north and northwest and are often followed by a southwest wind change. In this situation ... the side of a fire can quickly become a much larger fire front.¹⁹

Figure 1.3 shows the effect on a fire of a change in wind direction.

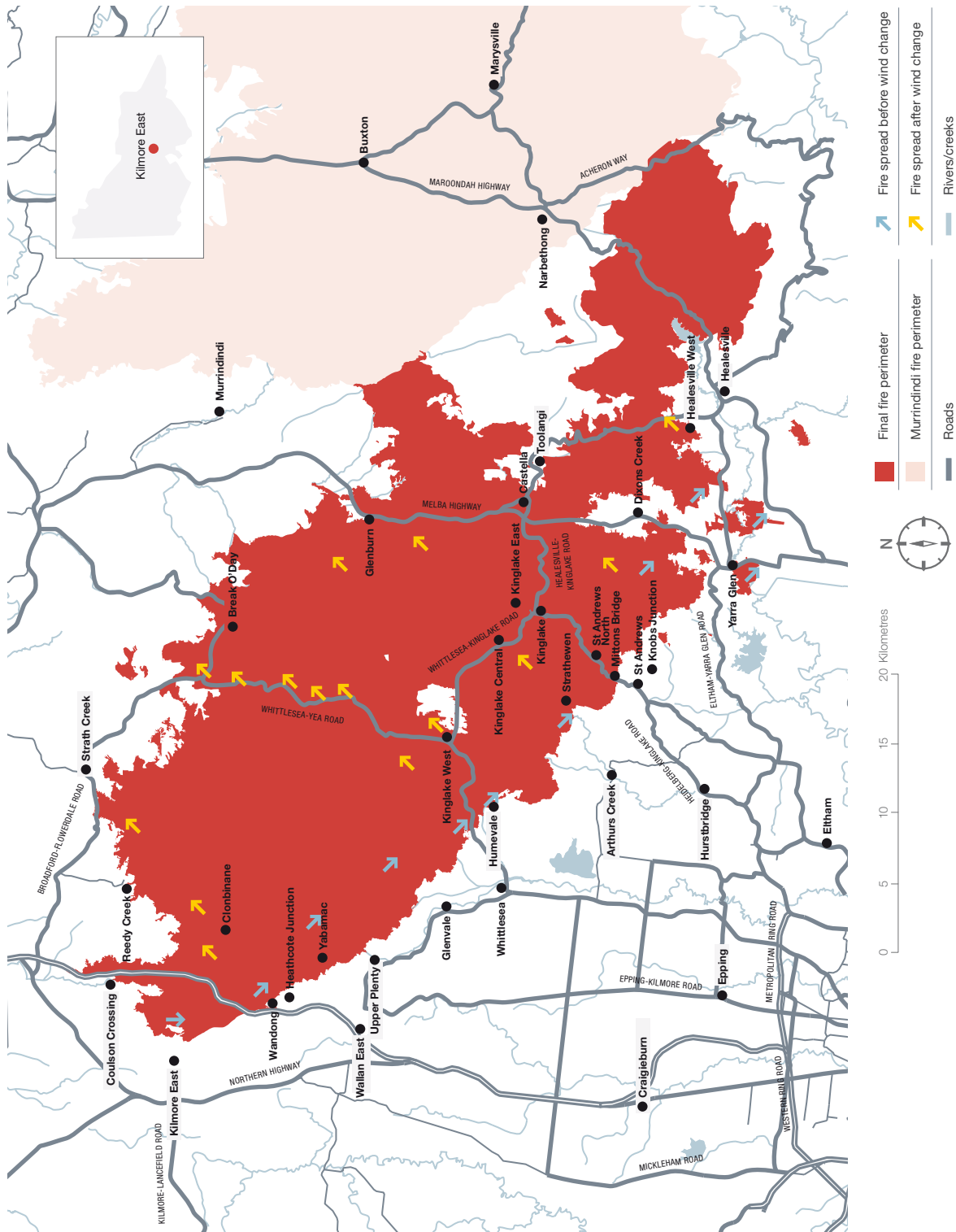
Figure 1.3 The effect of a change in wind direction on fire shape



Source: Exhibit 269 – Statement of Russell, Annexure 1.²⁰

Figure 1.4 shows the effect on the Kilmore East fire of the change in wind direction on 7 February.

Figure 1.4 The effect on the Kilmore East fire of the change in wind direction on 7 February



Source: Exhibit 994 – Kilmore East Fire – Fire Spread Map.²¹

The passage of a cold front was a feature of the Ash Wednesday fires in 1983.²² As detailed in the next section, conditions were similar on 7 February 2009, when a south-westerly wind change passing across the state led to enormous destruction.

7 February

On the evening of 6 February a high-pressure system in the Tasman Sea was causing very hot air flows from the north-west over much of Victoria. A cold front that extended across southern Western Australia to the south of the Great Australian Bight was moving east, towards Victoria.²³

On 7 February temperatures rose quickly, and gale-force north-westerly winds began to reach ground level. By 11:00 temperatures in much of the state were near 40°C and relative humidity was already below 20 per cent. Both the Forest Fire Danger Index and the Grassland Fire Danger Index were above 50 by 11:00 in western and central Victoria and were approaching 50 in the rest of Victoria. In the afternoon temperatures rose to well above 40°C in many parts of the state and relative humidity dropped to below 10 per cent.²⁴

In the far south-west a strong, gusty south-westerly wind change arrived at about 12:30, causing temperatures to drop and relative humidity to increase. By this stage many places had reported if not their hottest day on record then their hottest for February. Numerous all-time site records were set—including in Melbourne, where the temperature reached 46.4°C, exceeding the previous record of 45.6°C set on Black Friday (13 January 1939). The new record was also 3.2°C above the previous February record, which had been set in 1983.²⁵

The fires in Victoria's Western District—albeit on a smaller scale—heralded the arrival of forecast wind changes:

- At Pomborneit–Weerite the south-westerly change arrived at approximately 14:15.²⁶
- At Coleraine a south-westerly change arrived at the fire ground at 14:32.²⁷
- At Horsham the fire on the town's eastern flank had largely been contained by the time the south-westerly change arrived, at 16:29, but it was recognised that had the flank of this fire not been secured the township could well have been threatened.²⁸

The strong, gusty south-westerly change moved eastwards at about 30 kilometres an hour.²⁹ Its impact was felt progressively across the state:

- at Mt Porndon, near Pomborneit, at 14:15³⁰
- at Coleraine at 14:32³¹
- at Horsham at 16:29³²
- at Yarra Glen and Whittlesea between 17:40 and 18:10³³
- at Jeeralang between 17:45 and 18:15³⁴
- at Kinglake and Kinglake West between 17:50 and 18:20³⁵
- at Callignee between 17:55 and 18:25³⁶
- at Carrajung Lower between 18:00 and 18:30³⁷
- at Glenburn between 18:15 and 18:45³⁸
- at Narbethong between 18:15 and 18:45³⁹
- at Redesdale at 18:35⁴⁰
- at Flowerdale between 18:30 and 19:00⁴¹
- at Bendigo about 18:45⁴²
- at Marysville between 18:35 and 19:05⁴³
- at Taggerty between 19:15 and 19:45⁴⁴
- at Myrtleford between 23:25 and 23:55⁴⁵
- at Mudgegonga and Stanley between 23:45 and 00:15⁴⁶
- at Bruarong between 23:55 and 00:25.⁴⁷

Figure 1.5 shows the wind change's progress.

Figure 1.5 Progress of the wind change, 7 February 2009



Source: Exhibit 22 – Statement of Williams, Annexure 1.⁴⁸

Fire danger ratings were extreme ahead of the wind change, and in central parts of the state they did not drop significantly until up to an hour after the change.⁴⁹ For some fires the fire intensity increased substantially after the wind change, and fire behaviour became erratic, particularly in eastern parts of the state. The fires changed direction rapidly, taking many residents and firefighters by surprise.⁵⁰

It was after the wind change that the Beechworth–Mudgegonga, Kilmore East, Murrindindi and Churchill fires were at their most savage. In each case the north-eastern flank of the fire became a much wider firefront of much greater intensity. For example, the Beechworth–Mudgegonga flank became a 32-kilometre front heading north-east towards cleared agricultural land, forest and Mudgegonga; the Kilmore East firefront moved north and north-east in a series of running ‘tongues’, up slopes and gullies and through the settlements of Kinglake, Pheasant Creek and Kinglake West; the full force of the Murrindindi fire was unleashed on the township of Marysville; and the Churchill fire burned progressively through Hazelwood North, Hazelwood South, Koornalla, Traralgon South, Callignee, Callignee South, Callignee North, Jeeralang, Jeeralang North, Devon, Yarram and Carrajung South and on to the Won Wron State Forest.⁵¹

1.1.2 TOPOGRAPHY

For every 10 degrees of slope, the speed of a fire travelling uphill doubles. In south-eastern Australia areas facing north and north-west are generally drier, aiding fire spread. Hills and gullies can channel fire and promote spotting over considerable distances.⁵²

Much of Victoria's natural environment is hilly or mountainous. Many parts of the state contain mountain ranges, among them the Otway Ranges in the south, the Grampians in the west and the Great Dividing Range in the east. In these areas much of the land is forested, and the high fuel loads can sustain ferocious fires. Some of the fires of 7 February burned over grassland and stubble, but those that were most intense burned through forest, including in areas that usually remain moist year round.

1.1.3 THE FUEL LOAD

In this context 'fuel' is a generic term used to describe anything that combusts and provides energy for a fire. In a bushfire the available fuel is generally vegetation—leaves, bark, twigs, branches and trees—and it influences the way a fire behaves and travels. It varies in its type, size, quantity, arrangement and moisture content.⁵³

On 7 February the characteristics of the fuel—in particular its extreme dryness, the total amount available, and its presentation on the forest floor—favoured ignition and promoted fires' initial spread.⁵⁴

The Beechworth–Mudgegonga, Kilmore East and Murrindindi fires all burned through areas rich in mountain ash; such forests are characterised by tall trees and an often dense understorey of other species. This forest, with its very high fuel load, is usually moist but, because of the exceptionally dry conditions leading up to 7 February, it had a very low moisture content. Additionally, ash trees have long ribbons of bark that hang loosely from the trunk and branches; they ignite easily during a fire and can be transported long distances by convection columns.⁵⁵

The rate of spread and final perimeter of the Beechworth–Mudgegonga fire were significantly moderated by previous prescribed burning. The rate of spread of the Kilmore East fire in some places was appreciably slowed by previous prescribed burning. Fuel-reduction burns are also thought to have inhibited the run of the Bendigo fire.⁵⁶

1.1.4 FIRE BEHAVIOUR

'Fire behaviour' covers everything a fire does—the way the fire ignites, develops and grows; the characteristics of the flame front; and all other phenomena associated with a moving fire.⁵⁷

The Commission discussed fire behaviour in some detail in its interim report. In summary, it noted the following:

- The weather conditions leading up to 7 February, and the combination of drought and heatwave conditions, led to greater fuel combustibility and volatile fire behaviour.⁵⁸
- The fires varied in type and behaviour
 - classic grass and scrub fires in western Victoria⁵⁹
 - conventional bushfires progressing from surface fires to crowning in tree tops, with flame heights of 30 metres and more⁶⁰
 - fires igniting as a result of spotting, with directly sighted spot fires 13–14 kilometres ahead of firefronts and some spot fires estimated to be up to 35 kilometres ahead⁶¹
 - some spot fires close to the main firefront burning back towards the fire against the prevailing wind because of the convection forces.⁶²
- Some fires did not progress in a neat, linear movement across the countryside. Instead there was a chaotic series of surging fires, with spontaneous spotting kilometres ahead of the firefronts. The spot fires started further fires, which in turn burnt some areas well ahead of the main firefront. The main firefront subsequently passed over the areas affected by the spot fires, burning any remaining fuel. This process led to the fires progressing even faster than they otherwise would have.⁶³

- Although the flanks of some fires could be identified and in some cases secured, the heads of the fires were largely hidden by smoke and generated a very loud roar. Their location was not readily known until the fires were seen burning houses, properties and other parts of the landscape.⁶⁴

The day was expected to be—and in every respect turned out to be—a day of destructive and intense fire conditions.

Conditions were conducive to long-distance spotting. Very dry fuels and strong surface winds resulted in intense fire behaviour and the development of very strong convective activity capable of lifting firebrands such as burning bark very high in the convection column. Strong upper air winds provided the mechanism for transporting burning bark downwind for many kilometres.⁶⁵

Spotting was an important factor in the spread of the Kilmore East fire. It facilitated fire spread from one ridge top to the next in areas of broken terrain and carried the fire across sparse eaten-out pasture or, at higher elevations, across areas where grass was less than fully cured and might otherwise have arrested the fire's spread.⁶⁶

Although they varied in their size and impacts, the most severe of the 7 February fires the Commission examined shared the following features:

- rapid fire spread following ignition, which responding crews could not contain in rural and forested areas
- fires crowning in forested areas, meaning they became impossible for ground crews to control
- convection columns being generated above the fires
- extensive spotting as a result of fuel type, weather conditions and topography
- the wind change altering the direction of fire spread, causing a flank of the fire to become an extended fire front.

1.2 WAS THE DAY UNPRECEDENTED? WERE THE FIRES?

A number of witnesses sought to excuse failings on 7 February by saying that the fires or the day, or both, were 'unprecedented'.⁶⁷ For the reasons that follow the Commission considers neither the day nor the fires to have been unprecedented.

A panel of six experts in land and fuel management gave evidence before the Commission, in part discussing whether the fires of 7 February 2009 were unprecedented. At the time none agreed with the proposition that the fires themselves were unprecedented; some acknowledged, however, that the weather conditions, or the fires' subsequent impact, had not previously been equalled.⁶⁸ Mr Phil Cheney, an honorary research fellow with CSIRO, said:

I certainly don't think they are unprecedented in even our recent history over the last 50 years. What we are doing better is making more measurements and making more observations ... So I think there is very little evidence to say these were unprecedented.⁶⁹

Professor Ross Bradstock, another member of the panel and professor at the Centre for Environmental Risk Management of Bushfires at the University of Wollongong, said:

I don't think these fires are unprecedented, at least in historical time, in terms of size and intensity and pattern in the landscape. I guess the thing you could add to that, though, is we must appreciate that land use and people and property are very different now than they were in 1939 or even 1983 and so you have to take that into account in understanding consequence of this event.⁷⁰

Having told the Commission 'the conditions that we saw on 7 February were as extreme as we have ever seen them', Dr Tolhurst went on to say, as part of the panel discussion, 'I don't consider it unprecedented'.⁷¹

Dr Malcolm Gill, a visiting fellow at the Australian National University, said that use of the term 'unprecedented' depended on the criteria adopted and that, although some weather indicators reached record levels, the size of the fire did not.⁷²

When asked whether the fires were unprecedented, Mr Jerry Williams, former US Forest Service National Director of Fire and Aviation, who has extensively researched 'megafires' in the United States, replied:

In terms of size of fire, we [United States] have always had big fires and Australia has always had big fires. In terms of impact, though, this was unprecedented. I think you have to use that word when you talk about one of the largest, if not the largest, civil disaster in the country's history.⁷³

Mr Richard Alder, an experienced fire manager who is now General Manager of the National Aerial Firefighting Centre, travelled by plane over the fires on 7 February. He commented on seeing the Kilmore East fire from the air near Wandong:

I'd regard the fire behaviour as certainly the upper edge of what I've observed before. I can't say it was unprecedented. I think I've probably observed fire spread as rapidly as that but not for as sustained a period—for shorter periods.⁷⁴

Separately, the Commission also heard evidence from Professor John McAneney, from Risk Frontiers at Macquarie University, who has been associated with recent research arising from major fires in the past. He was asked for his opinion as to whether the 2009 fires were unprecedented: 'In my view they weren't. Every time we have these big fires there will be a report saying the conditions were unprecedented, and they probably are in the lifetime of the person making the observations!'⁷⁵

The study he was collaborating on had normalised statistics on housing density and population and loss of homes and deaths since 1926. This study had revealed that the 2009 fires were fourth on the list of property loss and second in terms of the ratio of lives lost to property lost. The highest ratio for property loss was in 1939 and the highest ratio for fatalities to property loss was in 1926. He mentioned reports of 2,000 structures burnt in the 1898 fires and that the 1851 fires burnt about 5 million hectares—'a huge part of Victoria'.⁷⁶

While acknowledging these expert opinions, the Commission can readily understand the observations of people actually on the ground fighting the fires on the day. Nearly all witnesses who had seen the fires first hand said the fires' behaviour was beyond their experience. Even experienced firefighters who had been active on Ash Wednesday, in 1983, said they had not seen anything that compared with the fires of 7 February 2009. People did not expect the severity of the fire they witnessed.⁷⁷

Witnesses—both firefighters and lay witnesses—compared the sound of the approaching fire to that of jumbo jets or steam trains. One even likened the sound to that of an artillery battle. Mr Andrew Lawrence, a CFA volunteer who fought the Churchill fire, described the sound as being 'so loud it was impossible to hear anyone speaking'.⁷⁸

Witnesses described the fires as 'swirling vortexes', with flame heights of up to 100 metres. The fires seemed to create their own wind, which some described as 'cyclonic'. Mr Leigh Jowett said it was as though 'the wind [was] pulling the trees right out of the ground around my house'.⁷⁹

The fires advanced quickly. As Mr Ken Rogers described it, 'My wife went from happily preparing dinner ... to survival mode in virtually an instant'.⁸⁰ Mr Peter Olorenshaw described the initial ember attack as 'like being in torrential rain, but it was burning', while Ms Vicki Ruhr described it as 'like a monsoon of fire'.⁸¹

Many witnesses' descriptions touched on the terror the fires inspired. Each person had their own way of telling their story, and the Commission does not dispute the accuracy of their recollection. As a measure of the ferocity of these fires compared with fires of past years, however, the descriptions lack the ability to provide a satisfactory frame of reference.

The Commission notes that many witnesses, including some veterans of Ash Wednesday in 1983, had never experienced a day of similar violence and were taken completely by surprise. It also acknowledges, however, descriptions of past fire events that accord well with people's experience of 7 February. Writing of the 13 January 1939 fires, Justice Leonard Stretton described them as 'the most disastrous forest calamity the State of Victoria has known'.⁸²

The fires of 7 February were indeed catastrophic, but the Commission does not accept that they were without precedent. Among other fires that have devastated Victoria in living memory are the 1939 (Black Friday), 1983

(Ash Wednesday), 2003 (north-east Victoria and Gippsland) and 2007 (Alpine) fires. The two most recent of these fires each burnt four times as much of the state as the 7 February 2009 fires, although there was minimal loss of life because they burnt largely uninhabited or only lightly settled rural areas.⁸³

Because of their close proximity to major population centres, the 2009 fires were critically dangerous and placed large numbers of people at risk. Perhaps in terms of the resultant high death toll, the fires could be described as unprecedented, but that is only part of the story.

The panel of experts who gave evidence to the Commission on fuel management largely concurred in the view that, as bushfires go, the 2009 fires were not without precedent in an area of Australia long regarded as being one of the most, if not the most, bushfire prone parts of the world—an area described by Professor Stephen Pyne, the celebrated US commentator on high-intensity bushland fires as reflecting ‘... a unique sort of meteorological ... and biophysical arrangements in which large fires are going to happen’.⁸⁴ The research Professor McAneney is associated with provides a comparative picture that accords with this point of view.⁸⁵

The Commission is in no doubt that the influence of the long drought years, which broke a number of meteorological records, and the impact of the heatwave immediately preceding the fires helped create the conditions for a major conflagration to occur once the fires started. Nevertheless, although this served to highlight the extreme level of risk that existed, the Commission does not consider that the resultant fires could be judged as representing a shift change that sets them apart from what Victoria has experienced from time to time in the past.

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- 1 Exhibit 11 – Statement of Esplin (WIT.005.001.0001) [140]–[199]
 - 2 Exhibit 11 – Statement of Esplin, Attachment 42 (WIT.005.001.2304), Attachment 44 (WIT.005.001.2306), Attachment 49 (WIT.005.001.2314), Attachment 50 (WIT.005.001.2316), Attachment 51 (WIT.005.001.2320), Attachment 58 (WIT.005.001.2358), Attachment 59 (WIT.005.001.2359), Attachment 61 (WIT.005.001.2361), Attachment 62 (WIT.005.001.2362); Exhibit 130 – Supplementary Statement of Waller (WIT.3024.001.0073) [9]
 - 3 Exhibit 6 – Statement of Waller, Annexure 39 (WIT.002.001.0832); Rees T1852:19–T1852:30, T2415:21–T2415:25
 - 4 Exhibit 737 – Expert Report of Tolhurst on Land and Fuel Management (EXP.013.001.0001) at 0002
 - 5 Williams T720:10–T720:14
 - 6 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [19]
 - 7 Williams T720:29–T721:9
 - 8 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [22]
 - 9 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [24]–[25]; Williams T724:23–T724:24
 - 10 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [22]
 - 11 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [18]
 - 12 Exhibit 22 – Statement of Williams, Annexure 1 (WIT.013.001.0012) at 0028
 - 13 Exhibit 32 – Report on the Physical Nature of the Victorian Fire occurring on 7th February 2009 (EXP.003.001.0017) at 0019
 - 14 Exhibit 269 – Statement of Russell, Annexure 1 (WIT.3004.013.0021) at 0045
 - 15 Exhibit 269 – Statement of Russell, Annexure 1 (WIT.3004.013.0021) at 0046
 - 16 Rees T35:11–T35:25
 - 17 Exhibit 269 – Statement of Russell, Annexure 1 (WIT.3004.013.0021) at 0046
 - 18 Exhibit 32 – Tolhurst Report on the Physical Nature of the Victorian Fires (EXP.003.001.0017) at 0022; Exhibit 3 – Statement of Rees (WIT.004.001.0001) [234]–[235]; Waller T4360:8–T4360:22
 - 19 Exhibit 3 – Statement of Rees (WIT.004.001.0001) [234.3]
 - 20 Exhibit 269 – Statement of Russell, Annexure 1 (WIT.3004.013.0021) at 0047
 - 21 Exhibit 994 – Kilmore East Fire – Fire Spread Map (CFA.600.006.0005)
 - 22 Exhibit 32 – Tolhurst Report on the Physical Nature of the Victorian Fires (EXP.003.001.0017) at 0022
 - 23 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [28]
 - 24 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [30]–[31]
 - 25 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [29], [32]
 - 26 Exhibit 4 – Supplementary Statement of Rees (WIT.004.002.0001) [68]–[69]
 - 27 Exhibit 277 – Statement of Speirs (WIT.3004.014.0001) [131], Annexure 6 (WIT.3004.014.0046)
 - 28 Exhibit 269 – Statement of Russell (WIT.3004.013.0001) [55], Annexure 10 (WIT.3004.013.0239); Russell T7315:19–T7315:31; Rees T58:19–T58:29

- 29 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [33]; Williams T732:29–T732:30
- 30 Exhibit 4 – Statement of Rees (WIT.004.002.0001) [68]; Rees T64:27–T64:30
- 31 Exhibit 277 – Statement of Speirs (WIT.3004.014.0001) [131], Annexure 6 (WIT.3004.014.0046)
- 32 Exhibit 269 – Statement of Russell (WIT.3004.013.0001) [55]
- 33 Exhibit 557 – Meteorological Aspects of the Kilmore East Fire (BOM.901.0048) at 0060
- 34 Exhibit 557 – Meteorological Aspects of the Churchill Fire (BOM.901.0001) at 0015
- 35 Exhibit 557 – Meteorological Aspects of the Kilmore East Fire (BOM.901.0048) at 0060
- 36 Exhibit 557 – Meteorological Aspects of the Churchill Fire (BOM.901.0001) at 0015
- 37 Exhibit 557 – Meteorological Aspects of the Churchill Fire (BOM.901.0001) at 0015
- 38 Exhibit 557 – Meteorological Aspects of the Kilmore East Fire (BOM.901.0048) at 0060
- 39 Exhibit 557 – Meteorological Aspects of the Murrindindi Fire (BOM.901.0172) at 0184
- 40 Exhibit 557 – Meteorological Aspects of the Redesdale Fire (BOM.901.0213) at 0224
- 41 Exhibit 557 – Meteorological Aspects of the Kilmore East Fire (BOM.901.0048) at 0060
- 42 Exhibit 557 – Meteorological Aspects of the Maiden Gully Fire (BOM.901.0096) at 0106
- 43 Exhibit 557 – Meteorological Aspects of the Murrindindi Fire (BOM.901.0172) at 0184
- 44 Exhibit 557 – Meteorological Aspects of the Murrindindi Fire (BOM.901.0172) at 0184
- 45 Exhibit 557 – Meteorological Aspects of the Murmungee Fire (BOM.901.0131) at 0145
- 46 Exhibit 557 – Meteorological Aspects of the Murmungee Fire (BOM.901.0131) at 0145
- 47 Exhibit 557 – Meteorological Aspects of the Murmungee Fire (BOM.901.0131) at 0145
- 48 Exhibit 22 – Statement of Williams, Annexure 1 (WIT.013.001.0012) at 0043
- 49 Exhibit 22 – Statement of Williams (WIT.013.001.0002) [33]
- 50 Exhibit 514 – Supplementary Statement of Crowe (WIT.3004.022.0001) [146]; Exhibit 334 – Statement of Ware (WIT.3004.016.0205) [47]; Exhibit 388 – Churchill Fire Narrative (WIT.3004.018.0009); Exhibit 894 – Review of fatalities in the February 7 2009 Bushfires – Final Report (Amended version without markup) (EXP.029.003.0001) at 0020–0021; Handmer T18546:15–T18546:18, T18553:10–T18553:13; Keating T9193:10–T9194:19; Rees T52:6–T52:7; Dixon T6718:2–T6718:4
- 51 Exhibit 514 – Supplementary Statement of Crowe (WIT.3004.022.0001) [146]; Lawlor T6920:8–T6920:15
- 52 Exhibit 737 – Expert Report of Tolhurst on Land and Fuel Management (EXP.013.001.0001) at 0008
- 53 Exhibit 126 – Bushfire CRC – Victorian 2009 Bushfire – Research Response Interim Report – June 2009 (CRC.300.001.0001_R) at 0020_R; Exhibit 269 – Statement of Russell, Annexure 1 (WIT.3004.013.0021) at 0042–0043
- 54 Exhibit 126 – Bushfire CRC – Victorian 2009 Bushfire – Research Response Interim Report – June 2009 (CRC.300.001.0001_R) at 0026_R; Exhibit 722 – Expert Report of McCaw on Fuel Management (EXP.026.001.0001) at 0006; Fogarty T14781:6–T14781:20
- 55 Lawlor T8194:18–T8195:7
- 56 Exhibit 722 – Expert Report of McCaw on Fuel Management (EXP.026.001.0001) at 0016; Exhibit 458 – Statement of Gilmore, Annexure 8 (WIT.3004.019.0147) at 0163–0166; Exhibit 249 – Statement of Lawlor (WIT.3024.002.0187) [27]–[28]; Lawlor T6922:1–T6922:16
- 57 Exhibit 672 – Bushfire CRC Final Report (CRC.300.007.0001_R) at 0012_R
- 58 Tolhurst T1762:11–T1762:16
- 59 Rees T67:11–T67:19
- 60 Williamson T4457:21–T4457:26
- 61 Exhibit 32 – Tolhurst Report on the Physical Nature of the Victorian Fires (EXP.003.001.0017) at 0027; Willans T3030:21–T3030:23; Tolhurst T1026:3–T1026:29
- 62 Willans T3032:19–T3032:31
- 63 Willans T3030:14–T3030:30; Rees T85:31–T86:6; McCormack T4102:2–T4102:5; T4102:12–T4102:17
- 64 McCormack T4102:8–T4102:14
- 65 Exhibit 672 – Bushfire CRC Final Report (CRC.300.007.0020_R) at 0070_R
- 66 Exhibit 672 – Bushfire CRC Final Report (CRC.300.007.0020_R) at 0070_R
- 67 Esplin T374:26–T374:27; Rees T2384:28–T2385:5; Paterson T4315:20–T4316:3; Wood T9779:12–T9779:29; Ruhr T11904:4–T11904:7
- 68 Land and fuel management expert panel discussion T15237:1–T15241:8
- 69 Land and fuel management expert panel discussion T15237:9–T15237:12, T15238:16–T15238:17
- 70 Land and fuel management expert panel discussion T15239:14–T15239:21
- 71 Tolhurst T1765:20–T1765:22; Land and fuel management expert panel discussion T15240:13
- 72 Land and fuel management expert panel discussion T15240:30–T15241:8
- 73 Williams T15384:14–T15384:19
- 74 Alder T18018:20–T18018:24
- 75 McAneney T14120:13–T14120:16

- 76 McAnaney T14121:11–T14121:22
- 77 Exhibit 456 – Statement of Smith, Annexure 3 (WIT.3004.020.0232) at 0234; Cutting T10330:6–T10330:12; Fallon T7964:3–T7964:6; Smith T12884:14–T12884:16; Rice T8537:22–T8537:25, T8541:4–T8541:8
- 78 Exhibit 93 – Statement of Willans (SUMM.044.002.0084) at 0087; Exhibit 17 – Statement of Spooner (WIT.011.001.0005_R) at 0009_R–0010_R; Exhibit 224 – Statement of Cowdery (WIT.081.001.0001_R) [15]; Exhibit 429 – Statement of Weir (SUMM.044.002.3841_R) at 3846_R; Exhibit 13 – Statement of Newman (WIT.009.001.0001_R) [13]; Exhibit 87 – Statement of Ananiev (WIT.040.001.0001_R) [17]; Exhibit 97 – Statement of O’Neill (WIT.047.001.0001_R) [21]; Exhibit 77 – Statement of Walter (WIT.041.001.0001_R) [26]; Exhibit 420 – Statement of Lawrence (SUMM.044.003.2157) at 2160
- 79 Exhibit 429 – Statement of Weir (SUMM.044.002.3841_R) at 3848_R; Exhibit 61 – Statement of Olorenshaw (WIT.034.001.0001_R) [51]–[53]; Exhibit 337 – Statement of Lawlor (WIT.3024.003.0190) [18]; Exhibit 379 – Witness Statement of Jowett (WIT.109.001.0001_R) [43]; Exhibit 411 – Statement of Taylor (WIT.3024.004.0001) [86]
- 80 Exhibit 20 – Statement of Rogers (WIT.015.001.0001_R) [5]
- 81 Exhibit 61 – Statement of Olorenshaw (WIT.034.001.0001_R) [54]; Exhibit 545 – Statement of Ruhr (WIT.122.001.0001_R) [53]
- 82 Exhibit 81 – 1939 Victorian Bushfires Royal Commission Report (TEN.028.001.0001) at 0004
- 83 Exhibit 726 – Eastern Victoria: Bushfires (RSCH.030.001.0373); Exhibit 726 – Great Divide Complex Bushfires: Victoria (RSCH.030.001.0377)
- 84 Pyne T18438:31–T18439:2
- 85 Exhibit 687 – Normalised Australian Bushfire Building Damage and Fatalities 1925-2009 (TEN.204.001.0001) at 0005



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