

**Town and city bushfire disaster review, case studies and lessons  
across Australia**

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**Limitations and disclaimer**

This document has been prepared and issued in good faith and has been prepared without payment, in order to aid progression of this important issue.

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It is up to each applicable authority to consider potential lessons, opportunities and strategies to best reduce town and city bushfire disasters, opportunities and strategies adopted would likely vary with each state/ town/ city, taking into account a broad range of issues, fire risks, fire seasons and differing opportunities available.

## **1 Introduction**

There have been many bushfires that have had major impacts on settlements, towns and cities across Australia and a number of these that were bushfire disasters. A number of town and city bushfire disasters are outlined in this review. The author outlines 19 town and city bushfire disaster case studies, ranging from bushfire impacts of the early settlements in the 1851 Victorian bushfires to bushfires in 2021, a period covering 170 years.

A concern area is that the author considers that large numbers of Australian towns and cities are inadequately prepared for bushfires and this is one of the reasons for undertaking this review. In addition, the author considers that there is an ongoing issue of inadequate mitigation to protect many communities across Australia.

Large numbers of communities, people and firefighters continue to be injured and killed in bushfires.

Another issue that greatly concerns the author is that Australia has never really fully nor effectively captured and locked in many of the key lessons in relation to avoiding and reducing town and city bushfire disasters across Australian communities on an ongoing basis.

Thus, a major focus of this review is capturing key bushfire disaster lessons and insights in relation to town and city bushfire disaster avoidance, sound fire and fuel mitigation, fuel management, preparedness for bushfires, community and firefighter safety, infrastructure protection, firefighting attack and a range of other lessons and insights.

The concerns identified above highlight the importance of undertaking this review.

The author plans to undertake a future update to this study at some point in the future and comments would be considered at [johnodonnell1954@outlook.com](mailto:johnodonnell1954@outlook.com)

## 2 Town and city bushfire disaster case studies across Australia

A number of the larger town and city impact and disaster bushfire case studies are highlighted below, more recent studies are outlined first, then going back in time to earlier town, city and settlement bushfire disasters.

The author has included lessons and insights for the majority of these disaster case studies, some of this information is included in Annexures 1, 2 and 3.

The author didn't undertake analysis of the bushfire information or lessons and insights in the case studies within Section 2, but did so in relation to teasing out key town and city bushfire disaster lessons and insights in Section 3.

Wikipedia within extracted information source information is not included in this review, but the Wikipedia numbering is retained, this information can be readily sourced from Wikipedia.

### 2.1 Western Australia Wooroloo bushfire 2021

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights (where information is available). A considerable amount of information is included to highlight important bushfire issues and also assist in the capture of key lessons and insights.

#### Bushfire information

The Wooroloo bushfire in 2021 destroyed 86 homes and burnt 10,750 hectares and burnt from 1 February to 7 February 2021. This case study focuses on inadequacy of preparedness in relation to a major bushfire.

2021 Wooroloo bushfire extracted from Wikipedia 3 January 2024:

*The 2021 Wooroloo bushfire was a fast moving bushfire that started on 1 February in Wooroloo, 45 kilometres (28 mi) north-east of the Perth central business district, in the Shire of Mundaring, Western Australia. By 2 February, the bushfire emergency had spread to Shires of Chittering and Northam, and the City of Swan.[2] It had destroyed at least 86 houses and 2 fire trucks.[3] By 6 February, the bushfire had travelled 26 km (16 mi) from its source. The fire coincided with a five day lockdown of the Perth metropolitan region that started at 6pm on 31 January, due to a case of COVID-19 outside of hotel quarantine. In July 2021, WA Police charged a man with a breach of duty and carrying out an activity that could cause a fire, alleging that he used an angle grinder that caused sparks.[4]*

#### Lessons and insights

There are many lessons in relation to the Wooroloo bushfire as detailed by the Bushfire Front (2021):

*The preparedness status of the firegrounds.*

*Approximately three weeks before the fire, members of the Bushfire Front had inspected areas that were subsequently consumed by the fire during the first day and night. We found:*

- *Very few, probably only 1 in 50 properties had been prepared in the expectation of a bushfire; most properties were not just under-prepared, but invited destruction by bushfire.*
- *Lack of preparedness was demonstrated by: houses embraced by long-unburnt bushland; houses and other buildings overtopped by eucalyptus trees; extensive areas of well-cured grass in paddocks that had not been grazed or mown; road verge bushland carrying continuous, heavy and aerated fuels and long-unburnt grass trees with skirts down to the ground.*
- *The area is naturally difficult for fire suppression, being hilly, and with access/egress confined to narrow, often twisting and steep roads.*
- *In one area, a relatively newly established residential subdivision which was subsequently virtually destroyed in the fire, all of the street trees were tall eucalypts; these highly flammable trees would have contributed massively to fire rate of spread and the ember storm that hit the houses in this subdivision.*

*While a small number of responsible land/property owners had made sound preparation, they were let down by the apathy of neighbours and the failures of the authorities. Clearly no coordinated, determined and responsible effort had been made either by land owners or by LGAs to prepare this area in the expectation of a bushfire on a bad day. On the contrary the entire area could be described as a sitting duck.*

*This is all the more remarkable considering the history of serious bushfires in this area, going back to 1961, and the recent tragic bushfires in eastern and south-western Australia. The occurrence of fast-moving intense bushfires burning on hot, windy summer days is not a rarity, an unprecedented event, but is an inherent part of the Australian scene. The LGA and residents in the Wooroloo Fire area were seemingly ignorant of this ... or if they knew it, they thought that "it would never happen to them".*

*This is a philosophy many city-bred Australians take with them when they move into the rural/urban interface. Deep-seated apathy and resistance to lesson-learning is the reason why professional agencies like DFES must come in over the top and require LGA and residents to prepare responsibly for the inevitable bushfire, or pay a penalty. This concept has long been resisted by DFES and its predecessors, citing a lack of legislative support, and by LGA who do not want to be seen as being tough on their ratepayers.*

*We see no possibility that communities or residents in bushfire-prone areas in WA will respond adequately to “warnings” or education or communication programs. They never have in the past. Community education must be coupled with enforcement of good laws. This is the only approach that will work.*

and further on:

*Had we seen ...*

- *Houses free from overhanging and flammable vegetation and sealed to prevent ember entry;*
- *Grassy paddocks grazed or slashed/mown, enabling easy fire suppression by residents or brigades;*
- *Fuel reduction of privately-owned bushland either by mild intensity prescribed burning or grazing;*
- *Shires committed to and implementing DFES-approved cross-tenure Bushfire Risk Management Plans aimed at minimising hazards and fuels, and maximizing preparedness;*
- *Systematic fuel reduction on road and other reserves under the control of LGA so as to reduce fire intensity and spotting, and make roads safer;*
- *Strict enforcement of the Bush Fires Act by LGA and DFES during the previous months to maximise bushfire preparedness and damage mitigation on private land;*
- *The preparation, implementation and enforcement of DFES-approved site-specific bushfire management plans for all residential subdivisions;*
- *Residents who clearly understood that protection of their own lives and properties was their responsibility and that they could not rely upon, or even expect firefighters to save them and their assets;*
- *The entire community braced for a bushfire as the predicted fire weather developed ...*

*... there would still have been a fire, but the outcome in terms of damage and cost would have been very different.*

This information provides a brilliant hard-hitting summary of the problems and lessons in relation to this bushfire. Lessons and insights have been captured in Section 3.

## **2.2 Australian bushfires 2019 and 2020**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### **Bushfire information**

2019–20 Australian bushfire season extracted from Wikipedia 28 November 2023 (refer Wikipedia for references):

*The 2019–20 Australian bushfire season<sup>[a]</sup> or Black Summer was one of the most intense and catastrophic fire seasons on record in Australia. It included a period of bushfires in many parts of Australia, which, due to its unusual intensity, size, duration, and uncontrollable dimension, was considered a megafire by media at the time.<sup>[16][b]</sup> Exceptionally dry conditions, a lack of soil moisture, and early fires in Central Queensland led to an early start to the bushfire season, beginning in June 2019.<sup>[18]</sup> Hundreds of fires burnt, mainly in the southeast of the country, until May 2020. The most severe fires peaked from December 2019 to January 2020.*

*The fires burnt an estimated 24.3 million hectares (243,000 square kilometres),<sup>[c][1]</sup> destroyed over 3,000 buildings (including 2,779 homes),<sup>[19]</sup> and killed at least 34 people.<sup>[20][21][22][23][24][d]</sup> It was claimed that three billion terrestrial vertebrates – the vast majority being reptiles – were affected and some endangered species were believed to be driven to extinction.<sup>[25]</sup> The cost of dealing with the bushfires was expected to exceed the A\$4.4 billion of the 2009 Black Saturday fires,<sup>[26]</sup> and tourism sector revenues fell by more than A\$1 billion.<sup>[27]</sup> Economists estimated the bushfires – Australia's costliest natural disaster in history – may have cost over A\$78–88 billion in property damage and economic losses.<sup>[28]</sup> Nearly 80% of Australians were affected by the bushfires in some way.<sup>[29]</sup> At its peak, air quality dropped to hazardous levels in all southern and eastern states,<sup>[30]</sup> and smoke had been moving upwards of 11,000 kilometres (6,800 mi) across the South Pacific Ocean, impacting weather conditions in other continents.<sup>[31][32]</sup> Satellite data estimated the carbon emissions from the fires to be around 715 million tons,<sup>[33][34]</sup> surpassing Australia's normal annual bushfire and fossil fuel emissions by around 80%.<sup>[35][36][37]</sup>*

A number of 2019/ 20 bushfire case studies are highlighted below:

[Mallacoota, Victoria, December 2019](#)

2019–20 Australian bushfire season extracted from Wikipedia July 2020:

*Thousands of people fled to the lake and ocean in Mallacoota, as bushfires hit the Gippsland town on Tuesday. The out-of-control fire reached the town in the morning and about 4,000 people fled to the coastline, with Country Fire Authority members working to protect them. Dec 30, 2019 Authorities have estimated that more than 120 structures in Mallacoota were destroyed, including at least 100 homes. Another estimate provided in the Guardian noted some 150 houses were destroyed in the fire.*

More fuel reduction on public land was a key demand from a meeting at Mallacoota in 2023, attended by some 130 people, mainly from East Gippsland and information on this is included in Howitt Society (2023) "Are Mallacoota and East Gippsland in general prepared for another major fire?" The meeting, organised by the Howitt Society, sought to focus on this question:

*A resolution, passed overwhelmingly, was "That this meeting requests The Howitt Society to recommend to government that the current Safer Together policy, which focuses on burning strategically to protect assets, be extended to a broad-based approach, aiming for a minimum of 5% of Victoria's public land being fuel-reduced annually, as per Recommendation 56 of the 2009 Bushfires Royal Commission."*

*This change is essential to lessen the ember attack caused by high intensity fire some distance from the assets. The recommendation also recognises that the forest itself is an asset which needs to be protected using regular low intensity fire, in order to maintain forest health and protect environmental values within the forest including flora, fauna, soil and water.*

*The resolution arose following a presentation by world-renowned forest fire expert Dr Kevin Tolhurst, Associate Professor in Fire Ecology and Management in the Department of Forest and Ecosystem Science, University of Melbourne. The presentation from Dr Tolhurst clearly showed how the fire that impacted Mallacoota in 2019/20 would have been much less severe had there have been regular fuel reduction burning operations in the surrounding forest area.*

*There were some other key messages from the presentation, as follows.*

*On days of extreme fire danger, a wildfire progresses by a series of spot fires, often a long way ahead of the fire front. These spot fires are caused by burning embers driven by wind and cause the loss of most assets such as houses.*

*For every hectare of fuel reduction achieved there will be three hectares reduction in the area burnt by wildfire, and at a lower intensity.*

*Of the many factors affecting fire intensity (wind, temperature, humidity, slope and fuel type and quantity) the only factor which managers can influence is fuel quantity. Fuel reduction burning is the most cost effective way of reducing that fuel.*

#### Eden, NSW

Jurskis V (2020) noted:

*"After the winds once again came from the southwest, there was massive destruction of forests and wildlife to the south of our town. Homes and infrastructure were needlessly incinerated. People in Eden were urged to evacuate. I continued clearing, pruning and raking around my home. As the Border Fire approached on 4<sup>th</sup> January, it became completely dark at 4 pm. There was a constant rain of scorched and burnt eucalypt leaves from forests far to the south. I patrolled around my block until 4 am. If we'd had embers from the northwest instead of ashes from the south, I wouldn't be here to tell". "We were lucky because we didn't get the hot, dry north-westerly winds, changing to south-westerly, that have driven the inevitable firestorms in eastern Australia since Aboriginal management was disrupted. But the explosive 3-Dimensionally continuous fuel is still there in a broad swathe from far to the northwest, right into the middle of Eden. We had no peace of mind until the rains came to break the drought. Despite our temporary reprieve, the forest is still declining and the scrub is still booming".*

#### Cabramurra, NSW, 4 January 2020

Wood (2020) outlined:

*Despite suffering "major losses" in their operational township of Cabramurra after the Dunns Road fire passed through it, the Snowy Hydro 2.0 team re-started work this week, saying that the project will be a key part of the region's recovery. A total of 36 houses were destroyed in the 4 January fire, along with several of the unit blocks, the school and the old ski club.*



*“Thankfully the main buildings housing the bistro and general store, the fuel depot and other buildings are all standing and will be a great base to rebuild from. Services have been restored to the township including power, water and sewerage,” says a spokesperson.*

#### Balmoral, NSW, December 2019

AFPA (2020) noted:

*The village in the NSW Southern Highlands was hit hard by multiple fire fronts just before Christmas, with 18 homes destroyed and 90 per cent of the surrounding bush burnt. The local fire captain, Brendon O’Connor, who has decades of firefighting experience, has been hailed as a hero for saving much of the town from the catastrophic fires. He attributed the intensity of the Balmoral fire to the lack of fuel removal in the forest surrounding the village, and says that there needs to be a much more aggressive program of fuel reduction – including through mechanical removal – to avoid a repeat.*

#### Tumbarumba 2019 and 2020

Dunns Road bushfire was 333,940 hectares in size and resulted in the loss of 182 homes (extracted from Wikipedia List of fires and impacts of the 2019–20 Australian bushfire season on 19 January 2024. The other large bushfire in this area was the Green Valley bushfire.

Great information on these bushfires is provided in the book Tumbarumba Writers Group (2023) Tumbarumba Under Siege.

#### Australian 2019/ 2020 town impacts

There is a list of towns impacted by the 2019/ 20 bushfires on Wikipedia, unfortunately this list isn’t fully completed, refer link below:

[https://en.wikipedia.org/wiki/List\\_of\\_fires\\_and\\_impacts\\_of\\_the\\_2019%E2%80%9320\\_Australian\\_bushfire\\_season](https://en.wikipedia.org/wiki/List_of_fires_and_impacts_of_the_2019%E2%80%9320_Australian_bushfire_season)

#### **Lessons and insights**

Three of the four cases above (Mallacoota, Eden and Balmoral) outlined the importance of reducing fuel loads and lessons in regards to the need for aggressive fuel reduction.

Unfortunately, in SE Australia there were lots of lessons from the 2019/ 20 bushfires in regards to inadequate mitigation, focus on suppression and not adequate mitigation and other areas, but little apparent learning and capturing of learnings in regards to community safety and reduction of landscape intensities from bushfire inquiries and the Bushfire Royal Commission. The author considers that community safety and preparedness hasn’t improved greatly since 2019/ 20 and has likely declined further with the dense regrowth fuels from the intense 2019/ 20 bushfires and other bushfires.

There are some lessons in the Royal Commission into National Natural Disaster Arrangements Report 28 October 2020 and state inquiry reports, but unfortunately limited learnings in regards to fire mitigation, including prescribed burning.

#### Panel and inquiry failures

This is succinctly outlined by Underwood (2020):

<https://quadrant.org.au/opinion/doomed-planet/2020/11/the-flaming-idiocy-of-yet-another-bushfire-panel/>

*But put these operational issues aside. The fact is that once there was the deadly combination of drought, heavy fuels, many fires and vulnerable communities, the disaster was ordained. This has nothing to do with climate change; it is the inevitable consequence of foolish policies, incompetent governance and unprofessional land management.*

These are important findings and have been incorporated into Section 3 key lessons and learnings.

IFA Media Release (2020) noted *The Bushfire Royal Commission’s final report is totally underwhelming and fails to address the current imbalance between fire prevention and fire response says the Institute of Foresters (IFA/AFG), the professional association representing some 1,000 forest scientists, researchers and professional forest managers in Australia.*

<https://www.forestry.org.au/media-release-bushfire-royal-commission-report-lacks-vision/>

Nolan et al. (2021) in their paper “What Do the Australian Black Summer Fires Signify for the Global Fire Crisis?” ask a critical question “Is Australia Better Equipped for a Future of Extreme Fire Seasons?” and their response is: *“While governmental inquiries produced broad-ranging recommendations, we argue that they have not resulted in a fundamental shift in the way in which fire will be managed in the future. Overwhelmingly, they reinforce the status quo of a centralised and technology focussed approach to the mitigation of risk, with greater strategic nuance and an expanded role for national level co-ordination. While technological solutions can provide important support for fire management, the implementation of technological solutions may also lead to perverse outcomes if not implemented thoughtfully.”*

This author agrees with the Nolan et al. findings above, especially in regards to “they have not resulted in a fundamental shift in the way in which fire will be managed in the future”. Limited state prescribed burning data over the last five years supports this view.

#### Inaction in relation to many missed bushfire contributory factors in relation to the 2019/ 20 bushfires

A review of the 2019/ 20 bushfires in regards to contributory factors to the bushfires was completed by O'Donnell (2023) and this review teased out the contributory factors in relation to these bushfires.

<https://arr.news/2023/08/04/the-2019-20-bushfires-contributory-factors-john-odonnell/>

In relation to the 2019/ 20 major bushfires, it is the author's opinion (and many others) that there has been inadequate listening to many communities and active and retired experienced land and fire managers in relation to bushfire management and mitigation concerns raised during and after the bushfires. Many submissions and concerns to improve bushfire management and mitigation have been missed, or worse, ignored.

This contributory factor assessment is an important step in order to:

- Identify factors that haven't been adequately considered or missed, that influenced the fuels, forest fire resilience, bushfire attack, safety, impact, cost, bushfire extent and intensity of the major 2019/ 20 forest bushfires across south eastern Australia.
- Integrate the information in relation to this matter, assessing this area in detail, particularly in relation to south eastern Australia.
- Identify important factors in relation to community, fire fighter safety, infrastructure and environmental safety. Considering the community and fire fighter safety factors alone, this concern area is of the utmost importance and hopefully this document will tease out issues that need urgent actioning.
- Assist in reducing the impacts, costs, extent and intensity of ongoing major bushfires across south eastern Australia during the 2023/ 24 bushfire seasons and beyond.
- Consider implementation of the identified contributory factors into fire management systems, policies, guidelines, legislation, agreements, mitigation, land management, bushfire attack, preparedness, risk management, auditing, learning systems, training and budgeting.

Particular contributory factors during the 2019/ 20 bushfires varied across individual bushfires, seasons (spring and summer), days, states, regions and locations. These contributory factors can and do occur together in combinations, increasing bushfire risks, extent and intensity and reducing potential of bushfire control options and effectiveness. The identified contributory factors are separated into relevant heading categories to optimise consideration of important issues and optimise actioning opportunities

It is readily apparent that there are a large number of contributory factors that influenced the fuels, fire resilience, bushfire attack, safety, bushfire extent and intensity of the 2019/ 20 major bushfires across south eastern Australia across the broad heading issues outlined.

The 2019/ 20 bushfire contributory factors in the linked document provide a base allowing consideration of opportunity areas and exploring ideas and innovation, including in relation to the establishment of safe, healthy and resilient landscapes, importantly reducing bushfire extent and intensity, and improving community safety, fire fighter safety and native fauna habitat safety.

It is essential to consider and address identified contributory factors, noting that if we as a society don't actively identify, consider and effectively address the contributory factors that influenced the fuels, fire resilience, bushfire attack, safety, bushfire extent and intensity of the 2019/ 20 major bushfires across south eastern Australia and action associated opportunities, Australia will continue to have more of the same disastrous bushfires, impacting on communities, fire fighters, infrastructure, flora, fauna and the environment.

Actioning contributory factors is all the more important considering the lack of progress on addressing important contributory factors, considering low rates of prescribed burning and also considering in many cases the complacency in regards to bushfire mitigation management. A cooperative spirit is required to pull this all together.

#### Apparent inaction in relation to sound Kangaroo Valley Community Bushfire Committee submissions

Kangaroo Valley Community Bushfire Committee Compendium of Submissions to the NSW Independent Bushfire Inquiry 2020 noted:

*Key correspondence to the NSW Independent Bushfire Inquiry 2020 from a progressive community was not listened to nor addressed.*

Considerable detail on this is outlined in Annexure 1.

Key Kangaroo Valley Community Bushfire Committee concerns include:

- The State needs to introduce a revised approach to hazard reduction in order to ensure fuel load management in bushfire prone areas is given sufficient priority by the RFS, overcome risk aversion within the RFS to hazard reduction and reduce the workload currently placed on RFS volunteers so that they can concentrate on the core responsibility of protecting rural communities by reduction in fuel loads.
- The current NSW approach to bush fire risk management planning indicates that some community engagement has occurred and that some hazard reduction may be undertaken. It creates an illusion that effective bushfire risk management planning has been carried out when, in fact, the reality, for communities such as Kangaroo Valley, is that there has been no significant engagement with the community or systematic planning.
- The Kangaroo Valley community's experience is that the RFS has failed to put in place any methodology for recording or monitoring the performance of bush fire risk management plans and there has been no attempt to evaluate specified treatments.
- The KVCBC understands that the RFS has primary responsibility for around 200 square kilometres of Kangaroo Valley, most of which is privately owned. A good deal of this area is heavily forested and has had no major fuel reduction since the 1983 fires.
- A combination of factors/ restrictions that make hazard reduction very difficult to achieve in Kangaroo Valley.
- Concerns in relation to Community Protection Plans (CPP) as a means of offering additional protection to hazard reduction and community engagement.

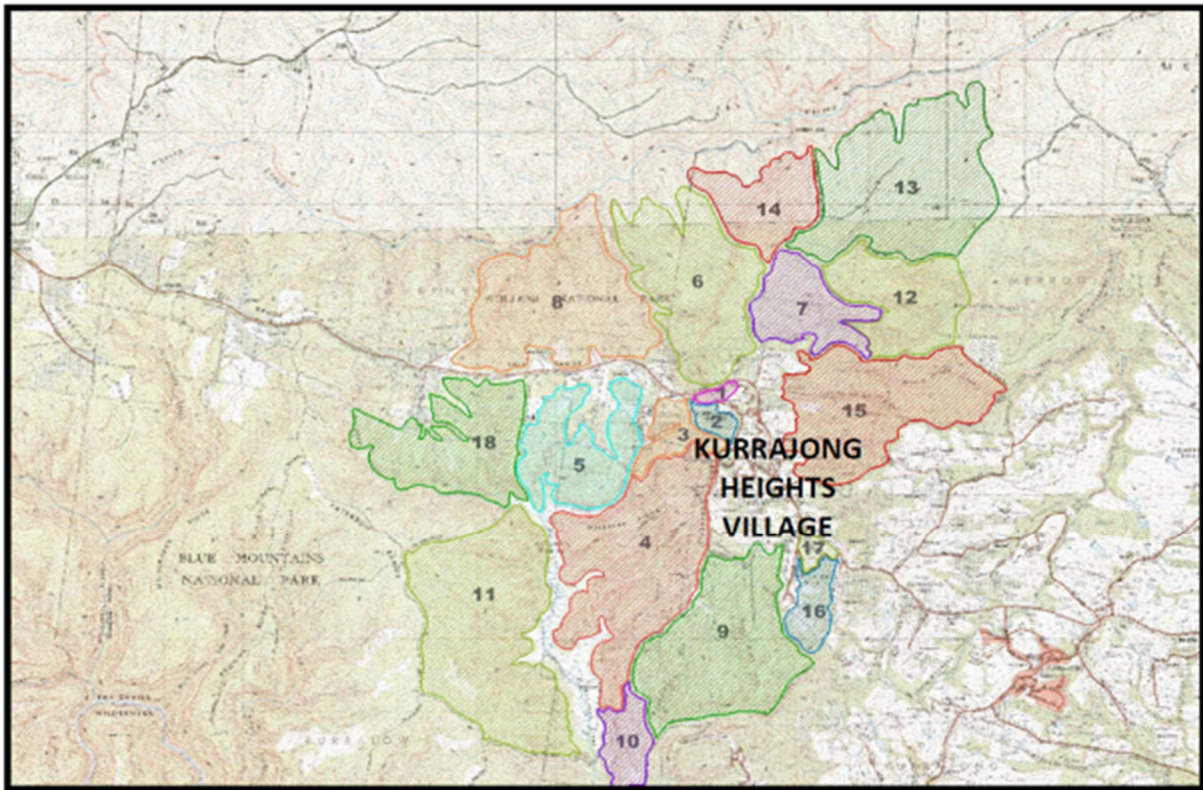
#### Inaction in relation to learning from a very successful community protection case study submission from Kurrajong Heights

A useful case bushfire community protection study is extracted from Brian William's submission to 2020 Bushfire Royal Commission, a very good submission:

*Kurrajong Heights has a highly successful BFMP that has kept the community safe for 68 years. The Kurrajong Heights BFMP relies heavily on local knowledge.*

*Knowledge of terrain, fire behaviour and fire paths.*

*The Kurrajong Heights Brigade has developed and implemented a plan that hazard reduces blocks using a mosaic pattern. This strategy keeps low fuel areas as a blocking influence for approaching wildfire. Refer below:*



**Figure. Kurrajong Heights Brigade hazard reduction blocks using a mosaic pattern**

In conclusion and unfortunately, there have a number of lessons and insights, but in the main, these weren't listened to nor adopted into recommendations or practice.

### **2.3 Western Australia Waroona bushfire including Yarloop 2016**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

#### **Bushfire information**

As extracted from AFPA (2020):

On 6 January 2016, the communities of Yarloop and surrounding areas in the Shires of Harvey and Waroona (south-west WA) were hit by a devastating bushfire that killed two people and destroyed 181 homes. An independent report found that fuel management was the cornerstone of every issue relating to the fire.

The inquiry noted that localised areas of long unburnt fuel within and adjoining Yarloop played a significant contribution to the damage by generating very high fire intensities and mass ember attack that resulted in extensive damage to buildings.

The inquiry recommended that more regular, effective fuel management practices be employed, with a focus on biomass removal and hazard reduction burning.

As noted by Ferguson (2016):

Some details in relation to the fire:

- The total area burnt was 69,165 hectares Private property area burnt: 31,180 hectares Public land area burnt: 37,985 hectares Forest Products Commission plantation burnt: 3,300 hectares.
- Fatalities: 2 and
- Buildings 181 (166 dwellings in Yarloop).

Yarloop was significantly affected by the fire with two fatalities of residents and the destruction of 166 houses and residential buildings. It is the view of the Special Inquiry that localised areas of long unburnt fuel within and adjoining Yarloop played a significant contribution to the damage in town by generating very high fire intensities and mass ember attack that resulted in extensive damage to buildings.

In relation to a question in regards to the defendability of the town, a witness advised at the Inquiry: *Given what I know of Yarloop and in terms of its preparedness and its setting and the nature of most of the buildings and the fire, the nature of the fire that came through there, I would agree with that. It was undefendable, certainly on the eastern side – yes – the eastern side of the town that took the brunt of the impact.*

The inquiry made an important recommendation in regards to fuel management. Recommendation 5: The Department of Fire and Emergency Services, utilising the Office of Bushfire Risk Management, to develop a simplified and fast track hazard reduction burn (and other fuel mitigation techniques) planning and approval process to ensure the timely conduct of township and asset protection burns by Bush Fire Brigades and individual property owners. The process is to be agile and adaptable for the range of stakeholders which may participate in low risk, small scale, low complexity burns planning and approvals.

Burrows (2019) also addressed the Waroona fire, Western Australia, 5 January 2016 as Case study 6:

#### *Background*

*Started by lightning, this fire burnt 70,000 ha of forest and farmland. There were two fatalities and 181 buildings destroyed including 166 homes in the township of Yarloop, virtually destroying the town. There was significant damage to public and private infrastructure, rural industries, water catchments and forest and environmental values. The estimated economic cost of the fire was \$155 million.*

#### **Lessons and insights**

Lessons and insights in relation to this bushfire provided by Burrows (2019) are outlined in Annexure 2. A large number of lessons and insights are outlined in relation to the Waroona bushfire and a number of other bushfires.

The lessons from Burrows (2019) have been analysed and used in developing the key town and city bushfire disaster lessons and insights outlined in Section 3.

As highlighted in McCaw et al. (2016):

*There is a need to better understand the interactions between weather, fuels, atmospheric conditions and extreme fire behaviour associated with the formation of pyro-cumulonimbus.*

*The circumstances and impacts of this fire highlight the importance of fuel management in bushland in and around settlements, as well as across the broader landscape. This includes fuel management in the complex mosaic of vegetation age and structure that arises following bauxite mining operations in State forest.*

and:

*For most of 6 and 7 January the fire was burning in forest fuels that were at least 10 years old, with sizeable areas of fuel more than 20 years old. The existence of large tracts of old fuel undoubtedly contributed to the rapid spread and high intensity of the fire, and to other phenomena including crown fire, mass spotting and the development of multiple events of pyro-convection.*

and:

*Localised areas of long unburnt fuel adjoining Yarloop clearly played a key role in generating very high fire intensities and mass spotting that resulted in extensive damage to a large number of buildings in the town.*

*Abundant and long unburnt fuels in road verges and other vegetation corridors also probably contributed to the scale of the impact on the electricity transmission grid by facilitating the combustion of power poles.*

Peace (2017) highlighted key lessons from this bushfire in relation to Forest Danger Index peak, entrainment, downslope winds and pyrocumulonimbus. These are detailed are outlined on pages 11 to 13 of that report.

## **2.4 South Australia Pinery bushfire 2015**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### **Bushfire information**

This bushfire was on 25 November 2015.

Information on this bushfire outlined in Burrows (2019):

#### *Background*

*The Pinery fire, which is believed to have been caused by a faulty electric fence, burnt more than 82,500 hectares of mostly cleared/cropped farmland with patches of forest reserves in South Australia's mid-north. Losses amounted to 97 homes, 546 sheds and other structures, 413 vehicles and pieces of farm machinery, 18,600 livestock, 54,000 poultry, \$30 million in crops, and thousands of livestock. Insurance claims were ~\$172 million (Zimmerman 2017), on top of suppression and other costs. During the fire, two people lost their lives. The SA Country Fire Service (CFS) engaged Noetic Solutions (2016) to prepare a 'lessons learnt' review of the bushfire. The 'Lessons learnt' section of the Pinery 23 fire recovery final report (Zimmerman 2017) lists 41, detailed recommendations, which are summarised here.*

#### **Lessons and insights**

Lessons and insights in relation to this bushfire provided by Burrows (2019) are outlined in Annexure 2. A large number of lessons and insights are outlined in relation to the Pinery bushfire. The lessons from Burrows (2019) have been analysed and used in developing the key town and city bushfire disaster lessons and insights outlined in Section 3.

### **2.5 South Australia Sampson Flat bushfire 2015**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

#### **Bushfire information**

Burrows (2019) noted:

*This bushfire was on 2 January 2015.*

#### *Background*

*This fire became the most destructive fire in the Adelaide Hills in 30 years, burning 12,600 hectares of forest/woodlands and agricultural land with losses including 24 homes, 146 other structures, five businesses, livestock and fencing. The damage bill alone was estimated at \$13 million. To my knowledge, there was no formal, publicly available review of or inquiry into this fire, so documentation is scarce.*

#### **Lessons and insights**

Lessons and insights in relation to this bushfire provided by Burrows (2019) are outlined in Annexure 2. A large number of lessons and insights are outlined in relation to the Pinery Flat bushfire. The lessons from Burrows (2019) have been analysed and used in developing the key town and city bushfire disaster lessons and insights outlined in Section 3.

### **2.6 NSW bushfires 2013**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

#### **Bushfire information**

NSW Rural Fire Service (2013) outlined:

#### *Summary*

*In mid-October 2013, a number of large and destructive fires affected communities including the Blue Mountains, Port Stephens, Central Coast, Hawkesbury and Southern Highlands.*

*In mid-October 2013, a number of large and destructive fires affected communities including the Blue Mountains, Port Stephens, Central Coast, Hawkesbury and Southern Highlands.*

*Sadly, more than 200 homes were destroyed in the fires however thousands more were saved due to the work of firefighters.*

*Crews from the NSW Rural Fire Service, Fire & Rescue NSW, National Parks and Forestry Corporation worked to protect people and properties. They were assisted by interstate crews.*

*A State of Emergency was declared at the height of the fire emergency.*

As noted in 2013 New South Wales bushfires extracted from Wikipedia on 28 November 2023:

*The 2013 New South Wales bushfires were a series of bushfires in Australia across the state of New South Wales primarily starting, or becoming notable, on 13 October 2013; followed by the worst of the fires beginning in the Greater Blue Mountains Area on 16 and 17 October 2013.*

*High fuel loads, coupled with warm, dry and windy weather, provided dangerous conditions which fuelled the fires. They all swept everywhere across the state. At the peak of the fires, on the morning of 18 October, over 100 fires were burning across the state.[10] The Premier of New South Wales Barry O'Farrell declared a state of emergency on 20 October,[11] empowering firefighters to evict residents and demolish fire-affected buildings.[12]*

*The fires were the worst in New South Wales since the 1960s, although they were dwarfed by the 2019-2020 Australia bushfires.[12] As of 19 October 2013, 248 houses and other structures were destroyed across the state.[6] Two fatalities were attributed to the fires.[7][8] It was estimated that claims will exceed A\$94 million.[1]*

### **Lessons and insights**

Curtin (2018) noted:

*After hearing 15 days of evidence in the coronial inquiry from June, 2015, to November last year, Ms Toose made several recommendations which could help prevent a repeat of that devastating day.*

*She recommended that Endeavour Energy ensure its contractors who manage vegetation under power lines and do pre-summer checks receive appropriate training and equipment, including a sounding hammer or rubber mallet, which could have indicated that the tree in Linksvie Road, Springwood, was rotten and hollow.*

*She noted that NSW police on the afternoon were called into action despite having no personal protective equipment, so recommended that officers in bushfire-prone areas be given that equipment and training in how to use it.*

*Ms Toose also recommended that Rural Fire Service personnel and volunteers be given more training in safe ways of fighting fires near electricity.*

### **2.7 Tasmanian Dunalley bushfire 2013**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

#### **Bushfire information**

Burrows (2019) included a case study (case study 3) on the Dunalley fire in Tasmania on 3 January 2013. Brief detail about this bushfire is included below;

#### **Background**

*Multiple fires started by various causes occurred over the period 3-5 January 2013, burning a total of ~100,000 ha of forest and other bushland, and agricultural land. Losses included 431 buildings (203 dwellings), infrastructure, 662 km of fencing and 10,000 stock. The financial cost, which does not include suppression and recovery costs, was estimated at \$100 million. The most damaging of the fires was the ~24,000 ha Forcett-Dunalley fire (the Dunalley fire), so is the focus of the current study.*

AFPA (2020) noted:

*In January 2013, major fires ravaged areas around Forcett, Lake Repulse and Bicheno in south-eastern Tasmania. More than 200 homes were lost. An independent inquiry identified fuel reduction practices as a high priority and recommended a strategic fuel management plan be developed and implemented with measurable targets, and that the planning should happen across all land tenures. The Inquiry noted that the rapid spread of the fire was attributable, in part, to high fuel loads, combined with wooded and inaccessible terrain.*

#### **Lessons and insights**

Lessons and insights in relation to this bushfire provided by Burrows (2019) are outlined in Annexure 2. A large number of lessons and insights are outlined in relation to the Dunalley bushfire. The lessons from Burrows (2019) have been analysed and used in developing the key town and city bushfire disaster lessons and insights outlined in Section 3.

### **2.8 Victorian bushfires 2009**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

## **Bushfire information**

Information extracted from Wikipedia in 2021:

*The 2009 Victorian bushfires also called Black Saturday, where more than 400 bushfires started in Victoria, Australia on February 7, 2009.*

*Many houses in the Victorian towns of Steels Creek, Humevale, Wandong, St Andrews, Callignee, and Koornalla were also destroyed or damaged. There were people killed at each town. The fires affected 78 towns and left about 7,500 people homeless. More than 4,000 firemen and women worked to control and stop the fires.*

*In regards to the Kinglake area (Kilmore East fire), the fire was fanned by extreme north westerly winds, and travelled 50 km (31 mi) southeast in a narrow fire front through Wandong and Clonbinane, into Kinglake National Park, and then onto the towns of Humevale, Kinglake West, Strathewen and St Andrews (understood from Craig Hearson that the Kilmore East fire did not impact the Kinglake National Park or Strathewen district on the southern run, the majority of the damage and life loss was in the period after the wind change come through that afternoon). The cool change passed through the area around 5:30 pm, bringing strong south westerly winds. The wind change turned the initial long and narrow fire band into a wide fire front that moved in a northeast direction through Kinglake, Steels Creek, Dixons Creek, Chum Creek, Toolangi, Hazeldene, Broadford and Flowerdale. The area became the worst-impacted in the state, with a total of 120 deaths and more than 1,200 homes destroyed.*

*Marysville is a small town which previously had a population of over 500 people, was devastated by the Murrindindi Mill bushfire on 7 February 2009. On 19 February 2009 the official death toll was 45. Around 90% of the town's buildings were destroyed. Prior to the Black Saturday fire, the population in 2006 was 519. At the 2011 Census, the population had reduced to 226, by the 2016 Census it had risen to 394.*

Further information extracted from Wikipedia on 19 January 2024 in relation to the Black Saturday bushfires:

*The Black Saturday bushfires were a series of bushfires that either ignited or were already burning across the Australian state of Victoria on and around Saturday, 7 February 2009, and were one of Australia's all-time worst bushfire disasters. The fires occurred during extreme bushfire weather conditions and resulted in Australia's highest-ever loss of human life from a bushfire,<sup>[10]</sup> with 173 fatalities.<sup>[11]</sup> Many people were left homeless as a result.*

*As many as 400 individual fires were recorded on Saturday 7 February; the day has become widely referred to in Australia as Black Saturday.*

*The 2009 Victorian Bushfires Royal Commission, headed by Justice Bernard Teague, was held in response to the bushfires.*

and:

*David Packham, bushfire expert and research fellow at Monash University, argued that high fuel loads in bushland led to the destructive intensity of the fires, saying that "There has been total mismanagement of the Australian forest environment."<sup>[184]</sup>*

Burrows (2019) provides further information in Case study 1: 'Black Saturday' fires, Victoria, 7 February 2009:

### **Background**

*The 'Black Saturday' bushfires remain one of Australia's worst natural disasters, with multiple fires burning about 450,000 ha of forest and farmland, killing 173 people (7 others died later from injuries) and destroying over 2000 homes and 3500 other buildings. In addition to the economic cost (estimated \$4.4 billion), the fires caused significant trauma, dislocation and disruption to affected communities. The incident was the subject of a Royal Commission (VBRC 2010), which focused on fifteen of the most damaging fires. There have been numerous detailed investigations, analyses and scientific reports, so the incident is well documented and is briefly summarised here. The VBRC recommendations formed the basis for the Fire Management Reform Program initiated by the Victorian Government.*

### **Lessons and insights**

Lessons and insights in relation to this bushfire provided by Burrows (2019) are outlined in Annexure 2. A large number of lessons and insights are outlined in relation to the 2009 Victorian bushfires. The lessons from Burrows (2019) have been analysed and used in developing the key town and city bushfire disaster lessons and insights outlined in Section 3.



Other Victorian lessons and insights are outlined in Leonard et al. (2009).

## **2.9 ACT Canberra bushfires 2003**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### **Bushfire information**

Information extracted from Wikipedia on 27 October 2021 titled 2003 Canberra Bushfires:

*The 2003 Canberra bushfires caused severe damage to the suburbs and outer areas of Canberra, the capital city of Australia, during 18–22 January 2003. Almost 70% of the Australian Capital Territory's (ACT) pastures, pine plantations, and nature parks were severely damaged,<sup>[1]</sup> and most of the Mount Stromlo Observatory was destroyed. After burning for a week around the edges of the ACT, the fires entered the suburbs of Canberra on 18 March 2003. Over the next ten hours, four people died, over 490 were injured, and 470 homes were destroyed or severely damaged, requiring a significant relief and reconstruction effort.*

*On 8 January 2003, lightning strikes started four fires in New South Wales, over the border but in close proximity to Canberra. Despite their proximity and very small initial sizes, low intensity, and low rate of spread, these fires were not extinguished or contained by New South Wales emergency services personnel. Subsequent inquiries into the bushfires, including the Roche report, the McLeod inquiry, and the Coroner's Report, identified poor management of the initial response as a key contributor to the disaster that unfolded on 18 January 2003.*

*The ACT Government McLeod Inquiry to examine and report on the operational response to the ACT bushfires of 8 to 21 January 2003 found amongst a number of issues that management of fuel load in parks and adequate access to remote areas were both lacking (August 2003).*

*The ACT Government established the McLeod Inquiry to examine and report on the operational response to the bushfires. The Inquiry was headed by Ron McLeod, a former Commonwealth Ombudsman. The Inquiry handed down its findings on 1 August 2003.*

*The inquiry found that:*

- *The fires, started by lightning strikes, might have been contained, had they been attacked more aggressively in the 24 hours after they broke out. Large stretches of dry, drought-affected vegetation and weather conditions that were extremely conducive to fire meant that once the fires reached a certain size, they were very difficult to control.*
- *Management of fuel load in parks and adequate access to remote areas were both lacking.*
- *Emergency service personnel performed creditably, but they were overwhelmed by the intensity of the fires and the unexpected speed of their advance on 18 January.*
- *A comprehensive ACT Emergency Plan was in place at the time of the fire; it worked, particularly in recovery after the fires, in dealing with the large number of people who needed temporary shelter and assistance as a consequence of the fires.*
- *Inadequacies in the physical construction and layout of the Emergency Services Bureau centre in Curtin were a hindrance.*
- *There were some equipment and resourcing deficiencies within the ACT's emergency service organisations.*
- *Information and advice given to the community about the progress of the fires, the seriousness of the threat, and the preparations the public should be making was seriously inadequate. There was also confusion as to whether homes had to be evacuated.*

*The Inquiry recommended there should be increased emphasis given to controlled burning as a fuel-reduction strategy, access to and training of emergency personnel in remote areas needed to be improved and a number of changes be made to the emergency services and the policies that govern their operations, including a greater emphasis on provision of information to the public.*

Onfray (2023) highlighted many concerns in relation to bushfire management around Canberra:

*According to retired CSIRO research scientist and international expert on bushfire behaviour and management, Dr Phil Cheney:*

*“The fact that bushfires burnt into the urban area under extreme conditions did not reflect a failure of fuel management on the urban interface but rather a failure of fuel management in the forest area”.*

*Heavy fuels and lack of access hindered suppression efforts early in the development of the fires. They contributed to the fires burning a large area before the onset of extreme fire weather that drove them to Canberra.*

*This case study looks at the history of fires that have previously threatened Canberra, the decline in active fuel management and the inevitable consequence that culminated in a firestorm in January 2003. After many lessons, an adequate fire management system was developed surrounding the Bush Capital. However, from the 1990s, it was gradually dismantled in favour of an emergency response to dealing with fires and little fire preparation. Given the predictable outcome, it begs the question – why are lessons learnt so easily forgotten and ignored?*

and:  
*“Government managers are not measuring up to the task of bushfire management. These days it’s about suppression, not prevention. The suppression industry thrives on fires. Big fires.” Ron McLeod.*

and:  
*What eastern Australia has experienced in the last 30 years with extensive and damaging bushfires personifies the old saying that lessons are hard-won but are quickly forgotten.*

and:  
*The Canberra fire problem is known and is a reality. But unfortunately, in the lead-up to January 2003, the threat of a major catastrophic wildfire descending on the suburbs of Canberra was ignored. Simply put, the history of bushfires in the ACT is evidence that a conflagration was inevitable if the fuel loads in the surrounding forests to the west were not managed and if fires were not attacked rapidly, contained and not left to smoulder.*

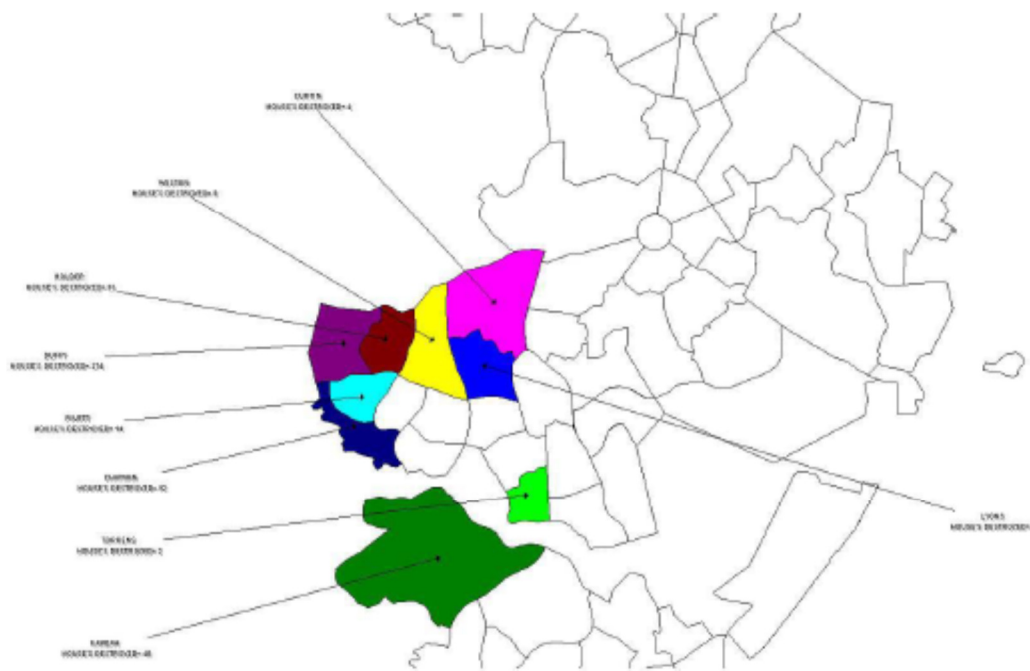
Canberra had the best protected perimeter of any city in Southern Australia (Cheney (2020) pers comm). The planning meant that suburban blocks were largely completed so there was no shoestring development; maintenance of public parks by mowing was high and the western perimeter was mostly grazed grassland with a small section of pine plantation.

The National Museum Australia Defining Moments Canberra bushfires document on the web included useful photos in relation to this disaster.

### **Lessons and insights**

As noted in Blanchi and Leonard (2005), it appears that in Duffy most houses were ignited by either ember attack or house-to-house ignition. The initial vegetation and structural fires in Duffy created an even more concentrated and enduring ember attack for those further downwind. The ember attack caused by persistent winds blowing over structural fires played a role in the spread of fire deep into urban areas. Some of the structural fires provided direct flame attack and radiation impact on adjacent structures. This effect was exacerbated by the placement of relatively large houses on medium sized blocks, and the presence of timber fences and vegetation between the closely aligned structures.

Figure 1 below highlights destroyed house incidents for all of Canberra (extracted Figure 4 from Blanchi and Leonard (2005)).



**Figure 4. Destroyed house incidents, all Canberra**  
 (produced by S/Constable Paul N. Turk Actomis, 20 January 2003)

**Figure 1. Destroyed house incidents all Canberra. Extracted Figure 4 from Blanchi and Leonard (2005). Note, there was no detail on the colours and was difficult to read the small writing associated with the various colours.**

As noted in Blanchi and Leonard (2005), the amount and type of vegetation around the house was found to be an important factor in previous bushfire survey investigations (Ramsay et al. 1987). Houses were more likely to be damaged or destroyed as the vegetation around them became thicker and the proportion of trees to shrub increased (Ramsay et al. 1987). It is desirable to have a fuel-reduced area around a building to reduce the level of hazard, in particular the risk of attack by flame contact and radiant heat.

Blanchi and Leonard (2005) made recommendations to mitigate bushfire impact at the urban interface following investigations of the serious Canberra bushfires, a number of these being:

- Implement the provisions of AS 3959 to the Canberra urban interface. In virtually all cases, the exposure level will be deemed to be medium in accordance with the provisions of AS 3959 requiring the provision of basic ember protection at little additional cost to construction. This zoning may also lead to increased voluntary adoption of these mitigation measures.
- Encourage the community to become bushfire aware and suggest the benefits of retrofitting basic ember protection provisions to their homes if they are deemed to be in a medium level zone as defined in AS 3959.
- Continue the strategy of using perimeter roads as radiation and flame buffers for urban assets.
- Utilise the knowledge collected in the Canberra fires to influence the priorities on which all regulatory reform and community education are based.
- Provide risk assessment methodologies that identify both the risk of a bushfire attack and the susceptibility of an urban and peri-urban area.
- Encourage the use and positioning of outbuildings around residential structures that reduce their potential ignition and impact on the main structure and
- Ensure that house losses many hours after a bushfire front have impacted an urban area is a consideration when allocating firefighting resources to the event. Note, the practical reality is that firefighting resources will likely be overwhelmed.

As extracted from ACT Fires January 2003 (2006):

- *The Ellis Report contains a statistical analysis of a total of 779 houses allocated into the three categories referred to above. The results of the survey demonstrated that there was a significant statistical association between house loss and garden type, with houses with more unkempt or fuel heavy gardens (type 1) more likely to be destroyed as a result of ember attack from a bushfire. Dr Ellis also gave evidence that the statistical tests pointed out that cypress trees in general and conifers in particular, were a factor in house loss and damage.*
- *The Ellis Report includes a general estimate that 50% of the impact of the fires in the suburbs came from ember attack directly out of the neighbouring forests and the other 50% of impact was likely to have been caused by fire spread within the urban area, either ember attack from fuels within other houses or direct house to house flame contact. Among other things, he concluded that land management agencies cannot stop fire brands reaching residential properties and igniting any ignitable fuel on that property.*
- *The Leonard Report includes a general discussion of mechanisms of bushfire impact on urban assets. In particular, the report notes that: Survey work has revealed that many houses are ignited from radiation and flame contact from adjacent buildings or features such as timber fences. The duration of the radiation and flame exposure from adjacent burning structures may be for a significantly longer period (an hour or more) compared to the exposure to the firefront itself (a few minutes). Embers are the major cause of ignition, as they can attack a building for some time before a firefront arrives, during the passage of the firefront and for many hours after the fire has passed[1696] . As with the work undertaken by Dr Ellis and his colleagues, Mr Leonard's research also confirmed that there was no evidence from the survey of houses impacted in the Duffy area of damage caused by direct flame contact or radiant heat out of the forest: What was very evident when we performed our initial investigation of the area was that the road and clearing zone that formed the perimeter of the Duffy area between the continuous forest fuel and the structures were significant enough to prevent radiation and flame in themselves causing damage to the structures.*
- *Also noted in the Leonard Report. In the course of discussing further the aspects of house design that make houses more susceptible to ember attack and, therefore destruction, Mr Leonard referred to a fairly clear statistical verification of the impact of protected versus non-protected vent systems in houses, with houses with vents that were not protected by a metal mesh with holes smaller than 2mm more likely to be destroyed during bushfire. Mr Leonard also noted a strong statistical bias to show that a destroyed building has a much higher chance of having a destroyed out building associated with it. He concluded that it could be presumed that a component of the statistical bias was due to the fact that the outbuilding represented a significant additional attack on the main structure through flame radiation and ember source. He added that an out building is designed with many more gaps due to cheap construction and is therefore more susceptible to ember attack. Sheds and garages often also contain a large number of readily combustible items like stored timber, paint tins and so on. Mr Leonard confirmed that timber fences, because they represent a large component of the dried timber load usually very close to the main structure, and gas lines, were other issues identified in the Leonard Report. However, Mr Leonard did note that, while you can detect some evidence of the effect of a ruptured gas line on a damaged house, once a house is reduced to rubble, it is virtually impossible to determine that its loss was due to a gas line.*

Onfray (2023) identified failures in the following areas for the 2003 bushfires in Annexure 3, the key extracted lessons and insights are:

- Avoid large contiguous area of mountainous and foothill country without any fuel reduction burning for long periods.
- Avoid focussing solely on managing fuels at the urban interface and not across forested landscapes.
- Sound network of properly maintained fire trails for access and use as fire control lines.
- Quick initial attack of fires as soon as they are detected and high importance of ongoing ground operations continuing into the night when conditions are most favourable for firefighting
- Ensuring that the lessons of past disasters and the recommendations following them are captured and forgotten or denied.

## **2.10 NSW Black Christmas bushfires 2001 and 2002**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### **Bushfire information**

NSW Black Christmas bushfires extracted from Wikipedia 28 November 2023:

*In Australia, during winter and spring 2001, low rainfall across combined with a hot, dry December created ideal conditions for bushfires. On the day of Christmas Eve, firefighters from the Grose Vale Rural Fire Service (RFS) brigade attended a blaze in rugged terrain at the end of Cabbage Tree Rd, Grose Vale, believed to have been caused by power lines in the Grose Valley.*

*On Christmas Day, strong westerly winds fuelled more than 100 bushfires across the state, creating a plume of smoke that extended across Sydney.[2] This plume of smoke would not clear for some days as the bushfires continued to burn, creating some of the worst pollution that Sydney has ever experienced, with a regional pollution index reading of: 200 in North-West Sydney; 120 in Central-East and South-West Sydney.[3][4] The fires mainly burnt in Lane Cove National Park, the Royal National Park and Blue Mountains National Park. Approximately 753,314 hectares (1,861,480 acres) was burnt.[1] 121 homes were destroyed across the state and 36 damaged, mostly in the lower Blue Mountains and west of the Royal National Park around Helensburgh.[5] Arsonists were believed to be responsible for starting many of the fires, leading to harsher penalties for those who start bushfires.*

*The dry conditions that started the bushfires continued well into 2002, resulting in the worst drought in 100 years. The drought was declared a “one in 1000 year event”. [6] The drought finally broke with the La Nina event of 2010–2011. Significantly higher than average rainfall began in July 2010, it was Australia’s second wettest year on record.[7]*

- Cost A\$70 million
- Date(s) 24 December 2001 – 7 January 2002
- Burned area 753,314 hectares (1,861,480 acres)[1]
- Buildings destroyed
- 109 homes
- 433 outbuildings[1]
- Deaths Nil
- Non-fatal injuries 4

Further detail in relation to this bushfire is outlined within:

<https://knowledge.aidr.org.au/resources/bushfire-black-christmas-2001/>

### **Lessons and insights**

The Joint Select Committee on Bushfires (2002) made generic findings recommendations.

Two important insights raised were:

- *Finding. The committee acknowledges the example of effective use of the zoning approach to hazard reduction presented by the Kurrajong Heights Rural Fire Brigade.*
- *Recommendation. That performance audits of implementation of Bushfire Risk Management Plans be undertaken by the Commissioner of the NSW Rural Fire Service in accordance with a Strategic Audit Plan to be approved by the Minister for Emergency Services.*

These were important matters identified.

### **2.11 NSW Eastern Seaboard bushfires 1994**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

#### **Bushfire information**

Extracted from Wikipedia 1994 eastern seaboard fires on 28 November 2023:

*The 1994 eastern seaboard fires were significant Australian bushfires that occurred in New South Wales, Australia during the bushfire season of 1993–1994. Some 20,000 firefighters were deployed against some 800 fires throughout the state, and along the coast and ranges from Batemans Bay in the south to the Queensland border in the north, including populated areas of the city of Sydney, the Blue Mountains and the Central Coast. The fires caused mass evacuations of many thousands of people, claimed four lives, destroyed some 225 homes and burned out 800,000 hectares (2,000,000 acres) of bushland.[1][2] The firefighting effort raised in response was one of the largest seen in Australian history.*

#### *Extent of the fires*

*From 27 December 1993 to 16 January 1994, over 800 severe fires burned along the coastal areas of New South Wales, affecting the state’s most populous regions. Blazes emerged from the Queensland border down the north and central coast, through the Sydney basin and down the south coast to Batemans Bay. The 800,000 hectare spread of fires were generally contained within less than 100 kilometres from the coast, and many burned through rugged and largely uninhabited country in national parks or nature reserves.[3]*

As noted in Wyndham (2021) Eastern seaboard bushfires 1994:

[http://dictionaryofsydney.org/entry/eastern\\_seaboard\\_bushfires\\_1994](http://dictionaryofsydney.org/entry/eastern_seaboard_bushfires_1994)

*The bushfire season of 1994 was one of the worst in the history of New South Wales. Eight hundred blazes torched over 800,000 hectares of bushland from Batemans Bay to the Queensland border, with mass evacuations occurring in populated areas up and down the state.[1] Three volunteer firefighters; Robert Page, Norman Anthes and Clinton Westwood, plus one civilian, lost their lives during the bushfires. Westwood was only seventeen when he died in a tanker crash on 29 January 1994.[2]*

*During the 1980s and 1990s, bushfires had become more frequent and dangerous; however, nothing had prepared the firefighters of New South Wales for the wall of flame that engulfed the state in December 1993.[3] Searing heat and strong winds saw fire fronts tear through the state in the new year, with 225 homes lost and the train line to Newcastle cut off by flames.[4] Suburbs as close to central Sydney as Turramurra, Killara and Pymble were affected, with fierce fires burning in the Lane Cove, Ku-ring-gai Chase and Royal National Parks and southern suburbs Menai, Como West and Jannali. In Bonnet Bay, a 42-year-old woman died after seeking shelter in a swimming pool, with two children found with her treated for serious burns.*

*Twenty thousand firefighters were called out to assist with the bushfire effort, alongside interstate fire teams and the Australian Defence Force. At the time, bushfire administration in the state was undertaken by separate bodies, the Department of Bush Fire Services and local councils. This led to some confusion between organisations during the bushfire crisis.*

Other information is available in:

Thirty Years Since the 1994 bushfires Museum of Fires <https://www.museumoffire.net/single-post/thirty-years-since-the-1994-bushfires>

### **Lessons and insights**

Wyndham (2021) noted: [http://dictionaryofsydney.org/entry/eastern\\_seaboard\\_bushfires\\_1994](http://dictionaryofsydney.org/entry/eastern_seaboard_bushfires_1994)

*Legal investigations into the causes of fires in New South Wales are under the jurisdiction of the coroner. A coronial inquiry was launched at the Glebe Coroner's Court in August 1994, with an inquest into the four fatalities conducted at the same time. Over the course of the two-year inquiry, Senior Deputy State Coroner John Hiatt made 125 findings and recommendations.[5]*

*The most influential of Hiatt's recommendations was the amalgamation of all firefighting services in the state into a single Rural Fire Service (RFS) with a simplified chain of command. Other recommendations included revisions of building codes in fire-prone areas and the improvement of technology for communications during fires.[6] The Rural Fires Act 1997 formally established the modern NSW Rural Fire Service, that was divided into teams attending rural fire districts based on local government boundaries.[7] ....*

### **2.12 South Australia and Victoria Ash Wednesday bushfires 1983**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

#### **Bushfire information**

As noted in Sullivan (2004), Ash Wednesday on 16 February 1983, brought the worst fire disaster in Australia since Black Friday in 1939. A total of about 370,000 ha were burnt, 76 people were killed, and some 2500 structures were destroyed.

*Ash Wednesday is a prime example of particularly severe fire weather conditions in south-eastern Australia. Timing of the passage of the cold front was such that, as it swept across southern Australia during daylight hours, extreme fire weather extended from Port Lincoln in South Australia to east of Melbourne, Victoria, a distance of 800 km. At most locations, hot strong northerly winds started blowing early in the morning (0900 hrs EDST), and increased to average mean speeds of 45-50 km/h for several hours preceding the front. Unusually strong westerly winds were associated with the frontal change, which reached Ceduna at 1230 hrs, Adelaide at 1445 hrs and Melbourne at 2030 hrs. Mean wind speeds were in excess of 70 km/h, with gust speeds up to 110 km/h. Much of south-eastern Australia was experiencing severe drought at the time, and most of the damage occurred in forested areas. However, a number of severe grassfires occurred in South Australia and Victoria in areas where the drought was not extreme.*

As noted in Wikipedia Ash Wednesday bushfires (extracted 4 January 2024) in relation to town impacts:

*Whole townships were obliterated in minutes. In the Dandenong Ranges, the villages of Cockatoo and Upper Beaconsfield were devastated, with twelve volunteer firefighters losing their lives after being trapped by a wall of flame when the wind change struck, while parts of Belgrave Heights (where this fire started) and Belgrave South suffered large areas of property loss.*

Most of Macedon and much of historic Mount Macedon to the north-west of Melbourne was razed, including many heritage-listed 19th-century mansions and famed gardens.

A fire that started in Deans Marsh raced into the Otway Forest. When the wind change happen the fire formed a huge front and headed for the coast. Burning all night, the morning after Ash Wednesday, first light revealed the devastation of the popular coastal towns along the Great Ocean Road such as Aireys Inlet, Anglesea and Lorne resembled barren moonscapes. The fire on the coast had been so intense that firefighters were forced to abandon all control efforts and let it burn until it reached the ocean, destroying everything in its path.[31] Residents were forced down to the water edge of beaches in the areas to escape the flames.

### **Lessons and insights**

Victoria (1984) noted:

#### *Section 3 - Mitigation and preparedness*

*300. Mitigation and preparedness must always be regarded as a major bushfire counter-measure. Many discrete aspects influence its effectiveness. They include:*

- *General apathy within the community*
- *The policies and attitudes of governments*
- *Use of legislation and regulation*
- *Fuel reduction policies*
- *The roles, responsibilities and powers of involved organisations, including local government*
- *Individual responsibility*
- *Special policies and measures in fire-prone areas*
- *Emergency training, public awareness and education*
- *Preservation of the environment*
- *Insurance aspects.*

*301. Current standards of mitigation and preparedness in Victoria are too low, thus reducing counter-disaster effectiveness.*

*Recommendation: Mitigation and preparedness be enhanced and maintained for the future. Some coordinating mechanism or system be introduced at State Government level for this purpose.*

As noted in Wikipedia Ash Wednesday bushfires (2024):

#### *Aftermath*

*Many of the Victorian fires were thought to have been caused by sparks between short-circuiting power lines, and tree branches connecting with power lines. A systematic review of fire safety was undertaken; areas under high-tension pylons were cleared and local domestic lines considered to be at risk were replaced with insulated three-phase supply lines.*

*In South Australia, an inquest into the fires found that the communication systems used by the CFS were inadequate and, as a result, the government radio network was installed, although this did not happen until almost 20 years later.<sup>[33]</sup> Improvements in weather forecasting, with particular reference to wind changes and fronts, was undertaken by the Bureau of Meteorology. An emergency disaster plan, known as Displan, was also legislated. Many of the lessons learned in building better homes for fire survival, bush management and emergency response efficiency in analysis of the fires conducted by the CSIRO were to prove vital in later crises, including the 1994 Eastern seaboard and 2003 Canberra fire outbreaks.<sup>[34]</sup>*

*A study was conducted into the 32 fatalities (excluding firefighters) that occurred in Victoria. It revealed that 25 were outside their homes, several of whom died in vehicles while attempting to escape the conflagration. It was found that delaying evacuation until the last minute was a common failing.<sup>[35]</sup>*

Krusel and Petris (1992) highlighted the following:

*Recent studies of disaster state that disasters are simply manifestations of the vulnerability of a community to a hazard. In this analysis of the 32 civilian deaths on Ash Wednesday, we have identified three senses of vulnerability. The victims of these fires died because they (a) implemented an ineffective survival strategy; (b) had insufficient warning; or (c) were incapable of implementing an effective survival strategy without support. We believe that these*

deficiencies are not being adequately addressed by current bushfire safety practices. This paper has demonstrated that an alternative approach that may effectively deal with these strategies is one based on community groups. Members of these groups can work together to develop bushfire safety strategies that best satisfy their particular needs.

The author of this review considers most of these issues still apply at this time.

### **2.13 Tasmania Hobart bushfires 1967**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

#### **Bushfire information**

As noted in Wikipedia 1967 Tasmanian Fires (extracted 27 October 2021):

*The worst of the fires was the Hobart Fire, which encroached upon the city of Hobart. In total, the fires claimed 62 lives in a single day. Property loss was also extensive with 1293 homes and over 1700 other buildings destroyed. The fires destroyed 80 bridges, 4800 sections of power lines, 1500 motor vehicles and over 100 other structures. It was estimated that at least 62,000 farm animals were killed. The total damage amounted to \$40,000,000 in 1967 Australian dollar values. The resulting insurance payout was the then largest in Australian history.*

Wikipedia (20 July 2020) provided information in regards to the causes of the Hobart 1967 bushfires. The late winter and early spring of 1966 had been wet over south eastern Tasmania, resulting in a large amount of vegetation growth by November. However, in November, Tasmania began its driest eight-month period since 1885, and by the end of January 1967 the luxuriant growth in the area had dried off. Though January was a cool month, hot weather began early in February, so that in the days leading up to 7 February 1967, several bush fires were burning uncontrolled in the areas concerned. Some of these fires had been deliberately lit for burning off, despite the extremely dry conditions at the time. Reports into the causes of the fire stated that only 22 of the 110 fires were started accidentally.

As noted in Sullivan (2004):

*On the morning of 7 February 1967, in excess of 80 uncontrolled fires were burning in and around Hobart but, until that time, had only burnt a total of 1500 ha (or 0.6 of the total area that would eventually burn). Some fires were pre-existing; some were lit on the day, some within the suburbs and some up to 100 km from the city. Dry conditions had prevailed from October 1966 throughout southern and eastern Tasmania. Grass was prolific due to above average rains in September/ October. However, the winter had been relatively mild and not very wet. Grass growth was further enhanced by above average temperatures and the low incidence of frost during the spring growth period. By early February this grass had become fully cured.*

*On the morning of the 6 February, a high pressure system that had been located in the Tasman Sea since early on the 3 February, merged with a new high pressure system that had passed over Tasmania on the 5 February, resulting in steadily increasing maximum air temperatures during this period. On the 7 February, a low-pressure system that had moved into the area on the 6 February from the Southern Ocean and which contained a number of cold fronts pushed the isobars tighter over southern Victoria and Tasmania. This resulted in air temperatures rising from 29°C at 0900 hrs to 39°C at 1200 hrs. Temperatures remained above 35°C for a period of almost 5 hours. Relative humidity had dropped to 14% by 1200 hrs and remained almost constant for 3 hours. Mean wind speed increased from 11-13 km/h between 0900 and 1000 hrs to 37-41 km/h between 1000 and 1100 hrs. After this time, the wind became gusty and after 1200 hrs gusts frequently exceeded 93 km/h, the maximum recorded being 120 km/h at 1330 hrs. Mean wind speeds between 1200 hrs and 1500 hrs were between 41 and 67 km/h. The GFDI reached a maximum of 96 and remained at the extreme rating for 7 hours. The main cold front arrived at 1930 hrs and was preceded by a gradual diminishing of fire weather conditions.*

*In total 62 people were killed as a result of these fires, 20 as a result of a single fire that burnt through the western suburban fringe of Hobart burning an area of 6680 ha. A total of 226,500 ha were burnt in the 5½ hours between 1030 hrs and 1600 hrs, 85% of the final area burnt (...). In all, 1446 major buildings were destroyed and 795 square miles were burnt out. Damage costs were in excess of \$40 million.*

In the McArthur (1969) report in relation to the Hobart fires, McArthur assessed fire behaviour and house loss in urban areas (this review has listed these as dot points):

- *At times the fires burning through mixed forest and grassland fuels ignited large numbers of houses in various western suburbs of Hobart and in towns and villages such as Taroona, Kingston, Snug, Richmond, New Norfolk, Boyer, Colebrook and Rokeby;*



- *In the main, these areas could be called fringe urban development where streets followed creek bottoms or ridges and were separated by open grassland areas or poor quality eucalypt bush. No large continuous built-up area was seriously involved by fire;*
- *Houses were generally ignited by wind driven embers lodging in the eaves or beneath the house. In many instances doors and windows were left open and the interior of the house ignited. In some cases garages or wood heaps caught alight and fire then spread to the house by flame contact;*
- *Once alight, most houses burnt out extremely rapidly and destruction was almost invariably complete;*
- *From a cursory examination there did not appear to be any significant relationship between type of house construction and chances of survival. House construction was generally of brick or brick veneer, timber or asbestos cement. A more detailed investigation of this aspect was carried out by CSIRO and the final details of the survey are not known;*
- *The percentage (house) loss in any particular area ranged from 18 percent in Olinda Grove Road to 78 percent in Summerleas Road. The percentage loss in a particular street varied accordingly to its location in respect of the main head fire, and losses were certainly greatest in an area where two fires merged, such as in Bracken Land and Summerleas Road; and*
- *One feature of housing losses in these fringe developments was the fact that groups of houses tended to survive in some localities, notably along Waterworks Road. When these situations were investigated, it was found that in all cases a group of people under strong leadership had stayed and fought the fires with garden hoses, wet bags and any other rough and ready means available. This proved that houses could be saved and people survive in an environment of fire which few other people in the world have ever experienced.*

ABC News (2017) highlighted other factors:

*"It's no surprise given the lack of control that was there, anyone and everyone if they chose could light a fire and fires roamed the countryside through the summer months," Mr Gledhill said.*

*The report into the cause identified other issues including a high fuel load from growing use of superphosphate fertilisers at the time, a decrease in Tasmania's rabbit population, and livestock being transported by vehicles instead of walking through roadside undergrowth.*

*Complacency was also a factor.*

*"There was a lack of public appreciation of the fire danger with a consequent indifference to it ... this contributed to the severity of the losses which occurred," the report said.*

*"The vast majority of people had no experience of such a widespread disaster and never contemplated that such a thing could occur."*

There are many photos, weather information and costs of the bushfires outlined in the ABC News (2017) article.

Sandford (2016) Tasmania has to learn lessons of the 1967 bushfires Let's not go through the horror and pain of the 1967 bushfires again, writes Rosemary Sanford 3 min read February 24, 2016 - 2:57PM:

*In Hobart, new subdivisions and houses continue to be approved by Hobart City Council in leafy, hilly surrounds and steep valleys such as those containing the Hobart and Sandy Bay rivulets. These valleys acted as funnels for the flames that ravaged Fern Tree, the Cascades, South Hobart, the Waterworks valley, Huon Rd and Dynnyrne in 1967.*

*In 1967, homes in Fern Tree, Huon Rd, the Cascades, Hillborough, Jubilee and Marlyn roads and Strickland Avenue down to the brewery were obliterated; nearly all farms and residences in the Waterworks valley were wiped out or damaged. Embers reached Glen and Adelaide streets in South Hobart.*

### **Lessons and insights**

Cheney (1976) outlined lesson information:

*During the Tasmanian fires in 1967, 110 individual fire origins were identified within a 55 km radius of Hobart; 90 fires had started some time in the three weeks prior to 7 February and 70 of these were free-burning on the morning of the 7th when extreme fire danger conditions arose. Either no suppression action had been attempted or only a part of the fire perimeter had been brought under control (McArthur 1968a).*

and:

*In the 1967 Tasmanian fires, many lives were lost as a result of heavy short-distance spotting from Eucalyptus obliqua which created a localised fire-storm effect in the front of the fire (McArthur 1968a).*

and:

*Although many fires had been free-burning for some weeks, only 1500 ha of land had been burnt up to the onset of extreme fire weather at 1030 hours on 7 February. This area was only 0.6 per cent of the total area eventually burnt. In 5! hours between 1030 and 1600 around 226 500 ha, or 85 per cent of the total area, burnt causing extensive damage.*

*The remaining 36 000 ha which made up the total area of 264 000 ha burnt over a period of several weeks after 7 February.*

*The fires caused 62 fatalities and resulted in damage estimated at between \$33 and \$44 million (Bond et al. 1967, McArthur 1968a).*

*These fires also illustrate the importance of a single fire in fire disaster. The overall area burnt and the fire origins are shown in Figure 1 (note not attached). Although a great deal of damage and loss of life occurred at the junctions of large fires a disproportionate amount of damage was caused by the one fire which burnt directly through the western suburban fringe of Hobart.... This fire which burnt only 6680 ha was estimated to have caused \$13.5 million damage and 20 fatalities. The average cost of this fire was \$2020 per hectare compared with the average overall damage figure of \$125-167 per hectare.*

*The fires of 7 February were essentially wind-driven and there was little interaction between the major fires so it is highly likely that had only this fire occurred, the damage caused to the suburban area would have been of the same order of magnitude although hopefully the number of fatalities would have been reduced. Conversely, had this single fire not occurred, none of the other 109 origins would have burnt severely into the western fringe of the city.*

Other information on lessons is outlined in:

The McArthur (1969) report in relation to the Hobart fires, McArthur assessed fire behaviour and house loss in urban areas and there are a number of lessons and insights identified above in relation to embers and house loss.

Sullivan (2004) studied 9 severe bushfire events and considered the conditions that may lead to severe fire events, including for the Hobart bushfires, including:

- Rainfall deficit (and El Nino events)
- Synoptic situations
- Diurnal variation
- Atmospheric stability
- Fuel conditions and moisture content forest and grass
- Ignition potential and sources

ABC News (2017):

- Of the 110 fires, 88 were found to be deliberately lit, although the exact causes are unclear. Some were from burn-offs started in the days prior.
- No-one was prepared for the speed and ferocity of the bushfires which swept through south-east Tasmania.
- The Hobart fire encroached into many suburban streets.
- Gridlock on the Brooker Highway, Hobart, as people evacuated.
- Firefighting equipment was rudimentary.

ABC News (2017) asks the question:

What has changed?

*The devastation wrought on Black Tuesday saw the birth of the modern fire service, with a coordinated statewide approach to bushfire management.*

*"Prior to 1967 there were very few firefighters outside the major metropolitan areas, training was very rudimentary, you learnt to drive the truck and operate the pump and that was about it," Mr Crawford said.*

Today, career and volunteer firefighters receive specialised training in structure, vehicle and bushfire fighting and hazardous materials.

Wet sacks and gum boughs have been replaced by high-tech equipment and water-bombing helicopters.

Mr Crawford said in 1967 there was very little ability to coordinate crews.

"Radio, wireless telegraphy for vehicles was in its infancy in the fire brigades, and on that particular day with the weather conditions that we had, it didn't work in some locations," he said.

Mr Gledhill said social media, smart phones, satellites and software were now at the front line in disseminating crisis information.

"Today's fire permit system stemmed from then," he said.

Regular fire awareness information sessions are held in local communities, but authorities fear complacency and indifference may yet feed another bushfire disaster.

## **2.14 Western Australia Dwellingup bushfire 1961**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### **Bushfire information**

Rodger (1961) noted:

*Detailed investigations and inspections by the Commission were consequently confined to the South-West Land Division where evidence was given with regard to a total of 963,640 acres burnt over in the summer of 1960-61. There is little doubt that there were many fires which were not brought to notice and it is believed that the total area burnt (over the Division) in 1960-61 was approximately 1,250,000 acres.*

*The 1960-61 fire season was unusually severe and apart from a rainfall deficiency in winter, spring and early summer months was marked by an unusual number of dry thunderstorms and some severe cyclonic disturbances.*

Wikipedia information extracted from 1961 Western Australian bushfires on 28 November 2023:

*In early 1961, a series of bushfires burned in the south-west region of Western Australia.[1] The devastating fires burned large areas of forest in and around Dwellingup from 20 to 24 January, at Pemberton and in the Shannon River region between 11 and 15 February,[1] and in the Augusta-Margaret River area in early March. There were also major fires which burned in the Darling Scarp around Kalamunda. The towns of Dwellingup and Karridale were largely destroyed by the fires, as were a number of smaller railway and mill settlements. There was no loss of human life.*

*Whilst the 1960 rainy season over the affected region had not been excessively dry, rainfall had been below average over the region affected by the fires ever since August of that year – thus the forests were perhaps even drier than they would normally be by January. However, the underlying cause of the Dwellingup fires lay far to the north in the Pilbara, where a tropical cyclone had formed on 15 January northeast of Darwin had followed a trajectory along the north west Western Australian coast and intensified north east of Onslow and then moved steadily southwards, hitting that town on 24–25 January while having a central pressure of 920 hPa. Hurricane-force winds demolished several buildings and storm surge inundated the town with 1.8 metres water. With a strong high pressure system to the east of the cyclone remaining almost stationary for some days, hot north-easterly winds developed and became so intense that by the 20<sup>th</sup> maximum temperatures throughout the south west were uniformly above 40 °C (104 °F) and remained at that level for the following five days. During this period, as the cyclone moved slowly along the coast it drenched Onslow and the neighbouring district, but only dry thunderstorms occurred in the south-west, which started fires that spread extremely rapidly in the hot, windy conditions.*

*The first fires were reported from Dwellingup, 110 kilometres (68 mi) south of Perth, on 19 January and the following day fires erupted in the timbered country of the Darling Scarp around Mundaring and Mount Helena. Although as the cyclone tracked down the west coast some rain came around 25 January to ease the fires,[2][3] not all were fully extinguished. Moreover, as the normal dry summer weather evaporated further moisture from the forests, when another severe cyclone hit Onslow on 12 February it caused even stronger winds (sustained at up to 60 kilometres per hour (37 mph) with much stronger gusts) and as this cyclone moved inland, lost intensity and produced no rain in fire-affected areas, decaying bushfires were re-ignited.*

*The fire from Dwellingup consequently moved downslope toward the major town of Pinjarra where it burned a significant portion of the town's buildings—500 people were left homeless. As the forests surrounding began re-igniting, the entire population of a number of other mill towns was relocated to Dwellingup in the following days. The fires continued to burn owing to the strong winds, and many tiny timber towns were completely burnt out – Holyoake, Nanga Brook, Marrinup and Banksiadale; and were never re-built.*

*The 2 March saw Onslow's third cyclone In five weeks, which like the second did not produce any rain in the affected areas and led to temperatures reaching in Perth 37.8 °C (100.0 °F) on the first two days of March for the first time. Fires spread southward to Augusta-Margaret River Shire, though some in that area were thought to have been deliberately lit, and continued to rage within 25 kilometres of Perth city.[4] Although rain was predicted,[4] it did not eventuate. Despite the dryness of the cool change, an easing of the winds allowed fire fighters to finally bring the flames under control. However, in all it is estimated that the fires burned a total of 4,400 square kilometres (1,700 sq mi) of bushland, and property damage far exceeded this.*

*Following the fires, a Royal Commission was conducted to investigate causes and in following years many recommendations were made to improve controlled burning in the tall eucalypt forests of the south-west.*

Cheney (1976) noted:

*Dwellingup fires originated from 19 individual lightning fires which resulted from electrical storms on the 19 and 20 January. Nine of these fires were rapidly controlled but the remaining 10 joined together and burnt a large area between the 22 and 25 January (Rodger 1961).*

and:

*1960-61 Fire season:*

*The largest fire for the season was the Dwellingup fire which burnt 146 000 ha, destroyed settlements at Holyoake and Nangabrook and burnt numerous buildings in Dwellingup. The fire was started by multiple lightning strikes on 19 and 20 January and burnt mainly in heavy forest fuels. Intense spotting from the fibrous bark of jarrah (*Eucalyptus marginata*) was a feature of this fire and largely responsible for destruction in the three towns.*

*On 24 January this fire was burning out of control on a wide front to the north of Dwellingup. Fire fighters were hopeful of bringing the perimeter under control when conditions were expected to ease during the night. However, between 2000 and 2030 hours, there was a brief period of gale-force wind which caused intense spotting in, and to the south of Dwellingup. Outside the fire area the squall had a wind speed of only 45-55 km/h and lasted only 15 minutes, but the fire storm resulting from the mass spotting induced surface winds which were estimated to be 100-110 km/h and lasted in Dwellingup for over two hours. Many buildings in the town were unroofed by the high winds and ignited by the mass of burning debris which showered the town.*

and:

*The major burning period of the Dwellingup fire was longer than the other fires cited but the period of extreme fire behaviour which caused the massive spotting and the subsequent fire storm was initiated by a very brief period of strong winds, perhaps as short as 15 minutes. Much of the area burnt on 25 January 1961 resulted from the coalescence of spot fires initiated between 2000 and 2400 hours.*

### **Lessons and insights**

Following the fires, a Royal Commission was conducted to investigate causes and in following years many recommendations were made to improve controlled burning in the tall eucalypt forests of the south-west.

Cheney (1976) highlighted:

*After the Dwellingup fires in 1961, there were large changes in the areas prescribed burnt and now the whole of the State forests have been brought under rotational prescribed burning designed to keep fuels in strategic areas at a low level. The burning now covers an annual area .of some 330 000 ha or 18 per cent of native forest area. It is interesting to note that the last major fire which burnt in the karri forests in 1969 occurred in some of the then-remaining areas of heavy fuels which had not been brought under the prescribed burning programme (Peet 1969).*

*Aerial prescribed burning techniques also provide fire control authorities with the means of rapidly controlling summer wildfires in mountainous terrain where access and conventional fire-fighting methods can be extremely slow (Hodgson and Cheney 1969). Fires in inaccessible country which were previously allowed to burn for several weeks can now be rapidly burnt out to existing control lines in a few hours, with low intensity fires, during periods of low fire danger. The technique is not yet widely adopted as it often requires an early decision to bum out a relatively large area in order to prevent a larger area being burnt by a high-intensity fire during periods of extreme fire danger.*

and:

*After most fire disasters there have been some improvements in fire control. After the 1961 Dwellingup fires there were major changes in the Rural Fires Board of Western Australia and improvements in prescribed burning in forest areas both on State forest and other timbered lands.*

The Rodger (1961) report of the Royal Commission made 27 recommendations, three of the key recommendations included:

(19) *the Forests Department carry out more research into both the technical and practical side of fire control as a necessary accompaniment to the expenditure of money on other forest works and that forest fire control officers be sent overseas at intervals to gain information regarding the latest developments in this work;*

(20) *the Forests Department make every endeavour to improve and extend the practice of control burning to ensure that the forests receive the maximum protection practicable consistent with silvicultural requirements;*

(21) *no opportunity be lost by the Forests Department to improve the efficiency of their firefighting gangs, radio and other equipment in the light of the latest practical and scientific developments;*

## **2.15 NSW Leura Blue Mountains bushfires 1957**

Information on this case study is provided on bushfire information.

### **Bushfire information**

Australia Disaster Knowledge Hub Blue Mountains and Sydney region bushfires, 1957 (extracted 28 November 2023):

*Quick Statistics*

*4 Fatalities*

*£1,000,000 Insurance Costs*

*158 Homes Destroyed*

*Between 30 November and 2 December 1957, bushfires caused widespread damage in around the Blue Mountains and Sydney. The worst-affected areas were Leura and Wentworth Falls; other damage was recorded at Megalong Valley, Lithgow and Jenolan Caves.*

*As a result of the fires, 158 buildings were destroyed and four people died. The damage was estimated at approximately £1,000,000.*

No lessons are captured in this document.

## **2.16 Victorian bushfires 1943 and 1944**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### **Bushfire information**

Wikipedia 1943–44 Australian bushfire season information as extracted 15 February 2024 provides valuable information in regards to the impacts of these bushfires on communities and townships:

*A series of major bushfires following severe drought conditions in the state of Victoria in Australia, occurred during the summer of 1943–44. It was the driest summer ever recorded in Melbourne until 2002 with just 46 millimetres or 1.81 inches falling, a third of the long-term average.[1] Between 22 December 1943 and 15 February 1944, burnt an estimated one million ha,[2] 51 people were killed, 700 injured, and 650 buildings were destroyed across the state.[3] Many personnel who would have been normally available for fire fighting duties had been posted overseas and to remote areas of Australia during World War II.[1]*

*Timeline December–January*

*The first major fire was a grassfire at Wangarrata on 22 December which burnt hundreds of hectares and resulted in 10 deaths.[3] On 14 January and the following day, fires broke out across the state.[1] To the west of Melbourne, a series of bushfires broke out between South Australian border and the outskirts of Geelong including areas near the towns of Hamilton, Skipton, Dunkeld, Birregurra and Goroke.[1] Many smaller towns were substantially damaged. In Derrinallum, the only buildings left standing were the Mechanics' Institute, two churches and several business*

premises.[4] In central Victoria, fires occurred near Daylesford, Woodend, Gisborne and Bendigo.[1] In the Melbourne area, 63 homes were destroyed at Beaumaris and another 5 in the Glenroy – Pascoe Vale area.[5]

On 14 February a fire broke out near Yallourn.[5] In Hernes Oak, 16 houses and the post office were destroyed while 80 houses were destroyed and 6 lives lost in the Morwell district and 40 houses destroyed and 3 deaths occurred in the Traralgon area.[5]

A major outcome following the fires was a Royal Commission led by Judge Leonard Stretton and the establishment of the Country Fire Authority in 1945 to co-ordinate rural fire brigades.

The State Library Victoria website in relation to Bushfires in Victoria 1944 outlines:

*The fires of 1944 were severe, with 32 people killed, and 700 homes destroyed. The devastation caused by these fires led to the creation of legislation which established the Country Fire Authority (CFA). The CFA commenced operation on 2 April 1945.*

Information extracted from DBpedia noted:

*A series of major bushfires following severe drought conditions in the state of Victoria in Australia, occurred during the summer of 1943–44. It was the driest summer ever recorded in Melbourne until 2002 with just 46 millimetres or 1.81 inches falling, a third of the long-term average. Between 22 December 1943 and 15 February 1944, burnt an estimated one million ha, 51 people were killed, 700 injured, and 650 buildings were destroyed across the state. Many personnel who would have been normally available for fire fighting duties had been posted overseas and to remote areas of Australia during World War II.*

McHugh P (2024) provided details below in relation to these bushfires, not all detail included:

*Melbourne was hot in January, and the driest since colonial records began. Less than three quarters of an inch of rain fell, less than a third of the long-term average, as drought conditions gripped much of southern Australia leaving many areas tinder dry and fire prone.*

*The early weeks of 1944 produced heat waves with temperatures exceeding 100 degrees on the old Fahrenheit scale.*

*Bushfires just before Christmas on 22 December 1943 had already killed 10 firefighters near Wangaratta.*

*Eighty years ago today, on Friday 14 January 1944 bushfires raged at Daylesford, Woodend, Gisborne and other central Victorian towns near Bendigo. To the west of Melbourne there were blazes out of control from Geelong to the South Australian border. Fires burned near towns such as Hamilton, Skipton, Dunkeld, Birregurra, Goroke and Geelong itself.*

*Friday was hot with a strong dry northerly wind, the maximum temperature rose to 103.2° F with a maximum wind gusting to 54 mph, the relative humidity fell to 6% and the moisture content in fuel plummeted to about 2%.*

*In the sleepy beachside suburbs of Beaumaris, Cheltenham, Black Rock and Mentone, about 12 miles south of Melbourne, the threat came swiftly as two overlapping bushfires broke out during late morning. The first began near the corner of Bay Road and Reserve Road and spread into the grounds of the Victorian Golf Club. It was followed by another nearby blaze soon after.*

*At the time, these neighbourhoods resembled small coastal villages with unmade roads, sandy tracks and modest weatherboard and fibro-cement houses scattered throughout the dense thickets of t-tree scrub with overhanging manna gums and an understory of acacias and tall bracken. There was also a string of more substantial brick homes with manicured gardens along Beach Road overlooking Port Phillip Bay.*

*These fires, along with those at Wangaratta and Yallourn a month later on 14 February 1944 finally forced the State Government to act. The Premier Sir Albert Dunstan and Minister for Forests Sir Albert Lind, who had both delayed legislative changes in Parliament, decided there was no alternative but to ask Judge Stretton to chair a second Royal Commission.*

*Stretton's report returned to his earlier themes and once again highlighted the lack of a cohesive firefighting ability outside the Melbourne area.*

*After nearly six months of debate and argy-bargy in State Parliament, legislation to establish the Country Fire Authority was finally given Royal Assent on 4 December 1944, and came into effect on 2 April 1945.*

Leonard and McArthur (1999) noted the following:

*One of the many bushfires of 1944 occurred on the outskirts of Melbourne at bayside Beaumaris. It burnt an area of 280 ha, directly threatening 118 houses of which 58 were destroyed and 8 were damaged.*

and:

*Barrow suggested that simple precautions such as enclosing the underfloor space of houses, covering ventilators with metal mesh enclosing the eaves and keeping stacks of fuel and trees and shrubs clear of walls, would greatly increase the resistance of a house to fire with little, if any, increase in cost. These measures would be likely to be far more effective than such methods of protection as the use of non-combustible materials for walls. He was the first person to scientifically identify the ignition "mechanisms of bushfire attack on houses, and to document the fact that houses tended to burn down from the inside. His work attacked existing myths about the destruction of houses in bushfires, and gave clear guidelines to improving the performance of houses in bushfire-prone areas. It is more the pity that Barrow's research went largely unnoticed; His findings were published in a scientific journal and there they languished.-The most important thing we can learn from Barrow's landmark work is the necessity to deliver the findings to the end-user\* in this case the home owner or occupier.*

The early work by Barrow was innovative and needs to be better recognised.

Duff et al. (2018) provided further information in relation to these bushfires.

### **Lessons and insights**

There are useful learnings in relation to bushfire protection surrounding communities and in relation to prescribed burning in relation to the Stretton Royal Commission of 1944:

- Royal Commission Records (VPRS11910) Royal Commission On Yallourn Bushfires (1944) Final Report; 1944 Public Records Office of Victoria. First [and interim] report on bush fire at Yallourn on February 14th, 1944, with particular reference to report of Royal Commission of Inquiry, March 1944. This report has been digitised and can be read online via the State Library's catalogue.
- Royal Commission Records (VPRS11910) Royal Commission On Yallourn Bushfires (1944) Final Report; 1944 Public Records Office of Victoria. Report of the Royal Commission to inquire into the place of origin and the causes of the fires which commenced at Yallourn on the 14th day of February, 1944... Victorian Parliamentary Paper No. 4 of 1944. This report has been digitised and can be read online via the State Library's catalogue.

Gamble (2024 website) noted in relation to lessons from the Beaumaris Bushfires of 1944:

*In the 1940s the widespread controls that now exist over aspects of backyard behaviour did not apply. For instance, nearly all houses had backyard incinerators and residents lit them when they felt a need to burn rubbish. Bonfires in vacant paddocks were part of the culture and many people attended them at least once a year, on Guy Fawkes Night, 5th November. People burned off dry grass and leaves without any control over when it was safe to do so, and, though most residents were careful, it took only one act of negligence to start a dangerous fire in areas where bushland was close to settlements. No one knows what caused many of the 1944 fires but it is safe to say that careless 'burning off' was involved in some of them. Days of total fire ban, proclaimed by fire authorities for a whole State, or a district within it, were in the future. It was not until the CFA and MFB received specific powers in the late 1950s that centrally-determined regulations about lighting fires in certain areas on certain days were applied.*

*It was the 1944 fires that finally brought action on the co-ordination of fire fighting on a State-wide basis. In the disastrous fires of both 1939 and 1944 it had been found that efficient management of fire fighting groups had been lacking. For instance, there was no central control over when the burning of fire breaks was safe, no central body exerted control over bush brigades throughout the State of Victoria, and warning systems were not really adequate. No central direction of fire-fighting resources was in place, so that it was possible for brigades to be available for action but not called to the areas of most need in a crisis situation when confusion could occur at times. There had been a Royal Commission on fire services after the 1939 bushfires but no action had occurred during the war. After the 1944 fires, and the inefficient responses to them, there was immediate government action on fire control outside the city boundaries. In 1945 the Country Fire Authority was established as the co-ordinating body for brigades beyond the jurisdiction of the Metropolitan Fire Brigade. This body is still operative after nearly sixty years and, with its city counterpart, determines fire bans on fire-danger days.*

*The fires at Beaumaris provided an example of the dangers that occur when outer metropolitan housing development reaches into pristine bush. Australian cities have continually faced this problem on their fringes. In 1983 the Ash Wednesday disaster provided another spectacular instance in the Dandenongs near Melbourne, and the outskirts of Sydney and Canberra have had shocking infernos over very recent summers. The interface between the city and the bush in Australia has often provided the venue for terrifying fire events. Beaumaris in 1944 was one in a long series.*

## **2.17 Victorian bushfires 1939**

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### **Bushfire information**

Extracted from Wikipedia, 18 July 2020 Victorian 1939 bushfires:

*The Black Friday bushfires of 13 January 1939, in Victoria, Australia, were part of the devastating 1938–1939 bushfire season in Australia, which saw bushfires burning for the whole summer, and ash falling as far away as New Zealand. It was calculated that three-quarters of the State of Victoria was directly or indirectly affected by the disaster, while other Australian states and the Australian Capital Territory were also badly hit by fires and extreme heat. As of 3 November 2011, the event was one of the worst recorded bushfires in Australia, and the third most deadly.*

*Fires burned almost 2,000,000 hectares (4,900,000 acres) of land in Victoria, where 71 people were killed, and several towns were entirely obliterated. Over 1,300 homes and 69 sawmills were burned, and 3,700 buildings were destroyed or damaged. In response, the Victorian state government convened a Royal Commission that resulted in major changes in forest management. The Royal Commission noted that 'it appeared the whole State was alight on Friday, 13 January 1939'.*

*The subsequent Victorian Royal Commission investigation of the fires recorded that Victoria had not seen such dry conditions for more than two decades, and its rich plains lay "bare and baking; and the forest, from the foothills to the alpine heights, were tinder". Fires had been burning separately across Victoria through December, but reached a new intensity and "joined forces in a terrible confluence of flame.."<sup>[2]</sup>:Introduction— Part 1 ...on Friday, 13 January.*

*The subsequent Royal Commission, under Judge Leonard Edward Bishop Stretton (known as the Stretton Inquiry), attributed blame for the fires to careless burning, campfires, graziers, sawmillers and land clearing.*

*Prior to 13 January 1939, many fires were already burning. Some of the fires started as early as December 1938, but most of them started in the first week of January 1939. Some of these fires could not be extinguished. Others were left unattended or, as Judge Stretton wrote, the fires were allowed to burn "under control", as it was falsely and dangerously called. Stretton declared that most of the fires were lit by the "hand of man".*

and:

*The most damage was felt in the mountain and alpine areas in the northeast and around the southwest coast. The Acheron, Tanjil and Thomson Valleys and the Grampians, were also hit. Five townships – Hill End, Narbethong, Nayook West, Noojee (apart from the Hotel), Woods Point – were completely destroyed and not all were rebuilt afterwards. The towns of Omeo, Pomonal, Warrandyte (though this is now a suburb of Melbourne, it was not in 1939) and Yarra Glen were also badly damaged.*

*Towns damaged or destroyed:*

*Central*

- *Dromana*
- *Healesville*
- *Kinglake*
- *Marysville*
- *Narbethong – destroyed*
- *Warburton*
- *Warrandyte*
- *Yarra Glen*



## East

- Hill End – destroyed
- Nayook West – destroyed
- Matlock – 15 died at a sawmill
- Noojee – destroyed
- Omeo
- Woods Point – destroyed

## West

- Pomonal
- Portland

Forest Fire Management Victoria (2021) noted:

*Fanned by powerful winds, the Black Friday fires (13 January 1939) swept rapidly across large areas of Victoria, causing widespread destruction. Flames leaped large distances, and giant trees were blown out of the ground by fierce winds. Large pieces of burning bark (embers) were carried for kilometres, starting new fires in places that had not previously been affected by flames.*

*Almost two million hectares burned across the state. Large areas of state forest, containing giant stands of Mountain Ash and other valuable timbers, were destroyed. As a result, approximately 575,000 hectares of reserved forest and 780,000 hectares of Crown land burned.*

*A sawmill settlement near Matlock, east of Melbourne, 15 people died while escaping from the fires. The townships of Narbethong, Noojee, Woods Point, Nayook West and Hill End were completely destroyed. In addition, the townships of Warrandyte, Yarra Glen, Omeo and Pomonal were damaged.*

*The bushfires also affected the Black Range, Rubicon, Acheron, Noojee, Tanjil Bren, Hill End, Woods Point, Matlock, Erica, Omeo, Toombullup and the Black Forest. Intense fires burned the urban fringe of Melbourne in the Yarra Ranges east of Melbourne, affecting towns including Toolangi, Warburton and Thomson Valley.*

*The intensity of the fire produced vast amounts of smoke and ash, with reports of ash falling as far away as New Zealand. However, the devastation ended late on Sunday, 15 January, after rain fell across the state.*

*The fires caused a total of 71 deaths and thousands of sheep, cattle, and horses killed by the intense heat and flames.*

## Lessons and insights

As noted in Wikipedia, 18 July 2020 Victorian 1939 bushfires:

*As a consequence of Judge Stretton's report, the Forests Commission Victoria gained additional funding and took responsibility for fire protection on all public land including State forests, unoccupied Crown Lands and National Parks, plus a buffer extending one mile beyond their boundaries on to private land. Its responsibilities grew in one leap from 2.4 to 6.5 million hectares (5.9 to 16.1 million acres). Stretton's recommendations officially sanctioned and encouraged the common bush practice of controlled burning to minimise future risks.*

*Its recommendations led to sweeping changes, including stringent regulation of burning and fire safety measures for sawmills, grazing licensees and the general public, the compulsory construction of dugouts at forest sawmills, increasing the forest roads network and firebreaks, construction of forest dams, fire towers and RAAF aerial patrols linked by the Commissions radio network VL3AA to ground observers.*

Victoria (1984) included an extensive array of measures in this inquiry report, including in relation to:

- Chapter iii. the measures taken to prevent the outbreak and spread of such fires and the measures taken to protect life and private and public property.

- *Chapter iv. the measures which are necessary or desirable to be taken by any and what persons, corporations or bodies to prevent the outbreak of bush fires in Victoria or to prevent the spreading of such fires.*
- *Chapter v. the measures which are necessary or desirable to be taken by any and what corporations, persons or bodies to protect life and private and public property in the event of bush fires burning in Victoria.*

Forest Fire Management Victoria (2021) noted:

- *Three weeks after the bushfires, Judge Leonard E B Stretton led a Royal Commission into the causes of the January 1939 fires. Judge Stretton investigated procedures and measures needed to prevent the fires and protect life and property in the event of future bushfires.*
- *Judge Stretton made seven significant recommendations to improve forest and fire management and to help prevent events like the Black Friday bushfires from occurring again.*
- *These recommendations achieved a clear separation of fire and forest management, better cooperation between competing government departments, and more flexible and understandable laws of fire protection and prevention. The findings of the Royal Commission still inform Victoria's fire management practices today.*
- *The first significant initiative from Judge Stretton's recommendations was the Forests Act 1939, which enabled the Forests Commission (now the Department of Environment, Land, Water and Planning) to take complete control of fire suppression and prevention on public land in Victoria. In 1944 the Country Fire Authority (now CFA) was formed to manage fire on private land outside greater Melbourne. There were now three separate firefighting agencies in Victoria: Forests Commission (now DEWLP), the CFA, and the Metropolitan Fire Brigade (protecting inner Melbourne).*
- *Judge Stretton recommended protecting forests through a strategic program of burning selected forest areas in a controlled way during spring and autumn (planned burns). Following the Black Friday bushfires, planned burning became an official fire management practice in Victoria.*
- *Judge Stretton also recommended placing fire towers at strategic locations to ensure fires are detected early before they spread. With an enhanced network of roads and access tracks within the millions of hectares of public land in Victoria. This network has allowed access for firefighters and their equipment into the more remote areas of the state.*

## **2.18 Victorian bushfires 1926**

Information on this case study is provided on bushfire information.

### **Bushfire information**

1925–26 Victorian bushfire season Wikipedia extracted on 28 November 2023:

*A series of major bushfires occurred between 26 January and 10 March 1926 in the state of Victoria in Australia.[1][2] A total of 60 people were killed with 700 injured, and 1000 buildings and 390,000 ha were destroyed across the south-east of the state.[2]*

*On 14 February, later referred to as Black Sunday, bushfires swept across Gippsland, the Yarra Valley, the Dandenong Ranges and the Kinglake area.[1] The fires had originated in forest areas on 26 January, but wind gusts of up to 97 km per hour led to the joining of the fire fronts on 14 February.[1] In the Warburton area, 31 deaths were recorded including 14 at Wooley's Mill in Gilderoy, 6 at Big Pats Creek and 2 at Powelltown.[2] Other affected settlements included Noojee, Erica and Kinglake, where St Mark's Church and Thompson's Hotel were amongst the buildings destroyed.[3][4]*

Duff et al. (2018) noted the following in relation to Black Sunday - 1926

*During the summer months of 1925 to 1926 (December-February), Gippsland grazier fires were common in the high country to burn off the old grass to promote new healthy grass growth for sheep and cattle. However, on February 14th, 1926, after a month of drought and high heat, wind gusts of 97 km/h led to many fires joining and growing in intensity. This became the start of Black Sunday. The mass of fires led to 31 lives being lost and 700 injuries. Over 1,000 buildings were burnt down and 390,000 hectares of land was torched across the Gippsland, Yarra Valley, Dandenong Ranges, and the Kinglake area (Black Sunday). Firefighters at the time had little to no coordinated approach to extinguishing these fires and were equipped with only damp hessian sacks and beaters (Black Sunday). Due to the extraordinarily hot temperatures when these fires took place, many cars and other man-made objects could not withstand the overbearing heat. Suburban areas were left riddled with melted vehicles and other smoldering debris.*

No lessons are captured in this document.

## 2.19 Victorian bushfires 1851

Information on this case study is provided in two sections, firstly as bushfire information and secondly lessons and insights.

### Bushfire information

O'Bryan (2018) highlights concise information in regards to the 1851 bushfires in Victoria:

*Nowadays, the authorities report Black Thursday as follows: deaths 15, area burnt 5 million ha, buildings lost 1300, stock losses 1 million (eg, VBRC 2010).*

Wikipedia Black Thursday bushfires provided information dated 23 August 2021:

*The Black Thursday bushfires were a devastating series of fires that swept the state of Victoria, Australia, on 6 February 1851, burning up 5 million hectares (12 million acres; 50,000 square kilometres; 19,000 square miles), or about a quarter of the state's area. Twelve human lives were lost, along with one million sheep, thousands of cattle and countless native animals.*

The author notes that there are slight differences above in relation to the information provided.

Information in Trove on Fri 29 Aug 1851 - The Sydney Morning Herald (NSW : 1842 - 1954) Page 2 - Population of Victoria highlighted that the population of Victoria in 1851 was 77,315 people. . There is some applicable information in relation to the 1851 bushfires impacts on settlements and threatening of other settlements:

Wikipedia 1851 Black Thursday bushfires information dated 23 August 2021:

*The catastrophic fire caused the loss of human life, cattle, and land for miles and affected many regions including Portland, Plenty Ranges, Western Port, (Empire, Sydney 19 Feb 1851)] the Wimmera and Dandenong districts, Gippsland, and Mount Macedon. Farms across the region were destroyed, along with a number of settlements in Gippsland, Western Port, Geelong, Heidelberg and east to Diamond Creek and Dandenong. Three men from Mount Macedon lost their lives. Overall, the disaster resulted in the deaths of twelve people, one million sheep, and thousands of cattle over 60 to 80 kilometres (40 to 50 mi).*

*The initial response to the calamity was a public meeting held on 11 February 1851 at Geelong. The community came together to discuss relief efforts for those affected, especially for citizens who lost everything. To assist the poor, many even cancelled outstanding debts.*

O'Bryan (2018) further highlighted:

*The toll included - Dandenong township was engulfed, Diamond Creek - Plenty River suffered, where a woman and 5 children were killed, Mt Macedon ranges were fully alight, Barrabool Hills were engulfed, Barwon Heads to Mt Gambier was alight, towns of Warrnambool, Apollo Bay and Portland were threatened, Mt Cole and Buninyong burnt, Seymour and Kilmore fires joined and burnt between Broken and Goulburn Rivers. Hundreds left homeless. Inquests were held in Melbourne and Geelong on the deaths of 10 people, but more were missed.*

and:

Extract from an eye witness account was published in England by Francis Peter Labilliere. *It was from the darkness of the day in Melbourne and Geelong, rather than from the charring effects of the fire, that the name was derived. In Melbourne the heat was excessive, and the atmosphere thick and smoky. It was known that great fires were raging in the country. Much uneasiness was felt lest one should break out in the city; for with the high, hot wind, it was impossible to say how far it might have carried destruction. Burnt leaves were falling everywhere—some being carried on board vessels many miles out at sea. The neighbouring colonies did not experience the horrors of Black Thursday.*

According to the CFA website on 29 August 2021, Major Fires 1851 Black Thursday locations included Wimmera, Portland, Gippsland, Plenty Ranges, Westernport, Dandenong districts, Heidelberg. The website Bushfire Education Bushfires in Our History notes the locations for the 1851 bushfires as Portland, Plenty Ranges, Westernport, Wimmera and Dandenong and notes localities listed are indicative only.

### Lessons and insights

O'Donnell (2021 a) highlighted a number of lessons from these large bushfires in 1851, as noted indicated in the text below:

*The weather conditions on 6 February 1851 were extreme, at midday on Thursday 6 February the thermometer at Charles Brentani's shop was 110°F (43.3°C) in the shade and 129°F (53.9°C) in the sun. Similar extremes were not*

reached again in Melbourne until 1876 (43.7°C in the shade), 1939 (45.6°C) and 2009 (46.4°C). Fuels were extremely dry. The bushfires on 6 February and at times after were intense and extensive, with up to 5 M hectares impacted. There are indications of very long distance firebrand movement in the 1851 bushfires as observed by Captain Reynolds.

The review has identified weather records in relation to the bushfires, however, these are not extensive. Also reviewed in detail is settlement, population and epidemics. Aboriginal use of fire and maintenance of forests as open and safe forests is considered in detail as is change in land management following European settlement.

Vegetation, fuels and fuel loads build up very quickly following reduction in Aboriginal cultural burning practices. It is apparent in 1851 the fire landscape wasn't safe, given the 1851 bushfires scale and intensity. As noted by Howitt and other explorers, seedlings and regrowth was reduced after low intensity burns. As noted by Howitt in 1891 "After some years of occupation whole tracts of country became overgrown by forest and arborescent shrubs. The Black Thursday fires of 1851 followed from and reinforced these changes, "open forest" that had been occupied by aboriginal people became "dense scrub", and red gum woodlands declined and died". (Howitt 1891) (Jurskis, 2006). It is understood that there was extensive forest regrowth following the reduction in Aboriginal burning for each of the 1805, 1824 (early 1820's) and 1851 bushfires.

The importance of Aboriginal cultural burning/ ecological maintenance burning in setting up safe and healthy landscapes is critical, apply this across landscapes.

There was some awareness of precautionary bushfire measures for crops and grasses at the time of the 1851 bushfires. Other risk measures were used such as in the Wimmera and provision was made for a place for safety in case of fire.

An Act to Restrain the Careless Use of Fire was passed in February 1854.

Fuel issues and many other issues that occurred in the 1851 bushfires still apply to this day.

## **2.20 Other overseas bushfire case studies**

There are 7 overseas cases studies included within Burrows (2019), including lessons. It is recommended that readers read this valuable report and included overseas case studies.

### 3 Key town and city bushfire disaster lessons and insights

There are a large number of bushfire disaster lessons outlined in Section 2 above.

A major focus of this section is capturing key bushfire disaster lessons and insights in bushfire disaster avoidance, sound fire and fuel mitigation, fuel management, preparation/ preparedness for all bushfires applicable to towns and cities, firefighting attack, including major bushfires, community and firefighter safety, infrastructure protection and a range of other lessons.

The author didn't undertake analysis of the bushfire information or lessons and insights in the individual case studies in Section 2, but completed an analysis in relation to teasing out key town and city bushfire disaster lessons and insights which are outlined below in Section 3. The lessons and insight analysis included an assessment of the case study lessons and insights in Section 2, the documents listed below and also from past experience:

- As noted, Section 2 information and references above.
- Royal Commission Records (VPRS11910) Royal Commission On Yallourn Bushfires (1944) Final Report; 1944 Public Records Office of Victoria. First [and interim] report on bush fire at Yallourn on February 14th, 1944, with particular reference to report of Royal Commission of Inquiry, March 1944. This report has been digitised and can be read online via the State Library's catalogue.
- Royal Commission Records (VPRS11910) Royal Commission On Yallourn Bushfires (1944) Final Report; 1944 Public Records Office of Victoria. Report of the Royal Commission to inquire into the place of origin and the causes of the fires which commenced at Yallourn on the 14th day of February, 1944... Victorian Parliamentary Paper No. 4 of 1944. This report has been digitised and can be read online via the State Library's catalogue.
- Rodger CJ (1961) Report of the Royal Commission Bushfires of December 1960 and Jan February March 1961 in Western Australia.
- McArthur, A.G. (1969). The Tasmanian bushfires of 7th February, 1967, and associated fire behaviour characteristics. Mass Fire Symposium (Canberra). Vol. February. Maribyrnong, Victoria: Defence Standards Laboratories. p. 7. Archived from the original on 2 August 2002. Retrieved 5 June 2015.
- Cheney NP (1976) Bushfire Disasters in Australia, 1945–1975, *Australian Forestry*, 39:4, 245-268, DOI: 10.1080/00049158.1976.10675654 To link to this article: <https://doi.org/10.1080/00049158.1976.10675654>.
- Krusel N and Petris SN (1992) CFA Occasional Paper No 1A Study Of Civilian Deaths In the 1983 Ash Wednesday Bushfires Victoria, Australia December.
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- Boura J (1998) Community Fireguard: creating partnerships with the community to minimise the impact of bushfire Projects Manager, Wildfire Management Community Risk Management Department, Country Fire Authority, Melbourne, Australia.1998 *Australian Journal of Emergency Management* pg 59 -64 Spring.
- Leonard JE and McArthur NA (1999) A History of Research into Building Performance m Australian Bushfires Conference Proceedings Bushfire 99 Australian Bushfire Conference, Albury, July 1999.
- Joint Select Committee on Bushfires (2002) Report on the Inquiry into the 2001/2002 Bushfires, Parliament NSW, Legislative Assembly. [Sydney, NSW] :The committee, 2002. x pp., 120 pp. ; 30 cm. Chair: John Price. "June 2002".
- Jurskis V, Bridges B and de Mar P (2003) "Fire management in Australia: the lessons of 200 years" *Environmental Science State Forests of NSW*.
- Sullivan (2004) Nature of Severe Fire Events Client Report for Fire Management Unit Department of Urban Services ACT Government CSIRO Forestry and Forest Products July 2004.
- Blanchi R and Leonard L (2005) Investigation of Bushfire Attack Mechanisms Resulting in House Loss in the ACT Bushfire 2003 Bushfire CRC Report April 2005.
- ACT Fires January 2003 (2006) Submissions of Counsel Assisting Inquests into the Death of Dorothy McGrath, Alison Mary Tener, Peter Brabazon Brooke and Douglas John Fraser and Inquiry into the Fires of January 2003, Lex Lasry QC Ted Woodward, Counsel Assisting the Coroner 2 April 2006.
- Boer MM, Sadler RJ, Wittkuhn RS, McCaw L, Pauline F. Grierson PF (2009) Long-term impacts of prescribed burning on regional extent and incidence of wildfires—Evidence from 50 years of active fire management in SW Australian forests, *Forest Ecology and Management* Volume 259, Issue 1, 5 December 2009, Pages 132-142.
- Leonard J et al. (2009) Victorian 2009 Bushfire Research Response final report Building and Land Use planning research after the 7 February Preliminary Findings 2009 bushfires Bushfire CRC October 2009.
- McLennan J, Elliott G and Wright L (2014) Bushfire survival preparations by householders in at-risk areas of south-eastern Australia *Australian Journal of Emergency Management* I Volume 29, No. 2, April 2014.
- Deloitte Access Economics (2013) "Building Our Nation's Resilience to Natural Disasters" for the Australian Business Roundtable for Disaster Resilience and Safer Communities.

- Ferguson E (2016) Government of Western Australia, 2016, “Reframing rural fire management”, report of the special inquiry into the January 2016 Waroona fire. 29 April.
- Florec V (2016) Economic analysis of prescribed burning in the South West of Western Australia UWA School of Agricultural Research Economics. PhD thesis.
- ABC News (2017) 1967 Black Tuesday bushfires explained: What have we learned?
- Burrows N (2019) Lessons and Insights from Significant Bushfires in Australia and Overseas, Informing the 2018 Queensland Bushfires Review , Commissioned by the Office of the Inspector-General Emergency Management, Queensland Bushfires and Natural Hazards CRC, FireNinti Consulting- May 2019.
- Davey SM and Sarre A (2020) Editorial: the 2019/20 Black Summer bushfires Australian Forestry, Volume 83, 2020 - Issue 2 Editorial | Published Online: 04 Jun 2020).
- Jurskis V, Underwood R, Neil Burrows N (2020) How Australian Aborigines Shaped and Maintained Fire Regimes and the Biota. Ecology and Evolutionary Biology. Vol. 5, No. 4, 2020.
- Underwood R (2020) The Utter Failure of Yet Another Bushfire Panel, in Quadrant on 19 November 2020.
- IFA Media Release (2020) Underwhelming Bushfire Royal Commission report lacks vision needed to address Australia’s bushfire woes Friday 30 October.
- Kangaroo Valley Community Bushfire Committee (2020) Compendium of Submissions to the NSW Independent Bushfire Inquiry.
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- Bushfire Front (2021) Submission to the Independent Inquiry into the Wooroloo bushfire from the Bushfire Front Inc of WA, September.
- O’Donnell (2021 a) Major bushfires in Australian history. The 1851 Victorian bushfires 28 pp. 20 September 2021. Australian Rural and Regional News dated 24 September 2021.
- O’Donnell J (2021 b) Potential opportunities for improved town and city bushfire protection across Australia. Town and city bushfire protection case studies. <https://arr.news/2023/08/04/the-2019-20-bushfires-contributory-factors-john-odonnell/>
- Fasullo JT, Rosenbloom N and Buchholz R (2023) A multiyear tropical Pacific cooling response to recent Australian wildfires in Cesm2 Science Advances 10 May 2023 Vol 9, Issue 19 DOI: 10.1126/sciadv.adg121.
- O’Donnell J (2023) Contributory factors that influenced fuels, forest fire resilience, bushfire attack, safety, impact, cost, bushfire extent and intensity of the 2019/ 2020 major bushfires across south eastern Australia, John O’Donnell Australian Rural and Regional News 4 August 2023. With Annexure. <https://arr.news/2023/08/04/the-2019-20-bushfires-contributory-factors-john-odonnell/>
- Howitt Society (2023) “Are Mallacoota and East Gippsland in general prepared for another major fire?”
- Onfray R (2023) A case study in folly #2 – the 2003 Canberra firestorm 6 January 2023.
- VFFA (2023) Current inadequacies and opportunities to improve community safety and planning in NSW, VFFA website, 20 November. Review within VFFA website article 27 November 2023.
- O’Donnell J (2024) Case study examples where prescribed burning has assisted in restricting bushfire impacts on communities, in preparation.
- Wikipedia bushfire information outlined in Section 2.

The above list highlights that a broad range of documents have been assessed in the review to assist in optimising lessons and insights.

The key town and city bushfire disaster lessons and insights are outlined in Sections 3.1 to 3.22.

### **3.1 Sound government policy lessons and insights**

1. Readjust expenditure away from the current bushfire suppression, response and recovery focus and more focussed towards bushfire prevention, mitigation prescribed burning, adaptive mechanical treatment/ thinning of dense forests to reduce bushfire risks to communities and forests.
2. Optimise community bushfire protection and rectify/ refine policies to improve community bushfire protection. Factors that need to be reviewed include inadequate prescribed burning across landscapes and adjacent to communities, long fire return intervals for prescribed burning, huge contiguous fuel loads, dense fuel strata, inadequate bushfire risk management planning, inadequate community safety focus, inadequate capturing of bushfire lessons, inadequate fire policies, poor design and mitigation in towns and cities, low community ownership and inadequate increasing insurance cost focus.
3. Optimise bushfire policies and measures in fire-prone areas.
4. Optimise fire fighter safety and rectify/ refine policies to improve firefighter safety.

5. Develop fire policy incorporating key findings from Davey and Sarre (2020) *The fires of 2019/20 have shown that current fire management will not, or is unlikely to, sustain the full range of ecosystem processes and biodiversity, nor reduce to an acceptable level the impact of wildfires on local and rural communities, forests and ecological communities, biodiversity and wood resources. Finding sustainable, affordable and socially acceptable approaches to managing fire requires a cohesive, considered, evidence-based approach across jurisdictions and tenure.*
6. Optimise accountability and transparency in bushfire management committees, fire policies, bushfire documentation and decisions and publication of meeting minutes/ documentation on the web.

### **3.2 Community design lessons and insights**

1. Design, layout, manage and maintain towns and cities that best address defensible space requirements and important issues such as bushfire wicks, bushfire funnels, ember attack, house-to-house ignition. density of housing, safe landscaping, fire safe tree selection, use of timber fences and treatment of fuels. Extreme care needs to be undertaken in relation to landscape plant selection and there is guidance available in relation to this. Flammable vegetation can contribute to fire rate of spread and the ember storms.
2. Implement the provisions of current Australian standards and state requirements in relation to house and structure design for bushfires.
3. Review individual town/ city design and roads in relation to these being conducive to and safe for firefighting and emergency access, firefighting and escape.
4. Review opportunities to use perimeter roads as radiation and flame buffers for urban assets.
5. Encourage retrofitting of basic ember protection provisions to older/ fire risk homes.
6. Review bushfire design requirements in relation to outbuildings, as these represent a significant additional attack threat on the main residence structure through flame radiation and ember source.

### **3.3 Community preparation, preparedness and participation lessons and insights**

1. Ensure community preparedness annually pre bushfire seasons. This includes addressing fire hazards such as houses and other buildings overtopped by eucalyptus trees; houses adjacent/ within long-unburnt bushland; heavy grass fuels in paddocks that had not been grazed or mown and road verges bushland carrying continuous, heavy and aerated fuels.
2. Undertake coordinated and responsible efforts to prepare communities for bushfires, including bad fire days/ worst possible fire days. Because threat involves the intensity of the bushfire, fire protection planning should be based on the bushfire threat that involves under the “worst possible” or “worst recorded” fire weather conditions. While the risk may be low, the threat can be very high in Australian towns and cities, depending on the amount of fuel both in the environs and within the township and the individual home gardens.
3. Coordinate collaborative approaches to reduce the threat of bushfires to communities and in the Wildland Urban Interface (WUI). Consider the fuel reduction approach which the Kurrajong Heights Brigade in NSW has developed and consider implementation for all Australian towns and cities. This hazard reduces vegetation blocks using a mosaic pattern for large areas surrounding the town. This Kurrajong Heights strategy keeps low fuel areas as a blocking influence for approaching bushfires. The Kurrajong Heights has a highly successful BFMP that has kept the community safe for 68 years and the Kurrajong Heights BFMP relies heavily on local knowledge and knowledge of terrain, fire behaviour and fire paths.
4. Optimise community preparation inside towns and cities, at the perimeter and across landscapes outside towns and cities.
5. Undertake strict enforcement of bushfire legislation by local governments to optimise bushfire preparedness and fire mitigation on private land. Ensure legislation is in place to allow enforcement.
6. Ensure community education is coupled with enforcement of sound bushfire laws to best ensure community protection.
7. Adopt approaches that address community and at times government apathy/ complacency to bushfire preparation approaches and programs.
8. Optimise implementation of community protection focus/ fire adapted communities focus across Australian towns and cities. The ongoing risks and potential impact of bushfires on communities, critical infrastructure and properties for SE Australia remains extremely high.
9. Provide effective support and programs in NSW for community participation and preparedness for bushfires, noting Victoria, SA, Tasmania, SA and WA have community fire participation programs in place. This government support is critical, noting this issue has important link with the National Strategy for Disaster Resilience, critical infrastructure resilience strategies and emergency management arrangements. Establishment of fire adapted community groups in towns and cities would be another opportunity to improve community safety. There does not appear to be federal requirements for nationally consistent community protection plans.

10. Consider the community protection approaches as used for US communities for all Australian towns and cities, including Firewise, local fire safe councils, the Fire Adapted Communities and the Ready and Set, Go! Program.
11. Undertake annual assessment of safety of town/ city evacuation routes in the event of a bushfire/ s.
12. Optimise implementation of household bushfire survival plans.
13. Review regularly the number of people living in regional and city locations, including at the wildland urban interface, increasing the risks of bushfires starting, including non-permanent residents, hobby farms and weekend retreats. This has become a bigger problem as people from the city often had very little knowledge on how to reduce the fire risk on their property and often do not ask key questions from the local owners.

### **3.4 Community bushfire planning lessons and insights**

1. Undertake a detailed examination of all current Community Protection Plans (such as NSW towns, 117 communities), Community Information Guides – Bushfire (Victoria, 278 communities) and other approaches in other states for improvement opportunities, successes and failures, including against the 2019/ 20 bushfires, where large number of such communities were badly affected. This would include community risk rating, area of community covered, fuel loads, prescribed burning, state owned lands, fire brand risks, mitigation measures and community involvement.
2. Focus on worse case bushfire disasters in planning systems. Consider all assets in fire planning, including communications tower, fire stations, hospitals, schools and business centres. Examine town planning controls in regards to current and new developments across towns and cities, including in bushfire prone areas. Optimise processes for addressing bushfire risk at the planning stage for new urban developments and small undeveloped rural lots including restricting developments in high bushfire-risk areas.
3. Optimise systems and processes to ensure the provisions of the bush fire legislation is enforced by local government annually, including in relation to ensuring household and landowner preparation is checked before the start of each bushfire season.
4. Optimise bushfire safety of existing buildings and provide education and training to improve bushfire risk management in the building and planning sectors.

### **3.5 Community safety and evacuation lessons and insights**

1. Undertake annual review current fire management in relation to community, fire fighter and environment safety. As noted by Morgan et al (2020), “the current fire management will not sustain the full range of ecosystem processes and biodiversity, nor reduce to an acceptable level the impact of wildfires on human lives and property”.
2. Undertake ongoing mitigation in relation to all likely evacuation and key road routes to reduce route blockage risks from bushfires, restricting safe access and emergency escape, many having no mitigation treatment measures such as low intensity burning, fuel treatment and dangerous tree management. Prescribed burning provides an added degree of safety where single road into the town could be threatened by bushfires.
3. Undertake annual assessment of safety of town/ city evacuation routes in the event of a bushfire/ s.
4. Undertake annual community preparation and safety pre each bushfire season.
5. Undertake periodic reviews of community members that may decide to leave/ evacuate at the last moment or a have a commitment to defending, even under the highest levels of fire danger. Ensure/ encourage the defenders will have adequate defences, water supplies and alternative power.
6. Ensure that there are annual checks of bushfire warning and communication systems and procedures before each bushfire season.
7. Increase disaster collaboration in public and private partnerships, such as those that increase alignment between insurance providers, residents, and local and state governments. Such measures could further encourage and incentivize disaster risk-reduction measures at the individual parcel and neighbourhood scale.

### **3.6 Community and house ignition, fire spread and fire behaviour lessons and insights**

1. Capture the lessons and insights of Blanche and Leonard (2005) in relation to vegetation fires, structural fires and ember attack in the spread of fire deep into urban areas. Blanche and Leonard (2005) made recommendations to mitigate bushfire impact at the urban interface following investigations of the serious Canberra bushfires, a number of these being:
  - *Implement the provisions of AS 3959 to the Canberra urban interface. In virtually all cases, the exposure level will be deemed to be medium in accordance with the provisions of AS 3959 requiring the provision of basic ember protection at little additional cost to construction. This zoning may also lead to increased voluntary adoption of these mitigation measures;*
  - *Encourage the community to become bushfire aware and suggest the benefits of retrofitting basic ember protection provisions to their homes if they are deemed to be in a medium level zone as defined in AS 3959;*
  - *Continue the strategy of using perimeter roads as radiation and flame buffers for urban assets;*



- *Utilise the knowledge collected in the Canberra fires to influence the priorities on which all regulatory reform and community education are based;*
  - *Provide risk assessment methodologies that identify both the risk of a bushfire attack and the susceptibility of an urban and peri-urban area;*
  - *Encourage the use and positioning of outbuildings around residential structures that reduce their potential ignition and impact on the main structure; and*
  - *Ensure that house losses many hours after a bushfire front has impacted an urban area is a consideration when allocating firefighting resources to the event. Note, the practical reality is that firefighting resources will likely be overwhelmed.*
2. Capture the lessons and insights of Leonard et al. (2009) in relation to house bushfire exposure and vulnerability, defendability and prevention measures.
  3. Capture the lessons and insights of the Ellis Report as extracted from ACT Fires January 2003 (2006) which contains a statistical analysis of a total of 779 houses allocated into the three categories referred to above. The results of the survey demonstrated that there was a significant statistical association between house loss and garden type, with houses with more unkempt or fuel heavy gardens (type 1) more likely to be destroyed as a result of ember attack from a bushfire. Dr Ellis also gave evidence that the statistical tests pointed out that cypress trees in general and conifers in particular, were a factor in house loss and damage. The Ellis Report includes a general estimate that 50% of the impact of the fires in the suburbs came from ember attack directly out of the neighbouring forests and the other 50% of impact was likely to have been caused by fire spread within the urban area, either ember attack from fuels within other houses or direct house to house flame contact.
  4. Capture the lessons and insights of Ramsay et al. (1996) utilising eleven years of research into the reasons why houses are ignited and subsequently destroyed in bushfires in Australia, particularly in relation to bushfires in February 1983 and January 1994.
  5. Capture the lessons and insights of Burrows (2019), outlined in Annexure 2.
  6. Capture the lessons from Peace (2017) in relation to FDI Index peak, entrainment, downslope winds and pyrocumulonimbus.
  7. Capture the lessons and insights as highlighted in McCaw et al. (2016) including the importance of fuel management in bushland in and around settlements, as well as across the broader landscape, the need to better understand the interactions between weather, fuels, atmospheric conditions and extreme fire behaviour associated with the formation of pyro-cumulonimbus.
  8. Assess severe bushfires in relation to the conditions that may lead to severe fire events as adopted by Sullivan (2004), including for the 1967 Hobart bushfires. These conditions included rainfall deficit (and El Nino events); synoptic situations; diurnal variation; atmospheric stability; fuel conditions and moisture content forest and grass and ignition potential and sources.
  9. Manage and maintain households and town and city structures that best incorporate defendable space, ember attack, house-to-house ignition and fire wise gardens.
  10. In relation to house design, address non-protected vent systems in houses, out building sheds and garage safety, timber fences and gas lines in relation to bushfire safety.
  11. Ensure bushfire path mapping is available for all towns, cities and local government areas. Increase district/ community/ town/ city awareness of previous bushfire travel paths over the last 80 plus years and authorise local town/ city bushfire plan members to progress this in relation to preparedness and mitigation and optimise escape routes.
  12. Ensure mapping of all major sources of firebrands such as eucalypt/ other species with loose bark that increase the risk of fire brand storms over communities and manage these areas for firebrand fuel.

### **3.7 Fuel and fuel load across landscapes, around and in communities lessons and insights**

1. Utilise fuel treatments at landscape scales, mitigating adverse effects of bushfires by reducing flame lengths, reducing fire behaviour and reducing spotting, and increasing opportunities for effective fire suppression, thereby minimizing costs and increasing safety. The removal of broad scale burning in favour of managing fuel at a micro level on the urban interface is often futile because the condition of fuels adjacent to the urban areas, the setback distances and the compact nature of urban development made Canberra one of the safest urban-rural interface regions in the country. The fact that the 2003 fires burnt into the urban area was a failure to manage fires in forest areas, not a failure of fuel management at the interface.
2. Optimise fuel treatment effectiveness by integrating fuels, topography, prevailing winds, fire or treatment history, and undertaking strategic treatments.
3. Quantify the extent of risk of fuel build-up around communities annual in order to develop risk-based mitigation programs. Avoid focussing solely on managing fuels at the urban interface as disaster awaits. Government prepare and support the strategic fuel management planning, which must have measurable targets that are monitored and reported and be based on sensible fire intervals between prescribed burns of the order of 3-6 years.

4. Actively treat and reduce areas of heavy forest fuel which results in severe fire behaviour, fire brands and difficulty in the early suppression of bushfires, at and outside communities. Unless landscape fuel loads are treated, major community bushfires will continue to occur. Understand that long unburnt fuels in road verges and other vegetation corridors will very likely contribute to the extent of the impacts and intensities on assets and communities.
5. Reduce fuel loads along ridge lines down to mid slopes from high-very high to low- moderate wherever possible utilising regular prescribed burning.
6. Reduce heavy fuels in road reserves (verges), along irrigation drains, tree lines, reserves and other linear features act as 'fuses' or 'fire wicks' frustrating suppression operations and taking fire into communities. Regular fuel reduction reduces fire intensity and spotting and make roads safer;
7. Undertake vegetation thinning/ weed removal in high risk, hazard and threat areas, with mulch stacked away from trees and burnt or mulched.
8. Optimise grazing in high risk/ hazard and threat bushfire areas across landscapes, adjacent to towns/ cities and areas within towns and cities to reduce fire risks.
9. Undertake ongoing dead tree removal work around communities to reduce bushfire risks.
10. Optimise bushfire safe landscaping around and within towns and around houses in many cases, reducing bushfire risks. Work with communities in relation to fire safe/ firewise gardens and reducing fuels, especially close to houses.

### **3.8 Prescribed burning measures in communities and across landscapes and resilient bushfire landscape lessons and insights**

1. Undertake prescribed burning of adequate size, shape and location to reduce bushfire risks. Prescribed burns can limit the extent/ width of the bushfire runs, reducing the rate of spread and spotting potential of the head fire. Although prescribed burn areas can be outflanked as the bushfire grow, they often offer tactical opportunities for containment that would otherwise not have been available.
2. Optimise prescribed burning in areas difficult for fire suppression, including steep areas, poor access and unsafe fire fighting conditions.
3. Optimise prescribed burning in areas beside access tracks and ridges to optimise bushfire attack opportunities and firefighter safety.
4. Utilise the science and experience in other jurisdictions suggests the level of landscape burning needs to be 8-10% per annum if any significant risk reduction benefits are to be realised (e.g., refer to WA data including Boer et al. 2009; Burrows and McCaw 2013; Burrows 2018).
5. Streamline and fast-track prescribed burn planning and approvals process to ensure the timely conduct of town, city and asset protection burns.
6. Undertake much greater use of small aircraft and drones for prescribed burning to increase rates and areas of prescribed burning to forests per year.
7. Optimise utilisation of time, resources, drones, alliances, innovation and other measures to increase prescribed burning and vegetation treatment extent. Focus on avoiding excuses for reduced prescribed burning programs and get on with prescribed burning, mechanical treatment and grazing programs.
8. Optimise regular prescribed burning, including reducing the extremely long fire intervals for prescribed burning up to 30 years, that often delay prescribed burning programs increases prescribed burning intensity and bushfire intensity.
9. Review Local Bushfire Risk Management Plans to utilise broad-scale prescribed burning in forested areas and incorporate the lessons of large intense bushfires such as the 2019/ 20 bushfires.
10. Utilise aerial prescribed burning techniques that provides fire control authorities with the means of rapidly controlling summer wildfires in mountainous terrain where access and conventional fire-fighting methods can be extremely slow. Fires in inaccessible country which were previously allowed to burn for several weeks can be rapidly burnt out to existing control lines in a few hours, with low intensity fires, during periods of low fire danger.
11. Undertake low intensity burning across landscapes to address eucalypt decline and reduce bushfire risks with dense understories associated with eucalypt decline.

### **3.9 Other fuel treatment measures across landscapes and resilient bushfire landscape lessons and insights**

1. Undertake hazard reduction using a range of activities, including any one or a combination of burning, including slashing, mechanical intervention, thinning and grazing.
2. Consider mechanical thinning dense forests and reducing the number of smaller trees and vegetation (and drought stress), noting that thinning lessens the intensity of future wildfires. Consider US approaches for resilient fire landscapes and safer communities for Australia, including low intensity burning and thinning.

3. Adopt valuable fire safe approaches and documents, including Can We Better Fire-Proof Our Country Towns? Using matches and machines to reduce fuel load and also AFPA (2020) Using Fire and Machines to Better Fire-Proof Our Country Towns, Australian Forest Products Association.

### **3.10 Infrastructure protection lessons and insights**

1. Establish systems to ensure facilities such as schools, hospitals, evacuation centres, electricity, communications and infrastructure are adequately prepared for bushfires each bushfire season. Consider details, locations, risks, hazards, protection measures and classification of all infrastructure in towns and cities and update this information annually. Annual audits could be undertaken by the utility authorities, applicable government departments and applicable industries. Another option is to undertake audits by Council on all these zones.
2. Assess telecommunication and electricity infrastructure in regards to bushfire risks, hazards and threats and also consider rebuilding costs. In regards to bushfire risks/ hazards/ threats, concrete/ steel electricity poles/ underground infrastructure can be considered in timbered areas, communication shed design reviewed, cable design reviewed and trees kept well away from the towers/ sheds. In bushfires, telecommunication and electricity infrastructure can be out for a considerable number of days or longer, or most of the bushfire period, reducing flow of information to the fire fighters and community.

### **3.11 Land management lessons and insights**

1. Undertake effective adaptive land management action, increasing prescribed burning, thinning and improving forest health, in order to increase bushfire resilience and reduce intense bushfires.

### **3.12 Return fire interval failure lessons and insights**

1. Focus on sensible fire intervals between prescribed burns and fires of the order of 3-6 years.
2. Avoid and reduce large contiguous tracts of heavy forest fuel loads in landscapes, adjacent and within communities, which results in severe fire behaviour and often prevents early suppression of bushfires. This emphasises the importance of adequate levels of landscape fuel hazard reduction as well as the need to manage fuels around communities and infrastructure.

### **3.13 Firefighter safety lessons and insights**

1. Optimise the safety of fire-fighters, especially in relation to avoiding high fuel loads/ high bushfire intensities and reduce the enormous responsibility on incident controllers when deciding where to allocate firefighters. Optimise consider firefighters anchoring points in safe zones to put out spot fires and containment. Always question if staff and volunteers should be sent into highly hazardous bushfire conditions, especially where the governments, landowners and residents have not taken appropriate mitigating action beforehand.
2. Optimise regular landscape prescribed burning which makes bushfire suppression easier, safer and cheaper and also reduces bushfire losses, human, built and environmental. Utilise opportunities for upskilling and fire mitigation training for bushfires using coordinated prescribed burning programs to develop fire skills.
3. Ensure fire safe establishment of track/ trail networks to access areas for prescribed burning and bushfire fighting. Ensure tracks/ trails are permanent and suitable for the movement of heavy vehicles and personnel safely and quickly. Optimise regular burning programs in the forest areas where the tracks are located in order to optimize firefighter safety.
4. Optimise communication systems to handle communication in bushfire events, reducing bushfire safety risks.

### **3.14 Firefighting attack lessons and insights**

1. Change the focus from a bushfire suppression focus to an effective mitigation and suppression focus. A Menzies Research Centre (2020) report noted that in 2014, a report released by the Productivity Commission into Natural Disaster Funding Arrangements found that government natural disaster funding arrangements had been inefficient, inequitable and unsustainable and noted mitigation funding amounted to only three per cent of what is spent on post-disaster recovery.
2. Establish efficient and innovative systems to quickly detect, locate, report and geo-reference new and incipient fires for quick coordinated initial attack. Camera and satellite systems have advantages but fire towers can cover large areas.
3. Adopt aggressive first attack/s on all bushfires, also taking into account current observed behaviour and forecast potential fire behaviour.
4. Ensure effective approach/standards for mop-up and blackening out; improve training and protocols for back-burning and training in safe ways of fighting fires near electricity.
5. Understand that firebrands can travel up to 35 km and map where major firebrand forests are located in bushfire suppression planning.
6. Ensure dozers and plant are on the bushfire fire grounds quickly, as required.

7. Understand aircraft effectiveness and limitations in regards to effectiveness, cost, weather, smoke and standby arrangements. Ensure procedures are evaluated in relation to the use of fixed wing water bombers, including trigger points for activation on high-risk days.
8. Optimise understanding of the interactions between weather, fuels, atmospheric conditions and extreme fire behaviour associated with the formation of pyro-cumulonimbus (lesson from the Waroona and other bushfires).
9. Establish a system for the voluntary registration of firefighting units, contractor and forestry industry firefighting resources. The purpose is to facilitate the safe, efficient and effective recognition, organisation, deployment, management and coordination of these resources.
10. Utilise prescribed burning reducing the total weight of fuels and hence the rate of spread, intensity and the potential of fires to generate spot fires ahead of the main fire. Recent prescribed burns, particularly those which are less than 2-3 years old, and have discontinuous surface fuels – can substantially reduce the progress and impact of major bushfire runs.
11. Utilise the fact that prescribed burning can contribute significantly to early containment of multiple fires, provide safe anchor points for fire containment, and increase the effectiveness of suppression operations. Prescribed burning improves the overall effectiveness of fire management at the landscape and regional scales particularly by enabling prioritisation of suppression action during multiple ignition events (e.g. widespread lightning storms) and reducing fire severity and damage to environmental and commercial forest values. This contribution is often overlooked.
12. Implement fuel reduced areas along waterways, access roads and other timbered areas near towns to reduce fire wick areas and relieve the pressure on suppression forces in these areas.
13. Adopt policies and practices that reduce/ minimise the excessive number of intense bushfires that are continuing, increasing areas of dense regrowth and future bushfires and not learning the lessons from large areas of intense bushfires. This is extremely evident in the data from the 2019/ 20 Australian bushfires.

### **3.15 Access, firebreaks and water supply lessons and insights**

1. Utilise airports, roads and fire trails for bushfire mitigation and suppression and wherever possible ensure safe for vehicle passing and turning.
2. Ensure fire roads, trails and tracks are mapped/ tabulated in relation to extent, location, adequacy, access to vulnerable areas, barriers and maintenance for areas surrounding all bushfire communities and across landscapes.
3. Undertake required construction of new fire trails and accesses and ensure ongoing maintenance of current tracks and accesses.
4. Look closely where fire roads, trails and tracks have been closed and seek reasons why/ recommendation further action if concerns are identified.
5. Undertake annual reviews of the location, volume and availability of water sources for bushfires and provide water storage locations.
6. Utilise temporary water storages where required for bushfire control.

### **3.16 Economic and expenditure lessons and insights**

1. Consider the full costs of bushfire disasters on communities and opportunities to reduce such disaster costs. There are many economic reform and productivity opportunities across the spectrum of mitigation, prevention, suppression and recovery, including in regard to bushfires. Some of these opportunities include implementing cost effective opportunities as identified by Deloitte Access Economics (2013) and Menzies Centre 2020 report: including Government funding should prioritise risk reduction which will reduce the need to spend on disaster recovery.
2. Urgently address high and rising bushfire disaster insurance costs via increased mitigation funding/ opportunities as highlighted in this review.
3. Utilise the science and experience in other jurisdictions that suggests the level of landscape burning needs to be 8-10% per annum if any significant risk reduction benefits are to be realised.
4. Utilise the research of Florec (2016) in relation to the value of prescribed burning. *The long-term analysis shows that not doing any prescribed burning for several years can be very costly for the south-west of WA, with large increases in damages and suppression expenditures. The net benefits of prescribed burning appear much larger in a long-term analysis compared to a short-term analysis. As a result, the long-term analysis shows a more clear-cut answer. It suggests that substantial benefits that can be gained from increasing the amount of area prescribed burned per year in the region. There are not large economic differences between prescribed burning 10, 15 and 20% of public land in the long term, but each of these is greatly superior to doing nothing. The results from the long-term model indicate that prescribed burning may generate between AU\$10 and AU\$47 benefits every year per dollar invested compared to doing nothing.*
5. Undertake an assessment/ review/ audit of subsidisation of Commonwealth funding to states for major bushfires, where SE Australian states undertake miniscule and inadequate areas of prescribed burning across

all forest areas, not adequate for community protection. These assessments would be best to consider incentives and minimum standards for increased prescribed burning.

### **3.17 Capture and retention lessons and insights**

1. Effectively capture and retain past bushfire findings, lessons/ insights and any inactioning of these findings/ recommendations, noting what is the point of holding inquiries unless the agreed recommendations and lessons are followed diligently. Always consider lessons are hard won and easily forgotten.
2. Capture all bushfire contributory factors across large bushfires and action the contributory factors where inaction has occurred. One example is in relation to the 2019/ 20 bushfires: A review of the 2019/ 20 bushfires in regards to contributory factors of the bushfires titled "The 2019/ 20 bushfires – contributory factors: John O'Donnell teases out the contributory factors to the bushfires. There are many contributory factors in relation to large scale bushfires, and they all need to be considered and actioned.
3. Review reasons for apathy and resistance to lesson/ insight learning in SE Australia, noting there are cultural and structural deficiencies in capturing learning lessons from many previous incidents.
4. Explore opportunities to better capture bushfire lessons straight after bushfires as outlined in a Victorian community bushfire. This example Community Emergency Planning Group (2012) Hot Debrief – CRG Meeting Tuesday 2nd October 2012 included members of the Loch Sport CRG, members of the Community Emergency Planning Group, local residents/property owners, Parks Vic, DSE Heyfield District, CFA - Gippsland Region, Wellington Shire Council.
5. Ensure all state fire authorities release lessons and insights from bushfires at the end of each bushfire season as publicly available reports.
6. Ensure capture of good and poor outcome case studies, including where innovations do not work
7. Regularly refine/ update fire protocols and training.

### **3.18 Sound listening lessons and insights**

1. Ensure sound listening in relation to fire management to skilled bushfire personnel, including current fire fighters, land managers and many retired personnel with the street smarts prepared to give up their time to safeguard Australia in relation to bushfires. There have been too many cases of not listening to these people.
2. Utilise truly independent bushfire reviews after individual and extensive/ intensive bushfires and bushfire seasons. Where large scale bushfire disasters occur, consider the use of alternative advice of normal experts and advisers to reduce risks of "same, same" outcomes.
3. Bushfire inquiries, commissions and review include a "Submissions Report" to highlight how each submitted issue has been addressed and responded to. This would likely group similar broad issues. Too many important issues have been missed, unfortunately many of these cost lives.

### **3.19 Risk management lessons and insights**

1. Ensure disaster risks to communities are assessed considering combinations of hazards, including drought, heavy fuels, many bushfires and vulnerable communities. Ensure risk assessment methodologies identify both the risk of a bushfire attack and the susceptibility of urban and peri-urban areas. Focus on worst case bushfire disasters in planning and risk management systems.
2. Prepare and manage bushfire risk management plans focussed on individual towns/ cities with greater community participation, with plans and mitigation updated annually. Assess if local government bushfire risk management plans are generic documents, cover very large areas, often undertake limited fire mitigation annually and assess effectiveness of this approach. Also, ensure local government bushfire risk management plans are updated annually and updated as required after bushfires/ failures.
3. Focus on regular and ongoing review of bushfire risk, mitigation, suppression and bushfire risk management plan auditing. Undertake risk, hazard and threat assessment to assess and manage risks, hazards and threats inside and outside towns/ cities, preferably on an annual basis.
4. Reduce the risks associated with bushfires caused by the electricity distribution network. Examine measures to reduce the risk of fire starts from the electricity distribution networks.
5. Examine all education/ school bushfire danger risks in relation to heavy fuels close to buildings, heavy fuel loads in the surrounding bush, heaps of rubbish, including piles of logs, overgrown pathways, effective firebreaks, gutters clogged with leaves and entry points such as air conditioners that are no longer used but providing an entry point for windblown embers,
6. Address reduced time availability for prescribed burning, with limited volunteer availability as a result of a significant increases in other brigade activities. The transition away from the traditional 'bush fire brigade' in fire service organisations has often seen a shift in focus from bush firefighting and fuel management to activities associated with urban firefighting and auxiliary activities such as safe working on roofs, trail bikes, chain saws and remote area firefighting.

7. Undertake annual fire preparedness training, noting that people from the city often have very little knowledge on how to reduce the fire risk on their regional property and often do not ask key questions from the local owners.
8. Ensure annual pre bushfire season checks of power line and adjacent vegetation safety to reduce bushfire risks.
9. Ensure and bushfire personnel and volunteers are given sound training in safe ways of fighting fires near electricity.

### **3.20 Audit lessons and insights**

1. Optimise use of planning, mitigation, preparedness, suppression and risk performance auditing by local, state and federal governments, private and other land tenure management.

### **3.21 Annual community and government review lessons and insights**

1. Examine bushfire records against fuel treatments and ascertain successes, yearly and over long periods, noting prescribed burning of the order of only 1 % of forest landscapes is going to be much less successful.

### **3.22 Multiplier impacts following disasters**

1. Capture the lessons and insights from Fasullo et al. (2023) in relation to the climate response to bushfire burning emissions from the 2019–2020 Australian bushfire season as an important contributor to the 2020–2022 strong La Niña events, increasing the extent of bushfire disasters. Considering the implications of a vicious cycle is being set up, first major bushfires occurring with large emissions, such as the 2019/ 20 bushfires; consequent bigger floods following intense bushfires on impacted catchments; Pacific cooling and consequent increased rainfall impacts in E Australia making La Nina's worse (and disaster costs) and increasing vegetation growth occurs such as in 2020 to 2022 and finally consequent increased bushfire risks associated with vegetation growth when an El Nino pattern returns such over affected areas, such as in late 2023 over much of Australia. This cycle needs to be considered and actioned, there is one obvious solution in markedly increased prescribed burning across SE Australia, reducing both bushfire insurance costs, bushfire suppression costs and flood costs and better protecting communities and the environment.

#### **4 Conclusions in relation to town and city disasters across Australia**

The author considers that large numbers of Australian towns and cities are inadequately prepared for bushfires and this is one of the reasons for undertaking this review. Readers can assess bushfire preparation in relation to their own and other towns/ cities and assess if bushfire preparation is well managed, has improved after earlier bushfires and it has improved since the 2019/ 20 bushfires.

Nineteen Australian town and city impact and disaster bushfire case studies are highlighted above in Section 2. These outline bushfire information in relation to each of the selected bushfires, and in most cases bushfire lessons and insights.

These case studies are from Victoria 5, NSW 4, SA 3, WA 3, Tas 1, ACT 1, Australia 1 and a combined Vic/ SA case study, a broad representation of town and city disasters across most of Australia.

Seven older case studies are included in the bushfire disaster assessment from 1851 to 1967, it is important to note that town and city bushfire disasters are not just a recent phenomenon and have occurred since European settlement and the curtailment of Aboriginal burning practices. The other twelve case studies range from 1983 to 2021.

In relation to the status of town and city bushfire preparedness across SE Australia, the author considers bushfire preparedness and mitigation is inadequate because of the following factors:

- Miniscule rates of prescribed burning around and within towns and cities.
- Focus on town and city ring of confidence approaches with protection around the edges.
- Very limited prescribed burning across landscapes and restrictive rules and codes.
- Very high fuel loads/ strata, with huge contiguous areas of these fuels set up for intense bushfire runs.
- Increasing eucalypt decline and increasing dense forest understories and bushfire risks.
- Poor forest fire resilience.
- Restrictive fire policies reducing prescribed burning to very long timeframes.
- Missed opportunities for developing cooperative/ alliance approaches to prescribed burning arrangements and programs.
- Risk allocation to lighters of fires with minimal consideration of reducing fuel loads and strata.
- Huge areas of dead timber and fuels and dense regrowth from intense bushfires.
- Increasing urban residential areas at the interface.
- In many cases generic town bushfire risk management plans.
- Low levels of community participation and locations of fire adapted communities such as adopted in the US.
- Inadequate town and city bushfire design.
- Focus on bushfire suppression at the expense of fire mitigation.
- Inadequate government expenditure in relation to bushfire mitigation.
- Increased reliance on water bombing for control of forest fires,
- Inadequate bushfire planning and management focus in many towns and cities in relation to reducing bushfire risks.
- Inadequate focus on fire fighter safety.
- Loss of skilled firefighters and reduced use of effective suppression techniques, including quick attack and backburning at the right time.
- Complacency in regards to bushfires.
- Failures in communication and systems in some cases.
- Inadequate capture and retention of bushfire lessons and insights.

Inadequate bushfire preparedness and mitigation has resulted in the continuation of large intense bushfires across SE Australia, including impacts on towns and cities, and are often associated with long fire runs. Large numbers of communities, people and firefighters continue to be injured and killed in bushfires.

Another issue that greatly concerns the author is that Australia has never really fully nor effectively captured and locked in many of the key lessons in relation to avoiding and reducing town and city bushfire disasters across these communities on an ongoing basis.

A major focus of Section 3 is capturing key bushfire disaster lessons and insights in relation to town and city bushfire disaster avoidance, sound fire and fuel mitigation, fuel management, preparedness for bushfires, community and firefighter safety, infrastructure protection, firefighting attack and a range of other lessons from case studies over the last 170 years.

Twenty-two lesson and insight broad areas are outlined, and include a considerable number of lessons and insights, 127 in all. The analysis was detailed and assessed the case study lessons in Section 2 and also a large number of bushfire disaster documentation, as outlined at the start of Section 3.

These lessons and insights don't necessarily apply to upcoming bushfire disasters, but provide a broad base to progress bushfire disaster avoidance opportunities and reduction in the number, extent, intensity and impacts of future bushfire disasters.

It would be beneficial if governments across Australia, fire services, brigades, communities, home owners, business owners and landholders considered and acted on these lessons and insights in order to reduce bushfire disasters and improve town, city and firefighter safety, as well as town and city bushfire protection, bushfire preparedness and hopefully reduce increasing business and home insurance costs. The lessons and insights provide a base for consideration, it is up to governments, communities, to adopt lessons and insights into their own administration areas, including policies and practices.

If we don't improve actioning in regards to capturing and implementing town and city bushfire lessons and insights, there will continue to be large scale impacts on communities, community members, fire fighters, the environment and massive economic impacts.



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## **Annexure 1 Kangaroo Valley Community Bushfire Committee**

Kangaroo Valley Community Bushfire Committee Compendium of Submissions to the NSW Independent Bushfire Inquiry 2020:

Key correspondence to the NSW Independent Bushfire Inquiry 2020 highlights major concerns, from a progressive community.

### Protection through hazard reduction

*Number 10. The State introduce a revised approach to hazard reduction in order to  ensure fuel load management in bushfire prone areas is given sufficient priority by the RFS iv*

- *overcome risk aversion within the RFS to hazard reduction*
- *reduce the workload currently placed on RFS volunteers so that they can concentrate on the core responsibility of protecting rural communities by reduction in fuel loads.*

### Transparency in hazard reduction

*Number 20. The State amend the Rural Fires Act, 1997 and subordinate regulations to ensure accountability and transparency in hazard reduction programming including public access to information specifically relating to each local government area on*

- *hazard reduction schedules*
- *performance monitoring of hazard reductions  outcome of hazard reductions  historical hazard reduction outcomes.*

### Protection through hazard reduction Item 2 and Item 5

*The current NSW approach to bush fire risk management planning indicates that some community engagement has occurred and that some hazard reduction may be undertaken. It creates an illusion that effective bushfire risk management planning has been carried out when, in fact, the reality, for communities such as Kangaroo Valley, is that there has been no significant engagement with the community or systematic planning.*

*The Kangaroo Valley community's experience is that the RFS has failed to put in place any methodology for recording or monitoring the performance of bush fire risk management plans and there has been no attempt to evaluate specified treatments Recommendation 1. The State revise its policy and legislation on bush fire risk management planning as set out in the Rural Fires Act, 1997. Overarching goals of the revised policy and legislation should be to  significantly improve the quality of bush fire risk management planning undertaken at the level of local government taking into account the experience of other states such as Victoria*

### Protection through hazard reduction Item 2 and Item 5

*The KVCBC's recommendation regarding hazard reduction concern the inadequate protection provided by the RFS for forested areas on private landholdings and assets identified on the Shoalhaven Bush Fire Risk Management Plan (BFRMP) as being in need of protection. The KVCBC has no criticism of hazard reduction work undertaken in Kangaroo Valley by either WaterNSW or the NSW National Parks and Wildlife Service; combined, they are responsible for approximately 100 square kilometres of publicly-owned land in Kangaroo Valley.*

*The KVCBC understands that the RFS has primary responsibility for around 200 square kilometres of Kangaroo Valley, most of which is privately owned. A good deal of this area is heavily forested and has had no major fuel reduction since the 1983 fires. Prior to the Currowan fire, approximately only 0.15% of this area had its fuel load reduced by hazard reduction.*

*This figure is based on a 10-year hazard reduction cycle and means that very little protection by way of hazard reduction is being offered to the Kangaroo Valley community by the RFS. This is in no way a criticism of local volunteers, as the KVCBC is well aware of the efforts made by them to undertake hazard reduction. A combination of factors make hazard reduction very difficult to achieve in Kangaroo Valley, such as the following:*

- *Autumn and winter fogs lead to a burn window of only about 3 hours on many days.*
- *Local and NSW Government planning rules have allowed many houses to be constructed in heavily forested areas which increases the risk associated with hazard reduction and makes planning and conducting of hazard reduction significantly more difficult.*

- Restrictions are being placed on volunteers by the RFS as it becomes increasingly risk adverse. □ Limited volunteer availability has arisen as a result of a significant increases in other RFS activities. By the time volunteers fulfil administrative duties, training requirements, and respond to a doubling in regular call-outs with the much longer fire season, there is very little time left for hazard reduction.
- The transition away from the traditional 'bush fire brigade' in the Rural Fire Service organisation has seen a shift in focus from bush firefighting and fuel management to activities associated with urban firefighting and auxiliary activities such as safe working on roofs, trail bikes, chain saws, remote area firefighting (also carried out by associated land managers, such as, NPWS, NSW Forestry Corporation, and WaterNSW), aircraft operations etc. The RFS focus has shifted away from fuel management to 'toy' management.

#### *Recommendation 11.*

*The State introduce a revised approach to hazard reduction in order to □ ensure fuel load management in bushfire prone areas is given sufficient priority by the RFS □ overcome risk aversion within the RFS to hazard reduction Kangaroo Valley Community Bushfire Committee, Compendium of Submissions, NSW Independent Bushfire Inquiry, 2020 13 □ reduce the workload currently placed on RFS volunteers so that they can concentrate on the core responsibility of protecting rural communities by reduction in fuel loads.*

#### Community Protection Plans Item 2 and Item 5

*The NSW RFS currently provides locality- or village-based Community Protection Plans (CPP) as a means of offering additional protection to hazard reduction and community engagement. The RFS website indicates that 117 communities across NSW have a CPP. Kangaroo Valley, in spite of its Very High bushfire risk rating, is not included nor listed to have a CPP in the future. Based on the format of existing CPPs, even if a plan were to be provided, most likely it would only address the immediate village area and would provide no protection to the localities and neighbourhoods that comprise most of Kangaroo Valley.*

*The Victorian Country Fire Authority (CFA) changed its Township Protection Plans to Community Information Guides – Bushfire. These guides currently have been rolled out to 278 communities. The Victorian approach provides very easy to understand local information that can be viewed on a smart phone. In comparison, the NSW approach provides difficult to understand maps that need a tablet or bigger sized screen. The Victorian maps, by virtue of their design, are accessible to both locals and tourists, while the NSW maps would only be accessible with significant local knowledge or a tourist with a high degree of map reading skills.*

*The KVCBC believes that the current CPP program is totally inadequate for the following reasons: □ no accountability or transparency as to which communities are selected □ the maps are difficult for the general public to understand □ lack of quality local information □ maps are not useable on a smart phone screen □ roll out of the program is such that large sections of the NSW will never be protected □ lack of independent evidence that the CPP has been successful at providing protection to communities.*

#### *Recommendation 15.*

*The State change the RFS Community Protection Plan (CPP) program in order to □ provide community information guides as in Victoria and other southern states □ adopt a map display that is usable on a small screen similar to the Victorian guide □ provide a similar level of quality of information as in the Victorian guide □ provide transparency in decision-making as to how communities are selected □ provide a 5-year rolling schedule for the implementation of the guides.*

## Annexure 2 Lessons and insights as outlined in Burrows (2019)

Lessons and insights as outlined in Burrows (2019) in relation to a number of bushfires.

Bushfire	Lessons and insights
<p>WA Waroona bushfire including Yarloop 2016</p>	<p><i>Fuel management and fire prevention</i></p> <ul style="list-style-type: none"> <li>• <i>The State to readjust expenditure away from fire response and recovery and towards prevention and hazard (fuel) mitigation.</i></li> <li>• <i>Contiguous tracts of heavy, dry forest fuel resulted in severe fire behaviour, preventing the early suppression of this fire and before it reached settlements. This emphasises the importance of adequate levels of landscape fuel hazard reduction as well as the need to manage fuels around settlements and critical infrastructure.</i></li> <li>• <i>Need to regularly quantify extent of risk of fuel build-up around communities in order to develop risk-based mitigation programs.</i></li> <li>• <i>Need to target hazard reduction on public and private land at the urban-rural interface. The Department of Fire and Emergency Services (DFES) to develop a fast-track hazard reduction burn planning and approvals process to ensure the timely conduct of township and asset protection burns.</i></li> <li>• <i>Heavy fuels in road reserves (verges), along irrigation drains, tree lines and other linear features act as ‘fuses’ or ‘fire wicks’ frustrating suppression operations and taking fire into communities.</i></li> <li>• <i>A massive ember storm originating from patches of long-unburnt forest near the town of Yarloop ignited natural and anthropogenic fuels within the town. Many houses ignited simultaneously from ember attack and many were lost from house-to-house ignitions.</i></li> <li>• <i>Fuel hazard mitigation in and around settlements, in road reserves and at the rural-urban interface is complex, risky and costly. Expand the ‘Bushfire Mitigation Grant Scheme’ using state and federal funds to implement hazard reduction works on these lands. Every community is unique and local government, supported by the state government, is best placed to coordinate these activities.</i></li> <li>• <i>Develop guidelines with respect to clearing of vegetation / fuels by landholders from dwellings and other assets.</i></li> </ul> <p><i>Incident management</i></p> <ul style="list-style-type: none"> <li>• <i>The State Emergency Management Committee (SEMC) to adopt across all hazards, the doctrine of a) the primacy of life, b) the ‘Strategic Control Priorities’, and c) community warnings that are timely, tailored and relevant.</i></li> <li>• <i>Develop a ‘network’ of agency personnel who can be called upon for bushfire and emergency incident management capability within Western Australia. The arrangement will be led by the SEMC and modelled on systems used by the Department of Parks and Wildlife (DPAW).</i></li> <li>• <i>All L3 multi-agency IMTs will be integrated and pre-formed before the start of the bushfire season.</i></li> <li>• <i>In conjunction with AFAC, explore the development of a standardised initial (4 hr) Incident Action Plan (AIP).</i></li> <li>• <i>Extending fire behaviour predictions out from time of detection to longer periods will enable better appreciation of fire potential and earlier call on declaring the scale of the incident.</i></li> <li>• <i>Better training of ICs on the capabilities and limitations of large air tankers (LATs) and very large air tankers (VLATs).</i></li> <li>• <i>Having updated information (maps) on the position of the fire(s) is essential for developing reliable predictions of its spread. This is critical for community warnings and for planning suppression strategies. Need to investigate aerial and satellite intelligence gathering capacity.</i></li> <li>• <i>Review procedures to ensure that only vehicles ‘fit-for-purpose’ are dispatched to fire incidents.</i></li> <li>• <i>Incident management structures should include people with local knowledge. This will necessitate providing training for local volunteers to participate in IMTs.</i></li> </ul>

#### *Resource efficiency*

- *The SEMC, in consultation with other key stakeholders, establish a system for the voluntary registration of firefighting units, contractor and forestry industry firefighting resources. The purpose is to facilitate the safe, efficient and effective recognition, organisation, deployment, management and coordination of these resources. The systems would include a process for enabling access through traffic management points during bushfires.*
- *DFES and DPAW to investigate and adopt an emergency services resource management system that will enable better registration, tasking, tracking, management and coordination of personnel and resources.*

#### *Information, Alerts and Warnings*

- *DFES to investigate and adopt a system that will allow the public to opt in, monitor and receive, through a 'push mechanism', bushfire and other emergency warnings, maps and information using a wide variety of devices including personal hand held smart devices.*
- *SEMC (State Emergency Management Committee) to discuss with local governments the installation of bushfire emergency 'sirens' in fire-prone communities.*

#### *Evacuation and Shelter Issues*

- *Residents advised to evacuate but didn't know where to evacuate to! Need for early and clear instructions re evacuations.*
- *DFES to work with the Department of Planning and Local Governments to adopt a policy that enables local governments to identify, register and communicate, 'Places of Bushfire Last Resort' in settlements and town sites where the life risk from bushfire is very high.*
- *DFES develop a policy and guidance on a range of suitable bushfire shelter options.*

#### *Traffic Management*

- *DFES to issue a photo identification card to all bona fide personnel involved in firefighting and consider temporary windscreen signage to identify vehicles carrying personnel.*
- *SEMC to review the policy for traffic management at emergency incidents to reflect national 'best practice'.*

#### *Transition to recovery*

- *Need for rapid damage assessment teams.*
- *Recovery needs to start early - SEMC to develop an aide-memoire for ICs to guide the initial recovery considerations during an incident.*

#### *Rural Fire Capability*

- *The State Government to create a Rural Fire Service (RFS) to enhance the capability for rural fire management and bushfire risk management.*
- *SEMC to establish a State Bushfire Coordinating Committee (SBCC) as a sub-committee of SEMC - the SBCC will have the primary responsibility to develop a State Bushfire Management Policy and long term bushfire risk management objectives and advise the SEMC on matters pertaining to bushfire.*
- *The Department of the Premier and Cabinet to conduct an independent review of the current arrangement for the management and distribution of the Emergency Services Levy.*

*Under this heading there were also recommendations pertaining to volunteerism (in particular the better integration of local knowledge and volunteers into the incident management structure), occupational health and safety issues, and managing workload and firefighter fatigue. There was also a suggestion to establish a WA Centre for Excellence in rural and forest fire management.*

#### *Research issues*

- *Investigate the causes of, and effects of, PyroCb formation in bushfires.*



	<p><i>Other insights</i></p> <ul style="list-style-type: none"> <li>• <i>There are cultural and structural deficiencies in learning lessons from previous incidents.</i></li> <li>• <i>“If there was nothing else done but to manage fuels properly in areas vulnerable to bushfire then much of the work of this ‘Special Inquiry’ would be done”. (Ferguson 2016).</i></li> <li>• <i>Automatic vehicle location (AVL) capability – “...a very, very good tool”.</i></li> <li>• <i>Relevant DFES staff need enhanced training in hazard reduction burning, forest and rural fire behaviour, and rural firefighting techniques.</i></li> <li>• <i>DFES to implement a volunteer emergency services worker consultation framework.</i></li> </ul>
<p><b>South Australia Pinery bushfire 2015</b></p>	<p><i>Incident Management</i></p> <ul style="list-style-type: none"> <li>• <i>Better preparation and training for ‘out-of-scale’ incidents.</i></li> <li>• <i>Predefined clarity of roles and decision-making responsibilities throughout the various structures and agencies involved in incident management.</i></li> <li>• <i>Early establishment and ‘bedding down’ of the incident management structure, including IMTs and higher level structures.</i></li> <li>• <i>Early development and sharing of incident action plans enhances effective management of an incident.</i></li> <li>• <i>Need to improve the Situation Analysis function as the collection of information, its analysis and dissemination is critical for decision making.</i></li> <li>• <i>Incident management facilities and work areas need to be adequate to enable incident managers to operate effectively over a long time.</i></li> <li>• <i>Vehicle tracking systems improve personnel safety and incident management.</i></li> <li>• <i>The priorities and action plans of the control agency need to be clearly understood by all agencies with a direct or indirect role in emergency management.</i></li> <li>• <i>Better firefighter fatigue management.</i></li> </ul> <p><i>Public information and warnings</i></p> <ul style="list-style-type: none"> <li>• <i>Timely dissemination of necessary information, and issuing of warnings and actions to be taken, is critical for enabling appropriate community responses. To this end, best use should be made of current understanding of the situation, of fire behaviour and weather predictions, and of various communications media including the mobile phone network and the internet, including social media.</i></li> </ul>
<p><b>South Australia Sampson Flat bushfire 2015</b></p>	<p><i>As mentioned, I was unable to source a comprehensive review or inquiry into this fire, so the following is a paraphrased summary of the recommendations made in the AFAC response audit (sensu Neotics 2016).</i></p> <ul style="list-style-type: none"> <li>• <i>Powers for the State Controller to determine operational levels of readiness in some circumstances.</i></li> <li>• <i>Triggers in the Chief Officer’s standing orders to escalate the State Controller role to rank of Asst. Chief Officer.</i></li> <li>• <i>Review how regional resources are managed and tracked and incorporated into the Chief Officer’s standing orders.</i></li> <li>• <i>Emergency Management Australia’s, “Arrangements for interstate assistance” be applied for all future requests for assistance by SA authorities.</i></li> <li>• <i>Review nomenclature of personnel and centres consistent with the recommendations of the VBRC.</i></li> <li>• <i>Ensure that areas affected by a ‘declaration’ are clear.</i></li> <li>• <i>Increase the number of IMTs to align with the number of regions.</i></li> <li>• <i>Plan for one multi-agency Coordination Centre with capacity to deal with all incidents.</i></li> <li>• <i>Review Country Fire Service (CFS) operational facilities to provide more effective communications, connectivity and resource management.</i></li> <li>• <i>Review procedures to ensure effective communications between IMTs, Regional and State operational centres.</i></li> <li>• <i>Regional Controller to be appointed as IC on L3 incidents in the region.</i></li> <li>• <i>Review practices of issuing ‘emergency alert/warning/watch and act’ telephone messages to ensure it is consistent, relevant, and necessary.</i></li> <li>• <i>Review current weather, fuel loads and curing to ensure the most appropriate and accurate forecast is prepared, validated and issued.</i></li> </ul>

	<ul style="list-style-type: none"> <li>• Consider the 'Traffic Management' guidelines developed in Tasmania as a model.</li> <li>• Consider adopting common terminology and capability requirements for strike teams consistent with other jurisdictions.</li> <li>• Develop an effective inter-agency messaging system and resource management and tracking system.</li> <li>• Review legislation and regulations to ensure a consistent approach to emergency management to minimise risk of duplication and inconsistencies.</li> </ul>
<b>Tasmanian Dunalley bushfire 2013</b>	<p>The 2013 Tasmanian Bushfires Inquiry made 103 recommendations, which, for brevity, I summarise here under the thematic headings used in the report.</p> <p><i>Cause and circumstances of the fires</i></p> <ul style="list-style-type: none"> <li>• A recommendation to continue supporting efforts to develop better methods for forecasting and simulating fire risk.</li> <li>• Measures to reduce the risk of fire starts from the electricity distribution network.</li> </ul> <p><i>Response</i></p> <ul style="list-style-type: none"> <li>• Need for better records management and information sharing during incidents.</li> <li>• Need for clarity around roles and responsibilities of the State Controller, and in multi-agency events, of the various agencies –clarifying who is in charge.</li> <li>• Amendments to the legislation regarding state of emergency declarations.</li> <li>• Activate the Emergency Management Plan at lower thresholds to practice arrangements.</li> <li>• Need for integrated communications technology and interoperability in radio comms.</li> <li>• More timely development and issuing of Incident Action Plans (AIPs), inclusion of people with local knowledge in the IMTs and better integration of local knowledge and volunteer brigades.</li> <li>• Adopt a proactive approach and an aggressive first attack on fires commensurate with forecast potential fire behaviour rather than current observed behaviour.</li> <li>• Review approach/standards to mop-up and blackening out.</li> </ul> <p><i>Develop better operating procedures for night time operations.</i></p> <ul style="list-style-type: none"> <li>• Review procedures and evaluate the use of fixed wing water bombers including trigger points for activation on high risk days.</li> <li>• Review emergency traffic management policy.</li> <li>• Develop a state-level policy on evacuations; decisions on opening refuge centres are to be coordinated with Police.</li> <li>• Emergency management plans to include means of effectively engaging with local communities and services.</li> <li>• Discuss with Government, the adequacy of resources to deal with fire emergencies including future needs in a changing world.</li> </ul> <p><i>Transition to recovery</i></p> <ul style="list-style-type: none"> <li>• Recommendations pertaining to a review of the State Special Emergency Plan – Recovery, and details about what should be considered in the review including rapid damage assessment, rapid repair and functioning of essential services and critical infrastructure.</li> </ul> <p><i>Community alerts, warnings and information</i></p> <ul style="list-style-type: none"> <li>• The state Emergency Management Plan should include a comprehensive communication policy and plans.</li> <li>• Predictive modelling of fire spread to identify communities at risk and to develop emergency communications for those communities.</li> <li>• Warnings are not only issued when fires are 'out of control' but also on initiation.</li> <li>• Appropriate use of social media as an emergency management communication tool.</li> <li>• Review approaches to communicating with communities threatened by bushfire to ensure information is timely, accurate and helpful – individuals need to know what action to take.</li> <li>• Better mobile phone coverage.</li> </ul>

	<p><i>Preparation and planning</i></p> <ul style="list-style-type: none"> <li>• Recommendations pertaining to implementation of approved recommendations and lessons from the VBRC.</li> <li>• Mock exercises, training and development to improve state of readiness of emergency services.</li> <li>• An accountability process for managing continuous improvement in emergency services.</li> </ul> <p><i>Managing fire risk</i></p> <ul style="list-style-type: none"> <li>• Recommendations pertaining to accounting for demographic (population) change in assessment of the consequences of climate change on emergency events.</li> <li>• State Emergency Management Committee (SEMC) to consider structuring the Tasmania Emergency Management Plan so it provides more specific guidance, commitment to and accountability for action to be taken.</li> <li>• SEMC to determine suitable risk management tools, such as the Bushfire Risk Assessment Model, and encourage their use in assessing bushfire risk in a consistent manner.</li> <li>• A specific risk prevention and mitigation advisory body be established for the SEMC.</li> <li>• SEMC consider developing a bushfire hazard reduction program with municipal councils and Tasmania Fire Service.</li> <li>• Review resources available to Tasmania Parks and Wildlife Service to manage bushfire risk.</li> <li>• Revise the fire permit system.</li> <li>• Government should continue to support the Strategic Fuel Management Plan, which must have measurable targets that are monitored and reported.</li> <li>• Government makes land use planning and building construction to prevent and mitigate bushfire risk, a high priority.</li> <li>• Develop a bushfire community education and information strategy.</li> <li>• SEMC to develop a whole-of-government community resilience strategy for emergencies.</li> </ul> <p><i>Improving emergency management arrangements</i></p> <ul style="list-style-type: none"> <li>• A number of recommendations pertaining to Tasmania Police (TASPOL) – to ensure that emergency management is a priority and a section responsible for developing expertise in emergency management is established.</li> <li>• The Dept. of Justice to conduct a review to develop a model for integrated and interoperable emergency management.</li> </ul>
<p><b>Victorian bushfires 2009</b></p>	<p><i>Lessons and insights from this event are best summarised by the sixty three VBRC recommendations made under eight themes. As these are detailed in the VBRC report, I will summarise what I consider to be the most important learnings and insights that are likely to be of most benefit to Queensland.</i></p> <p><i>Bushfire safety policy</i></p> <ul style="list-style-type: none"> <li>• Need to revise the nationally adopted 'Prepare, Act, Survive', policy to ensure it provides timely and more informative advice to communities about how to respond.</li> <li>• 'Stay or go' policy assumed people had a plan and knew what to do when warned, but this was not always the case – many waited 'to see what would happen'. Leaving early is seen as the safest option.</li> <li>• Provide or identify community refuges.</li> <li>• Provide better community bushfire safety education programs.</li> <li>• With state government assistance, local councils to undertake better bushfire risk planning.</li> <li>• State to develop a comprehensive approach to bushfire shelter options.</li> <li>• State to develop a clear, comprehensive approach to evacuations.</li> <li>• The education curriculum to include fire history and the role of bushfires in Australian landscapes.</li> </ul>

#### *Emergency and incident management*

- *State level emergency management faltered because of confusion about roles, responsibilities and accountabilities, and deficient leadership.*
- *Better preparedness arrangements on FDR days of Severe or worse including the need to have in place by 1000h variously resourced Incident Management Teams (IMTs) under a Level 3 (L3) Incident Controller (IC).*
- *L3 ICs, regardless of agency, need to be trained to the same standards.*
- *Need for a uniform, transparent accredited training and performance review program for L3 LCs, and a traineeship program to ensure an adequate number of qualified L3 ILs.*
- *A suitably qualified, experienced, competent person be appointed IC regardless of the control agency for the fire.*
- *Clarify the function and powers of the Chief Commissioner of Police and of the Minister.*
- *Amendments to the AIIMS framework to improve information dissemination and to ensure someone with local knowledge is part of the IMT.*
- *Consider a graded scale of emergency declarations. (Note: some countries grade the scale of an individual fire severity similar to the way in which tropical cyclones are categorised).*
- *IMTs that were well prepared and staffed by well trained people with experience, performed well.*
- *Incident Action Plans (IAPs) are to developed within the first four hours of an incident and be made available to State and Regional operations centres.*
- *Improved mapping support and delivery systems.*
- *CFA volunteers to be issued with I.D. cards to facilitate passage through road blocks.*
- *Review roadblock and traffic management practices.*

#### *Fireground response*

- *Rapid and aggressive initial attack using ground crews and air attack can be effective.*
- *Aircraft effectiveness was limited by weather and smoke.*
- *A number of recommendations to improve the effectiveness and efficiency of aerial operations including making standby arrangements when fire danger rating exceeds certain thresholds, and improving dispatch protocols.*
- *Better interoperability between agencies at all levels.*
- *Need to improve information for dispatching and tracking firefighters and equipment.*
- *Need to improve radio comms plans and radio spatial coverage.*
- *Need to improve training and protocols for back-burning.*
- *Inadequate briefings, communications and communications equipment, maps and weather information can jeopardise firefighter safety.*
- *Safety advisers to be appointed to IMTs.*
- *All safety incidents, including 'near hits', to be investigated.*

#### *Community warnings*

- *Warnings were not timely, did not reach all those at risk and were too narrow in terms of options – they did not provide information about specific actions to take.*
- *Better information about the fire behaviour and home defendability, and the risks of staying.*

#### *Electricity-caused fires*

- *Bushfires caused by the electricity distribution network are not uncommon, especially on hot, windy days, so there are a number of technical recommendations in the VBRC report to reduce the risk of this ignition source.*

#### *Deliberately lit fires*

- *Victoria Police continue to pursue and review a coordinated state-wide approach to arson prevention, and ensure it is given a high priority within the agency.*

#### *Planning and building*

- *Recommendations dealing with need for centralised responsibility and expertise in mapping bushfire risk and bushfire-prone areas, especially at the rural-urban interface.*
- *Improved processes for addressing bushfire risk at the planning stage for new urban developments and small undeveloped rural lots including restricting developments in high bushfire-risk areas.*
- *Amend the performance requirements in the Building Code of Australia to ensure they incorporate reducing the risk of ignition from ember attack.*
- *Remove deemed-to-satisfy provisions for buildings in the BAL-FZ.*
- *Apply a minimum construction level of BAL-12.5 to all new buildings and extensions in bushfire-prone areas.*
- *Provide advice on how to improve bushfire safety of existing buildings and provide education and training to improve bushfire risk management in the building and planning sectors.*
- *Local councils to adopt a bushfire policy in their local planning policy framework.*

#### *Land and fuel management*

- *A most important and challenging recommendation deals with the need to implement a rolling fuel hazard reduction burning program of 5% of public bushlands per annum, as well as recommendations addressing fuel build-up in road verges and the need to assess bushfire risk on public roads.*

#### *Author's note:*

*In the years leading up to Black Saturday, authorities averaged <2% of public lands burnt per annum, which was inadequate. Victoria has since moved away from the 5% target to a complex 'risk-based' approach, which conceptually appears logical. However, the government has accepted a theoretical 'residual risk' of 60-70%, meaning it will take measures to reduce risk (from a theoretical 100% worst case scenario) by 30-40%. This translates to less prescribed burning but a higher level of bushfire risk acceptance. Science and experience in other jurisdictions suggests the level of landscape burning needs to be 8-10% per annum if any significant risk reduction benefits are to be realised (e.g., see Boer et al. 2009; Burrows and McCaw 2013; Burrows 2018).*

*Recently published computer simulations suggest landscape prescribed burning is of little benefit unless at least 25% is burnt per annum, and that only fuels within 100 m or so of settlements (the interface) need to be managed. The simulations are flawed, lack an understanding of severe fire behaviour, of prescribed burning and of fire suppression, and overlook vulnerable assets beyond the interface (see Burrows 2018 and case studies below). Although challenging, it is crucial to manage the fuel hazard a) in the landscape b) at the rural-urban interface and c) in 'backyards' at appropriate levels and to appropriate standards.*

#### *Organisational structure*

- *Recommendations to appoint a Fire Commissioner as an independent statutory officer responsible to the Minister for Police and Emergency Services and as the senior operational firefighter in Victoria with the task of increasing inter-agency operability and building a fire management capability prepared for high risk days.*

#### *Research and evaluation*

- *Recommendation to establishment a permanent national centre for bushfire research to investigate a number of issues (detailed by the VBRC).*
- *Appoint an independent monitor to track the implementation of the VBRC recommendations.*

### **Annexure 3 Onfray (2023) lessons in relation to the 2003 ACT bushfires**

Onfray (2023) highlights many lessons in relation to the 2003 ACT bushfires:

*The aftermath – why weren't previous warnings and lessons heeded?*

*"It's like a war zone". Chapman resident Steven Spencer quoted in the Canberra Times on 20 January 2003.*

*"It's just human nature to conveniently forget what you should have learned and repeat your stupid behaviours". Elliott Yeomans*

*Could the damage from the Canberra firestorm have been avoided?*

*I firmly believe that the disaster of January 2003 highlighted the lack of preparedness in the ACT community for a major bushfire. As urban development in the ACT grew, the attitudes to fire changed.*

*It is not acceptable to have a large contiguous area of mountainous and foothill country without any fuel reduction burning for over 20 years. Nor is it acceptable to not have a strategic network of properly maintained fire trails for access and use as fire control lines. And finally, firefighters must aggressively attack fires as soon as they are detected, and small and ground operations must continue into the night when conditions are most favourable for firefighting. It is also essential that bulldozers support ground crews, are on stand by, and are deployed as soon as possible to ensure new containment lines are constructed quickly, where required, to aid in containing the fires.*

*The emergency chiefs knew the problems they faced after the Christmas fires of 2001. The ACT Chief Fire Control Officer, Peter Lucas-Smith, conceded their focus solely on managing fuels at the urban interface was "probably only an entree to what's potentially going to occur". They had an immediate rethink about managing fuel loads by revising the Bushfire Management Plan which saw a strategy to bring back broad-scale fuel reduction burning in forested areas. It was noted that fuel loads in Namadgi National Park were at "maximum or equilibrium levels". But it was too late after 30 years of neglect. If it were not for the 2001 fires, the 2003 firestorm would have burnt onto Black Mountain when the winds shifted from north-west to westerly and there would have been the same impact on the suburb of O'Connor as there was on Duffy. This just further highlights the importance of managing fuel loads.*

*That the Canberra firestorm was allowed to develop as it did, despite the accumulated wisdom of so many previous inquiries and reports, court cases, millions of dollars in research and training, and an investment across the country conducting many years of prescribed burning programs must surely indicate that the lessons of past disasters and the recommendations following them have been forgotten or denied. What is the point of holding inquiries unless the agreed recommendations and lessons are followed diligently?*

*Are the capabilities of the new emergency chiefs able to protect the Bush Capital if they choose to ignore, or not even study and know these hard-won lessons? And why was one of ACT's most experienced firefighter shunned at the top level during the fires?*

*It is not a deliberate denial but a symptom of emergency managers not committed, long-term, to a dedicated role and changing cultures at every political election.*

*It is not as if 2003 was a new experience. The past lessons are well known. Their successes and messages should be permanently ingrained in all people associated with fighting fires and not overtaken by esoteric and untested ideology. At the Coronial inquiry, Cheney pointed out that the 1972 Pago fire started in a similar location to the Bendora fire and under similar weather conditions. The Pago fire was contained over a couple of days. The different response to the Bendora fire and its eventual tragic outcome reflected the operational and cultural changes that have happened with fire management over 30 years for the worse.*

*The removal of broad scale burning in favour of managing fuel at a micro level on the urban interface was futile because the condition of fuels adjacent to the urban areas, the setback distances and the compact nature of urban development made Canberra one of the safest urban-rural interface regions in the country. The fact that the 2003 fires burnt into the urban area was a failure to manage fires in forest areas, not a failure of fuel management at the interface. Indeed, this is the problem faced in similar areas around the country and for rural landholders that adding large areas of reserves managed under benign neglect.*

*The environmental protection priorities since the 1980s have led to large-scale neglect of bushfire preventative maintenance of forests, parks and adjacent rural areas. For example, the heavily influential NPA has many noble environmental ideals but no practical idea of implementing them that recognises the brutal reality that faces Canberra and its residents. While the NPA has always maintained they support prescribed burning, it comes with a caveat that it must be subservient to ecological considerations.*

*In 1980, they opposed the planned construction of new fire trails in the western area of Gatenby Nature Reserve, calling such proposals a “serious menace to the natural values of the Reserve...additional trails are unnecessary for fire management”. In commenting on a review of the Kosciusko National Park management plan in the same year, they questioned the necessity of broad area prescribed burning and argued for lightning fires to be allowed to burn. In response to the destructive fire in January 1983 in the Gatenby Nature Reserve, their “spiritual home”, they focussed on minimising damage after a fire started. No consideration was given to minimising the chance of fires ripping through the reserve in the first place. They also complained about the environmental impact of fire trails built or reopened during the fire to try and minimise the fire’s spread. However, they were silent on the ecological damage caused by the high-intensity fire.*

*The most devastating fire disasters in Australia’s history have occurred when the population, the government and the government agencies are unprepared. Sadly, the fire and emergency authorities displayed this by not warning or informing the public that the fires could converge on the suburbs of Canberra. A State of Emergency was not declared until 2:45 pm, moments before the first houses burnt in the outer suburb of Duffy. This was after residents were told until the morning of 18 January that the fires were under control.*

*For many years before 2003, rural landowners in the ACT and surrounding districts within NSW were outraged at the lack of fuel management and bushfire measures. As a result, fuel management was the primary focus of the **McBeth and Glenn Reports** and featured in several recommendations in the coroner’s and McLeod reports.*

*One of ACT’s most experienced firefighters, Chairman of the Bushfire Council for over 12 years and holder of the Australian Fire Service Medal, Val Jeffreys, was scathing in his submission to the inquiry claiming the fires were a “national disgrace”. He believed:*

*“...the fires were never under control and were never going to be controlled in the mountains once the non-existent initial attack failed”.*

*Part of the problem has been the hijacking of bushfire management strategies by green lobby groups that influence government policy decisions. Extreme conservationist concerns overrode operational recommendations and repeated warnings given to authorities. Based on fire experience dating back to the 1950s when he was the foundation member of the Tharwa Fire Brigade, Jeffreys claims his warnings were repeatedly ignored.*