Government
of South Australia

Independent Review into South Australia's 2019-20 Bushfire Season

The Review acknowledges traditional owners in South Australia and pays respects to Elders past and present and extends that respect to Aboriginal and Torres Strait Islander people throughout the State.

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Executive Summary

In the summer of 2019-20 bushfires devastated many parts of South Australia and resulted in the loss of three lives.

In the summer of 2019-20 bushfires devastated many parts of South Australia and resulted in the loss of three lives. On 28 January 2020 the South Australian Premier, the Hon. Steven Marshall MP, and South Australian Minister for Police and Emergency Services, the Hon. Corey Wingard MP announced an Independent Review (the Review) to assist in planning for the 2020-21 fire season (Appendix 1). The fires at Duck Ponds Port Lincoln (Nov 2019); Yorketown (Nov 2019); Adelaide Hills (Cudlee Creek Dec 2019); Kangaroo Island (Dec 2019); Miltalie (Dec 2019) and Keilira (Dec 2019) were the focus.

Community members were invited to 'have their say' about the bushfires via the government's YourSAy website. Submissions to the Review were sought by 22 of March 2020 and the Review set about planning for interviews and 'town hall' style meetings across the fire affected areas.

The Review was dramatically affected by the social distancing requirements imposed by all governments during the COVID-19 global pandemic during March 2020 and Minister Wingard issued a media release advising that a different approach was needed in the circumstances (Appendix 2). Submissions were extended until 17 April and it became more of a 'desk top review' supported by video and telephone conferencing, targeted interviews and surveys, as well as online community engagement (Appendices 3 & 4).

The Review committed to meet the reporting deadline of 30 June 2020, given the COVID-19 interruption to bushfire planning and emergency operational training. It was soon evident that the report will be delivered midway through the traditional fuel reduction and risk mitigation processes.

The Review adopted a simple three pronged approach of determining 'what worked?'; 'what did not work?' and 'what can we fix before the next bushfire season?'. It categorised all material presented into the Australian Emergency Management principles: Planning; Preparation; Response and Recovery (PPRR).

The Review did not examine every element of the terms of reference (ToRs) (Annexure 1) which would not have been possible given the social/ travel restrictions and the reporting deadline. 576 submissions including 100 targeted surveys were received although not all the submissions were relevant to the ToRs. Each piece of information received was analysed and linked to the ToRs or rejected as being outside of them.

The 'desk top' review approach did not provide the opportunity to experience the community's emotion – to feel the grief, hear the anger or witness the frustration expressed in some of the submissions. The Review acknowledges the excellent work of all involved in fighting South Australia's 2019-20 bushfires while at the same time identifying issues to improve.

Executive Summary

Successes

The South Australian 2019-20 bushfire season had the worst conditions on record and by most accounts the loss of life and property could have been far more severe. It is vital to recognise that the bushfires burnt under conditions that exceeded the limits of firefighting capacity. The statistical table on the right (Figure 1) indicates that the losses attributed to the fires included three human lives, 196 homes, 660 vehicles and 68,000 livestock as well as $200m of agricultural production. About 280,000 hectares (ha) of land was burnt and several national parks were totally or partially burnt.

The tourism and business losses are yet to be assessed and the physical and mental impacts of the bushfire experience are virtually incalculable.

The successful efforts of all of those involved in fighting the fires is acknowledged by this Review. The combined efforts of agencies – the Country Fire Service (CFS), SA Police (SAPOL), State Emergency Service (SES), Metropolitan Fire Service (MFS), Department for Environment and Water (DEW), Forestry SA (FSA) as well as the community and Farm Firefighting Units (FFUs) – restricted the devastation in one of the worst bushfire seasons during one of the harshest summers on record.

This Review is a prudent measure to establish whether there are better ways to deal with an evolving climate and lengthening bushfire season. As a community, we have to learn that it is not always worth putting lives at risk to fight fires. While South Australia's losses were significant, sadly, other states were also deeply affected, and their losses are our losses. Fires eventually will be controlled, but lives are lost forever. Sometimes Mother Nature provides such an insurmountable challenge that we ought not put volunteer and career firefighters at risk to rescue us. There were many complaints about the way the Ravine fires on Kangaroo Island were managed so while there was overall success, in the eyes of some, there needs to be improvements before the next bushfire season.

The expertise that volunteers brought to the bushfires is difficult to quantify. Those with local knowledge excelled and helped with decision making in what was a fast moving and dynamic situation. The Review heard from many volunteers, some of whom have spent decades fighting fires, and while some were overwhelmed with Incident Management Teams (IMTs) barely coping, others used their knowledge and experience to great effect. We should all be grateful for their efforts. The level of hazard reduction was criticised in the aftermath of the fires but as will become evident in this Review, the conditions were such that in some of the fires no amount of hazard reduction would have made any significant difference.

> The relationship between the volunteers, salaried staff and the agencies themselves was clearly central to the operational successes.

An obvious success which should not be taken for granted is the way the agencies worked together to deal with the challenges. The relationship between the volunteers, salaried staff and the agencies themselves was clearly central to the operational successes. Significant praise was received for each agency during the Review.

278,838	3	196	1,310+	892	104	660	67,928
Hectares burnt	Fatalities	Homes destroyed	Properties saved	Non-residential buildings destroyed or damaged*	Homes with major/minor damage	Vehicles lost/ damaged	Livestock

Cudlee Creek

938		1	
98		56	
542		325	
23,253		3,852	

Keilira

-		0	
1		0	
5		0	
37,182		3,666	

Duck Ponds

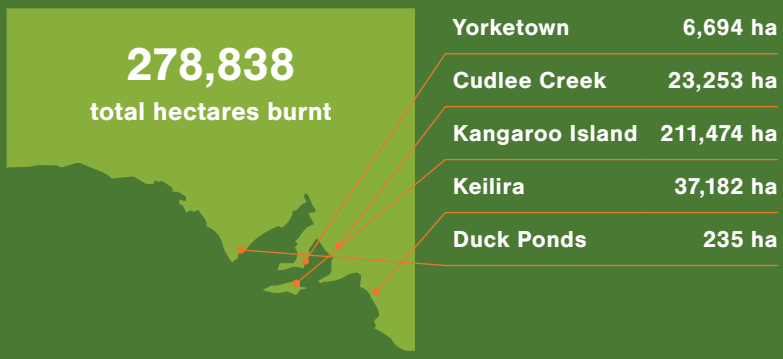
37		0	
2		7	
2		2	
235		0	

Kangaroo Island

335		2	
87		32	
332		322	
211,474		59,730	

Yorketown

-		0	
8		9	
11		11	
6,694		680	



Agriculture $186.57m in production alone, including:

- **1,190** primary production businesses impacted
- **67,928** of livestock worhth $16.99m
- **781ha** of viticulture worth $8.78m
- **15,275ha** of forestry worth $143.31m

National Parks over 90,000hs of parks burnt, including:

- **17** parks inpacted
- **100% lost** Charleston Conservation Park, Porter Scrub Conservation Park
- **98% lost** Flinders Chase National Park, Kelly Hill Conservation Park *(including $41m damage to park infrastucture)*
- **111** Heritage Agreements impacted, up to 27,546ha

Wildlife

- **40-50k** koalas lost
- **40 threatened species** had more than half of their habitats destroyed
- **2 birds + 4 mammals** named as highest priorities for urgent intervention

Industries most affected

Wine, Tourism, Honey, Farming *(crops/livestock)*, Forestry, Aquaculture

**Includes business and tourism facilities, community facilities, sheds, vacant houses, etc*

Figure 1: Bushfire impact data 2019/2020, South Australia

Executive Summary

Weather

Fire comprises three elements: oxygen, fuel and heat. Humans can mostly influence the second element – managing the fuel load while understanding the impacts of a changing climate. The 2019-20 fire season introduced a new paradigm of weather conditions that has probably slowly evolved but now needs to govern our expectations for future seasons.

The extended heatwave conditions during 2019-20 bushfire season brought unprecedented fire weather around the clock. The Bureau of Meteorology's (BoM) South Australian Manager, John Nairn, who is also an internationally recognised expert on heatwaves, explained this process to the Review;

> *"Fire activity overnight is a feature of having more heatwaves. Normally, as the ground cools the boundary layer decouples, an inversion forms and humidity recovers as night falls. When the surface remains hot it is difficult for an inversion to form and the boundary layer is still engaged, so there is no nocturnal effect. This is a feature of heatwaves."*

In the fires under review, this had major implications for resourcing both on the fireground and in incident management.

Therefore, it is clear that the traditional approach of fighting fires with the 'A' team on duty during the daylight hours and skeleton stand-in teams at night while the fires abate can no longer be expected. Wind changes and lightning strikes in some areas caused by weather events created by the fires themselves meant there was no respite.

Extended bushfire seasons are stretching available resources, especially aerial firefighting, which has previously been shared between the northern and southern hemispheres. Last summer saw Australia facing multiple campaign style bushfires across multiple jurisdictions simultaneously, placing unprecedented demand on aerial firefighting capability. Hopefully, issues such as aviation capability across all jurisdictions will be addressed by the Royal Commission into Natural Disaster Arrangements (Bushfire Royal Commission).

> Last summer saw Australia facing multiple campaign style bushfires across multiple jurisdictions simultaneously, placing unprecedented demand on aerial firefighting capability.

Weather that limits opportunities to reduce hazards during the 'off season' is exacerbated by confusion about what is permissible as well as what is required. The processes must be simplified and communicated to the community if the weather experienced in 2019-20 is to continue. Hazard reduction by all – public and private land holders alike - has to be understood and requires an investment of time and money.

Governance

This Review notes that there have been many previous reviews and inquiries into bushfires in South Australia. However, not all the recommendations accepted by government have been audited for implementation, nor did it appear during this Review that governments act upon the experiences of other jurisdictions. For South Australia had all the recommendations from previous reviews been implemented, some of the issues raised here would already have been addressed.

An example of inaction from previous reviews is the failure to provide automatic vehicle location (AVL) systems to the CFS fleet. To have not proceeded with this recommendation after the Pinery fires in 2015 is disappointing.

In addition to reviews not being followed there are other anomalies such as there being no statutory requirement for the State Bushfire Co-ordination Committee (SBCC) to report annually to Parliament which is unusual given that members of the SBCC are appointed by the Governor. Instead, the SBCC reports internally to the CFS, which is not considered to be good governance. Also, the State Bushfire Management Plan (SBMP) is intended to be a state-wide strategic document, but risk assessment processes are not the same in each agency and they are not integrated to give an overall picture of the risk for the state government.

The Review also highlights some anomalies with the role and function of the South Australian Fire and Emergency Services Commission (SAFECOM) and the overall planning process - most of the recommendations from this Review are SAFECOM's core business.

Adding to questions about governance, SAFECOM does not seem to have adopted its role of enabling the emergency service agencies to do their job. There were many complaints about SAFECOM attempting to assert itself beyond its legislative remit to a more operational role.

On examination of the legislation, there is a clear anomaly in having SAFECOM's Chief Executive (CE) preside over the SAFECOM Board which is akin to marking your own homework. This arrangement is not in line with normal Board/CEO relationships in either the private or public sectors. It would operate better under the normal conventions of a Board with an Independent Chair appointed by the Minister and the agency responding to the Board's direction in accordance with the Minister's intent.

The Review was not given a specific term of reference to examine SAFECOM but given the issues raised during the Review about matters falling within the remit of SAFECOM to deliver, it was inescapable not to examine SAFECOM's role to a limited degree. In doing so, we briefly looked at other options for a commission such as the creation of a department of fire and emergency services to improve governance. However, the Review took the view that without thoroughly examining all of the options, the costs associated with a machinery of government change in order to deliver a more accountable governance framework is, on the face of it, hard to justify. The Review takes the approach that a simple amendment of the legislation that results in the Minister appointing an Independent Chair is likely to deliver a better, and more conventional governance outcome.

The Review also briefly looked at separating the Emergency Services portfolio from the Emergency Management portfolio. Again, while not a term of reference for this Review, the arrangements in South Australia are similar to those of other states. Emergency Services agencies tend to be placed with the Police portfolios, given the operational nature of their roles, while Emergency Management is more a whole of government issue and can range in anything from a pandemic to a natural disaster. Emergency Management can often require a whole of government coordination and response and is therefore most appropriately situated within the Department of the Premier and Cabinet (DPC).

Executive Summary

Continuous Improvement

The CFS has worked hard in parallel with the Review to ensure constructive advances are made before the 2020-21 bushfire season but significant financial investment will be required to fix most of the problems. A range of issues have been identified for improvement including:

- **Planning to protect critical assets** such as mobile phone towers. Some firefighters said they were only tasked to 'fight the fires' and relied on local knowledge about what assets needed to be protected. This work can be improved so that all Bushfire Management Area Plans (BMAPs) are focused on critical infrastructure which translates to decision making in the Incident Management Teams (IMTs).
- **Training and equipment for volunteer brigades** requires improvement. For example, some are dealing with ageing vehicle fleets and none have AVL capability, as mentioned above.
- **IT and data systems integration** to allow information sharing between IMTs and the State Emergency Centre (SEC). The Review heard that records from the CFS's CRIIMSON database had to be manually extracted and uploaded so that SAPOL, SES and other agencies could receive and consider the information. This is a totally unacceptable situation and needs urgent investment and improvement.
- **A single source of truth and other information for community and stakeholders** – The ability to know where the fires are and where they are going is difficult to obtain as are rapid damage assessments, which were considered too slow. It is a critical area for improvement because social media will outpace information being processed through bureaucratic procedures and people will make their own decisions before authorities have time to consider the issues. A single endorsed social media platform needs to be implemented as well.

In summary, this Review acknowledges the enormous effort by all concerned to minimise the impact of the 2019-20 bushfire season but there are some institutional and capability improvements to make before the next fire season and beyond.

Recommendations

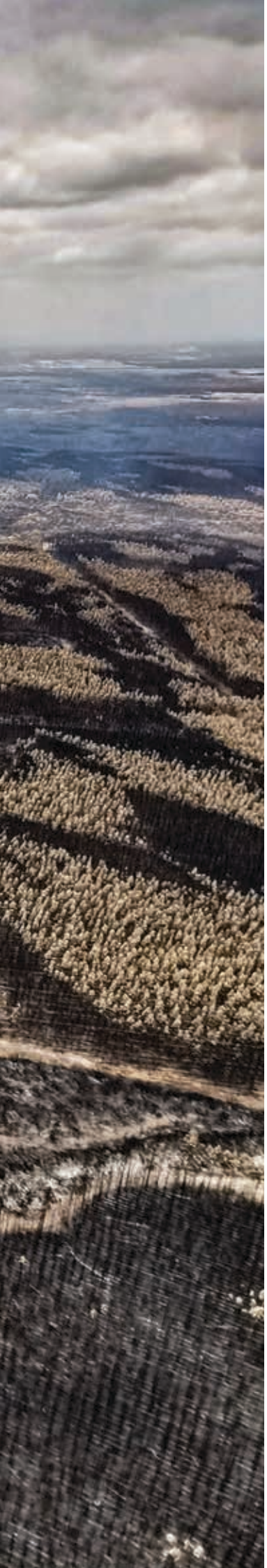
The Recommendations from this Review are to:

1. Implement previous review recommendations for bushfire management including those relating to the 2009 amendments to the *Fire and Emergency Services Act 2005*, State Bushfire Coordination Committee operation, State Bushfire Management Plan, as well as urgent completion of Codes of Practice for fuel hazard reduction on all land tenures, and redevelopment of Bushfire Management Area Plans accompanied by effective community engagement to build an understanding of risk.
2. Align risk assessment tools and processes to Risk Management Standard ISO 31000 and the National Emergency Risk Assessment Guidelines (NERAG) and communicate these on public-facing platforms. Make Bushfire Management Area Plans (BMAP) accountable for managing and reporting on region-specific risk and identifying critical infrastructure such as mobile phone towers as key risks.
3. Consider amending the *Fire and Emergency Services Act 2005* to align SAFECOM Board operations with accepted governance standards with the Minister appointing an Independent Chair of the SAFECOM Board. The SAFECOM Chief Executive (CE) should report to the Board and maintain SAFECOM's role at the direction of the Board. Alternatively, SAFECOM could be abolished, moving to a model of a Department of Fire and Emergency Services where the departmental head reports to the Minister but the value proposition of any such machinery of government change would need to be thoroughly examined.

4. Invest in upgrading and integrating ICT platforms to eliminate manual data transfers, and ensure IT and radio communication interoperability across the agencies, together with a dedicated focus on the development of a coordinated risk intelligence capability to provide all stakeholders with a common operating picture and rapid damage assessments.
5. Clarify and streamline processes and educate the community about their roles and responsibilities in managing native vegetation to improve hazard reduction on both public and private land. Provide additional resources to manage fuel in a shorter off fire season and develop a risk reduction target linked to prioritised objectives.
6. Consider removing stamp duty from home insurance to encourage a wider section of the community to take out insurance. South Australian government agencies should share their risk modelling data with the Insurance Council of Australia.
7. Prepare to 'scale up' capability during major bushfire events with senior representatives (including BoM staff) in the SEC 24/7, ensure adequate facilities for IMTs, base camps (e.g. Humanihuts) and recovery centres. Consider the resource implications of providing firefighters to interstate operations.
8. Engage with the Australian Defence Force (ADF) once or twice a year to understand the capabilities that could potentially be deployed. Educate IMTs about how to deploy ADF assistance effectively and develop a streamlined 'call out' procedure.
9. Invest in fireground leadership and incident management training for CFS, SES and MFS personnel to improve safety on the fireground. Invest in greater technological interoperability such as AVL, Thermal Imagery, Burnover Protection Systems (BOPS), lightning tracking and appropriate vehicle fleets for bushfire conditions including at the peri-urban interface.
10. Incorporate Farm Firefighting Units (FFUs) into the Australasian Inter Service Incident Management System (AIIMS) so that IMTs are aware of their presence on the fireground and their welfare and risks are understood.
11. Develop and practice procedures for the CFS, DEW and local governments to access and deploy heavy plant and machinery for fuel reduction operations both before and during bushfires.
12. Review the use of aviation assets including facilities to operate them given the increased pressure from extended fire seasons on northern and southern hemisphere resources. Review line scanning capability with a view to providing real time data to the IMTs on where fires are burning using aviation assets as an intelligence tool rather than just a fire suppression capability.
13. Better coordinate public information and warnings including evacuation plans and provide a single source of information about, the location and direction of fires, how and when to use *Safer Places*, *Places of Last Resort*, relief and recovery centres and directed evacuations.
14. Clarify business continuity and restoration of critical infrastructure in the planning and response phases to facilitate water replenishment, fireground remediation and access to businesses (including farming properties).
15. Collate data and research the impact of bushfires upon communities, firefighters and animals (both native and domestic) to identify appropriate medium and long-term welfare and support requirements.

Contents

Photo courtesy of Trent Lawson



01. Foreword

The intensity of the South Australian summer of 2019-20 was unprecedented, resulting in a series of devastating bushfires throughout many parts of the state. Fires at Duck Ponds, Port Lincoln (Nov 2019); Yorketown, Yorke Peninsula (Nov 2019); Cudlee Creek, Adelaide Hills (Dec 2019); Kangaroo Island (Dec 2019, Jan 2020) Keilira, South East (Dec 2019); Miltalie, Eastern Eyre Peninsula (Dec 2019), tested firefighters around the clock, resulted in the loss of three lives and destroyed properties.

An Independent Review of the circumstances surrounding this summer of fires was announced by the South Australian Premier, the Hon. Steven Marshall MP, and Minister for Police and Emergency Services, the Hon. Corey Wingard MP, on 28 January 2020.

The Review was forced to cancel its planned public 'town hall' consultations but gathered information through targeted interviews and online engagement. While it did not get a chance to experience the affected communities' emotions first-hand, the Review received 576 submissions, had extensive online engagement through the YourSAy website and conducted around 60 detailed interviews often with multiple participants.

The 15 recommendations (Appendix 5) are intended to inform preparations for the 2020-21 fire season and beyond.

While it did not get a chance to experience the affected communities' emotions first-hand, the Review received 576 submissions...

01. Foreword

The South Australian Government commissioned an Independent Review (The Review) into the 2019-20 South Australian Bushfires on 28 January 2020 to examine the circumstances surrounding the unprecedented fires. The aim was to engage broadly across the Emergency Services sector and the community to identify opportunities to better prepare for the 2020-21 bushfire season and improve the response and recovery. The Review was to report to South Australian Government by 30 June 2020, in time to prepare for summer of 2020-21 and has remained determined to deliver by this date despite the COVID-19 pandemic interruptions.

The Review sought to bring together research and advice from a range of sources including agencies, volunteer organisations, expert authorities, the community, and other stakeholders. It also liaised with the Bushfire Royal Commission. It had intended to balance written contributions and online engagement with interviews and public town hall style meetings across fire-affected areas.

Members of the community were invited to contribute to the 'YourSAy' website of the South Australian Department of the Premier and Cabinet (DPC) and the data was forwarded to the Review which comprised representatives from CFS, SAPOL, MFS, SAFECOM and DEW. Submissions to the Review were sought by 22 March 2020.

Like the rest of the world, the process was disrupted by the COVID-19 pandemic as travel and gathering restrictions shut down many activities across Australia, including plans for town hall meetings. On advice from the Review team the Police and Emergency Services Minister cancelled the proposed town hall meetings on 25 March 2020, advising the community that the Review would need to take a different approach due to social distancing restrictions and border closures. The closing date for submissions was extended until 17 April 2020.

The Review became more of a 'desk top' review, supported by video and telephone conferencing to meet the reporting deadline of 30 June 2020. This was vital to inform the annual fuel reduction and risk mitigation operations and compensate for the time lost in the bushfire planning and operational cycles through the COVID-19 disruption.

The Review adopted a simple three pronged approach of determining 'what worked?'; 'what did not work?' and 'what can we fix before the next bushfire season?'. In losing the town hall meetings, the Review recognises that it did not get the opportunity to experience the emotion of the community. It did not feel the grief, hear the anger or witness the frustration of the community that was expressed in some of the submissions.

Nonetheless, 576 submissions were received and over 100 targeted surveys were issued, albeit that not all the submissions were relevant to the ToRs. Around 60 video or telephone conference interviews were conducted, some with up to six people being involved.

> It also needs to be remembered that there was no legislative underpinning for the Review, it relied upon the co-operation of all those who contributed.

To process so many submissions and conduct the surveys and interviews in a matter of weeks required significant effort on the part of the Review team. There were literally thousands of pages of material that had to be examined. It also needs to be remembered that there was no legislative underpinning for the Review, it relied upon the co-operation of all those who contributed. The work of the South Australia Review Team in such a restricted environment compares extremely favourably with similar reviews and inquiries of this nature.

Photo courtesy of Derek Snowball

The combined efforts of volunteers, professionals, government officials and ministers were successful given that the conditions they faced were the worst on record.

02. The Review

The Independent Review reflects a desire to produce evidence-based, practical recommendations to guide policy makers in managing future fires. It focuses on the Australian Emergency Management principles: **Planning; Preparation; Response and Recovery.**

By any measure, the combined efforts of volunteers, professionals, government officials and ministers were successful given that the conditions they faced were the worst on record.

The Review methodology incorporated qualitative and quantitative data gathered from agencies, stakeholders and the community through interviews, submissions, targeted surveys and online engagement. It was significantly altered in response to the COVID-19 distancing constraints which forced cancellation of the town hall meetings planned in communities most affected by the bushfires. In place of public forums, around 60 targeted interviews were held with Chief Executives, leaders and subject-matter experts from peak bodies and agencies as well as numerous volunteers and individuals who were on the fireground. Targeted surveys of others asking the three review questions helped the Review team to identify key issues of focus.

The Review was careful not to impede other simultaneous investigations, including the Coroner's inquiry into the causes of the three deaths linked to the bushfires. Hence the Review did not examine the role, if any, of South Australian Power Networks (SAPN) in the bushfires.

It should also be noted that some agencies thought to have played critical roles did not provide submissions. This included the Department of Planning, Transport and Infrastructure (DPTI) which in addition to being the lead planning agency in South Australia also has a role in the management of fuel around major roads and infrastructure. The omission also included the ADF, which received mixed reviews of its contributions to the bushfires.

02. The Review

2.1 Approach

The Review genuinely acknowledges the excellent work of all involved in fighting South Australia's 2019-20 bushfires while at the same time identifying issues to improve emergency management in the future.

The Review focused on the Australian Emergency Management Principles; **Planning; Preparation; Response and Recovery** (PPRR) which provide a framework for dealing with the ToRs.

The South Australian 2019-20 bushfire season had, by all accounts, the worst conditions on record. Sadly, three lives were lost, but the numbers could have been much greater given the circumstances. The Review notes that the outcome is a credit to everyone involved. By any measure, the combined efforts of volunteers, professionals, government officials and ministers were successful. Not one of those elements could manage these fires alone: interoperability and coordinated effort is the only way to successfully meet the challenges of such major emergencies.

The Review was sensitive to other investigations related to the fires occurring simultaneously including the Bushfire Royal Commission and sought to work collaboratively while not overlapping. The Review referred interjurisdictional matters to the Bushfire Royal Commission including cross-jurisdictional assistance and the role of the ADF (Appendix 7). SAPOL was already investigating the cause of the fires and the causes of the three deaths linked to the bushfires by the time the Review began. The Review liaised with the South Australian Coroner's Office and SAPOL to ensure it did not impede those investigations and for this reason, the Review did not examine the role, if any, of SAPN in the bushfires.

In dealing with issues associated with volunteers, the Review has taken a 'systems' focus, with the assistance of a senior commissioned CFS officer to deal with criticism of individuals or decisions (Appendix 8). This recognises, that as with any volunteer arrangements, there will always be concerns that things could have been done better or that different decisions could have been made on the day. The strength of volunteering is also its weakness in that it does not have strict 'command and control' or stringent 'job/role' selection processes. Volunteering means doing the best you can with what and who you have on hand.

Photo courtesy of Elizabeth Mapletoft

Photo courtesy of Andrew Daniel

Photo courtesy of Stephen Brewster

2.2 Methodology

The Review draws on qualitative and quantitative data provided by relevant agencies and stakeholders including through interviews, targeted surveys, website engagement and submissions. All material presented to the Review either in written form, through surveys or through interviews, has been categorised into PPRR principles and aligned with the Review ToRs. Those who made submissions were contacted for clarification or additional information where required.

A Review Team was formed, initially with nine members including representatives with appropriate expertise from Emergency Services agencies, SAPOL and the Department for Environment and Water (DEW). The YourSAy website with information on the Review was launched on 1 February 2020 with an online survey and discussion board, and an opportunity for people to register for a public forum. The YourSAy campaign had a total combined reach of 145,718 via a group of communication channels and promotional activities on social media platforms and emails to registered users which led to 10,013 visits to the website.

As noted earlier, the methodology was intended to include six town hall meetings in April 2020 in communities directly affected by the 2019-20 bushfire season, including:

- Keilira
- Cudlee Creek
- Port Lincoln
- Yorketown
- Kingscote, Kangaroo Island
- Parndana, Kangaroo Island

> What worked?
> What did not work?
> What can we fix before the next bushfire season?

Regrettably, the meetings had to be cancelled to protect the community and the team while complying with the COVID-19 pandemic restrictions. Other forms of community consultation were explored. The review adopted a three pronged approach around the key questions: ‘what worked?’; ‘what did not work?’ and ‘what can we fix before the next bushfire season?’.

Photo courtesy of Andrew Stewart

Photo courtesy of Rob Hartill

Photo courtesy of Brett Loughlin

02. The Review

Ultimately, by the time the Review commenced in earnest in late March 2020 the Review team was reduced to seven members, working from home where possible, and they met via Microsoft Teams daily. The deadline for written submissions was extended to 17 April 2020.

Subject-matter experts identified 60 targeted stakeholder interviews (some with multiple attendees) to be conducted through teleconference or videoconference in place of the forums. Interviewees included CEs, leaders and experts from peak bodies and agencies as well as volunteers and individuals who were on the fireground.

A targeted survey with the three review questions was launched simultaneously aimed at individuals who registered for a public forum, stakeholders who were not selected for an interview, and people identified as having additional input. The responses helped identify further issues and narrow down areas of focus. As previously mentioned, the Review received a total of 576 submissions which is a considerable number when compared with other inquiries.

Curiously, several agencies thought to have played critical roles in the bushfires did not provide submissions. This included the Department of Planning Transport and Infrastructure (DPTI). DPTI is the lead development planning and assessment agency for South Australia and has a role both in hazard reduction compliance and as a land manager.

The findings and recommendations in this report are based on the information heard in interviews, and from submissions and supporting documents and data. Most public focus was on Prevention and Preparedness as illustrated in Figure 2. A breakdown of the top ten themes raised in the submissions in more detail is illustrated in Figure 3.

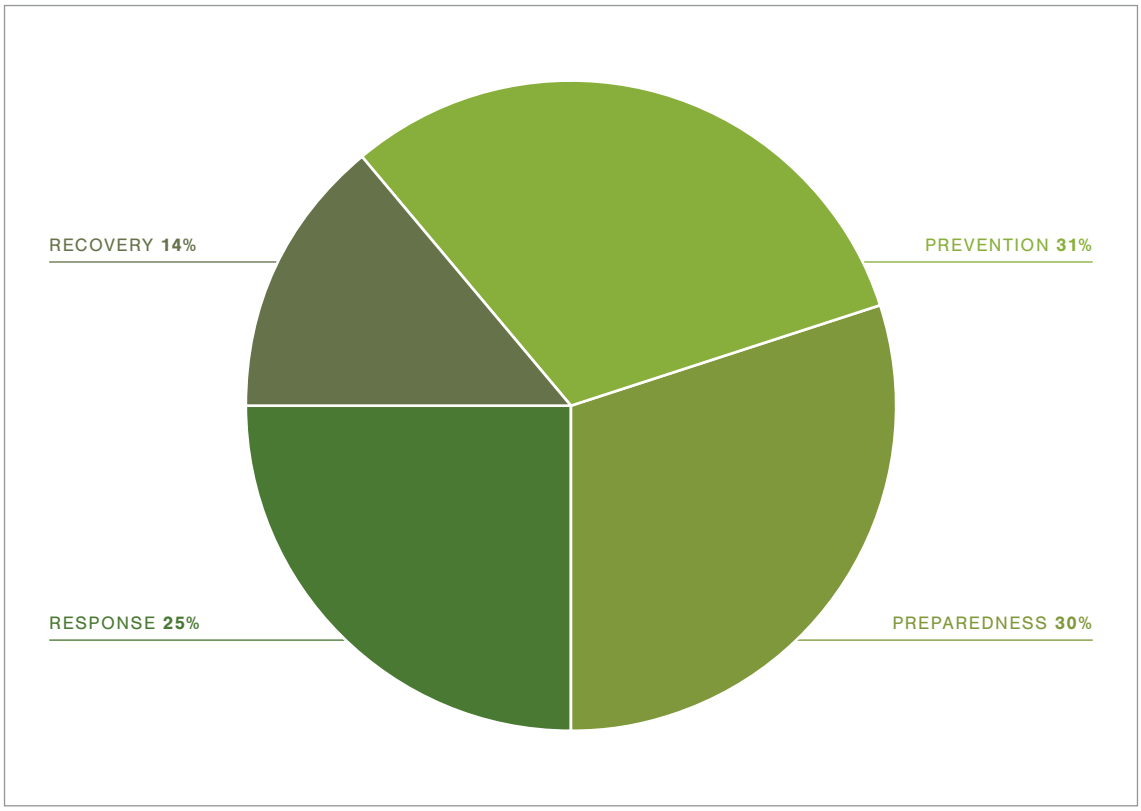


Figure 2: Public submissions by PPRR theme

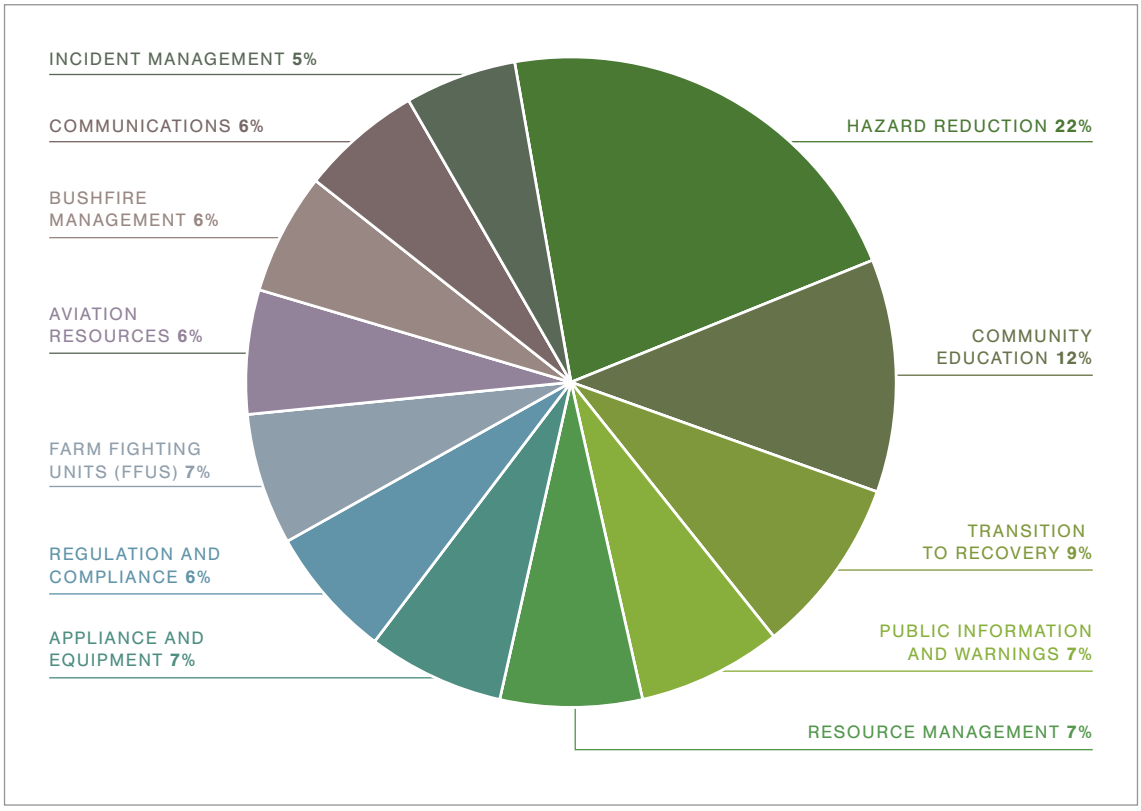


Figure 3: Top Ten Themes raised with the Review based on Terms of Reference

Photo courtesy of Rob Hartill

03. Synopsis of Events

The 2019-20 Bushfire Season was a 'Black Summer' of fires, with accumulated fire danger index recordings ranging from above average to the highest on record during the early part of the season. This tested fire agencies and the community to their limits with widespread destruction, including on Eyre Peninsula, Yorke Peninsula, Adelaide Hills, Lower South East, and Kangaroo Island.

The fire danger season started two weeks early in South Australia, with extreme weather on 11 November 2019 that continued throughout December and January 2020. Of the 31 Total Fire Ban (TFB) events across South Australia during the season, catastrophic days were observed 14 times on five days in 2019-20. This is the highest number of TFBs in a season since the rating category was introduced in 2010-11.

This chapter chronicles the conditions and events of the following fires: Duck Ponds, Eyre Peninsula; Yorketown, Yorke Peninsula; Cudlee Creek, Adelaide Hills; Duncan and Menzies, Kangaroo Island; the Ravine fires, Kangaroo Island and Miltalie, Eyre Peninsula (Appendix 9).

11 November: Duck Ponds

A fire at Duck Ponds on the Lower Eyre Peninsula heralded the start of a challenging fire season. Firefighters managed to save 41 properties but the fire burnt 228ha, two homes and two sheds before being subdued. It was actively monitored until 21 November 2019. The cause is undetermined but thought to be an electric fence.

20 November: Yorketown

A fire at Yorketown, Yorke Peninsula followed shortly after on a day of *Catastrophic Fire Risk*. The fast-moving grass and cropping fire was eventually contained the following night after burning eight dwellings and 11 sheds and was declared safe on 29 November 2019. The fire burnt 6,694ha of mostly private property and farmland.

20 December: Cudlee Creek, Duncan, Menzies

Just a month later, the *Catastrophic Fire Risk* evolved to be one of the toughest fire days in South Australia's history. Worst fears were realised when 387 emergency incidents occurred across the state, including the most significant at Cudlee Creek (Adelaide Hills), Duncan and Menzies

...catastrophic days were observed 14 times on five days.

(Kangaroo Island). The Cudlee Creek fire took off at 9.17am and hit a number of hills towns including Lobethal at 12.05pm, Woodside at 12.50pm, Brukunga at 2.45pm, Harrogate area at 6.31pm, and Mount Torrens at 7.23pm. Determined to be started by SAPN infrastructure, the fire resulted in the loss of one life and 51 firefighter injuries. By the time it was declared safe on 3 January 2020, 23,253ha, 98 dwellings, 542 sheds/outbuildings, and 325 vehicles had been destroyed. On the same day, lightning tracked across Kangaroo Island, particularly over the north coast, starting numerous fires which became the Duncan Fire Complex (six fires) and the Menzies Fire Complex (three fires).

Thanks to an incredible effort from firefighters only three dwellings were lost but these fires ultimately coalesced into the Ravine fire which burnt up to their boundaries on 3 January 2020 and then continued as a much larger single fire.

30 December: Miltalie, Ravine

Just 10 days later, firefighters experienced great gains and losses with fires contained and some started. Despite catastrophic fire conditions and widespread lighting strikes causing 190 incidents, fire authorities contained the Cudlee Creek, Duncan and Menzies fires. In the meantime, more than 25,000ha, a dwelling, five outbuildings, and 3,666 stock were burnt in the Keilira fire, near Kingston SE, sparked by dry lightning. Similarly, lightning sparked another fire on the eastern Eyre Peninsula at Miltalie, causing the loss of communications and power. In total 10,222ha were lost along with communications infrastructure but, importantly, there were no injuries. On the same day, lightning started the Ravine fires on Kangaroo Island – not just one fire but multiple new fires in relatively close proximity to each other.

Between 30 December 2019 and 3 January 2020, firefighters worked hard to try and contain the Ravine fires but on 3 January 2020, with conditions against them and fire fighting resources stretched across the nation, the fire escalated. Dangerous winds and pyroconvective fire behaviour left nearly half of Kangaroo Island burnt out in a single day. Two lives were lost, firefighters and locals suffered burnovers and stock and wildlife losses were extreme. More properties were lost on 9 January 2020.

By the time the fire was contained on 21 January 2020, it had burnt 211,474ha, destroyed 87 dwellings, 332 outbuildings, 322 vehicles, and killed 59,730 stock animals. Significant tourism assets were lost. The fires were only declared safe on 2 February 2020.

Government of South Australia

03. Synopsis of Events

3.1 General Observations

The 2019-20 Bushfire Season will be remembered as one of the worst in South Australia and the country. The BoM notes the accumulated fire danger index recordings were 'very much above average to highest on record during the early part of the 2019-20 fire season' (BoM Review Submission, p.16). This 'Black Summer' of fires tested fire agencies and the community to their limits, causing destruction and devastation around the country, including the Eyre Peninsula, Yorke Peninsula, Adelaide Hills, Lower South East, and Kangaroo Island in South Australia.

As early as August 2019, there were ominous signs of a dangerous fire season ahead. The Australian Seasonal Bushfire Outlook identified the Lower Eyre Peninsula (LEP) and Kangaroo Island (KI) as having above average fire potential and reinforced the Mount Lofty Ranges risks (Figure 4). Equally, BoM's Three Monthly Outlooks painted a grim picture of hot and dry spring evolving into a drier and warmer than average summer on top of drier-than-normal conditions over the preceding 12-18 months.

The Fire Danger Season was declared (on average) two weeks early across the state, commencing at its earliest on 22 October 2019 in the Flinders District. The first *High Risk* fire day occurred on 11 November 2019 with a series of Extreme and *Severe Fire Danger Index* ratings forecast.

Elevated fire risk remained a pattern throughout November, December and January with **significant fire weather days occurring on 20 November 2019, 20 December 2019, 30 December 2019, 3 January 2020, and 7 January 2020**.

In total, 31 days of TFBs occurred with bans declared across 152 fire ban districts. Of the 31 TFB events across South Australia, 'catastrophic days were observed 14 times on five days in 2019-20. This is a very high number of TFBs in a season since the rating category was introduced in 2010-11' (BoM, Review Submission, p.18).

Photo courtesy of Pip McGowan

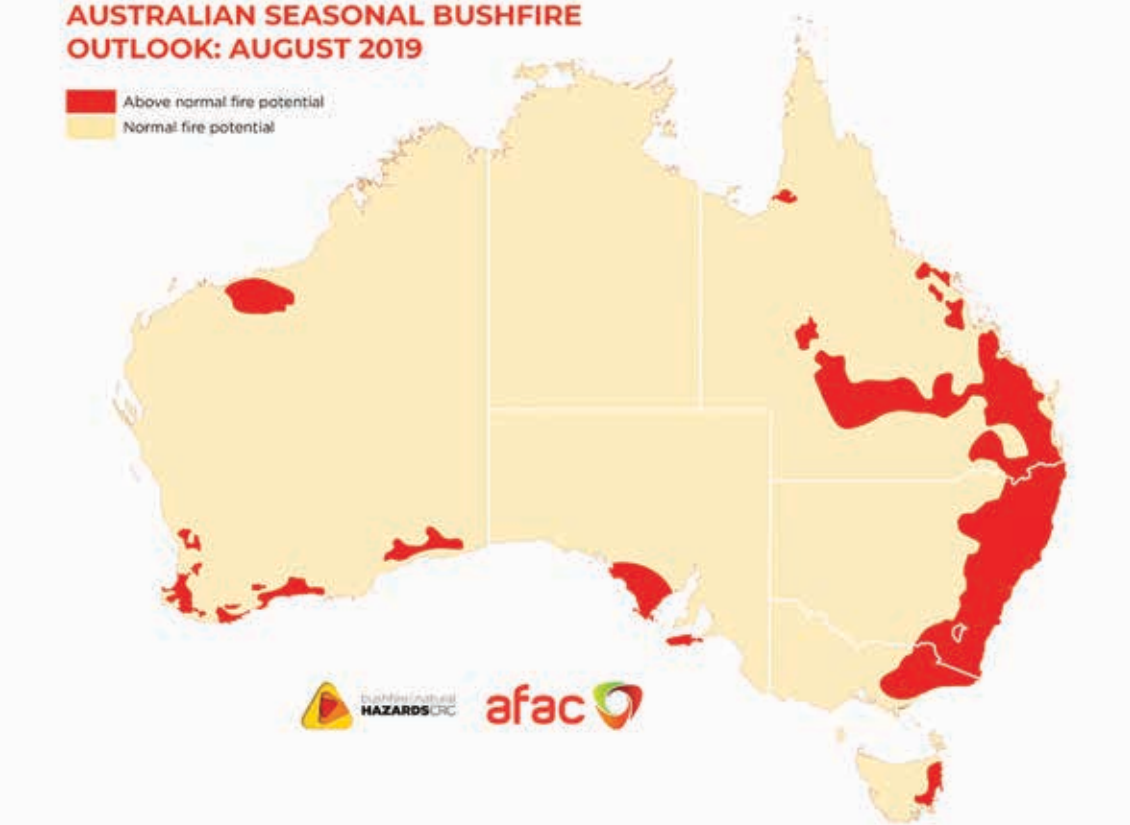
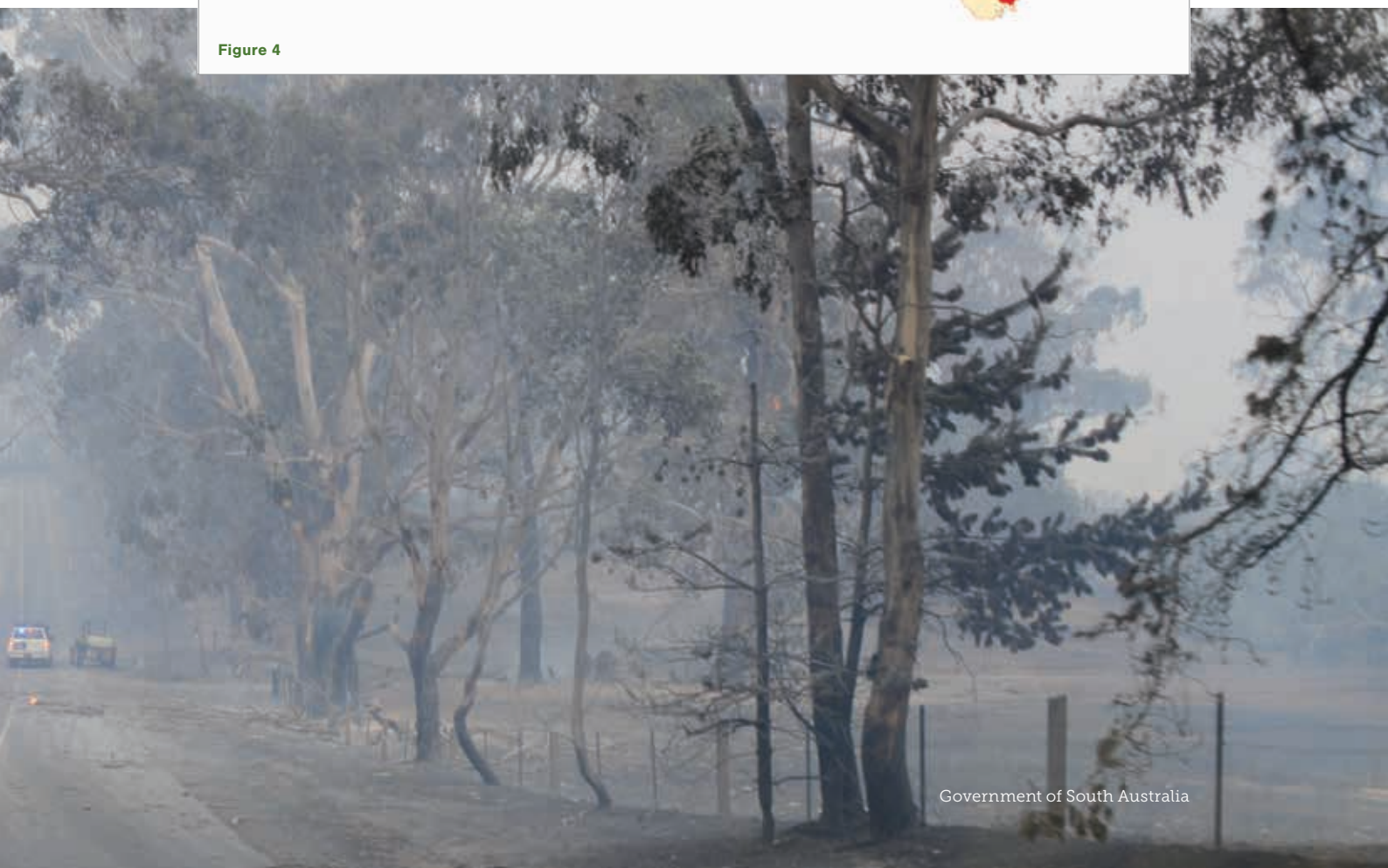


Figure 4



Government of South Australia

Fire Season 2019-20: **Timeline of Events**

SEPTEMBER

10 September

First deployment to QLD requested
Crews departed 11 September

OCTOBER

9 October

First deployment to NSW requested
Crews departed 10 October

NOVEMBER

1 November

Fire Danger Season (FDS) declared in numerous areas.

11 November

Total Fire Bans (TFBs)
Extreme forecast. Catastrophic observed (GDFI293 Port Lincoln)
Duck Ponds Fire, Port Lincoln
5 homes lost

17 November

Fire Danger Season declared in numerous areas.

20 November

Statewide TFBs - 7 of 15 areas Catastrophic
248 fires, 6 at Emergency Warning Message (EWM)
Yorketown Fire, Yorke Peninsula
11 homes destroyed
Reduced threat 21 November

DECEMBER

8 December

TFBs - Severe
Newlands Fire, Kangaroo Island, EWM
Nil losses

20 December

Statewide TFBs - 5 Catastrophic
Cudlee Creek Fire, Mount Lofty Ranges
86 homes destroyed
1 person killed
Lightning band across KI
Numerous new fires:
- Duncan and Menzies

30 December

TFBs - 3 Catastrophic
Lightning band across SA
Multiple new fires:
- Ravine Fire, Kangaroo Island
- Mitalie Fire, Eyre Peninsula
- Keilira Fire, Lower South East

No major breakouts on existing fires

31 December

Final NSW deployment and vehicles return to SA.

JANUARY

3 January

TFBs - 6 Extreme
Ravine Fires break containment
47% of Kangaroo Island devastated in just one day
56 homes destroyed
2 people killed

4 January

Cudlee Creek and Keilira Fires declared controlled

5 January

Mitalie Fire declared controlled

8 January

TFB Kangaroo Island - Severe
Breakouts in 2 locations
Impact on properties
All Kangaroo Island covered by EWMs
89 homes destroyed (total)

9 January

Keilira and Mitalie Fires delcared out

18 January

Commonwealth funded Large Air Tanker (LAT) arrives, 50 day contract

22 January

Cudlee Creek Fire declared out

28 January

State Government announces Independent Review into 2019/2020 Fire Season

31 January

Heavy rainfall across SA and Kangaroo Island
Kangaroo Island Fires declared controlled

FEBRUARY

27 February

Kangaroo Island Fires declared out

03. Synopsis of Events

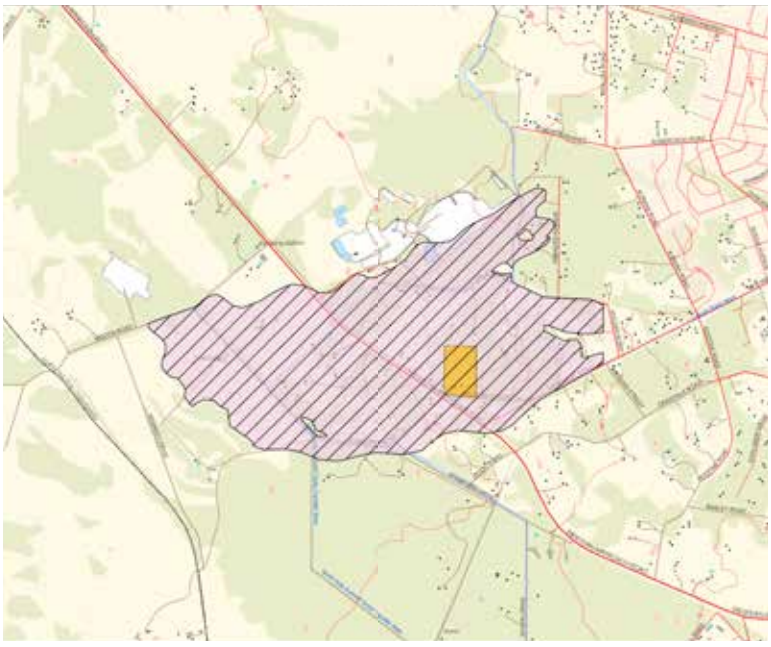
3.2 Monday 11 November 2019

3.2.1 Duck Ponds, Lower Eyre Peninsula

A fire at Duck Ponds on the Lower Eyre Peninsula on 11 November 2019 heralded the start of the state's most challenging fire season. The cause of the fire is still undetermined but thought to be ignited by an electric fence. While firefighters protected 41 dwellings and facilities, the fire burnt five residential properties, two sheds and 228ha of mainly private property. It required firefighters to actively patrol the area until 21 November when it was finally declared safe.

The event unfolded with Total Fire Bans (TFBs) declared in multiple districts across South Australia, with a forecast Grass Fire Danger Index (GFDI*) Extreme* rating. The actual GFDI recorded on that day in the Lower Eyre Peninsula was *Catastrophic* and, at the peak of the fire weather conditions, a fire started west of Port Lincoln near Duck Ponds. Multiple '000' calls were received at 4.00pm and aircraft and ground resources were immediately responded. The response was quickly upgraded to include additional ground and aviation resources, based on the conditions and the large column of smoke rapidly impacted rural properties and businesses on the outskirts of Port Lincoln. A forecast strong wind change occurred at 6.30pm and pushed the fire away from Port Lincoln and conditions gradually eased with the fire downgraded to *Watch and Act* at 8.00pm.

> The cause of the fire is still undetermined but thought to be ignited by an electric fence.



Map courtesy of DEW

Photo courtesy of Dyson Taverner

Photo courtesy of *Port Lincoln Times*

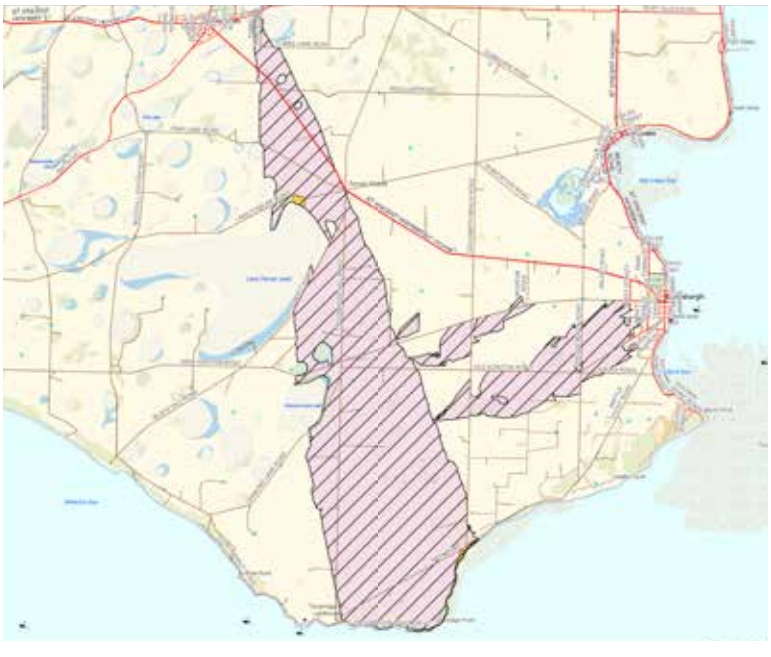
Photo courtesy of *Port Lincoln Times*

03. Synopsis of Events

3.3 Wednesday 20 November 2019

3.3.1 Yorketown, Yorke Peninsula

South Australians had been bracing for fire as the BoM forecast significant fire weather during the week leading up to 20 November 2019 and it gradually emerged that 20 November would bring some of the most difficult weather conditions the state had ever faced. *Catastrophic Forest and Grass Fire Danger Index* ratings were widespread. State-wide TFBs were declared on 19 November 2019 to limit the fire risk on the following day. In an ominous 'first' for South Australia, the forecast for 20 November 2019 predicted *Catastrophic* levels of fire danger across half the state. The forecast conditions eventuated with extremely dangerous conditions for a long period of the day. A total of 75 bush and grass fires occurred with five fires requiring Emergency Warning Messages (EWM) to be issued – the Yorketown fire the most serious.



Yorketown Bushfire

22 November 2019	
Tenure	
Minister for Environment	38.5 Ha
Other Government Land	20 Ha
Private (Non Government)	4862.6 Ha
Total Area Burnt	4921 ha
Total Perimeter	87.3 km

Map courtesy of DEW

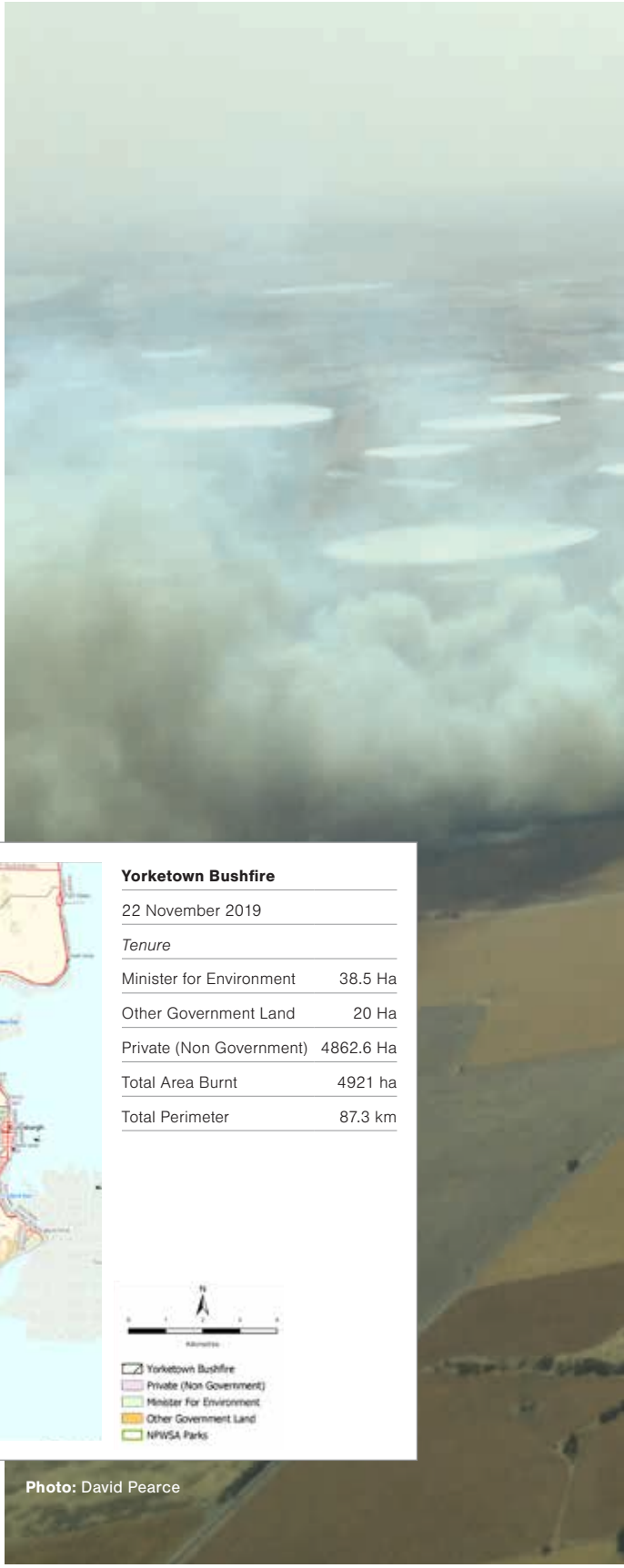


Photo: David Pearce


"On behalf of the communities
of Yorketown and Edithburgh.
We thank you from the bottom of
our hearts for your untiring
efforts over the past few days.
We will always remember your
strength, support and caring for us.
Words cannot convey what
it means to us all. Thank you."

03. Synopsis of Events

A furiously strong fire in Yorketown followed on 20 November 2019 – another day of TFBs and unprecedented fire conditions across the state. The fire broke out near a water tank on the outskirts of Yorketown and within four hours had burnt to the south coast of the Yorke Peninsula. It was eventually contained the following night but not before burning 11 dwellings and 11 sheds. The fire was declared safe on 29 November, having burnt 6,694ha of mostly private property and farmland. The cause of the fire was reported to be SAPN infrastructure.

The Yorketown fire was reported to '000' at 3.17pm - near the peak of *Catastrophic* conditions. The fire response was automatically upgraded and aircraft responded 20 minutes later. Extraordinarily strong wind changes in the early hours of 21 November 2019 caused two sections of the fire to break containment and rapidly threaten the coastal township of Edithburgh. It was eventually contained by 6.48pm (21 November 2019).

A furiously strong fire in Yorketown followed on 20 November 2019 – another day of TFBs and unprecedented fire conditions across the state.

Photos courtesy of *Yorke Peninsula Times*

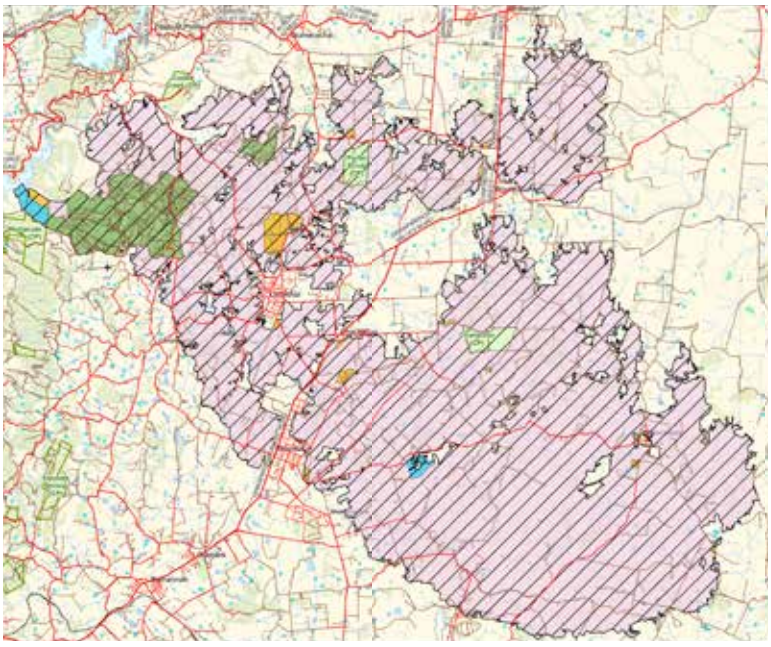
3.4 Friday 20 December 2019

Friday 20 December 2019 brought significant fire weather. Ahead of it, the BoM forecast firmed to show that South Australia was facing another extremely dangerous day with conditions eerily like those on 20 November 2019. State-wide TFBs were imposed on 19 December 2019 to reduce fire potential but the forecast *Catastrophic Fire Danger* became one of the toughest fire days in South Australia's history. Worst fears were realised when 387 emergency incidents occurred across the state. The Cudlee Creek (Adelaide Hills), Duncan, and Menzies (Kangaroo Island) fires became the most significant as extremely hot conditions, strong winds, and dry lightning affected locations around the state.

3.4.1 Cudlee Creek

The Cudlee Creek fire had a major impact on the Adelaide Hills resulting in the tragic loss of one life, 51 firefighter injuries and 86 dwellings, 542 sheds/outbuildings, and 325 vehicles destroyed. The fire, reported to have been started by SAPN infrastructure on the morning of 20 December 2019, claimed 23,253ha of predominantly private property. Despite several subsequent days of incredibly challenging weather the fire was declared contained on 31 December 2019 and controlled on 3 January 2020 before finally being declared safe on 22 January 2020.

The Cudlee Creek fire was initially reported to '000' at 9.17am, prompting immediate response of ground and aviation resources. This was upgraded two minutes later with aircraft arriving overhead 10 minutes from the time of call to find the fire burning aggressively up a hill. Despite best efforts, ground crews and aircraft were powerless to stop the fire spreading under the influence of strong winds and rapidly rising temperatures. Strike Teams responded to nearby Lobethal at 9.30am which became the first of several Adelaide Hills towns to be impacted by the fast-moving fire. The first of dozens of Emergency Warning Messages (EWMs) was issued at 9.36am and by 10.14am fire crews were reporting flame heights in excess of 30 metres. The fire directly hit Lobethal at 12.05pm with Woodside hit at 12.50pm, Brukunga at 2.45pm, Harrogate area at 6.31pm, and Mount Torrens at 7.23pm.



Cudlee Creek Bushfire

20 December 2019 to 22 January 2020

Tenure	
Minister for Environment	217.2 Ha
Other Government Land	223.5 Ha
Minister for Forests	996.2 Ha
SA Water Corporation	108.9 Ha
Private (Non Government)	20951.3 Ha
Total Area Burnt	22497 ha
Total Perimeter	559 km

Map courtesy of DEW

Photo courtesy of Dale Adams

Despite best efforts, ground crews and aircraft were powerless to stop the fire spreading under the influence of strong winds and rapidly rising temperatures.

03. Synopsis of Events

A thunderstorm system hit the fireground at 4.00pm, providing further complications for firefighters. Large Air Tankers from Victoria supported South Australian air crews as they performed water drops to protect life and property where they could. Extremely dangerous conditions resulted in numerous fire crews experiencing burnovers as they desperately tried to protect communities and several fire trucks were damaged, with injuries to firefighters. Conditions finally began to ease at 12.55am on 21 December 2019, but it took many days to contain the huge fire perimeter.

3.4.2 Duncan and Menzies

On the same day (20 December 2019), lightning started two fire complexes on Kangaroo Island which, while initially contained, ultimately caused terrible damage. Numerous fires were ignited by a significant band of lightning which tracked across Kangaroo Island, particularly across the length of the north coast. Around 8-10 new fires merged into what became the Duncan Fire Complex (six fires) and the Menzies Fire Complex (three fires). Despite initial confusion amid the broad area of lightning strikes, the numerous significant incidents and Cudlee Creek fire, firefighters realised by the morning of 21 December 2019 that they had two clusters of challenging fires on Kangaroo Island. Both fires were ultimately incorporated into the Ravine fire which burnt up to their boundaries on 3 January 2020.

An incredible effort by predominantly local CFS and DEW firefighters kept losses on 20 December 2019 to a single dwelling. The first fires were reported to '000' at 3.10pm with other fires reported at 3.23pm, and 3.37pm. A *Watch and Act* message covering a broad area of Kangaroo Island was issued at 3.41pm and was upgraded to an *Emergency Warning* at 8.35pm. Additional aircraft were responded to Kangaroo Island at first light on 21 December 2019 and additional EWMs were issued during the day. The Menzies fire complex was declared contained on 29 December 2019 while firefighters continued to fight the larger Duncan fire until it coalesced into the burnt area of the Ravine fire.

Photos courtesy of Dyson Taverner

03. Synopsis of Events

3.5 30 December 2019

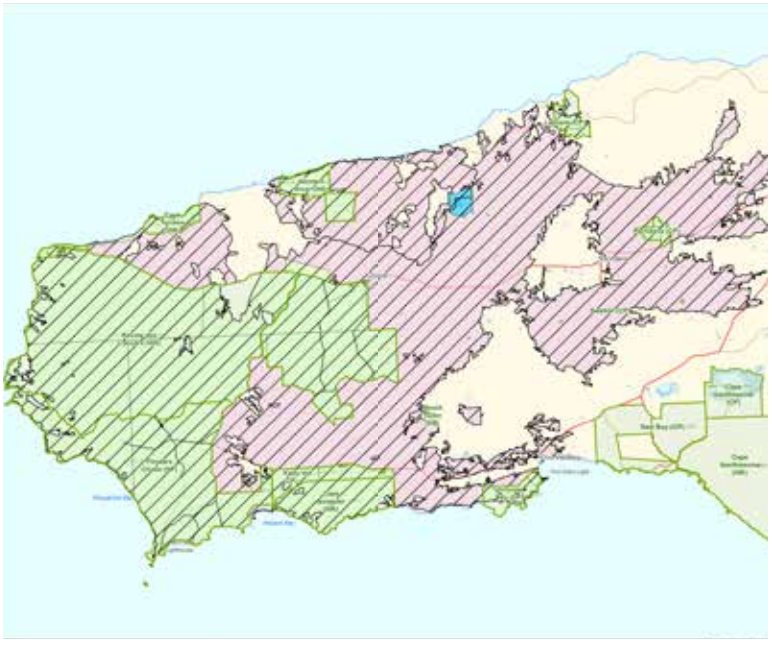
Just 10 days later, on 30 December 2019, South Australia braced again as more areas of *Catastrophic* and *Extreme* fire danger were forecast and the risk of breakout and rapid-fire growth in the Cudlee Creek, Duncan, and Menzies areas was high. With extensive public warnings already issued, fire agencies committed major levels of resources to the Cudlee Creek fireground to protect the significant population in the surrounding areas. The Cudlee Creek, Duncan, and Menzies fires remained behind control lines – despite the conditions. This was a tremendous outcome to secure the fire edge of these large and complex incidents in just 10 days from ignition.

Fire agencies responded to 190 incidents across South Australia as a large band of lightning came across the Eyre Peninsula, Yorke Peninsula, Kangaroo Island, and Lower South East in the early hours of 30 December 2019. Numerous fires started, including the major Ravine 1 & 2 fires, Keilira, and the Miltalie fires.

3.5.1 Ravine fires, Kangaroo Island

Lightning started the Ravine fires on Kangaroo Island in the early hours of Monday 30 December 2019 – not just one fire but multiple new fires in relatively close proximity. The Ravine 1 fire was three separate fires approximately 300 metres apart that combined into a single fire that burnt north to the Playford Highway before being contained. Ground crews, aircraft, and heavy machinery actively worked this fire from early morning on 30 December 2019.

The Ravine 2 fire (which ultimately caused significant destruction on Kangaroo Island) was located at 2.30pm by aircraft working on the Ravine 1 fire. Despite aircraft attack, the fire spread rapidly, crossing the Playford Highway in the evening, and impacting property in the DeMole Estate area. The Ravine 2 fire became the Ravine fire, incorporating the Ravine 1, Duncan, and Menzies fires, after its major fire run on 3 January 2020.



Kangaroo Island Bushfires

December 2019 to February 2020

Tenure	
Minister for Environment	86720.3 Ha
Other Government Land	108.1 Ha
SA Water Corporation	656.3 Ha
Private (Non Government)	114500.4 Ha
Total Area Burnt	201985.1 Ha

Map courtesy of DEW

Photo courtesy of CFS

Between Monday 30 December 2019 and the morning of Friday 3 January 2020, firefighters worked hard to try and contain the Ravine fires with back burns and containment lines. Yet they were hampered by resource constraints (as fires were fought elsewhere in South Australia and interstate), aggressive fire behaviour, and significant fire weather. The Ravine fire broke containment on the rugged North Coast near Cape Torrens early on 3 January 2020 and, under the influence of increasing winds and temperatures, took a devastating run to the south before a prolonged significant wind change pushed the fire east. It diverted north east before stopping on the north coast. The explosive Ravine fire, influenced by dangerous winds and pyroconvective fire behaviour, burnt out nearly half of Kangaroo Island in a single day. Tragically, two people were killed, and many properties were destroyed and damaged while firefighters and locals suffered burnovers. Stock losses were extreme, devastating the local agriculture sector. More than 90 per cent of the island's plantation forestry estate was destroyed. Property and environmental losses, including huge loss of wildlife, also had a profound impact on people, the island's environment and the tourism sector.

The explosive Ravine fire, influenced by dangerous winds and pyroconvective fire behaviour, burnt out nearly half of Kangaroo Island in a single day.

The Ravine fire broke out on another day of elevated fire weather on Thursday 9 January 2020, taking out more properties and livestock, and threatening the townships of Vivonne Bay and Parndana causing many residents to relocate to Kingscote. By the time the fire was contained on Tuesday 21 January 2020, the fire had burnt 211, 474ha and destroyed 89 dwellings, 332 outbuildings, 322 vehicles, and killed 59,730 stock animals – accounting for nearly 75 per cent of the national livestock losses over the bushfire season. Several iconic tourism facilities were destroyed including the Flinders Chase Visitor Centre, Kangaroo Island Wilderness Lodge, and the Southern Ocean Lodge. Nearly all (98%) of the Flinders Chase and Kelly Hill Conservation Parks were destroyed and an estimated 50,000 native animals were killed. The Ravine fires were declared safe on Thursday 6 February 2020 after considerable rainfall occurred across the fireground.

03. Synopsis of Events

3.5.2 Keilira fires, South East

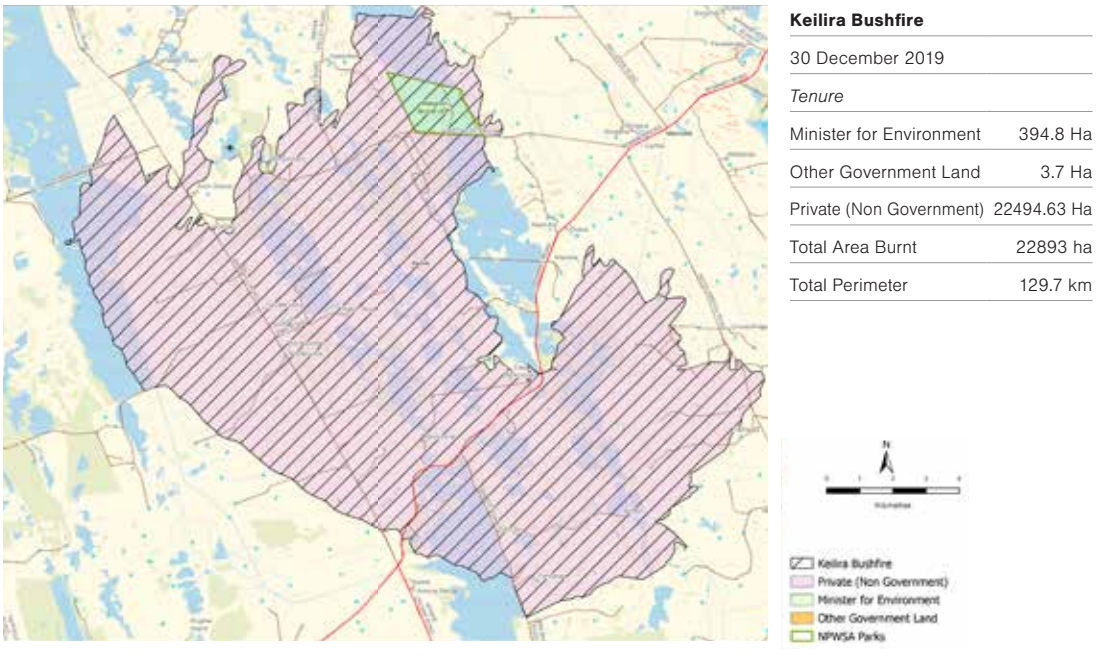
In the meantime, more than 25,000ha was burnt in the Keilira fire, near Kingston SE, sparked by dry lightning on Monday 30 December 2020. The fire was reported at 8.30am and by 11am was increasing in area and intensity. Two aerial drops occurred at 11.20am but these did not have time to take effect before westerly winds caused the fires to alter course and head towards farmhouses. By 1.10pm additional aircraft had been deployed and about 800ha had already been lost. With increasing winds and fire burning about an hour ahead of predictions, over 15,000 ha had been lost by 2.35pm. Smoke and wind conditions deteriorated and the only option was to attempt to slow the fire down from the southern side. Fires burning elsewhere in the state made it difficult to continue fighting this fire using aerial attack.

At 6.30pm the Riddoch Highway was closed and a rapid IMT had arrived at Lucindale to support fire operations. Conditions gradually eased during the night, aside from some flareups, and by 10am on 31 December 2019 the fire was under control but not before an occupied dwelling, five outbuildings, and 3,666 stock had been destroyed. One injury was reported and a total of 26,055ha was burnt. Crews patrolled over the next seven days, focusing on 3 January 2020 which was declared an extreme fire danger warning (FDW).

> Fires burning elsewhere in the state made it difficult to continue fighting this fire using aerial attack.

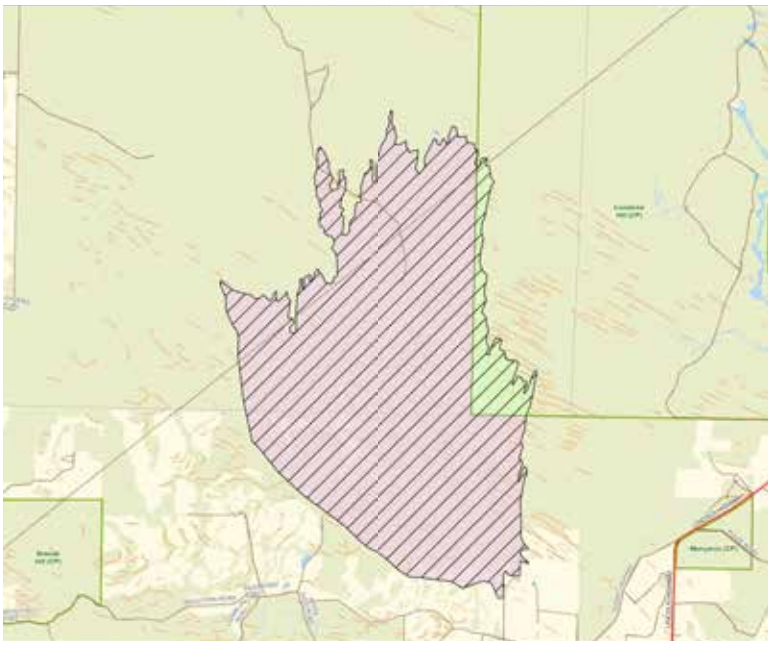
3.5.3 Miltalie fires, eastern Eyre Peninsula

The Eyre Peninsula was again threatened by fires on Monday 30 December 2019 when lightning near Sheoak Conservation Park sparked the Miltalie Fires. First reported at 11.52am, the fires immediately raised concern because of their proximity to the main electrical transmission lines that feed the Eyre Peninsula. After only 90 minutes the fires were burning on an 8-9km front reflecting the wind and dry conditions and by 4.00pm



Map courtesy of DEW

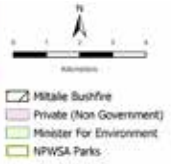
Photo courtesy of Trent Lawson



Mitalie Bushfire

30 December 2019

Tenure	
Minister for Environment	612.2 Ha
Private (Non Government)	9565.5 Ha
Total Area Burnt	10177.7 ha
Total Perimeter	74 km



Map courtesy of DEW

the Lincoln Highway had to be closed. By early evening power loss was affecting communications towers at Whites Knob, and Cleve and Kimba's communications were threatened. Fears that the Duke Mine may be impacted were relayed to the State Emergency Centre (SEC) while work continued identifying other critical infrastructure given the loss of communications towers during the afternoon. Aerial support began fighting the fires, but power had already been lost to the peninsula. Agencies sought to use generator power to re-establish communications after the Telstra tower had shut down. The fires were under control by 8.30pm and were monitored for the next five days. A total of 10,222h were lost along with communications infrastructure but, importantly, there were no injuries.

Photo courtesy of Trent Lawson

Weather conditions were so extreme that no level of hazard reduction would have prevented the fires.

04. Common Issues

An analysis of the PPRR and data around the three review questions identified a range of common issues at each stage of the emergency:

Extreme weather

While many have asserted that greater hazard reduction would have mitigated the 2019-20 South Australian bushfires, expert opinion suggests that the weather conditions were so extreme that no level of hazard reduction would have prevented the fires.

Overnight conditions did not provide the usual respite

In fact, firefighters and decision makers faced some of their worst conditions at night.

24-hour SEC decision making

With unprecedented conditions bringing no relief overnight, the usual strategy of having lower level staff in the SEC at night hampered its operations as some of these staff were not sufficiently senior to make decisions on behalf of their agency.

Review recommendations not implemented

South Australia has had 15 fire reviews since 1983 and many of the recommendations – particularly of later reviews – have not been implemented as expected.

SAFECOM mission-creep

The Review heard concerns about SAFECOM overstepping its legislated role and function.

SAFECOM Board conventions

Unlike other board conventions, the SAFECOM Chief Executive also chairs the SAFECOM Board raising questions about why this arrangement is in place and whether it delivers the best outcomes for Emergency Services agencies.

State emergency planning arrangements

The Review observed that the state emergency planning framework is effective if it is followed and agencies do not improvise or cut corners but it is important that people fulfil the roles outlined in the *Emergency Management Act 2004*.

04. Common Issues

4.1 Weather/scale of incidents

4.1.1 Finding

No level of hazard reduction would have prevented the fires experienced during the 2019-20 summer. However, a risk reduction target linked to prioritised objectives is still needed to minimise the impact upon individual communities.

> It is ... important that the community understands that the effectiveness of hazard reduction is strongly dependent on the weather conditions that prevail on the day they are impacted by fire. On extreme days (like Black Saturday and at certain times during the 2019-20 season) the effectiveness of most prescribed burning on stopping runs of large fires will be minimal because medium and long-range spotting will see these large areas overrun. However, research has shown that the fuel levels around properties and communities can make a significant difference to the intensity of the fire as it impacts private and public assets *(Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC), 2020, p. 3).*

Major fires in South Australia this season burnt under conditions that exceeded the limits of firefighting suppression capacity. Fire scientist Associate Professor Kevin Tolhurst has examined the nature of both the Cudlee Creek and Kangaroo Island fires in the 2019-20 season and concluded that fire control operations had little impact on both fires. He notes that fire behaviour in both the Cudlee Creek and Kangaroo Island fires exceeded the 'upper limit of direct attack with any means of firefighting, including machines, aircraft and firetankers', which is 3,500 kW/m (Tolhurst, 2020, pp 25,52). To put this in context, humans cannot survive exposure without protection to more than 5 kW/m. For the initial period following ignition in Cudlee Creek, and for all of the 3 January 2020 in the Ravine fire on Kangaroo Island, the fire intensity exceeded 30,000 kW/m.

As Associate Professor Tolhurst notes:

> At such intensities, crownfires are to be expected and there is little chance of defending houses, or for humans to survive in such conditions *(Tolhurst, 2020, pp.25,52).*

It is also almost certain that the nature of the fire behaviour observed in these incidents could not have been prevented by greater levels of hazard reduction.

However, Associate Professor Tolhurst says that unbounded prescribed burning undertaken in the Ravine des Casoars in the previous 10 years 'helped stop the initial run of the fire on 30 December and prevented a large area from being burnt by the subsequent run on 3 January' (noting that by that time the burn area had been 'reinforced' by additional surrounding backburns) (Tolhurst, 2020, p. 60).

What is less clear is 'how much land to treat' and where to undertake the work. According to the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC) it is 'sensible to link the level of planned burning to the level of risk reduction of individual communities rather than just an arbitrary area-burnt target that is not linked to prioritised objectives.

Without such an objective-based measure there is no answer to the question on the right amount of 'land to treat', and given that resources to deliver such works are inevitably limited (BNHCRC, 2020, p. 2). As noted above, effective fuel management around built assets can also significantly impact fire intensity and mitigate the level of damage.

It is also almost certain, due to the weather and climatic conditions outlined, that the fire behaviour could not have been prevented by greater levels of hazard reduction.

Photo courtesy of Trent Lawson

04. Common Issues

4.1.2 Finding

Overnight conditions during these fires meant that unlike previous occasions there was no respite for firefighters and decision makers.

Many experienced firefighters informed the Review that they had never witnessed overnight conditions such as those of the 2019-20 bushfire season. Fires burnt with at least as much ferocity at night as they did during daylight. If these types of conditions are now normal, they will force a new paradigm managing resources such as volunteers to contain bushfires overnight.

Meteorological and international scientific research are pointing to the increase in extreme heat as the most critical (but not the only) factor in the severity of the 2019-20 bushfire season (van Oldenburgh *et al*, 2020; Peace et al, 2020; BoM, 2020). This increase in extreme heat and persistent heatwaves has impacts on both surface and atmospheric weather conditions that sustain significant fire behaviour overnight as well as during the day (Figure 5). They support fire spread overnight, by inhibiting "formation of overnight near-surface inversions", resulting in poor humidity recovery (Peace *et al*, 2020). This in turn results in fuels remaining drier (Peace *et al*, 2020; Brown & McEvoy, 2020).

Before the December-January heatwaves, South Australia had already experienced above average temperatures and below average rainfall, producing very low soil moisture across the state for an extended period (BoM 2020, p. 4). Added to that, 'a rare and strong 'sudden stratospheric warming' event[1] occurred over the Antarctic ... significantly raised the likelihood of above-average temperatures and below-average rainfall across eastern Australia during spring and early summer, resulting in increased bushfire risk' (BoM, 2020, p. 4). Even before the fire season began, these climatic conditions had already produced very dry fuels across the state. This meant that 'not only fine dead litter [would] burn, but also stressed live vegetation and large dead woody material too, making fires more intense and more difficult to control' (Tolhurst, 2020, p. 11).

1 See: Bureau of Meteorology, 11 September 2019, *The air above Antarctica is suddenly getting warmer. Here's what it means for Australia,* http://media.Bureau.gov.au/social/blog/2195/the-air-above-antarctica-is-suddenly-getting-warmerheres-what-it-means-for-australia/

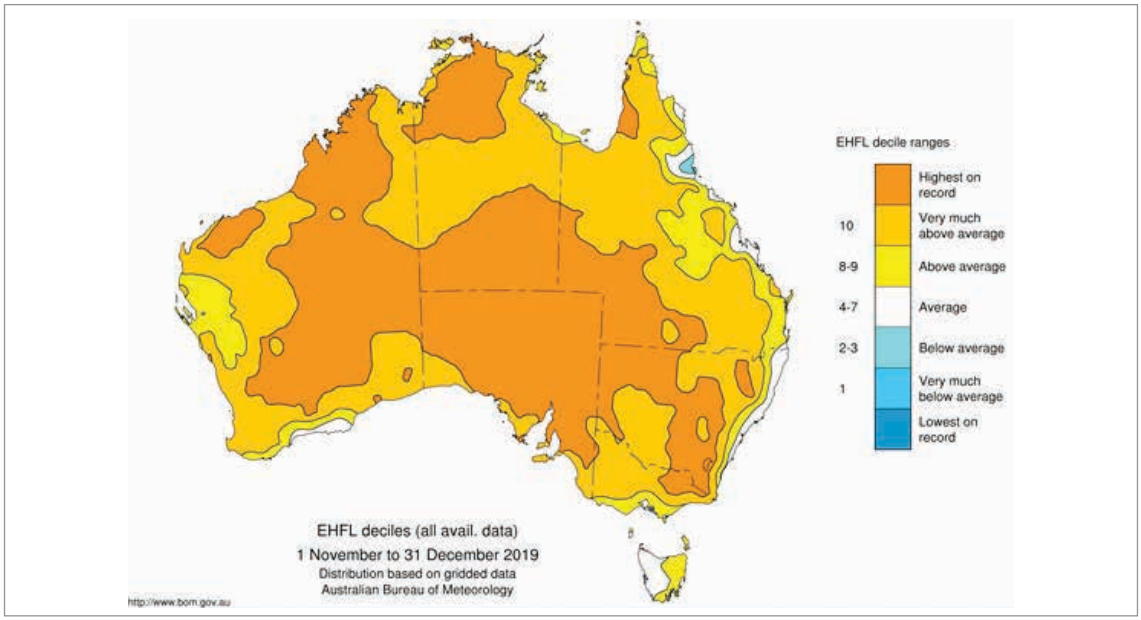


Figure 5 Map of Excess Heat Factor (EHFL) deciles for November and December 2019. Extreme heatwaves affected central SA during December, including the western half of Kangaroo Island. Heatwave intensity reduced slightly during January, but severe heatwaves continued to impact southern SA, including Kangaroo Island.

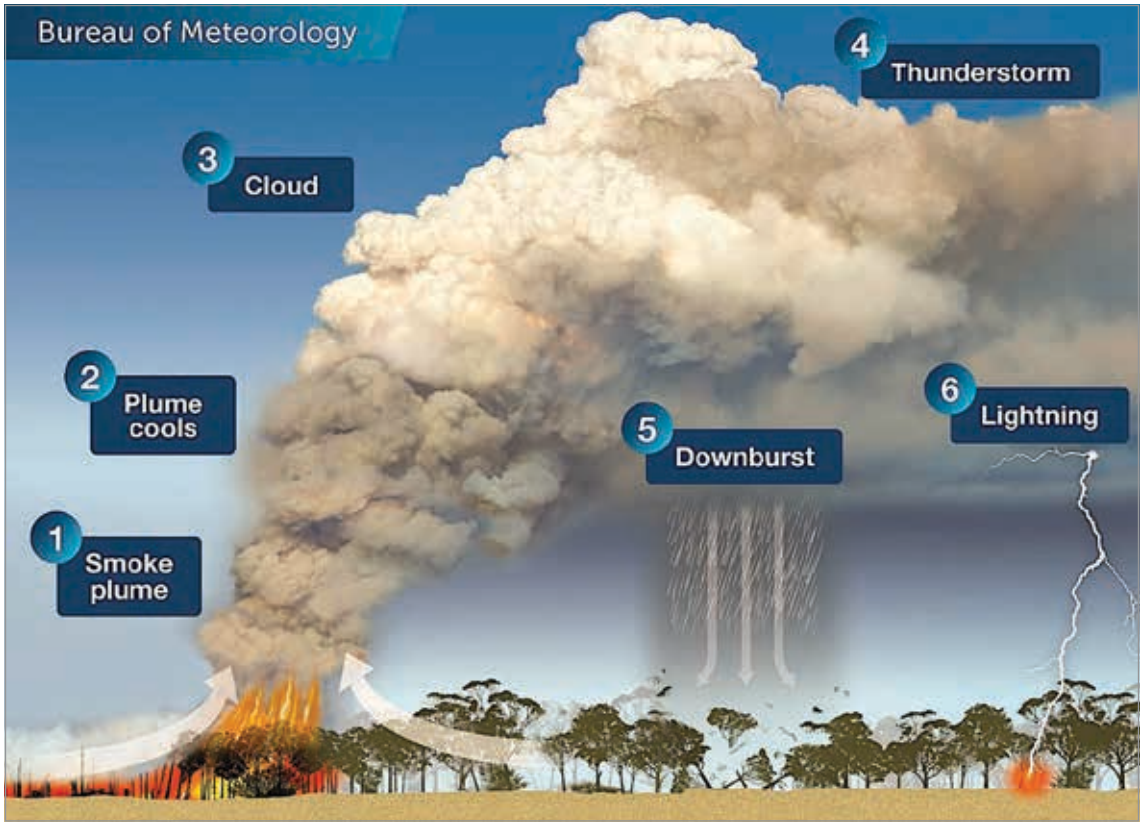


Figure 6 Pyrocumulonimbus cloud development. 1. A plume of hot, turbulent air and smoke rises. 2. Turbulence mixes cooler air into the plume, causing it to broaden and cool as it rises. 3. When the plume rises high enough, low atmospheric pressure causes its air to cool and cloud to form. 4. In an unstable atmosphere a thunderstorm can develop: pyrocumulonimbus cloud. 5. Rain in the cloud evaporates and cools when it comes into contact with dry air, producing a downburst. 6. Lightning may be produced and can ignite new fires.

Heatwaves also support deep atmospheric boundary layers, causing very dry air to persist to a significant height in the atmosphere (Peace *et al*, 2020). These conditions not favour development of deep, strong vertical motion in smoke plumes, and 'allow stronger, gusty winds to continue through the night', bad fire weather conditions to establish early in the day, and therefore extend the hours for fires to spread (Peace *et al*, 2020).

Pyrocumulus ('pyroCu') clouds are commonly formed during fires and, if conditions worsen, may form pyrocumulonimbus ('pyroCb'), which can generate their own weather, including lightning[2] (Figure 6). PyroCbs are widely recognised as being extremely dangerous in terms of their on ground impacts to life, property and the environment, and their formation is cause to implement the highest level of warning to fire crews and communities likely to be impacted during a fire.

The risk of pyro convection is growing 'due to a combination of significant decreases in atmospheric stability and humidity as well as more severe fire weather conditions near the surface' associated with long term changes in climatic and environmental conditions (Dowdy and Pepler, 2018, 2012) (Figure 7, over page). This has critical implications for bushfire suppression, management, firefighter, and public safety.

This season has shown, at least in some locations, even where a pyroCu does not develop into a pyroCb, the impacts can still be devastating. The Ravine fire on Kangaroo Island and the Green Valley fire in southern New South Wales appear to have generated pyroCu events which contributed to fatalities.

Complex fire and atmospheric interactions feature in major fires on Kangaroo Island (Peace and Mills 2012; Peace *et al*, 2015; Peace *et al* 2016). Based upon the observations of firefighters during the Ravine fire the

2 Australian Government Bureau of Meteorology, 8 January 2018, *When bushfires make their own weather,* See: http://media.Bureau.gov.au/social/blog/1618/when-bushfires-make-their-own-weather/

04. Common Issues

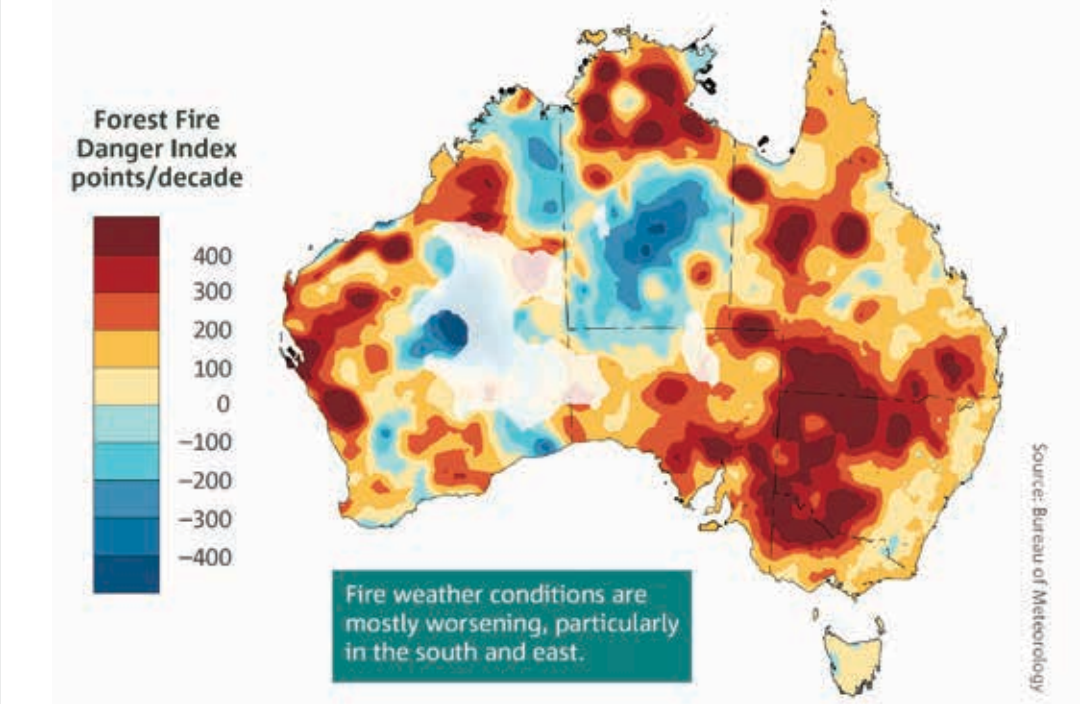


Figure 7 Trends from 1978 to 2017 in the annual (July to June) sum of the daily Forest Fire Danger Index – an indicator of the severity of the fire weather conditions. Positive trends, shown in the yellow to red colours, are indicative of an increasing length and intensity of the fire weather season. A trend of 300 FFDI points per decade is equivalent to an average trend of 30 FFDI points per year. Areas where there are sparse data coverage such as central parts of Western Australia are faded. *(CSIRO and the Bureau of Meteorology, 2018. State of the Climate 2018: 5*

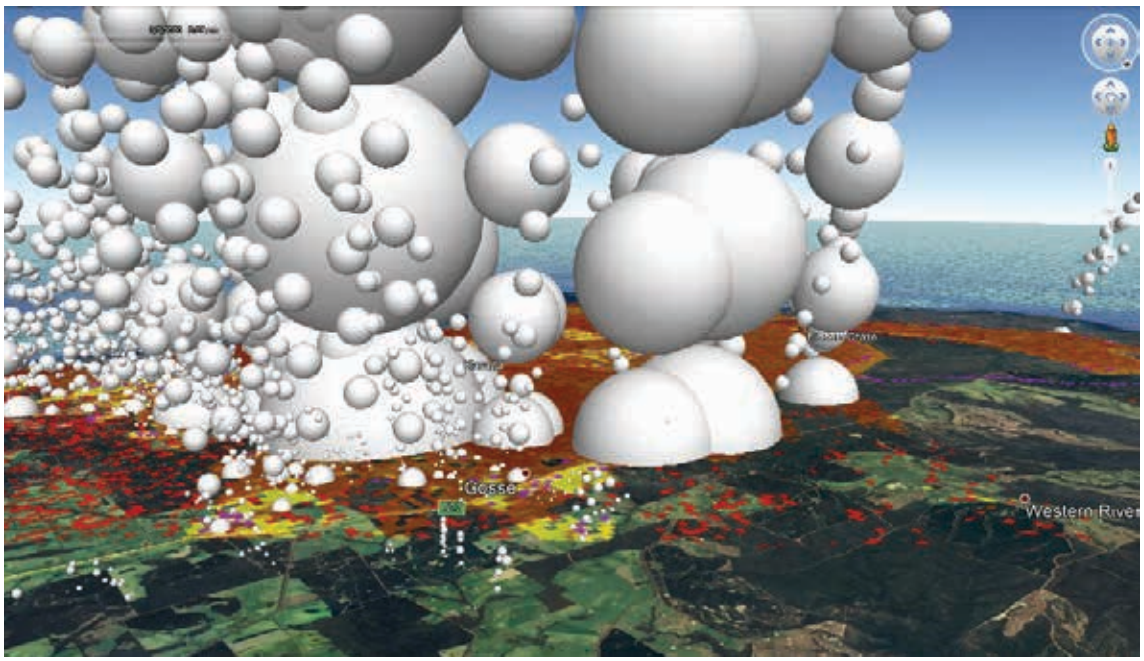


Figure 8 Fire spread and smoke plumes about 20:30hrs on 3rd Jan, Ravine fire. White bubbles represent the simulated convective activity of the fire. Larger bubbles signify greater convective strength. High bubbles signify hotter convective activity.

formation of pyroCu on the 3 January 2020 generated extremely dangerous fire weather conditions, including fire whirls. These were observed at more than one location in the south west corner of Kangaroo Island as the fire ran that afternoon and evening.

Modelling by Associate Professor Tolhurst (Tolhurst, 2020) demonstrates just how significant the convective influence was on fire behaviour during this period (Figure 8). Associate Professor Tolhurst also notes the speed of the Ravine fire on the afternoon of 3 January:

- accelerated between 1300-1400hrs from its morning rate of spread at around 1km/hr (with a spotting distance of around 3km) to 11km/hr (spotting 7-13km);
- remained between 5-10km/hr during the afternoon; and
- escalated to 14km/hr (spotting up to 24km) with the south westerly wind change around 1900hrs until at least around midnight (Tolhurst, 2020, pp 52-54).

More detailed research is needed – especially to help predict pyro convection — but initial indications are that the pyroconvective activity significantly influenced this extreme fire behaviour.

Additional weather data is at Appendices 10, 11 & 12.

4.2 Reviews recommendations not enacted

4.2.1 Finding

Not all accepted recommendations from previous reviews have been implemented.

A number of reviews into other significant bushfires provided lessons and recommendations for future events yet many of these were not implemented. The reviews of fire and Emergency Services in South Australia include:

- 2016 SA Bushfire Independent - South Australian Country Fire Service Project Pinery
- AFAC Independent Operational Audit - South Australian Fires of January 2015
- 2013 Review of the *Fire and Emergency Services Act 2005*
- 2012 Case Study of the 2007 Kangaroo Island Bushfires
- 2011 Natural Resources Committee Bushfire Inquiry
- 2008 Wangary Fires Coronial Inquest
- 2008 Volunteer Administrative Workload Review
- 2008 Review of the *Fire and Emergency Services Act 2005*
- 2007 Ministerial Review of Bushfire Management in South Australia
- 2007 Inquests into the deaths of [9 named people] (2005 Eyre Peninsula, Wangarry fires)
- 2005 Eyre Peninsula Bushfire and Native Vegetation Parliamentary review
- 2003 Review of the Emergency Services Sector (Dawkins Review)
- 1985 Review of electricity distribution policies in bushfire prone and environmentally sensitive areas
- 1983 Report of the Review Team on the South Australian bushfires
- 1983 Final report and recommendations of the State Disaster Plan (Welfare) Review Committee

The Coronial Inquest on the Wangary fires in 2007 resulted in 34 recommendations with the South Australian Government fully accepting 30 of these recommendations and partially accepting the remaining four. In 2010, SAFECOM conducted an audit of progress against the recommendations and concluded that 26 had been effectively completed and that one required no action. The remaining seven recommendations were either in progress or required some further work (Project Pinery Independent Report, 2016).

This Review was unable to find any **further follow up** on recommendations from some of those past reviews. The Review notes that SAFECOM is required under section 8(1)(h) of the *Fire and Emergency Services Act 2005*:

> *...to ensure that the emergency services organisations regularly review, and revise as necessary, their plans, structures, systems, targets and practices to address changing circumstances and to improve the provision of emergency services and business practices.*

04. Common Issues

4.3 Role of SAFECOM

4.3.1 Finding

The Review heard that SAFECOM's role is unclear and there are concerns about 'mission creep' beyond its legislated function of enabling the Emergency Services sector under the Board's direction.

Concerns were raised with the Review that SAFECOM is attempting 'mission creep' to *direct* the Emergency Services sector rather than fulfilling its legislated role as an *enabler* to the sector. The role has evolved over the years however, the role and function are clearly articulated in the *Fire and Emergency Services Act 2005 (FES Act)*. In short, it is to:

- Allocate resources effectively across the Emergency Services sector (CFS, SES and MFS);
- Ensure appropriate levels of strategic and administrative support to the Emergency Services agencies;
- Ensure the agencies have appropriate systems and practices in place;
- Ensure appropriate risk-management systems and practices are in place; and
- Ensure effective consultation with the community in relation to the FES Act.

The legislation also provides for regular review and revision as necessary of the agencies' plans, structures, systems, and practices. The current SAFECOM CE has recently delivered a report to the Minister suggesting several reforms and this Review has not repeated that work, leaving the Minister to decide what is required given the outcomes of this Review.

4.4 SAFECOM Board Structure

4.4.1 Finding

Contrary to accepted governance conventions, the SAFECOM CE chairs the SAFECOM Board which raises questions about whether it delivers the best outcomes.

SAFECOM is governed by a Board under the legislation and the Board reports to the Minister. Curiously, however, the legislation provides for the CE to also chair the Board. This is a significant shift from the usual governance arrangements where a CE would normally report to the Board and the Board would be separately chaired.

Photo courtesy of Darren Chapman

Under the *Corporations Act 2001* there are good reasons why this is normally the case – it is to avoid the organisation 'checking its own homework'. Both in ASX-listed companies and the public service[3], it is not recommended that the Managing Director or the Chief Executive also chair the Board. This Review may not have needed to highlight many of its findings - the lack of action on previous reviews, the lack of integration and interoperability of ICT systems, fleet suitability and management as well as the use of critical safety technology such as AVL - had SAFECOM been effectively performing its legislated role. Whether or not this is due to resourcing was not able to be examined by this Review.

It was suggested to the Review that any perceived over extension by SAFECOM into an operational role would be avoided if the Minister was to appoint a separate and Independent Chair of the SAFECOM Board, with the role of the CE amended under the legislation to reflect normal good governance. To do nothing risks SAFECOM becoming a fourth arm of Emergency Service providers.

Alternatively, the work of SAFECOM could be delivered by a department under the Minister's control however, any move in this direction would need to be well thought through and be cost neutral rather than imposing any budget losses to the operational agencies.

The Emergency Management Framework has delivered excellent outcomes during the current COVID-19 crisis where the South Australian Department for Health and Wellbeing has been the 'Control Agency' and the rest of the structure has worked well to support the government and the community. Replicating this practice in bushfires is more difficult because of the number of operational agencies involved as well as SAFECOM, even though CFS is clearly the 'Control Agency'.

4.5 State emergency planning arrangements

4.5.1 Finding

The State Emergency Planning Framework is effective if it is followed and agencies do not improvise or cut corners.

The State Emergency Management Planning and Response Framework is set out in the *Emergency Management Act 2004 (EM Act)*. The EM Act outlines the strategic governance arrangements and has been amended from time to time regarding electricity and other critical infrastructure (Figure 9, over page). The current COVID-19 pandemic is being managed under the same legislation. As good as any plan may be – plans do not make decisions – people do. So, it is vital that the right people fill the positions outlined in the strategic governance of the operational process outlined in the EM Act in Figures 10 and 11, over the page.

> As good as any plan may be – plans do not make decisions – people do.

This Review found that while the plan is in place and the SEC performed its functions, the SEC members were distracted by requests for information 'outside' the process outlined in the plan. This is only natural when a serious crisis is being managed and people in leadership positions are under pressure to make decisions or respond to requests for information to be given to the community.

The situation is exacerbated by the 24-hour news cycle and social media requiring leaders to be seen to be leading and resolving the situation. The Review examined the planning process and information flows and while some adjustments are identified, such as the provision of fire mapping and rapid damage assessments discussed elsewhere

3 Government of Western Australia, Public Service Commission, 23 May 2017, *Good governance principles, WA boards and committees, Principle 7, The board operates effectively* https://publicsector.wa.gov.au/public-administration/public-sector-governance/good-governance-wa-boards-and-committees/good-governance-principles-wa-boards-and-committees/principle-7-board-operates-effectively

Australian Institute of Company Directors, 2016, *Director Tools: Governance relations - Role of the chair,* https://aicd.companydirectors.com.au/~/media/cd2/resources/director-resources/director-tools/pdf/05446-3-13-mem-director-gr-role-of-the-chair_a4-web.ashx

04. Common Issues

in this Review, the State Emergency Planning Framework is effective. Discipline is required to avoid attempts to cut corners and communicate with people engaged in the SEC, in IMTs and on the frontline to get 'up to date' information before it is made public. The planning process is there to value-add to a state-wide understanding of how best to manage the crisis and it should be followed.

The EM Act provides a clear pathway for elements of emergency management decision making. As can be seen the function of emergency management is a well thought through process that is consistent with other Australian jurisdictions. Emergency Services, including volunteer associations deliver operational outcomes for the government in accordance with the higher level emergency management policies. This separation of function between DPC and SAFECOM is important for probity as it separates the policy and operational roles. Consistent with our Westminister model of government it maintains the operational independence of the response agencies from the ministerial accountability of the government of the day.

4.5.2 Finding

The SEC's decision making was impeded by having less senior staff rostered overnight who were not authorised to make decisions on behalf of their agency.

As discussed in 4.1 Weather/scale of incidents, the 2019-20 weather conditions were unprecedented and there was not the usual opportunity to rest or gain a tactical advantage in fighting the fires overnight. In fact, the fires intensified overnight on many occasions. So while lower level staff have traditionally filled in for the night shift, this was not as effective during the 2019-20 despite their best efforts because some were not authorised to make agency-based decisions. This is not a criticism of anybody – just an observation that senior staff who can speak or make decisions on behalf of their organisation need to be present in the SEC 24/7.

3. STRATEGIC GOVERNANCE

3.1 GOVERNANCE

3.1.1 Emergency Management Council

The Emergency Management Council, chaired by the Premier, provides strategic oversight of South Australia's security and emergency management arrangements and executive leadership during a significant security event or natural disaster.

The State Emergency Management Committee (SEMC) is a high-level, strategic planning committee established by section 6 of the Act, which provides leadership and maintains oversight of emergency management planning for South Australia.

SEMC takes an 'all hazards' approach, whereby policies, processes and systems are applied consistently across all hazards, both man-made and natural (e.g. earthquake, terrorism, flood, human disease, animal disease, etc.). SEMC is responsible for maintaining the State Emergency Management Plan (SEMP).

Strategic activities and initiatives of SEMC are primarily directed by the SEMC Strategic Framework and Plan 2017-2022. Advisory groups report to the SEMC on implementation of the Strategic Plan and other strategic initiatives. Advisory group terms of reference are published within the *SEMP Part 2 – Arrangements – Annex B – Committee Terms of Reference.*

SEMC will also address new or emerging matters or direction from the Premier as per its functions and may establish taskforces or other bodies to address issues that require a specialist activity be undertaken, for example, addressing a major inquiry.

SEMC will consider and engage with national emergency management directions informed by COAG, MCPEM, ANZEMC and ANZCTC. Emergency Management Zones & Zone Emergency Management Committees.

The State is divided into emergency management zones. Other than the Adelaide Hills and Fleurieu/Kangaroo Island Zone, these zones are based on the Government Reform Commission's uniform regional boundaries. The Adelaide Hills, Fleurieu and Kangaroo Island regions have been merged to form one zone for the purposes of emergency management in SA. The zones are as follows:

- Adelaide Hills, Fleurieu and Kangaroo Island
- Barossa
- Eastern Adelaide
- Eyre and Western
- Far North
- Limestone Coast
- Murray and Mallee
- Northern Adelaide
- Southern Adelaide
- Western Adelaide
- Yorke and Mid North

Each Zone has a Zone Emergency Management Committee (ZEMC) responsible for risk management, planning and implementation of Zone-level actions to build resilience and support State emergency management arrangements. The ZEMC ensures National Emergency Risk Assessment Guideline (NERAG) consistent emergency risk assessments are conducted for prioritised risks; contributes to the development of risk treatment options; monitors implementation of risk treatments via Hazard Leader and other relevant risk treatment plans; and develops a Zone Emergency Management Plan and other plans. Each ZEMC includes a zone recovery planner who assists with recovery preparedness, including development of a zone recovery operations plan.

The ZEMC is chaired by a senior member of local government. Operating guidelines for zone emergency management committees are described in *SEMP – Part 3 – Guidelines and Frameworks – Annex D – Zone Emergency Management Committee Guidelines.*

Figure 9 Extract from State Emergency Management Plan

04. Common Issues

Response Leadership Framework (Pre-Declaration)

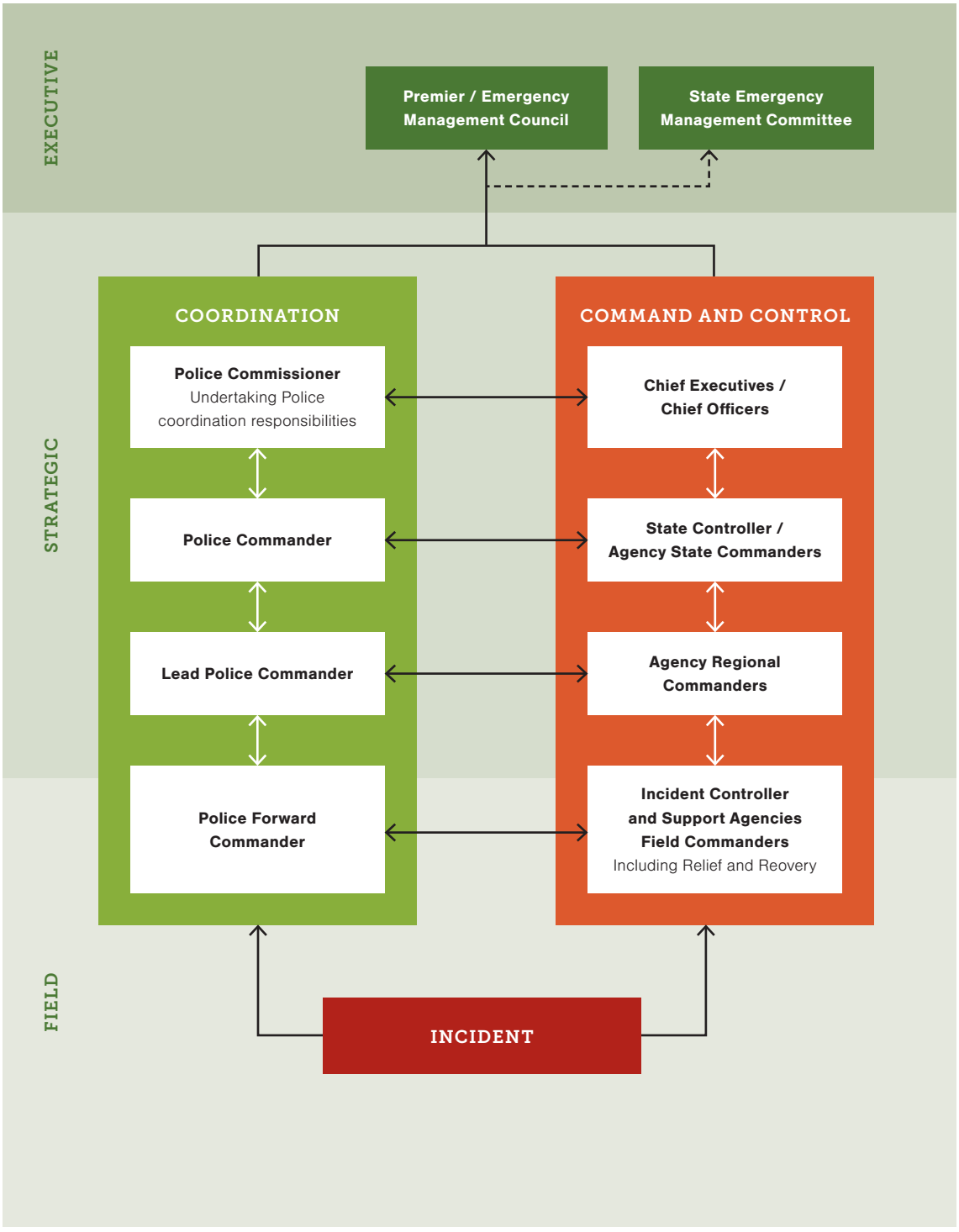


Figure 10 Command and Coordination arrangements prior to a declaration

Response Leadership Framework (Declaration)

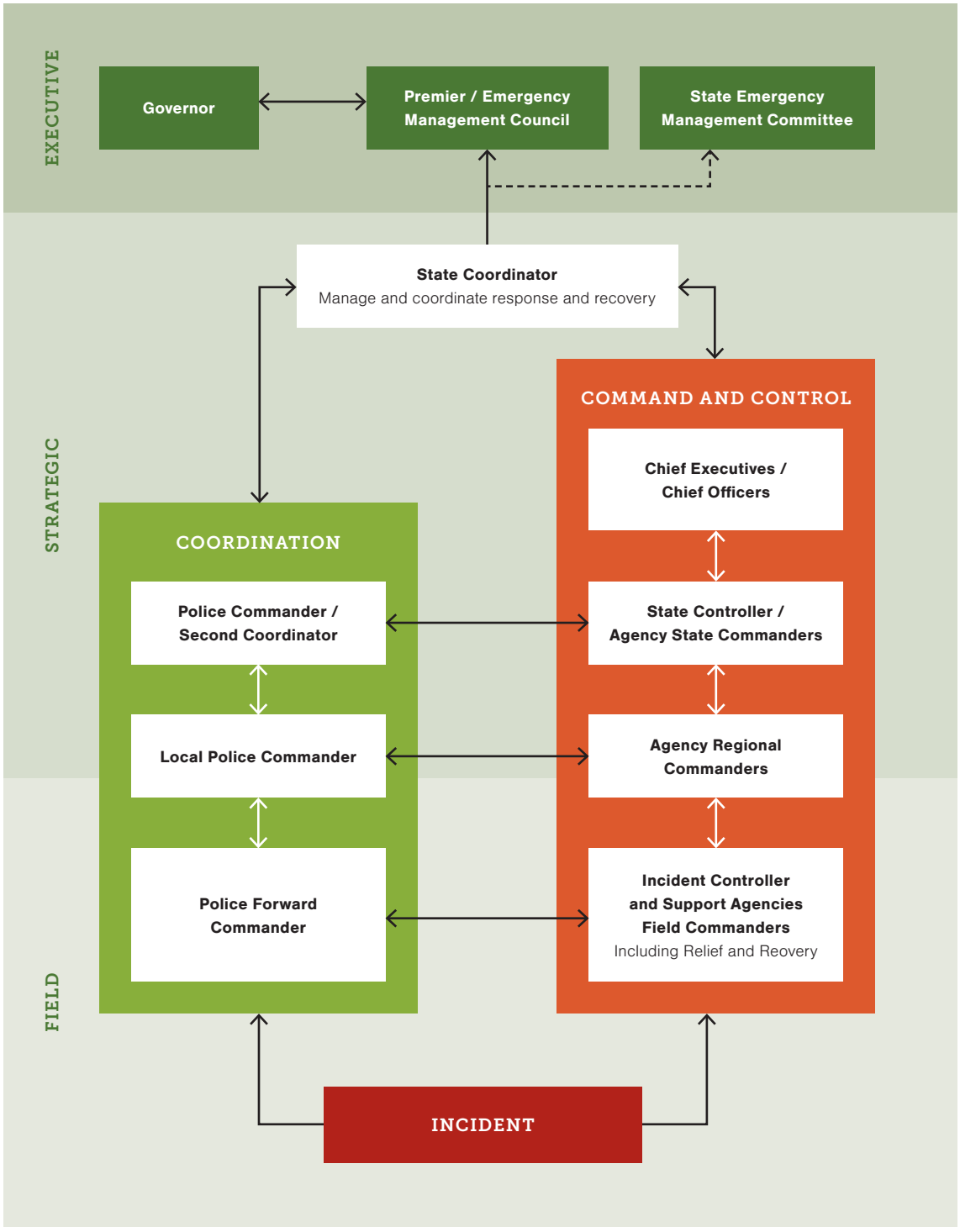


Figure 11 Command and Coordination arrangements during a declaration

Photo courtesy of Elizabeth Mapletoft

05. Prevention

A number of issues surrounding bushfire management structure, operations and resourcing have impeded work on prevention.

Bushfire management framework

This framework has been compromised because the 2009 amendments to the *Fire and Emergency Services Act 2005* relating to prevention and mitigation have not been fully implemented.

Reporting requirements for the State Bushfire Management Committee

The reporting and administrative arrangements for this committee do not fit its stature and role. Such a committee should have a statutory requirement to report annually to State Parliament and should be required to incorporate an appropriate level of expertise and authority. It needs additional administrative resourcing with dedicated high-level executive staff.

State Bushfire Management Plan

The State Bushfire Management Plan is intended to be a strategic coordination document which provides guidance on all elements of bushfire management across the PPRR spectrum, but it has not been presented to the Minister and has no lawful effect. The Review believes it needs to be redeveloped in accordance with the requirements of the *Fire and Emergency Services Act 2005* as a matter of urgency.

Bushfire management planning process

The bushfire management planning process is inconsistent and not integrated across agencies, and risk assessments in BMAPs are inconsistent with international standards. Accountability for mitigating risks is also unclear. The BMAP process and monitoring systems should be redeveloped with clear lines of accountability and resourced appropriately.

Communities also need to be involved in the development of BMAPs to better understand bushfire risks in their area.

Spatial tool

The CFS needs the latest technology including spatial modelling tools and online reporting to ensure that the bushfire planning and management processes are agile and responsive. Communities also need to be involved in the development of BMAPs to better understand bushfire risks in their area.

Data for risk intelligence

Data for risk intelligence (particularly operational information) does not flow freely and automatically and this impedes incident management and state coordination. Improved systems are needed for sharing data across agencies along with a whole of government approach to data management. Real time data should also be made available to the public through a central source.

Hazard management

Approval processes for fuel reduction, particularly in managing native vegetation or prescribed burning, are confusing and poorly understood by the community. Hazard reduction compliance is patchy and lacks standardisation. Community awareness programs and increased CFS capacity for managing hazard reduction is recommended, along with guidelines and resourcing to assist in managing compliance. Fuel reduction strategies such as prescribed burning, are incorrectly viewed as a panacea for reducing the risk of bushfire – much depends on the context. It should also be noted that, for greatest effect, prescribed burns must occur across public and private land.

05. Prevention

5.1 Bushfire Management Planning Framework

5.1.1 Finding

2009 amendments to the *Fire and Emergency Services Act 2005* introducing a bushfire management framework for prevention and mitigation have not been fully implemented. For example the State Bushfire Management Plan 2010 is incomplete, outdated and has no lawful force or effect.

In 2009 the *Fire and Emergency Services Act 2005* (FES Act) was amended to establish a State Bushfire Co-ordinating Committee (SBCC) responsible for bushfire management planning in South Australia, including the development of a State Bushfire Management Plan (SBMP). The committee divided the state into nine Bushfire Management Areas with a sub-committee, known as a Bushfire Management Committee (BMC), for each area, responsible for preparing a Bushfire Management Area Plan (BMAP).

The draft SBMP (2010) is incomplete and outdated and has no force or effect as it has never been presented to the Minister as required under s.73(9) of the FES Act. Furthermore, as outlined in Finding 5.2.2, the quality and consistency of the existing BMAPs has been significantly compromised by the SBCC's failure to expeditiously establish planning standards that reflect risk management best practice. Despite broad support for the risk-based approach to bushfire management, some elements of the 2009 amendments to the FES Act have not been fully implemented. The Review heard that this has compromised the effectiveness of the bushfire management planning framework.

Section 72B(1)(d) of the FES Act requires BMCs to report to the SBCC on 'failure or delay in relation to implementation' of BMAPs. BMCs may have done this, but multiple stakeholders advised implementation has still not occurred.

Moreover BMCs are required under s.73A to 'establish or adopt principles and standards to guide or measure the successful implementation of bushfire management strategies and initiatives'. The Review was not presented with any evidence that this has occurred to date.

There was significant delay in establishing common guidelines for preparing BMAPs following the FES Act amendments in 2009, even though Section 73(4)(c) requires the SBCC to 'set standards or requirements that must be applied or observed in the preparation and implementation of Bushfire Management Area Plans'. The guidelines have continued to evolve, with the first BMAP handbook published in 2015, and revised in 2018.

5.1.2 Finding

The State Bushfire Management Committee should have a statutory requirement to report annually to State Parliament and its membership should have an appropriate level of expertise and authority.

The SBCC reports annually to the CFS in accordance with s.71E of the FES Act and it is exempt from providing a report to State Parliament under the *Public Sector Act 2009*. The Review considers this an anomalous governance and reporting arrangement as the SBCC is chaired by the Chief Officer of the CFS. The SBCC is intended to be a high-level committee, appointed by the Governor, which has strategic oversight and coordination of bushfire management activities and it should be accountable to the Parliament. The Review also notes observations from several stakeholders that the SBCC membership does not currently encompass the level of expertise and authority required or expected of a committee operating at this level.

Several stakeholders also observed that the SBCC does not have dedicated support staff; the key staff who support the SBCC also hold senior operational roles within CFS. The Review considers that a committee operating at this level should have high level executive support solely focused on its functions and operation.

5.1.3 Finding

The CFS is not adequately resourced at central or regional levels to manage and implement the bushfire management planning framework.

A wide range of agencies, organisations and community members raised concerns about the failure to implement the bushfire management planning framework, with many saying it was inadequately resourced at state and regional levels. Support for these observations included evidence of:

- the incomplete State Bushfire Management Plan;
- a lack of high-level membership and executive support for the State Bushfire Coordination Committee and Bushfire Management Committees;
- a lack of consistent best practice standards for Bushfire Management Area Plans;
- poorly integrated bushfire management planning across agencies and sectors;
- a lack of on-ground bushfire mitigation action across all tenures (particularly on private and council land); and
- failure to engage local communities in Bushfire Management Area Planning.

These gaps reflect an attempt to implement wholesale reform to a process fundamental to community safety on a 'cost neutral' basis over more than a decade. Significant Australian Government grant funding was provided to the CFS to develop the initial set of BMAPs. However, except for the Burning on Private Lands Project (as detailed in Finding 5.5.3), there is no management structure or implementation framework established around them. The CFS must have adequate resources and capability to fully implement the 2009 FES Act amendments and achieve the intended community safety outcomes.

> The CFS must have adequate resources and capability to fully implement the 2009 FES Act amendments and achieve the intended community safety outcomes.

5.2 State bushfire management plan – role and status, reporting, accountability

5.2.1 Finding

The State Bushfire Management Plan is intended to provide strategic coordination and guidance on all elements of bushfire management across PPRR but this does not appear to be its function in South Australia.

The draft State Bushfire Management Plan 2010 is incomplete and outdated. As stated in Finding 5.1.1, it has no force or effect as it has never been presented to the Minister for his approval pursuant to s.73(9) of the FES Act. It needs to be redeveloped in accordance with the requirements of the FES Act as a matter of urgency.

The existing draft document does capture the intent of the plan under the 2009 amendments to the FES Act. These changes largely mirrored the bushfire management framework adopted by the New South Wales Rural Fire Service. In that context the SBMP is intended to fulfil a coordination function. It is required to provide:

- overarching guidance about bushfire risks in South Australia (including principles for achieving appropriate levels of hazard reduction);
- standards and requirements for preparing and implementing Bushfire Management Area Plans; and
- requirements for coordinating and integrating bushfire management activities across the PPRR spectrum.

In this sense, the document is in the form of a Control Agency plan for the purposes of s.5A(3)(b) of the *Emergency Management Act 2004 (EM Act).* Indeed, the 2010 draft SBMP sought to fulfil the requirements of the then Hazard Leader Plan for the purposes of the EM Act. A finalised plan with appropriate reporting and accountability mechanisms is required.

05. Prevention

5.3 Bushfire management planning process

5.3.1 Finding

Fire management plans in the CFS and state land management agencies have different risk assessment processes and these plans are not integrated.

5.3.2 Finding

Risk assessments in existing Bushfire Management Area Plans do not comply with the international standard for risk management (ISO 31000) or NERAG and there are no clear lines of accountability for mitigating risks.

BMAPs identify assets at risk from bushfire, assess the impact of the bushfire and allocate mitigation (or treatment) strategies. The current approach to assessing the risk ratings of fires in the state's nine Bushfire Management Areas as recorded in BMAPs is based only on the likelihood of fire rather than also considering its potential impact.

For example, the potential loss of a single dwelling is given the same likelihood rating as the loss of a hospital or electricity substation even though the potential for loss of life and/or disruption to services is far greater with the latter. This is because the BMAP risk assessment process is not based on ISO 31000 Risk Management and the NERAG.

Furthermore, the mitigation strategies identified in BMAPs are high level and do not guide specific on-ground actions or display them spatially (e.g. through bushfire management zoning). Also, until recently, the BMAP process did not include environmental assets, and still does not include assessment or spatial representation of landscape scale risk.

In addition to (and in many cases, preceding) BMAPs, South Australian land management agencies (DEW, SA Water and Forestry SA) have developed Fire Management Plans for their major landholdings. DEW's most recent plan is a multi-agency, cross tenure plan for the South Para Region of the Mount Lofty Ranges. While this pursues a governance approach and planning framework compliant with ISO 31000 and NERAG, it is not integrated with BMAP due to the different risk assessment methodologies.

The state's development planning regime also includes Bushfire Prone Area (BPA) mapping, which is based upon hazard assessments. A number of stakeholders drew the Review's attention to the discrepancies between BMAP risk assessments and the BPA hazard assessments, and the lack of integration of these processes.

Before BMAPs were introduced in 2015, local councils were responsible for developing bushfire, prevention plans for their areas. In some instances these plans were more detailed than the current BMAPs and included implementation plans which identified and prioritised on-ground actions. Unfortunately, local councils no longer develop these plans and the BMAP process does not yet adequately bridge this gap.

Based on these observations, the Review supports redeveloping the BMAP process (as detailed in 5.6) including **a system to monitor implementation of strategies to ensure there are clear lines of accountability for mitigating risks.**

5.3.3 Finding

DEW has developed an excellent spatial tool which can assist stakeholders to understand the relationship between fuel hazard and fire behaviour, and property and landscape risk.

DEW has developed an excellent spatial tool piloted as the Fleurieu Peninsula Fire Management Plan, to analyse bushfire risk and help stakeholders understand fuel hazard and fire behaviour. This development recognises that the current planning processes are unresponsive to climate and environmental changes and new knowledge, including operational learnings.

Historically, DEW Fire Management Plans have been prepared on a 10-year cycle rather than an agile fire management planning regime driven by real-time data, modelling and continuous improvement. DEW outlined several reforms to the agency's Fire Management Planning process and

has demonstrated the new Simulated Impact Model (SIM) tool. These proposed changes, including the use of sophisticated spatial data modelling to support risk assessment and treatment, are critical if the agency is to become more agile and responsive.

One of the outputs of the SIM tool, Property Risk, is shown in Figure 12. The cell of ignition origin is displayed by a purple star. The size of the glowing dot indicates the probability of ignitions impacting on built assets. The greater the size of the star, the more assets affected by the simulated bushfires started from the ignition scenarios within that cell. Impacted assets, (assets that have been impacted by a simulated fire intensity above 10,000kw or an ember density of 2.5/m2 or greater), are represented by a small square. A darkening shade of yellow represents a higher frequency of impacts and the red areas represent most frequently impacted assets. They can be used to strategically assess and mitigate bushfire risk to built assets.

Another output of the SIM, Landscape Risk, is shown in Figure 13, over page. The cell of ignition origin is displayed by a peach coloured star. The greater the size of the star the more area burnt because of the simulated bushfires started from the ignition scenarios within that cell. A heat map shows the number of times something has been burnt and the brighter the pixels, the greater the frequency of being burnt by simulated bushfires. Together they can be used to strategically assess and mitigate bushfire risk in the landscape.

The CFS must be resourced to fully implement the bushfire management framework under the FES Act. This includes redeveloping BMAPs throughout the state using the DEW SIM tool with the addition of:

- weighted consequence to assets;
- spatially captured bushfire management zones;
- specific risk treatments allocated to responsible agencies; and
- an online reporting tool.

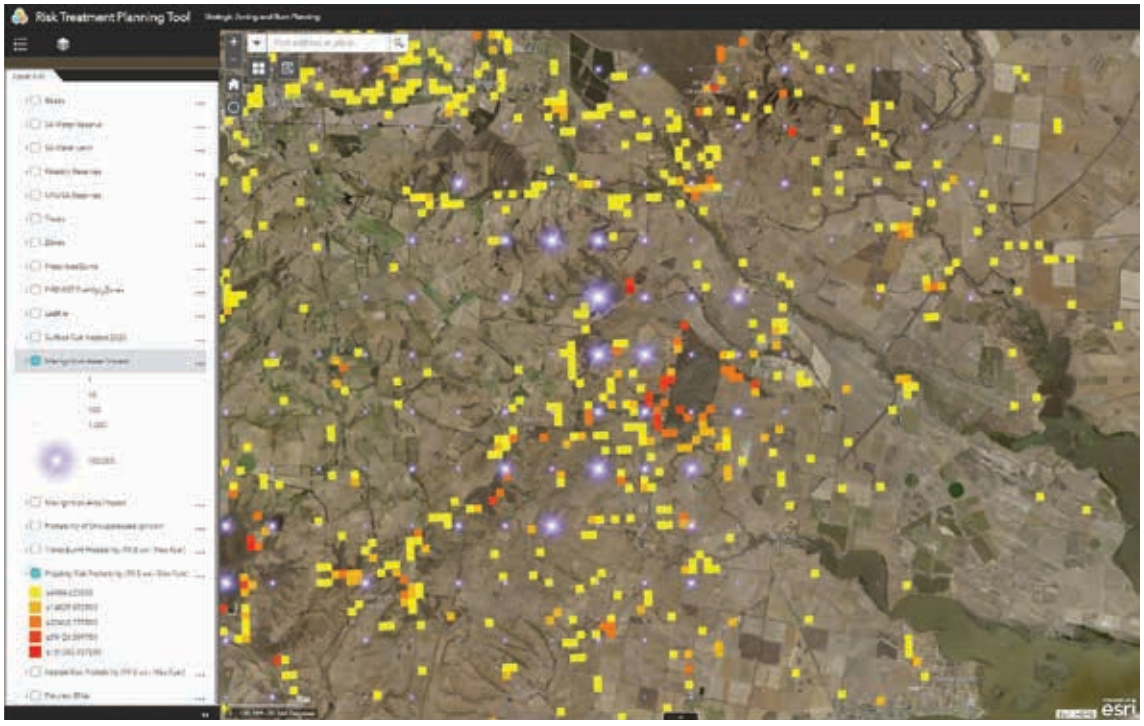


Figure 12 Property Risk as displayed by DEW SIM tool.

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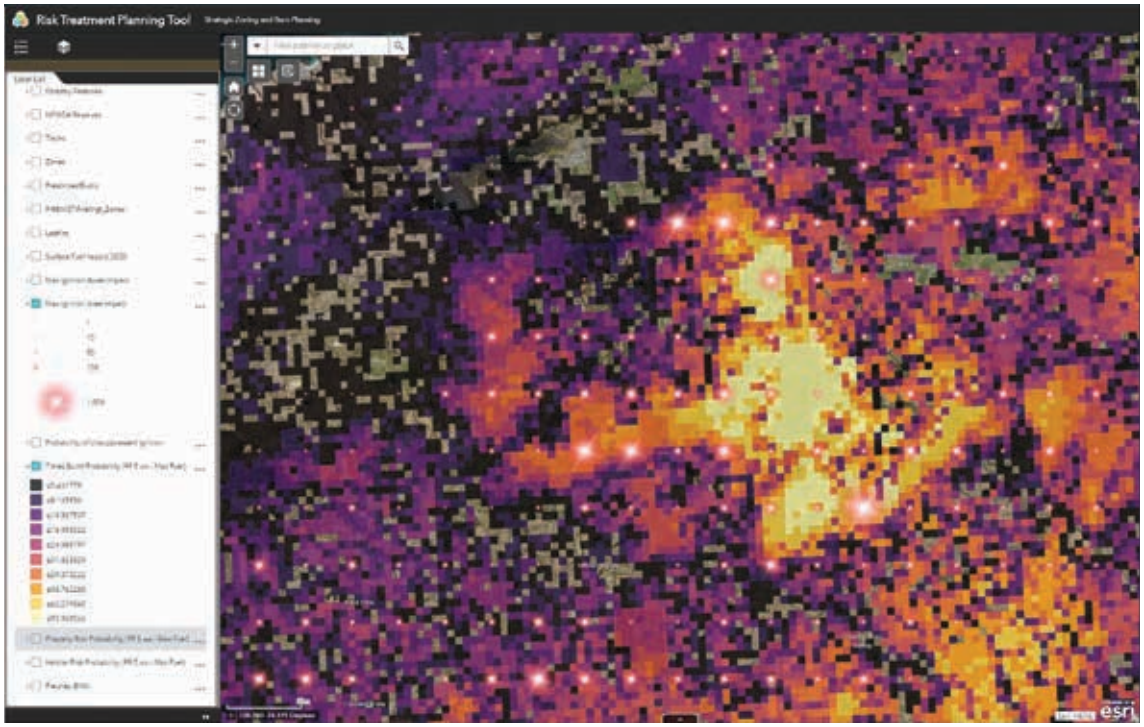

Figure 13 Landscape Risk as displayed by DEW SIM tool.

It is also important that communities are comprehensively engaged with redeveloping their BMAP to better understand their bushfire risk.

5.4 Native vegetation management and codification

5.4.1 Finding

The Native Vegetation Council (NVC) is criticised for being slow to respond to hazard reduction applications but the problem appears to be with the community's understanding of the process.

The current regulatory framework for managing native vegetation fire hazard reduction largely delegates authority and responsibility to the CFS and BMAPs under the FES Act. Although these reforms have been in place for over a decade, it appears that they have not been communicated effectively. The Review heard overwhelming evidence from community members and stakeholders that they had been unable to apply these provisions to native vegetation management for fuel hazard reduction.

However, the Review heard that it is possible that the community does not understand the application process.

The *Native Vegetation Act 1991* and *Regulations* were amended after the 2009 Victorian Bushfire Royal Commission into the Black Saturday Fires to give authority to approve or undertake fuel hazard reduction activities to individual landholders and the Chief Officer of the CFS. This aligned with the FES Act, the establishment of a SBMP and BMAPs Further amendments to streamline the application processes for fuel hazard reduction were enacted in 2013, 2014 and 2017.

As a result of these amendments, the NVC is now mostly removed from the fuel hazard reduction process except for directly approving a small number of ecological burns on private land

(approx. five per year). The NVC also provides private landholders with information about applying to clear native vegetation and provides annual training to CFS officers responsible for approving the applications.

Yet, despite these arrangements being in place for over a decade, it appears they are poorly understood by private landholders (i.e. landholders do not understand what they can clear or what the process is to gain approval to clear). The Review heard that at the time of the transfer of responsibilities from the NVC to the CFS no additional resources were provided. Furthermore, CFS officers are not fully equipped to approve native vegetation clearances for fuel hazard reduction despite the training they receive from the NVC.

The NVC believes that 'managing and clearing vegetation for fire prevention and control, whilst minimising impacts on biodiversity, requires a level of skills, expertise and knowledge in ecology as well as fuel management'. The NVC added that 'it is not possible to cover the diversity of vegetation and options for confident assessment in the field, particularly in complex vegetation environments' in an annual training session (NVC, 2020, p. 5).

Having said that, one application brought to the attention of the Review indicated that the ambiguity in this area has resulted in the NVC taking more than two years to consider approval for an application regarding vegetation clearance on KI.

5.4.2 Finding

The processes involved in seeking approvals for fuel reduction strategies are confusing and poorly understood by the community and the CFS needs greater capacity to support native vegetation management.

The community lacks understanding and capability to manage fuel reduction – particularly around prescribed burning on private land. While the State Government's 'Guide for Managing Native Vegetation to Reduce the Impact of Bushfire' 2009 (the Guide) was intended to help landholders understand what they can and can't do, and to assist them apply to the CFS to manage native vegetation, the Guide is outdated and not sufficiently simplified.

Therefore, the Review supports an approach to hazard reduction like the New South Wales Rural Fire Service (NSWRFS) 10/50 vegetation clearance framework supported by a more comprehensive community awareness programme, including a Code of Practice for Fuel Hazard Reduction on Private Land. The CFS needs suitably trained and experienced staff to undertake vegetation clearance assessments.

The *Native Vegetation Act* and *Regulations* currently:

- allow clearance for fire protection 20m around dwellings, 10m around buildings and 5m around property boundaries without approval;
- allow additional clearance, with CFS approval (Chief Officer or delegate), for fire breaks, fire access tracks, fuel reduction zones and prescribed burning;
- allow clearance to occur in accordance with approved BMAPs;
- provide approval for clearance undertaken in accordance with a Bushfire Plan (e.g. DEW, SA Water or ForestrySA Fire Management Plan), or prescribed burning for ecological management;
- provide CFS officers with authority to undertake native vegetation clearance when acting in an emergency to protect people and property in line with the FES Act.

Refer to Figure 14, over page.

It appears that private landholders who want to undertake prescribed burning on their own properties are unaware that the option for burning on private land exists under the Regulations. Moreover, the application process outlined in the Guide is confusing and applicants are required to develop an operational burn plan involving considerable understanding of fire behaviour and risk management.

While some of this knowledge remains in the community, particularly in rural areas, much of this knowledge has been lost and the community is looking to state government to reduce fuel loads. The CFS has the role of supporting this process under the *Native Vegetation Regulations* but it is simply not resourced to provide this level of service to the community.

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Native Vegetation Clearance for Fire Management

Authorising

The Native Vegetation Council, supported by DEW is responsible for administering the *Native Vegetation Act 1991*, which provides protection for native vegetation in the state and establishes the legislative framework for its management and removal. This applies across all land tenure, both public and private.

Native Vegetation Act 1991
Protects native vegetation across South Australia (except metro Adelaide)

Regulating

The Native Vegetation Regulations prescribes the circumstances in which native vegetation may be cleared and the process that is to be followed.

Native Vegetation Regulations, 2017
Allows clearance in certain circumstances such as fire protection and management

Implementing

The Native Vegetation Regulations allows for the clearance of native vegetation for fire protection purposes both with and without approval of the NVC, as well as authorising other bodies and processes to permit the clearance of native vegetation where required for fire protection and management.

Clearance allowed for fire protection without approval

20m around dwelling*, 10m around building, 5m around property boundary (each side)
**does not apply to large trees*

Clearance allowed with CFS approval (Chief Officer of CFS or delegate)

Fuel reduction; Fire breaks, Fire access tracks, Prescribed burning

Clearance allowed in accordance with BMAP without further approval

BMAP (Bushfire Management Area Plan) developed by Bushfire Management Committee and approved by State Bushfire Coordination Committee under *Fire and Emergency Services Act 2005*.

Clearance approved by Native Vegetation Council

Clearance undertaken in accordance with a Bushfire Plan (e.g. DEW Park Fire Management Plan), or prescribed burning for ecological management

Clearance required in emergency situations

MFS, CFS and SESofficers acting in accordance with *Fire and Emergency Services Act 2005* during a bushfire incident

Figure 14 Source: DEW, 2020.

The DEW/CFS Burning on Private Land Project is an excellent mechanism for providing support in the peri-urban areas but it needs to be significantly expanded into rural areas by building operational capability of CFS volunteers and landholders.

5.5 Hazard reduction – prescribed burning, compliance, shared responsibility

5.5.1 Finding

The level of fuel reduction permitted on private land is unclear and there is an inconsistent approach to compliance action (Section 105 Notices) to reduce fuel hazards.

A range of stakeholders and community members reported that administration of hazard reduction compliance is patchy and lacks standardisation, particularly on private land. Detailed standards, guidelines and resourcing are needed to help manage compliance.

The role of local government in fire prevention diminished when the FES Act was amended in 2009 as the sector no longer had responsibility for managing Bushfire Prevention Committees. However, its other educational and land management functions in relation to fire prevention remained unchanged. Although the legislation still required local government to play a role, many councils took the opportunity to reduce resources committed to fire prevention activities. Ten years on, this has resulted in a situation where there are now relatively few council fire prevention officers who do not also hold other multiple roles (such as general inspectors, rangers etc.).

There is a clear and urgent need for a Code of Practice around enforcing compliance of hazard reduction by private landholders, as provided for by Section 105F (3) of the FES Act. The SBCC identified the need to prepare such a Code of Practice but this has not progressed.

The current situation contrasts to the earlier Bushfire Prevention Committee era when detailed standards such as the required height for slashing and the width of fuel reduced breaks were specified by the committees for use in compliance notices.

Some submissions to the Review questioned requirements included in hazard reduction compliance notices, suggesting they were based upon the 'opinion' of the fire prevention officer. These officers have a compliance role in addition to an educative and advisory role but there are currently no common standards for hazard reduction requirements to assist them in transparently and effectively issuing s.105F notices – or for that matter issuing notices applying to other land tenures (which include council, Crown and commonwealth lands).

A Code of Practice properly resourced to enforce fire prevention activities to meet obligations under the FES Act is required as mentioned above. Accountability for compliance activities needs to be reinforced through the BMAP process with a single central repository of data maintained on s.105 notices.

5.5.2 Finding

Fuel reduction strategies such as prescribed burns tend to be short term and are incorrectly viewed as the panacea for reducing bushfire risks.

'Prescribed burning' is the planned application of fire under prescribed environmental conditions and within defined boundaries to achieve a management objective. It is usually used to reduce fuel hazard immediately adjacent to assets and to strategically reduce fuel loads in zones across the landscape to impede the spread of large bushfires (AFAC 2015).

Its effect in reducing hazards is highly dependent on the location of the burn, the fuel type, the intensity of the burn, and the time since it was last burnt. For example, a moderate intensity prescribed burn in stringy bark forest in the Mount Lofty Ranges may only have a measurable impact on fire behaviour for 5-7 years (although the effect of the reduced bark hazard in reducing long range spotting may persist for a longer period).

It is also not well understood that bushfires will continue to burn under extreme conditions and they will be difficult to control even in areas devoid of native vegetation. According to the Bushfire and Natural Hazards Cooperative Research Centre

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Extract from Dr Kevin Tolhurst AM Report *'The Nature of the Fatal Bushfires in South Australia, December 2019/January 2020'*

The chocolate brown areas on the fire history map are prescribed burn from 2015 to 2017. In the case of the fire area marked A, this area helped stop the initial run of the fire on 30 December and prevented a large area from being burnt by the subsequent run on 3 January. The 'shadow' created by this fire scar is about 5 km wide and 10 km long, so about 5,000 ha remained unburnt because of this fire scar of about 500 ha. Areas B and D, did not change the extent of the fire, but they did remain unburnt after the 3 January. Area C appears to have created an unburnt patch, of about similar size to itself, downwind of its location.

Clearly, areas burnt within the previous 10 years have an impact on reducing the extent and/or severity of wildfires. This would suggest that much more extensive prescribed burning would be beneficial in limiting the extent of wildfires. It is acknowledged, however, that because much of the terrain in this area is inaccessible, unbounded 'finger burning' should be considered rather than block burning to mineral earth fire boundaries.

Unbounded prescribed burning is a known and used practice in South Australia (and) has been used in conservation areas on the Eyre Peninsula and in the Riverlands/Murraylands. This indicates that knowledge and procedures already exist in DEW to undertake such prescribed burning. My recommendation (is) that unbounded prescribed burning should be supported, developed and encouraged to be used more regularly and more widely. Institutional impediments that limit the use of unbounded burning in remote areas should be examined with a view of reducing any such impediments and for looking at ways to provide more resources to undertake such prescribed burning in the future.

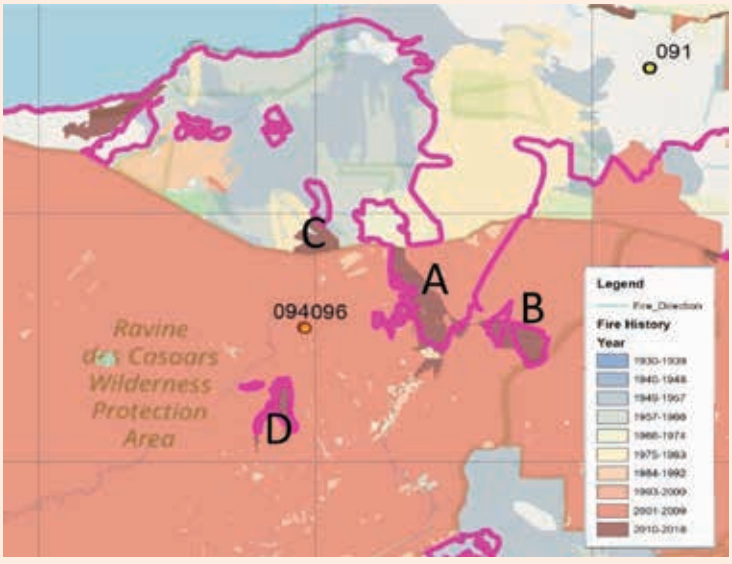

Figure 15 Effect of recently burnt areas on wildfire spread. Two burn scars from prescribed burns since 2015. Pink line shows the boundary of the 2020 fire.

(BNHCRC) 'the effectiveness of most prescribed burning on stopping runs of large fires will be minimal (on extreme days) because medium and long-range spotting will see these large areas overrun' (BNHCRC, 2020, p. 3).

> The effectiveness of most prescribed burning on stopping runs of large fires will be minimal (on extreme days) because medium and long-range spotting will see these large areas overrun.

However, research has shown that prescribed burning near houses is effective in reducing the intensity of the fire, thereby reducing house losses (Florec et al 2020).

Strategically reducing fuel across the landscape also has an important role to play in minimising the spread of fire and helping to suppress it, particularly on days of lower fire danger. For example, DEW noted that 'of the fuel reduction activities conducted in the parks and reserves of western Kangaroo Island in the last seven years, it is evident that these did provide some strategic advantage in combating the impacts of the fires on the lower fire danger days' (DEW, 2020, Attachment 7).

This observation was also noted by Associate Professor Tolhurst (Tolhurst 2020) (cited in 4.1) (refer Figure 15). Low fuel areas created by prescribed burning are particularly important for campaign fires, fought over many days or weeks, where there may be opportunities to suppress the fire before the weather escalates.

It can be difficult and risky for land management agencies to undertake prescribed burning in a controlled, effective, and cost-efficient manner. Burns need to be undertaken in autumn and spring to reduce fuel hazards, and sometimes in early or late summer to meet ecological objectives. It is well documented that the changing climate is leaving a narrow window for safely conducting prescribed burning.

Prescribed burning becomes even more challenging in remote areas with minimal or no access in to large continuous areas of vegetation (including Kangaroo Island, the Eyre Peninsula, and the Riverland). In these areas, unbounded burning is required (i.e. burning without the benefit of control lines). 'Unbounded burning', particularly in mallee fuels, requires lighting fire in elevated weather conditions and then relying on the ensuing weather to extinguish the fire or moderate its behaviour sufficiently to allow mop up.

This requires an expert understanding of local weather and fire behaviour, built up over many years. These operations are high risk

They also attract criticism from the public, who do not always understand the conditions required to implement large scale burns. To successfully implement unbounded burning it is imperative to have a social license to burn built on strong relationships with the local community together with government and industry support.

Without intervention, the areas burnt during the 2019-20 bushfires will become easier to manage over the next few seasons but the cycle of fuel load with its attendant fire risks will return in 5-7 years.

5.5.3 Finding

The community does not appear to understand that public land management agencies are only responsible for part of the total fuel hazard in South Australia (e.g. 39% in Mount Lofty Ranges) and prescribed burns are needed on both public and private land to reduce risks.

In the Mount Lofty Ranges, public land management agencies (DEW, SA Water and ForestrySA) deliver an annual prescribed burning programme. Until recently, most of this programme was undertaken on government (public) land and while it has reduced the risk of bushfire around public land, it is wrong to assume it has mitigated the risk to people and property across the landscape.

The 2009 Victorian Bushfire Royal Commission into the Black Saturday Fires found most deaths and damage to private assets resulted from the fires travelling over private land immediately before

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impact (BNHCRC, 2020, p.3). The damage to private assets was also observed in the Cudlee Creek and Kangaroo Island fires. The BNHCRC suggests that ignoring this fact is 'dangerous and inconsistent with the arguments relating to shared responsibility outlined in the Royal Commission report and enshrined in the National Strategy for Disaster Resilience' (BNHCRC, 2020, p. 3).

For greatest risk reduction, prescribed burn programmes must be applied at a landscape scale across both publicly and privately owned land. This is particularly true in the Mount Lofty Ranges, where 61 per cent of native vegetation (with high to extreme fuel loads) is privately owned.

Recognising the need for a tenure-blind approach to prescribed burning, the South Australian State Government commenced the 'Burning on Private Land Project' in 2016 to enable DEW, in partnership with CFS, to extend its prescribed burning to include strategic locations on privately owned lands. This programme has been well received with over 90 per cent of landowners approached approving burns on their land. DEW notes that 'without professional support, land owners are highly unlikely to conduct these strategic burns and instead opt for inappropriate alternatives such as mechanical land clearance, which can compromise environmental assets, or choose to undertake no hazard reduction activities at all' (DEW, 2020, p. 5).

> Without professional support, land owners are highly unlikely to conduct these strategic burns and instead opt for inappropriate alternatives such as mechanical land clearance, which can compromise environmental assets, or choose to undertake no hazard reduction activities at all.

The Review received numerous testimonials from landholders in the Mount Lofty Ranges commending the Burning on Private Land Project and supports increasing resources to enhance its delivery in the peri-urban environment and to expand into more rural areas of South Australia (as detailed in Finding 5.4.2)

Photo courtesy of Elizabeth Mapletoft

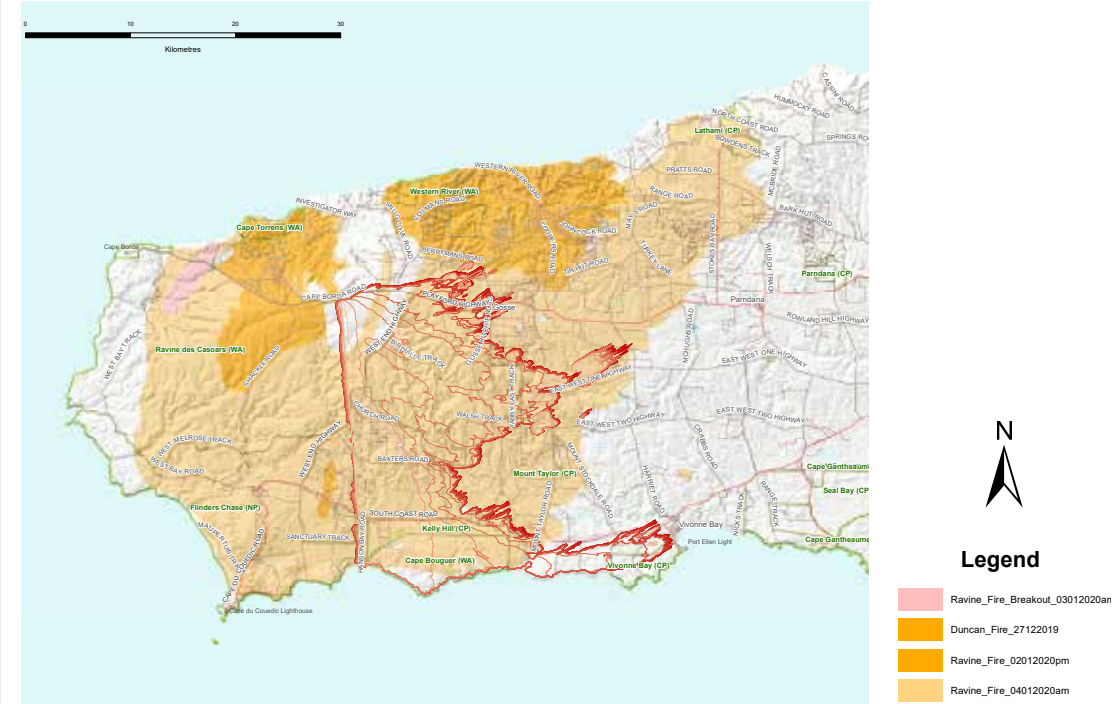

Figure 16 Ravine Fire (KI) Example of Fire Prediction Map.

5.6 Data for risk intelligence

5.6.1 Finding

Better systems are needed to share data across emergency and land management agencies to support the flow of information to IMTs and the SEC.

Systems are needed to share data across agencies with a whole of government approach to data management. Multiple information management systems operate in parallel across emergency and land management agencies and sharing data across agencies does not happen automatically. Several key stakeholders noted the difficulty in obtaining timely common operating data to support incident management and state coordination. Often critical information about an incident had to be manually transferred between agencies operating within an IMT, and between an IMT and state coordination entities. Manual capability is an important redundancy but it is not the optimal approach in time-critical situations demanding a high level of accuracy.

Incident mapping and spatial data is managed by the Mapping Functional Support Group (MFSG) (led by DEW) under the State Emergency Management arrangements. While MFSG's work is highly regarded, platforms for housing and transferring spatial and other data during incidents need to be integrated and consolidated. Data collation and analysis is not only about hardware and software; it needs to value add by providing risk intelligence to support emergency management planning and decision-making. This capability is not currently available and should be developed, particularly to support predictions.

Fire spread predictions (Figure 16) and forecasts were very valuable for IMTs during the 2019-20

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bushfires but the scale of operations pushed these services to their limit. Small numbers of qualified Fire Behaviour Analysts (FBAns) were borrowed from other duties[4]. The Review heard of the value of fire predictive mapping provided by DEW FBAns with supporting information from BoM during the fires and regards this as a significant capability.

It has been suggested to the Review that a dedicated Intelligence Functional Support Group be established under the State Emergency Management Plan. Such a group could be initiated but would need substantial investment to provide and co-ordinate an all hazards emergency management sector-wide intelligence, information, and data platform for holding, sharing and analysing information.

The CFS, DEW, Department of Primary Industries and Regions SA (PIRSA), and DPTI all have data warehouses. Current SEMC data projects are progressing at various rates with DPC, DEW and DPTI as lead agencies.

In addition a plethora of projects in the natural hazard/disaster risk data and intelligence space are being developed across government, local government and non-government organisations. Some of these are driven by the desire to have access to better data to inform strategies for climate change mitigation and management.

To have so many different projects in different levels of government across different agencies is creating confusion and potentially duplicated work. Many of these projects are not led by or do not involve the organisations that have legislative responsibility for emergency management. Leadership and coordination of these activities is urgently required.

The Office of Data Analytics (ODA) within the Department of the Premier and Cabinet (DPC) would be well placed to lead a collaborative whole of government review of a comprehensive risk intelligence data platform for natural hazards, encompassing all elements of emergency management.

4 The Bureau of Meteorology is progressively implementing a national system of resource coordination address the growing requirement for severe weather forecasting services

Photo courtesy of Ray Jackson

Photo courtesy of Mark Roberts

5.6.2 Finding

Existing risk intelligence data for bushfire prone land is not in real time whereas other governments have risk data readily available to the public.

While South Australia was the first state to make bushfire prone land mapping publicly available, it had not updated this work since its initial release commencing in the late 1980s. In the meantime, other jurisdictions have developed sophisticated online risk mapping tools which provide critical intelligence to the community, as well as government and industry stakeholders. Examples included Tasmania's *Risk Ready* tool and the *Brisbane City Council Flood Awareness Map*.

Tasmania's *Risk Ready* tool includes real-time bushfire risk mapping that is updated using the *Phoenix RapidFire* modelling tool, showing the projected reduction in bushfire risk where hazard reduction works have been completed.

A collaborative whole of government review of risk intelligence data led by the ODA, could also redevelop bushfire prone land mapping in South Australia for publication online.

Photo courtesy of Lucas Hobbs

6.0 Preparedness

The evidence around the preparedness phase points to a need for wide-ranging investment including in:

- **Public information** on preventable fires and high-risk activities; safe evacuation, what to bring to *Safer Places* and *Places of Last Resort.*
- **Modernising the vehicle fleet** - particularly with AVL capability – Vehicles also need Burnover Protection Systems (BOPS).
- **Real-time lightning tracking and rapid response** - with pre-planning for aerial reconnaissance and suppression and specialist remote ground crews for inaccessible terrain where lightning is forecast.
- **Appropriate facilities for Incident Management Teams**
- **Interoperable systems and processes** - A whole of government incident management system, or information sharing across Emergency Service agencies, VHF radios for agencies and contractors to improve communications with the fireground.
- **Intelligence about infrastructure assets** - asset protection priorities and post fire impact damage assessment.
- **Policies about deploying resources** interstate to protect the welfare of firefighters.

Other issues included in this chapter are:

Insurance - stamp duty concessions on insurance to promote insurance uptake (especially for low income earners). National standards on bushfire resilience for properties are also needed.

Planning for evacuations is needed - including self-evacuation and directed evacuation.

Operations planning – particularly around logistics and resilience needs to be regionally specific, particularly in relation to remote areas such as the Yorke Peninsula and the at times difficult to access areas such as Kangaroo Island and the Eyre Peninsula.

ADF Resources - ADF capabilities are not well understood by civilian agencies or the community.

Capability development - Consistent training and recruitment for fireground leaders in fire incident management, as well as better succession planning.

Other roles in the CFS need induction training not just filling in such as in the SEC and SCC.

Training in firefighting techniques - More CFS training and exposure to basic firefighting techniques for 'mopping up' activities, supported by ready access to handheld thermal imagery technology.

Staffing in peri-urban areas - The Review identifies the need to examine the current approach to deploying fire and rescue services to peri-urban areas given rising demand and complexity of incidents in some places.

The ABC - Given the ABC is the emergency broadcaster, any move to a new location for emergency management operations needs to include a position for the ABC to ensure accurate information is provided to the public.

Greater public information is needed around what people can and cannot do during the fire danger season.

Government of South Australia

6.0 Preparedness

6.1 SAPOL Operation NOMAD

6.1.1 Finding

SAPOL's Operation Nomad is an effective strategy to minimise risk during periods of high fire danger but additional public information is needed about high-risk activities.

While SAPOL has an effective programme – Operation Nomad - to help reduce deliberate or recklessly caused fires, greater public information is needed around what people can and cannot do during the fire danger season (FDS) and on high fire danger days.

Operation Nomad is a highly visible SAPOL bushfire prevention initiative undertaken to support the CFS, proactively patrolling areas identified as being high bushfire risk. The SAPOL Police Operations Centre (POC) can be activated to ensure support and oversight of Operation Nomad activities. A dedicated intelligence function identifies relevant offences, arson trends and persons identified as having a higher propensity to be involved in causing fires. These people are actively engaged and spoken to during the FDS. Any breaches of fire laws are strictly enforced with a low tolerance for any unlawful or reckless behaviour given negligent acts caused 75 per cent of the 406 'non-suspicious' Nomad fires reported during the 2018-19 FDS (SAPOL internal review of Operation Nomad, 2019).

SAPOL's State Community Engagement Section supports the operation with a crime prevention strategy. The Officer in Charge of this section chairs the Fire Prevention Strategic Alliance (FPSA) comprised of key agency and industry stakeholders aimed at reducing deliberate and accidental bushfires.

An internal SAPOL review identified a number of potential improvements including greater governance for the FPSA by having it report to the State Bushfire Coordination Committee. (SAPOL internal review of Operation Nomad 2019). The SAPOL review

Photos courtesy of SAPOL

also recommends that, along with 'deliberate', 'suspicious', 'non-suspicious' and 'undetermined' descriptors of fires, a new descriptor of 'preventable' is introduced to highlight the large percentage of preventable fires that are caused by activities such as the use of power tools or harvesting.

It is clear the public lacks understanding about what activities can and cannot be done during the FDS and on fire ban days. The SAPOL review identified the need for continued community education on fire laws and bushfire prevention by SAPOL and the CFS along with all other key stakeholders. FPSA could also play a role in educating the public and industry members as well as promoting greater liaison and information sharing within the Alliance.

Overwhelmingly, feedback received about Operation Nomad and its effective contribution to reducing the risk of bushfire ignitions was positive. It is clearly well received by the public, other agencies, the business and industrial community. The Review noted the findings and matters in SAPOL's recent internal review of the operation and commends the agency for the programme's success.

6.2 Insurance and Community Preparedness

6.2.1 Finding

Many properties and businesses were not insured — the reasons for which are not yet determined. Stamp duty concessions on insurance could be provided to reduce costs.

Insurance must be promoted to support resilience and recovery. This includes ensuring that the wide range of market options available to individuals and businesses in different circumstances are well publicised. Stamp duty concessions could be provided on insurance, particularly for low income earners, to encourage greater uptake as has occurred in other states.

A significant proportion of properties and businesses were underinsured or uninsured in South Australia during the 2019-20 season. This impacts the ability of a community to rebuild and recover when it occurs on a significant scale. This is exacerbated by the cost of site clean-up, which can be $50-100K per site. This cost is deducted from insurance payouts unless it is covered by government.

Information about the bushfire risk of an area directly influences insurance premiums. If this information does not reflect actual bushfire risk at a point in time - for example, if a risk has been reduced by recent local hazard reduction works, or by a home owner improving the resilience of their property - the premium may be higher than it could otherwise be. This further points to the need for real time risk intelligence data.

> ...only 10 per cent of properties in bushfire-prone areas of Australia are resilient to bushfire...

Australian standards for property resilience are needed. In the absence of agreed standards, property owners do not have definitive guidance on how to decrease the risk of their property being destroyed by bushfire. The insurance industry also has no standards against which to scale premiums. The Bushfire Building Council of Australia (BBCA) is developing Bushfire Resilience Star Ratings and estimates that only 10 per cent of properties in bushfire-prone areas of Australia are resilient to bushfire, underscoring the need for national standards to be developed as a matter of urgency.

6.2.2 Finding

Agencies should reinforce the message that individuals must take responsibility for preparing their own homes and having a bushfire plan, and that assistance through the '000' emergency call centre may be limited during a crisis.

While the CFS has invested significantly in community engagement and education to help landowners prepare for bushfires, more work is needed. Many people do not accurately perceive the risks of living in a fire-prone environment, according to research conducted by the BNHCRC after major fire events. Therefore, information on preparing the household for bushfires mostly goes unheeded.

6.0 Preparedness

While apathy or even ignorance of some landholders may be partially to blame, there has been a transfer of responsibility for protection against bushfire to emergency service organisations over many years. However, as pointed out by the Victorian 2009 Bushfire Royal Commission:

> *...that transfer of responsibility has probably gone too far. Individuals are no longer taking sufficient responsibility for their own risk management. It is analogous to the community not installing locks on houses because we have a police force to address the risk of burglary.*

The CFS should be commended for recognising the need for communities to take greater responsibility for their own bushfire safety and resourcing community engagement and education programs, such as Community Fire Safe, Bushfire Safety Week and Firey Women. Many submissions extolled the virtues of these programmes reporting that they are well received and useful to the community. Despite their popularity, they do not go far enough in prompting the behavioural change needed for people to take personal responsibility for their own bushfire safety and to build resilience.

Numerous submissions highlighted the need for further education or assistance on:

- How to prepare a property for bushfire (including where to get advice on hazard reduction and native vegetation clearance);
- How to write a bushfire survival plan;
- How to defend a property if choosing to stay and defend;
- How to apply for a permit to burn and how to conduct a burn; and
- What can be expected, in terms of assistance, during an emergency event.

This points to a need for continued investment in the CFS's existing community engagement and education programmes. These programs should be targeted via the BMAP process and supported by a more coherent process for native vegetation clearance approvals and Code of Practice for Fuel Hazard Reduction on Private Land (as outlined in Finding 5.4.2).

Local government submissions indicated that many residents in high risk areas want feedback on their bushfire survival plan and preparations by a suitably trained and qualified professional. While this brings up issues of liability, it is an area that needs to be explored, noting that it is already happening to some extent through the DEW/CFS Burning on Private Land Project (as described in 5.5.3). These face-to-face services are critical to building people's confidence in their own preparations and decision making and should not be overlooked.

6.3 Incident Management Team Facilities

6.3.1 Finding

Facilities for IMTs in a campaign event do not meet accepted guidelines and impede the teams' effectiveness in delivering SEC directions and operational demands.

South Australia lacks appropriate infrastructure to support incident management for bushfires and other hazards. The dearth of command/control facilities has been consistently identified in previous bushfire reviews and is noted again in compromising IMTs during the 2019-20 bushfire season. This was particularly true for those managing the Cudlee Creek and Kangaroo Island fires.

In January 2018, the *Guidelines for Level 2 and 3 Incident Management Facilities* were approved as part of the Capability Plans within the SEMP. In early 2019, the SEMC undertook an audit of Level 3 Incident Control Centres which highlighted that none of the centres met all the criteria in the guidelines. Most of the facilities failed to meet the requirements for size, ablutions, security, smart technologies, backup water and power, access to IT including adequate internet connections, and meal and welfare areas.

IMTs cannot provide effective command and control while operating from sub-standard facilities, inappropriate locations, and where there is a lack of supporting infrastructure. The CFS should receive resourcing and funding to establish several strategically located, all-hazard operational

management facilities that can effectively accommodate an IMT and Zone Emergency Support Team (ZEST).

The Review received several complaints that IMTs were so busy that many calls were left unanswered. Obviously, better facilities to provide for scaling up of events will allow more staff to monitor radios and telephones. These issues were identified in early 2019 and are yet to be acted upon. This points to the need for better coordination between SAFECOM's legislative role and the CFS being properly equipped to carry out its tasks.

6.4 Evacuation planning

6.4.1 Finding

***Places of last resort* are not well understood by the community in terms of what possessions (including pets) should be taken to these locations.**

The CFS has instigated *Bushfire Safer Places* and *Places of Last Resort* to direct people where to go if they choose to relocate early or if their bushfire survival plan fails (i.e. they leave late). The Review found a need for better community understanding around the location and purpose of *Bushfire Safer Places* and *Places of Last Resort*. The functions and available facilities as well as the level of safety provided at these locations need to be clearly explained.

Research conducted by the BNHCRC after major bushfire events found warnings about leaving early are mostly unheeded which 'presents a challenge for authorities responsible for fire season preparations, as it results in a large percentage of people waiting to see what will happen, and in many cases sees them leave at the last minute' (BNHCRC, 2020, p. 1).

Leaving at the last minute is seen by Emergency Services as the 'worst case scenario' as it often puts people at greater risk.

Many injuries and fatalities are sustained during bushfires due to vehicle accidents caused by people attempting to flee on roads with poor visibility and traffic congestion. Initiating *Bushfire Safer Places* and *Places of Last Resort* is an attempt to mitigate these risks. However, there is confusion between a *Place of Last Resort*

Photo courtesy of Kirstin Abley

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Unplanned evacuation from bushfires can cause further risk

Photo courtesy of *The Islander*

and an evacuation, relief, or recovery centre. A *Place of Last Resort* is not an evacuation centre and should not be used as one. A brief description of *Bushfire Safer Places* and *Places of Last Resort* is provided below.

- Bushfire Safer Places: Adelaide Metropolitan area, outer suburbs, and rural settlements. To be used if residents need to relocate early. Suitable during forecast bad fire weather or during bushfire but may be subject to sparks, embers, and smoke.
- Places of Last Resort: Ovals, buildings in rural areas. To be used when a bushfire survival plan has failed. Not suitable for extended use and provide only limited protection during bushfire.

It is important that the community understands there are no facilities provided at *Bushfire Safer Places* or *Places of Last Resort* and people choosing to relocate to these sites must be self-sufficient. There may also be no room for trailers, caravans, and horse floats etc.

6.4.2 Finding

There is insufficient preparation around evacuations including assessment of suitable routes to designated locations to reduce risks.

Evacuations – both self-evacuation and directed evacuation – need better planning including 'worst case' scenario planning. The Review heard that a traffic bottleneck occurred during the Cudlee Creek fire when a large number of locals self-evacuated from Woodside (south) towards Nairne and, at the same time, locals from Nairne, Kanmantoo, Brukunga and Harrogate evacuated (west) either towards the SE Freeway or Mount Barker. One police officer working in the area recalled hearing from a fellow patrol member that there was an estimated 6km long bank up of traffic on Woodside road (headed to Nairne from Woodside).

The officer observed that, 'had this fire event continued directly towards the Nairne / Hay Valley region, there was the potential for many casualties owing to the congestion at the T-Junction' (Sergeant Andrew Ausserlechner, personal communication, 29 Jan 2020). Similar

experiences occurred interstate and it is clear that self-evacuation can lead to extremely dangerous situations if a traffic jam occurs and people have nowhere to shelter.

There were also directed evacuations during the Kangaroo Island Ravine fire, most notably Parndana on 3 Jan 2020 and Vivonne Bay on 9 Jan 2020 and during the Yorketown fire on the 20 Nov 2019. While these evacuations went without incident residents expressed confusion about where to go and how to get there.

Advice on evacuations is contained in the SEMP. The authority to cause or undertake an evacuation during a bushfire rests with the Control Agency (CFS), under the FES Act. Once the decision to evacuate is made, the Control Agency must communicate that decision to the Coordinating Agency (SAPOL) in line with the normal provision of advice to the State Coordinator.

A directed evacuation may occur following a declaration under Section 25 of the EM Act or pursuant to Section 43 of the FES Act. There is a need for better planning and processes for immediate directed evacuation of localities or townships and for self-evacuation of individuals and families. This should include traffic management plans and identifying evacuation and relief and recovery centres with more thought given to 'worse case' and 'what if?' scenarios.

6.4.3 Finding

Asset protection priorities must be made clear to reduce the loss of critical infrastructure such as telephone towers, with memoranda of understanding (MOUs) between EM agencies and providers.

Firefighters and incident management personnel need ready access to intelligence that clearly identifies asset protection and post fire damage impact assessment priorities. This information needs to be current and useable at the local, regional, and state level with pre-incident planning data around access, water points, and hazards. The information should then be reinforced in the lead up to high risk days, included in incident planning and referred to during operations to improve the operational effectiveness of firefighting personnel.

The Review understands that elements of this information are spread across multiple systems and between multiple agencies. Therefore, information cannot be seamlessly accessed and utilised during high-tempo operations.

During the 2019-20 fire season several critical infrastructure and community assets were destroyed or damaged by fire. Firefighters were largely relying on local knowledge to determine what critical infrastructure (and its location) to defend. This reliance on local knowledge is not ideal as it may not always be available during campaign fires where local crews are supported or replaced by firefighters from outside the area.

As a priority, the CFS should, as the Control Agency for rural fire, consider leading an across agency process to ensure that firefighters, IMTs, and emergency management leaders have access to information about what is at risk to help reduce the impact on critical infrastructure and community assets.

The Review suggests that a revitalised SBCC (in its role as the state's peak bushfire management body) supports this work to ensure effective visibility and participation across all sectors.

6.5 Regionally specific operations planning

6.5.1 Finding

Kangaroo Island burns differently to mainland firegrounds which needs to be reflected in logistics and resilience planning and preparation.

All regions present their own challenges for operational planning and delivery in bushfire incidents. Inevitably, more remote areas present greater challenges and require careful pre-planning to manage logistics and to build resilience and capability for rapid response. There are a few regions of South Australia that demand detailed operational pre-planning based on long term and seasonal risk.

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Photo courtesy of Steve Schueler

Figure 17 KI fire behaviour in coastal mallee heath, Kelly Hill CP – prescribed burn conditions April 2013, max FFDI 10-12 with wind speeds 10-15kph. Photo courtesy of Dave Taylor

Photo courtesy of Ryan Purvis

These plans, and the regional relationships they are built upon, must be adequately resourced, and continuously maintained and exercised.

For example, Kangaroo Island presents challenges due to its isolation, minimal infrastructure capability, and small population relative to its geographic size. Added to these factors, the extensive closed mallee heath vegetation burns with ferocity even under moderate conditions (Figure 17). Equally, the island has complex weather patterns with a long-term history of significant dry lightning events in late November and December igniting bushfires on the Island.

> Kangaroo Island is no stranger to major campaign bushfire events and, given this, there is a need to better prepare for an early and comprehensive bushfire response.

Kangaroo Island is no stranger to major campaign bushfire events and, given this, there is a need to better prepare for an early and comprehensive bushfire response. Bushfire ignitions on the island always have significant potential if they are not contained early.

Preplanning is required for rapid aerial reconnaissance and deployment of experienced specialist remote ground crews suited to working in inaccessible areas. Heavy plant and equipment need to be placed on standby to provide the best opportunity to contain ignitions before they develop into major fires.

In the knowledge that, in a range of conditions early containment will not be possible, cascading arrangements should rapidly scale up the response by deploying additional crews, with supporting resources, and base camp facilities especially on days when high ignition risk is forecast.

Many people raised with the Review that insufficient hazard reduction is being undertaken along major roads and that the rules regarding vegetation clearance were directed towards improving road safety and not hazard reduction. It is evident that many experienced firefighting volunteers see roadside vegetation as a 'wick' for fires to burn into other areas. If this is a problem on Kangaroo Island, it no doubt relates to other parts of the state as well.

Planning across the state should effectively engage all relevant local community, business, and government stakeholders, particularly the Kangaroo Island Sealink ferry operators. Once identified in planning, these types of logistical challenges should be exercised during the off season.

6.6 ADF deployment arrangements and capability

6.6.1 Finding

There is insufficient understanding of when and how the ADF can assist the civilian authorities.

6.6.2 Finding

While there was widespread community appreciation for the morale boosting efforts of the ADF their assistance had mixed reactions. Some saw advantages while others did not know how to use defence personnel without displacing local tradespeople/contractors.

ADF capabilities are not well understood by civilian agencies nor the community. For non defence personnel it is difficult to know what help to seek. The ADF chose not to make a submission to this Review, asking instead 'what did we need?'.

It must be said that this is typical of the issues identified in some submissions and interviews during the Review. That is not to say that ADF deployment was not greatly appreciated. The ADF was especially useful in assisting with restoring the water supply to Kangaroo Island following damage to the Middle River Water Treatment Plant. However, since it was an unusual situation, these capabilities were not well known and there was confusion around the tasks defence personnel could undertake.

Despite minor issues the effort of the ADF were very welcomed and lifted the spirits of some very exhausted volunteers and community members.

6.0 Preparedness

> ...the effort of the ADF were very welcomed and lifted the spirits of some very exhausted volunteers and community members.

Suggestions about employing the suite of ADF resources in the future included greater use of Defence aircraft to transport firefighters and equipment for deployments. Ongoing communication and regularly scheduled training between the agencies should occur so that the ADF can be more effectively and efficiently utilised. However, care must be taken to ensure that local businesses and suppliers are not excluded from roles they would normally undertake.

The most positive comments about ADF assistance were the roles they performed in problem solving and logistics. However on the downside the process to engage their assistance is lengthy and not well understood and may be addressed by the Bushfire Royal Commission.

6.7 AVL and resource management

6.7.1 Finding

AVL capability is urgently needed for both the vehicle fleet and the portable radios used by CFS, MFS, DEW and SES crews.

South Australia's firefighting fleet does not have AVL capabilities which is considered a non-negotiable safety measure that should be implemented. As stated earlier in this Review, in an age when every taxi and ride sharing platform has AVL, it is surprising that firefighting vehicles used regularly in high-risk, high-threat environments do not have this capability.

This recommendation has been identified in a number of previous South Australian bushfire reviews and a significant funding bid has been made to government to address this issue. This capability needs to be a priority as the state faces a future where the changing climate will likely influence increasingly dangerous bushfire events.

An AVL system, linked to the Computer Aided Dispatch (CAD) system, and installed across

Photos courtesy of ADF

the whole of the emergency service fleets would improve safety, enhance situational awareness and provide better information from the fireground. This would help incident management and command personnel to manage resources and expedite the flow of information to the public by making the SEC deliberations more timely.

> ...the inability to adequately account for personnel on the fireground is causing considerable distress.

The Review heard that the inability to adequately account for personnel on the fireground is causing considerable distress. This includes FFU members who self deployed. One officer gave a sobering account of being unable to provide information to family members calling for updates on the whereabouts of their loved ones. Many portable radios now have GPS capability and this is used by other emergency personnel in other states, e.g. NSW Ambulance Service. This type of GPS tracking included in portable radios may help to identify FFU personnel and their location as they are often first to the scene of a bushfire.

6.8 Fleet appropriateness/ fit for purpose

6.8.1 Finding

There is an urgent need to review the age and appropriateness of the bushfire vehicle fleet in CFS, MFS, SES and DEW, ensuring all vehicles are fitted with Burnover Protection Systems (BOPS).

Concerns were raised about the age of frontline fleet vehicles across the Emergency Services and there is a strong desire to ensure that assets are strategically distributed based on the type of vehicle/asset and its suitability to protect firefighters in extreme conditions.

As well as concerns about fleet age, numerous submissions and interviews addressed serious concerns about safety systems on vehicles, and the use of older vehicles that are inherently unsafe for high risk operations. Those without BOPS pose a significant risk for firefighters exposed to burnovers. The Review commends authorities for the work to install BOPS on vehicles, which when fitted, dramatically improved the safety of

Photo courtesy of Brett Atkins

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Photo courtesy of Danny Crozier

Photo courtesy of Rick Ewins

personnel. However, a number of vehicles exposed to burnover situations in the 2019-20 bushfires did not have the retrofitted safety systems installed.

South Australian fire agencies need to urgently prioritise fitting safety systems to ensure vehicles are fit for purpose ahead of the next fire season. If this cannot be completed in time due to the impacts of COVID-19, consideration should be given to identifying frontline fire appliances that do not meet the established safety standards and limiting them to support roles in rural incidents.

This particularly applies to older single cab fire trucks, many of which are 20+ years old and cannot be retrofitted with appropriate safety systems due to their design. While dual cab appliances are considerably safer and more comfortable for crews, a number of single cabin CFS vehicles are not due for changeover until 2025. The CFS requires funding to accelerate replacement of these vehicles from frontline operations.

The Review also heard that retired tankers are retained on Kangaroo Island as contingency vehicles but have limited equipment, questionable levels of maintenance, and lack many of the required safety systems.

The MFS and CFS report the average age of their fleet as 14.5 years which creates a potential risk that a considerable number of vehicles must be replaced in the next 5-10 years. Significant investment will be required to modernise or replace these vehicles. This should be done in a coordinated manner to ensure interoperability of vehicle types, brands, and designs.

6.9 Capability development

6.9.1 Finding

Better succession planning and recruitment is required as well as additional training and development for leaders who are often given just-in-time training for key roles.

The Review heard a range of issues pointing to the need for more consistent training and recruitment of leaders in fireground and incident management,

as well as a whole of government approach to workforce planning and recruitment. IMT capability and fireground leadership were consistently listed as concerns and several senior emergency management personnel suggested the state has a deficit in fireground knowledge and experience, particularly at divisional and sector commander levels. These roles are critical to fireground discipline and active succession planning is urgently needed to ensure adequate recruitment, training, and development of personnel to fulfil these roles.

There was frustration about ongoing communication breakdowns between IMTs and the fireground, and little action appears to have been taken to address this critical issue. Some submissions called for stronger links between fireground operations and IMTs through Divisional Commanders. Some observed Divisional Commanders turnover far too regularly during incident operations, partly due to failures in resource management and partly due to an insufficient number of capable operators at this level. In a crisis, there will be many reasons senior personnel turnover as events scale up. The Review was also made aware of the need for more efficient handover briefings when senior staff are rotated or deployed to other more urgent tasks.

Rotating senior fireground leaders reduces the capacity to develop and implement considered control strategies based on sound knowledge of the incident. Some submissions suggested Divisional Commanders could have better links with the IMT Planning Function by working more closely with Ground Observers in the field. A closer engagement between Divisional Commanders and Ground Observers could improve incident outcomes, as better quality information could be made available to Incident Action Plans.

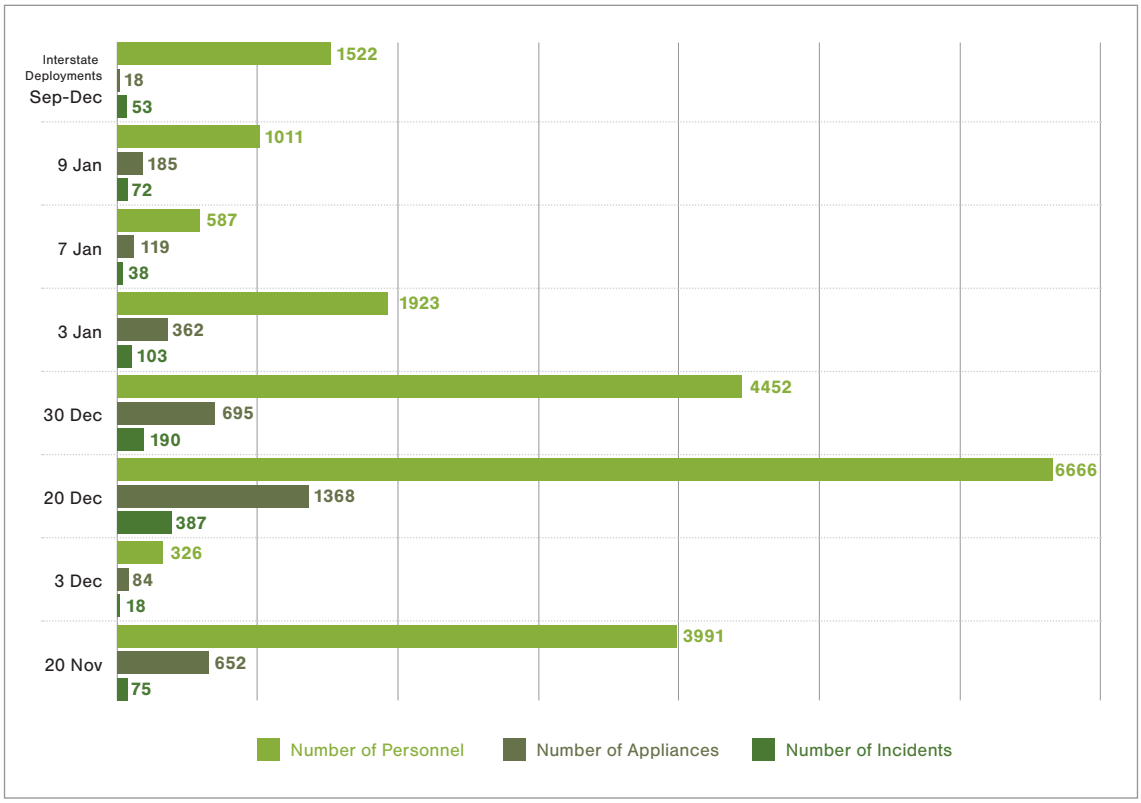

Figure 18a Personnel and Appliance Numbers – CFS Activity on Significant Days During 2019-2020 FDS

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Submissions were unanimous in their support and appreciation for the effort and commitment of volunteers and staff across all Emergency Services over the summer. However, an observed decline in the knowledge, skills and experience required to undertake basic bushfire suppression activities was a common thread.

This may be attributed in part to societal changes (e.g. farmers and CFS volunteers are undertaking less proactive hazard reduction due to changes in farming practices, perceived barriers with native vegetation management, and public liability). There is also a greater requirement for volunteers to attend non-fire incidents – e.g. road crash rescue and hazardous materials (HAZMAT) particularly in peri-urban brigades. DEW crews were the exception – they are observed as very competent in fire suppression, particularly backburning operations, which was attributed to their management of the state's prescribed burning programme (i.e. learning by doing).

The Review heard that IMTs lacked depth and some people were put into roles they were not adequately trained or experienced to undertake. The term 'just-in-time training' came up frequently during the examination of operations. Fireground leadership roles – divisional and sector commanders – were also an issue and the Review heard numerous anecdotes that personnel were put into these roles for the first time under significant pressure.

Having said that, there was consensus that the pre-planned IMT stand-up teams worked well, and that having multiple agencies in these teams added to their strength. An important discovery during the Review was that the membership structures

Photo courtesy of Brett Williams

of these pre-planned teams broke down over time due to the length of the bushfire season. Based on these observations, the processes and timeliness for training, endorsing, and maintaining IMT roles needs further consideration, including a whole of government approach to recruiting personnel.

It was also discovered during the Review that many volunteers and some salaried staff are 'thrown into' roles unfamiliar to them with no induction or prior training. Often, this situation cannot be helped in the midst of a crisis but clearly, the more that can be done to prepare people for their roles, the better they will perform. This is critical for roles such as in the IMTs and the State Co-ordination Centre (SCC). Having said that, many people given unfamiliar roles surely must have performed very well to achieve the outcomes that were achieved and it is a credit to them for stepping up.

6.9.2 Finding

More training is required for 'mopping up' activities supported by ready access to handheld thermal imagery technology.

Firefighters need more exposure to basic fireground practices, back burning and the development of control lines as part of routine training. It is also important that all brigades have ready access to Thermal Imaging Cameras which assist with detecting hot spots with training provided. These should be made available as standard stowage in every truck.

The Review heard that ineffective mopping up of active fire edges may have compromised the fire conditions but, of course, there was no way the Review could test the veracity of those claims. Mopping up involves patrolling the fire perimeter

Photo courtesy of Aaron Farrelly

Photo courtesy of David Booker

Photo courtesy of Aaron Macumber

Photo courtesy of Kirstin Abley

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to ensure control lines are blacked out sufficiently to prevent rekindles and spot overs occurring when the wind changes direction or weather conditions worsen.

A cultural shift is required in the approach to mopping up as it can have a significant impact upon resource allocation if not done properly. Effective mopping up involves getting off the back of the fire truck to break up and extinguish burning stumps, hollow trees, smouldering pine needles and peat etc.

The Review also noted that several submissions observed that some brigades need more training and practice in suppressing running grass fires, and others need more training and practice in steep terrain on scrub and forest fires.

6.10 Interstate deployment capability

6.10.1 Finding

Deploying personnel to interstate fires through the AFAC arrangements resulted in organisational fatigue during the 2019-20 bushfire season which was characterised by campaign fires.

The Review heard many differing views on the advantages and disadvantages of deploying South Australian volunteers and permanent staff interstate to assist with firefighting operations. Numerous extreme fire events occurred in South Australia and the eastern states simultaneously which placed immense pressure on all firefighting resources nationally. This highlights a need for careful consideration and planning around future interstate deployments.

Interstate deployments did have a cumulative impact on the availability of firefighters and other key personnel when fires broke out in South Australia. It also increased the demands on available firefighters and raised concerns about their welfare and fatigue management with some reporting that at times they felt physically and mentally exhausted.

To add to the situation, interstate agencies were unable to provide any assistance to South Australia due to the major fires that were burning in their own areas. This lack of interstate support, although understandable, stretched South Australian resources to capacity and the Review commends agencies for being able to meet the significant simultaneous challenges.

From September through to late December 2019, South Australia provided desperately needed firefighters and incident management personnel to New South Wales and Queensland. Around 2,000 firefighters were deployed to other states with approximately 70-130 firefighters and IMT personnel deployed at any one time. Without doubt those who travelled interstate were well received, did an excellent job, and neighbouring states were incredibly grateful for their support.

The experience was positive for many – most said they were proud to help interstate colleagues and communities and being so greatly appreciated was a morale booster. Everyone agreed interstate deployments are a good way of gaining valuable experience and training on firegrounds and for learning other firefighting approaches and techniques. They also helped forge a strong culture of collaboration between South Australian emergency service agencies; MFS, CFS, SES, DEW, and the South Australian Ambulance Service (SAAS), and these relationships transferred into the local working environment.

However, given the numerous long running fire campaigns in South Australia and interstate, many felt the demands of interstate deployments left South Australian agencies ‘organisationally fatigued’. One volunteer reported that between interstate deployments and campaigns in South Australia, he only had seven nights at his home in five weeks. Many firefighters, especially volunteers, experienced a much busier than usual fire season with more frequent fires increasing the number of call outs and requiring longer hours of work. Some people fought fires over several days in their own areas and then were immediately requested to assist on Kangaroo Island. Longer interstate deployments left some volunteers unable to commit to deploy within South Australia due to personal or work reasons.

Photos courtesy of CFS

Photo courtesy of ADF

Photo courtesy of Amelia Yarron

Photo courtesy of Brett Loughlin

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No formal policy exists between the agencies, union or volunteer associations in relation to interstate deployments. The Review believes such a policy should be explored, recognising the need to maintain local firefighting capacity while also addressing the welfare of staff and firefighters. Clarification is needed and should involve pre-set triggers so that we do not see a repeat of the physical and mental impost on so many volunteers and their employers.

...so we do not see a repeat of the physical and mental impost on so many volunteers and their employers.

SA CFS	
Volunteers	13,000
Appliances	800
Stations	438
Annual responses	9,500
SA SES	
Volunteers (not including marine rescue)	1,600
Units	73
SA MFS	
Full time and retained personnel	1,000
Appliances	150
Stations	37
Annual responses	20,441
DEW	
Full-time fire staff	140
Brigade (not including full time fire staff)	330
Appliances	125

Figure 18b Total agency capacity

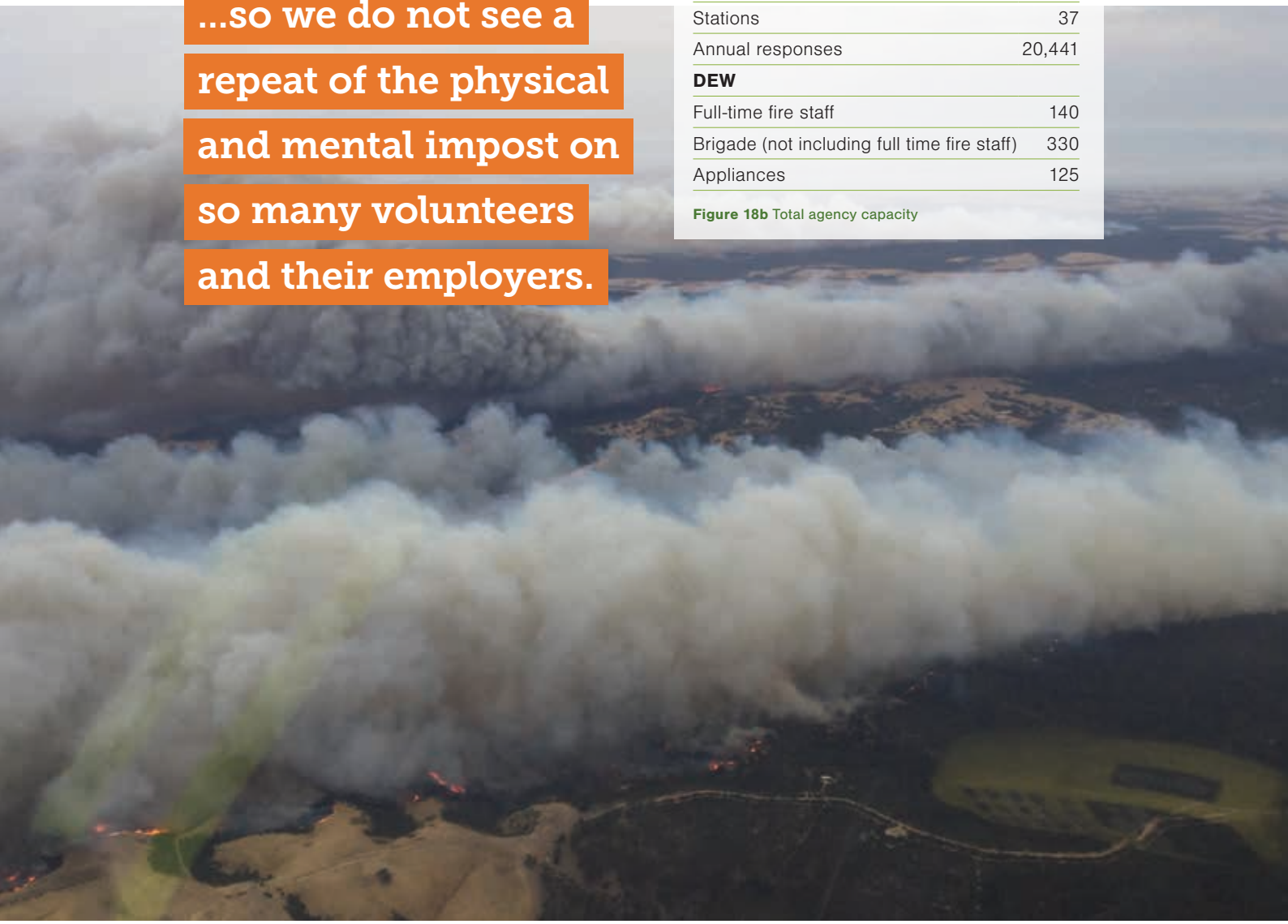

Photo courtesy of Dyson Taverner

6.11 Lightning Tracking and Rapid Response

6.11.1 Finding

Real time access to lightning tracking is needed to assist with early detection and rapid response to lightning strike ignitions.

The CFS requires tracking technology that will provide real time information about lightning strikes with the potential to start fires or exacerbate existing fires. South Australia lacks a bespoke system to monitor, report, and action lightning activity as it occurs. Fire agencies instead rely on either generic products through the BoM or subscriptions to third party suppliers.

In contrast interstate agencies, including the NSW Rural Fire Service (NSWRFS), have access to near real time lightning data which is part of their electronic incident management software. Such a system provides excellent situational awareness of where lightning activity may lead to new fires or affect existing firegrounds. The NSWRFS is able to share this intelligence with other agencies and the public.

Ready access to this type of intelligence also supports targeted patrolling, aerial reconnaissance and rapid response crew planning and deployment. The CFS should be resourced to develop a similar system for South Australia that could be part of part of either a redeveloped CRIIMSON incident information management programme or a new integrated operating system.

6.11.2 Finding

Pre-planning is required to deploy early aerial reconnaissance, specialist remote ground crews for inaccessible terrain and heavy plant where dry lightning is forecast.

It is a truism that ‘all big fires start small’. Ignitions from dry lightning strikes have the greatest potential to result in major bushfire incidents when they occur in remote and inaccessible areas. It is important to pre-plan to enable a rapid response. Additional specialist ground crew capacity is needed to access remote firegrounds and to boost aerial reconnaissance capacity.

The best chance of containing bushfire ignitions in remote and inaccessible areas early is through planning to support early detection. This can be through aerial reconnaissance, coupled with rapid response, deploying specialist ground crews known as Remote Area Firefighting Teams, (RAFT) and, where possible, heavy plant and machinery. This is very arduous and often high-risk firefighting. These crews must have high levels of fitness, training, and experience. In some circumstances they will need to be winched into locations by rotary wing aircraft.

South Australian fire services should be engaged in boosting surge capacity noting this will require investment in personnel, training, equipment, and capability development. That said, the returns on investment are significant, given the demonstrated successes of deploying remote area firefighting capability nationally and internationally. Currently, there are small numbers of such crews in Australia, and in South Australia only DEW has this capability.

Pre-planning early aerial reconnaissance where dry lightning is forecast is also important. The CFS has broadened its aerial firefighting Primary Response Zones (PRZ) over the past two fire seasons. This has reduced the capacity in the Secondary Response Zone (SRZ), reducing the ability to deploy aircraft on standby to areas within the SRZ (which includes Kangaroo Island).

Consideration should be given to bolstering the SRZ capacity for both reconnaissance and suppression, including investigating whether a Large Air Tanker or additional Type 1 helicopters would be useful in South Australia. The Review has noted in Finding 7.4.1 the need for line scanning aircraft and heavy plant to be placed on standby arrangements when high fire danger conditions have been forecast.

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6.12 Adequate staffing in peri-urban and expanding areas

6.12.1 Finding

The call rate to all hazards continues to grow in peri-urban areas of townships raising the need to review the principles for deploying fire and rescue services.

The current approach to deploying fire and rescue services in peri-urban areas may not be sustainable given rising demand and complexity of incidents in some places. Outer metropolitan suburbs and larger townships around Adelaide and larger regional areas are growing which means the number and complexity of non-bushfire incidents that fire services deal with is increasing. Indeed, bush and grass fires make up just a quarter of responses for the CFS.

The principles of dispatching CFS, MFS and SES resources are defined by boundaries as set out in the FES Act. A mutual aid agreement between the agencies also allows for the consideration of risk, and dispatches the nearest, fastest, most appropriate resource to an incident. The Review acknowledges that this agreement is in place. However, the Review also heard that, existing response models are often based on historic decisions rather than current realities.

It may be timely for Emergency Services to instigate a periodic review of their approach, with a future-facing policy that identifies triggers and requirements for deploying fire and rescue services based on best available response data. Such a periodic review may identify the need to transition from a volunteer-based model to a paid response approach, as occurred recently in Mount Barker, while in others it may indicate that a move away from paid response arrangements in communities where the population and call rate has declined.

Photo courtesy of Aaron Macumber

6.12.2 Finding

Standard equipment between agencies needs to be interoperable — there are differences and incompatibility between MFS and CFS radios, radio frequencies, Personal Protective Equipment (PPE), masks, trucks, maps, training, helmets, hose couplings and breathing apparatus.

Cooperative firefighting in South Australia could be improved by standard interoperable equipment and procedures across agencies. The 2019-20 fire season has demonstrated that South Australia cannot afford to have equipment, systems, and practices that do not support and complement each other. Concerns were raised that key critical systems such as tactical radios and breathing apparatus are not readily interoperable between the CFS and MFS. Different command structures, training, rural firefighting PPE, and other ancillary equipment add to the complexity. This can reduce agencies' ability to work seamlessly together and compromise firefighter safety.

The Review believes these matters need to be addressed through a coordinated and common-sense approach to the design and procurement of equipment and training for MFS, CFS, DEW, and Forestry SA (FSA). Equally there is a need for clear and comprehensive induction for personnel operating unfamiliar equipment and vehicles. The same challenges apply to interstate deployments. The Review noted that any intra or interstate deployments needs to give consideration to lead times for a familiarisation process.

While the MFS has started to provide bushfire training to its firefighters, numbers are currently limited. Ideally the MFS should continue this training, including specialist remote area operations. Joint training with the CFS should also be explored at every available opportunity

As identified earlier, under its legislative charter there is also scope for SAFECOM to provide cost savings to all agencies. As an enabling agency, SAFECOM should be supporting this process to ensure interoperability amongst the agencies.

6.13 Communications and ICT

6.13.1 Finding

Limited telecommunications connectivity and Government Radio Network data capability impedes CFS, Forest Industry Brigades and FFU communications and community messaging.

Limited telecommunications connectivity and congestion on the Government Radio Network (GRN) affected communications between agencies and with the public at critical times during the 2019-20 bushfire season. This Review notes the need to invest in Very High Frequency (VHF) radios for the MFS and in handheld VHF radios for contractors to support communications from the fireground when the GRN is congested.

During bushfires the GRN is used by the MFS, CFS, DEW and FSA, for command and control and air operations. It is also used by the coordination agencies, SAPOL, and support agencies, e.g. SES, SAAS and SA Water. The GRN comes under pressure at the most critical times in an incident as the number of users increases. This means that at the most acute times, the IMTs often have limited radio communications to help understand what is happening on the fireground. This can limit the ability to issue public warnings, report to the SEC and communicate with strike teams, divisions and sectors. This is a serious safety concern, especially when lifesaving information needs to be issued to crews.

> This is a serious safety concern, especially when lifesaving information needs to be issued to crews.

Private sector operators, including Forest Industry Brigades (FIBs), Farm Fighting Units (FFUs) and private contractors (e.g. operating heavy plant), generally have Ultra High Frequency (UHF) radios rather than GRN radios and cannot communicate with the combative agencies during fire operations. Few CFS appliances are fitted with UHF radios, which compromises their ability to communicate with FFUs and other operators. A lack of radio

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communication adds to the difficulty in identifying and tasking FIBs, FFUs and private contractors on the fireground and compromises their safety.

While some agencies have VHF radios, others, such as the MFS do not, which impedes communication on the fireground when the GRN is congested. CFS, DEW and FSA appliances are equipped with VHF radios for fireground communications. FIBs are usually equipped with VHF radios so they can communicate within strike teams and sectors on tactical matters if required. However, there are few portable VHFs for FFUs and private contractors.

The Review suggests MFS should have VHF radios and a significant investment should be made in portable VHFs (rather than retrofitting UHFs) to support private operators (FIBs, FFUs and private contractors) in fireground operations. All agencies should run a GRN radio operation refresher course at the start of the fire danger season to eliminate issues caused by human error.

6.13.2 Finding

ICT systems are inconsistent across the CFS — some volunteers are successfully using brigade management systems like BART but it has not been officially endorsed by the CFS or accepted service-wide.

ICT systems used across the CFS are inconsistent and there is no common resource management system among the agencies who provide crews, IMT members and support staff during an incident. Relying on largely manual processes makes it difficult to accurately track available and deployed resources. The CFS does have the Integrated Reports and Information System (IRIS), but it is not always utilised and that was certainly the case in the 2019-20 season.

It is untenable to plan for and manage incidents without resource information, and it is vital that effective and efficient common operating systems are put in place as a matter of urgency. This should include the Emerald system providing information about the qualifications and experience of CFS members, as it was a source of frustration that this information was not available online to help manage resources in the 2019-20 season.

Several senior CFS personnel observed that many brigades use various ICT software and hardware they have purchased through their own fundraising efforts. This includes tablets placed in appliances with mapping software and satellite imagery, and mobile resource management apps including the cloud-based team technology, Broadcast Alert Respond Turnout (BART).

BART is being used by a significant number of CFS brigades for rostering and collating information about member availability and turnout. It duplicates some aspects of the GRN paging system but, unlike the paging system, enables members to respond to requests for information, and post their availability. This significantly reduces the amount of time brigade duty officers need to spend making phone calls. However, not all brigades, or all members in brigades are signed up to BART, use it (due to poor mobile connectivity or preference), and it is not officially endorsed by CFS. Other independent ICT developments, such as the tablets mentioned above, also lack formal CFS support.

> This significantly reduces the amount of time brigade duty officers need to spend making phone calls.

Concerns about resource management failures and the implications for crew safety and welfare were a significant theme in interviews and submissions. These concerns included locating and identifying injured and burnt-over crews; ensuring appropriately qualified and experienced crew were deployed to roles (including leadership and licensing capabilities); and simply knowing who was on what appliance and where they were on the fireground. At the risk of being repetitive, the commonality and interopability of this basic equipment is core business for an agency like SAFECOM.

6.13.3 Finding

Information from the CFS CRIIMSON database had to be manually extracted and uploaded onto the systems used by other emergency management agencies delaying information transfers.

6.13.4 Finding

A common operating picture was difficult to obtain and it is not supported by integrated ICT systems across agencies.

Emergency services agencies use different ICT to manage operational incidents which makes sharing information more difficult. During a bushfire or other emergency event, timeliness and accuracy of information is imperative, especially if it is to be used for operational or strategic decision making. An all of government incident management system, or a system to share information across Emergency Service agencies, would be much more efficient and reliable. A single system would mean all agencies could rely on a single source of truth.

The CFS and MFS use a custom-built incident management/common operating picture system to manage and record information about operational incidents across the state. The SES and SAPOL cannot access this system as they have their own 'off the shelf' systems. Since personnel cannot electronically share data across agencies, SEC personnel manually transfer information from CRIIMSON to the SAPOL system, including printing information from CRIIMSON, then scanning and uploading to the SAPOL system.

This approach does not allow for automatic CRIIMSON updates so information may be outdated or incorrect when it is interrogated using the SAPOL system.

It follows that those who are trying to inform the community about a current situation of threat cannot be confident they have the latest accurate information. Achieving integration of the current systems could save lives and property. The public will no doubt be very surprised that this lack of interoperability exists in delivering their safety and wellbeing.

6.13.5 Finding

Given the Australian Broadcasting Corporation (ABC) is the emergency broadcaster, any move to a new location for emergency management operations needs to include a position for ABC management.

As the ABC is the trusted emergency broadcast partner of the Emergency Services, embedding an ABC Management position in the operations centre will assist in ensuring information to the community is timely, accurate and current.

Previous reviews of bushfires in Western Australia and NSW have reinforced the role of an embedded ABC manager into the central operations centre from where the state's co-ordination is occurring during an emergency. The reason why it is a 'manager' and not an ABC journalist is because journalists are required to report as part of their daily roles.

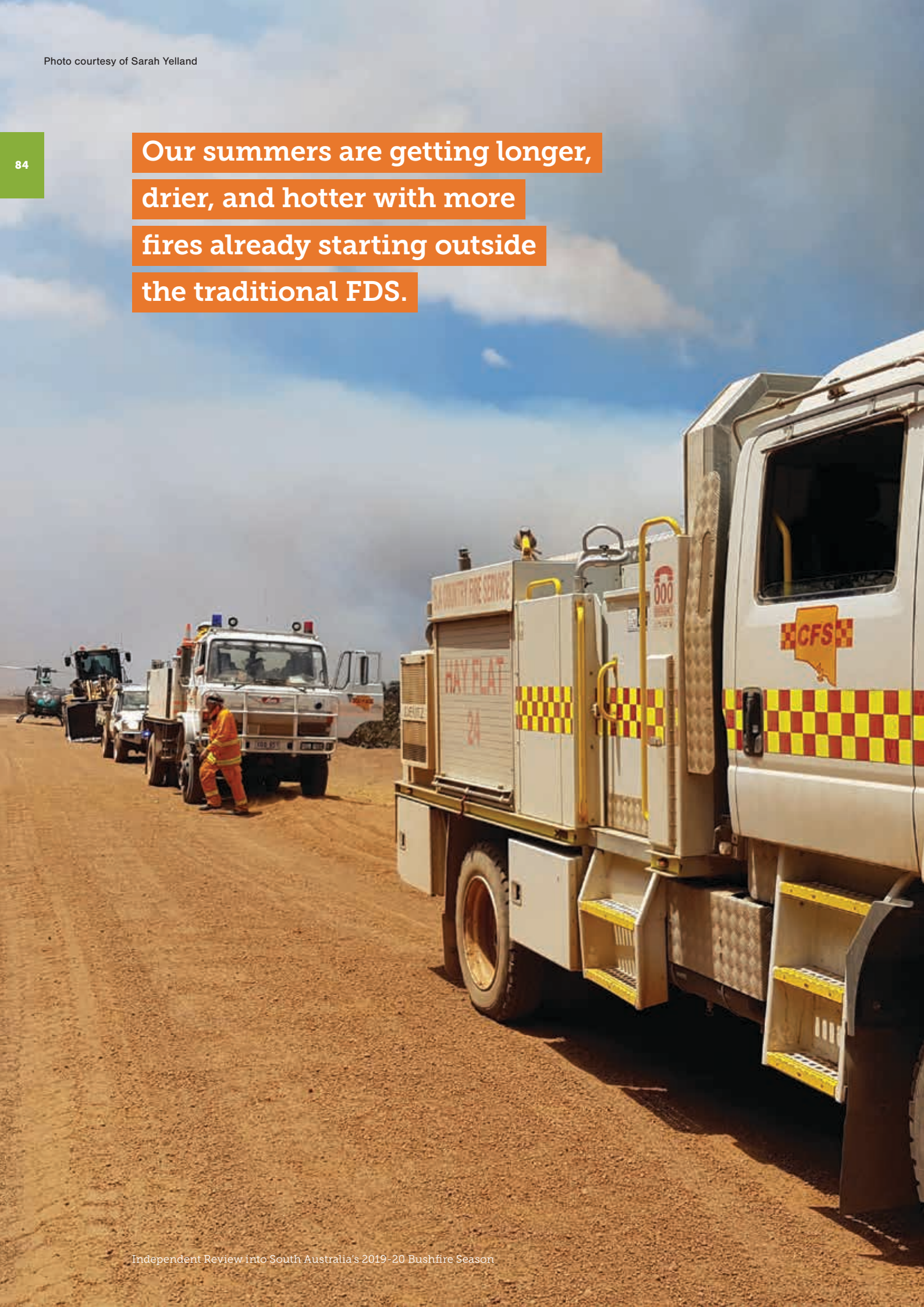
The ABC provides a capability within its budget to be the source of communication to the community at times of crisis and it can feed the news to other outlets to help those outlets to report to the community through their usual channels. The Review received several comments about the reliance placed upon the ABC's reporting during the bushfires so it is important that its engagement be appropriately facilitated.

The community relies on radio broadcasts for information relating to bushfires, the location of the fire, predictions about the fire's direction and for instructions on what to do and how to act in an emergency. Radio broadcasts are particularly vital when mobile phone towers are damaged affecting telephone communications and the internet as they were in 2019-20.

The CFS has made provisions in the new Emergency Services State Control Centre for a ground floor media briefing room to hold press conferences and an ABC ISDN Line (direct live cross connection) in a booth within the State Control Centre (SCC) to allow direct crosses into the ABC Radio. An experienced firefighter could be available to talk through the meaning of warnings and respond to talk back questions on the direction of fires and whether to evacuate.

Photo courtesy of Sarah Yelland

Our summers are getting longer, drier, and hotter with more fires already starting outside the traditional FDS.



07. Response

South Australia needs to be prepared for longer, more dangerous fire seasons with accommodation for visiting firefighters and additional aerial firefighting equipment.

Farm Firefighting Units (FFU) are a valuable resource and those actively engaged in firefighting need to be accounted for and appropriately directed, possibly using AIIMS. A policy is needed around standards of equipment and PPE carried by these units.

Crew accommodation – There is insufficient space to accommodate the number of responders brought in to deal with campaign fires which needs to be addressed for future emergencies.

Aerial capability – South Australia should boost its own aerial mapping and line scanning capability so that it does not need to rely on aircraft from other states which are not always available. The Turkey Lane airstrip on Kangaroo Island should be upgraded for emergency operations. In addition, the Review heard that there is a potential gap in leasing northern hemisphere aircraft for aerial firefighting as our summers get longer, drier, and hotter with more fires already starting outside the traditional FDS.

SEC capability – An oversight in sharing fire prediction maps during the last fire season resulted in the SEC not always having access to all of the available information. Arrangements should be made with the BoM to provide expert advice on fire risks to support SEC decisions. All agencies generally agree that the SEC operated effectively when activated but it was difficult to staff overnight with experienced personnel. Given that some of the fires intensified overnight, this was a problem.

Plant and equipment – Having arrangements in place to access equipment such as water tankers or bulldozers owned by businesses or local government on high fire risk days or in a fire incident has been suggested as a useful measure. However, devising an arrangement to appropriately compensate the owners remains a question. Equally, measures are required to ensure the safety of operators.

Public information and warnings – Emergency messaging was not clearly understood during the 2019-20 bushfires. The ‘AlertSA’ app and the CFS website were not as effective as intended in providing community information about fire location and risk and there was some confusion about maps. The community lacked information about the direction and estimated time of the fire arriving.

07. Response

7.1 Farm Firefighting Units (FFUs)

7.1.1 Finding

Deployment of FFUs is inconsistent and are not properly recorded. This makes resource management difficult and creates liability exposure should death or injury occur.

7.1.2 Finding

FFUs are a valuable resource but those who operate them are at as much risk of being seriously injured or killed as other emergency responders and their assistance to the community could be better managed using AIIMS.

CFS has been working collaboratively with primary producer peak bodies on the management of Farm Firefighting Units for nearly fifteen years, with the first joint guidelines signed off in 2006 and then revised in 2017. As well as the CFS Farm Firefighting Unit Guidelines (written in 2006 and updated in 2017), a number of previous state and national reviews have looked at the issue of managing FFUs and these bodies of work need to be included in efforts to improve FFUs in South Australia.

FFUs need to be accounted for and appropriately directed to ensure their safety and effective deployment. The review recommends that FFUs come under the AIIMS command and control structure.

Farm Firefighting Units (FFUs) are a valuable community resource, often the first units to respond, bringing local knowledge to the scene. Many submissions, while acknowledging their good work, also suggested a need for greater governance of their activities.

Some CFS brigades suggested they were losing brigade volunteers to the FFUs because of this perceived lack of control and accountability that exists with the FFUs compared to the CFS. Other submissions expressed concern for FFU safety due to the lack of any obvious standards or requirements to wear PPE.

While FFUs are a voluntary asset with equipment provided at their own expense, there is a need for greater governance while active on a fireground. There does not seem to be any clear policy regarding the level or standard of the firefighting equipment they carry or the PPE they wear, giving rise to health and safety and risk management

Photo courtesy of CFS

concerns. Part of any engagement strategy with the FFUs should include discussion to establish the minimum standard of firefighting equipment and PPE required to be carried by each unit.

7.2 Crew accommodation/ Humanihut

7.2.1 Finding

There was insufficient space to accommodate the number of responders brought in to deal with the fires which needs to be addressed for future emergencies.

7.2.2 Finding

One Humanihut was insufficient to accommodate the response operations on Kangaroo Island.

Accommodating firefighters brought in to support local crews was a significant issue during the campaign fires of the 2019-20 season. Suitable rest and accommodation facilities are vital during prolonged fire campaigns to provide firefighters with proper rest. When major fires broke out firefighters responded from all parts of the state to help. It meant that CFS and support agencies faced major logistical challenges e.g. providing meals and accommodation. This was even more pronounced when numerous resources came from the mainland to help fight the Kangaroo Island fires.

While the local island community rallied around the firefighters, providing appropriate accommodation became difficult when the number of firefighters from the mainland swelled to approximately 300. The SES was able to deploy a Humanihut base camp to the island but that could only accommodate 128 people.

Given the fire danger season is getting longer and more extreme, agencies need to plan for similar long running fire events where accommodation will be required for large numbers of firefighters. Consideration should be given to purchasing at least another Humanihut base camp providing appropriate accommodation for any future large-scale fire or emergency event as the Humanihut has proved its value as an easily deployable asset.

Photo courtesy of ADF

Government of South Australia

07. Response

7.3 Turkey Lane Airstrip

7.3.1 Finding

The landing strip at Turkey Lane on Kangaroo Island is not fit for purpose during emergencies causing damage to SA Water infrastructure and some propeller aircraft.

An upgrade could be considered for the Turkey Lane airstrip on Kangaroo Island to make it more suitable for Emergency Services use. Turkey Lane is a privately owned CFS designated airstrip on Kangaroo Island next to the island's water treatment plant at Middle River. Water bombing aircraft including fixed and rotary wing aircraft extensively used the airstrip during the Kangaroo Island fires as it was convenient for them to refuel and take on water at this location. However, as the airstrip and the apron are unsealed, loose debris created issues for both the aircraft and the water treatment plant.

This was significant when SA Water engineers were trying to reinstate the plant after the fire while firefighting activities were still taking place. The issue could be resolved by sealing the airstrip apron next to the refuelling points and the water treatment plant. While the airstrip is on private property it does provide significant tactical options for aerial firefighting.

7.4 Aviation Resources

7.4.1 Finding

Aviation line scanning and tactical firefighting resources are inadequate to meet contemporary demands.

The Review received many comments on the aerial firefighting team's professionalism and effectiveness. South Australia needs additional aerial line scanning and mapping capability (flying over a fireground to map the fire's intensity and progression). This provides vital information for firefighters and decision makers and safety advice to the public. Effective mapping and line scanning also help with early damage assessment and accurate fire prediction. While South Australia has some capacity, it relies on aircraft from NSW and Victoria which could not be supplied at critical times during 2019-20 as they were being used in those states' unprecedented fires. Effective mapping and line scanning is critical during a bushfire and this capability should be finalised and in place before the start of the next FDS.

South Australia's aerial firefighting strategy is for rapid response (through a system of Primary and Secondary Response Zones) and direct attack once a fire is reported (Aerotech, Submission, 2020, and interview on 24/4/20).

The Review was advised that DPC is considering a whole of government review into aircraft services is currently underway which may address this issue.

7.4.2 Finding

The use of northern hemisphere-based firefighting aircraft is becoming problematic as the bushfire season is extending in both hemispheres making it difficult to call on additional resources from overseas.

South Australia's firefighting aerial response is based on a fleet of Single Engine Air Tankers (SEATs) contracted to the CFS and larger aircraft brought in from overseas during the FDS. The overseas contract is for a minimum of 84 days with the possibility to extend at the end of the season.

A potential gap in leasing northern hemisphere aircraft for aerial firefighting exists as our summers get longer, drier, and hotter with more fires starting outside the traditional FDS. Overseas operators have priority contracts in the northern hemisphere which can limit their ability to come to Australia earlier, or stay longer, if requested. Other factors, such as the COVID-19 travel restrictions, may also add to the risk of overseas operators not even arriving when expected.

The CFS will need to closely monitor its aerial firefighting requirements particularly if the FDS or the number of severe, extreme, and catastrophic fire weather days increases. Managing pilot flying time and fatigue will need to be considered if the season gets longer with more extended fire campaigns. The CFS should consider the type

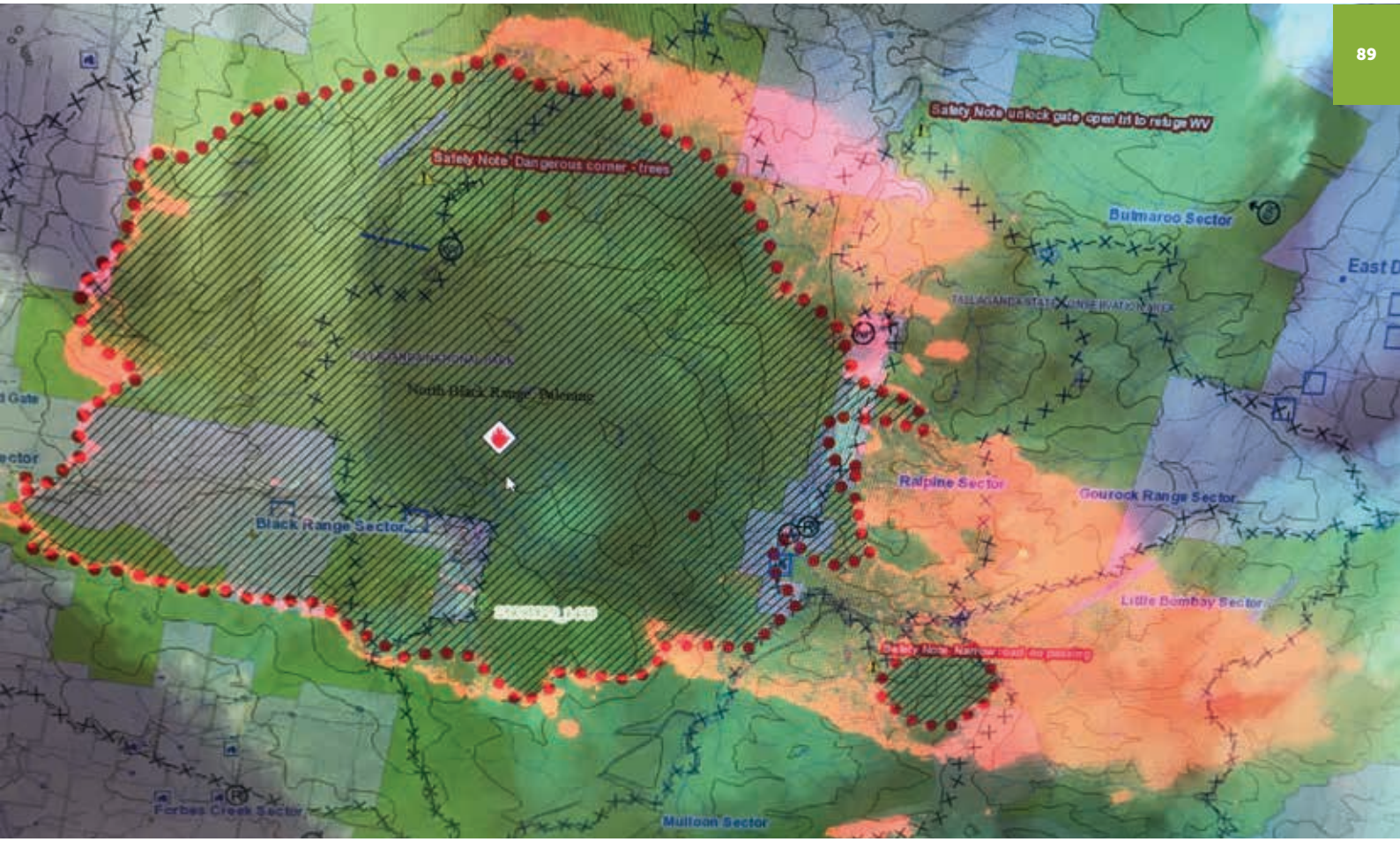


Photo courtesy of Brett Loughlin

Photo courtesy of CFS

07. Response

and size of aircrafts most suitable for aerial firefighting given the nature of fires and the terrain in South Australia, costs and the availability of supporting infrastructure. As previously discussed this may involve investigating a Large Air Tanker or additional Type 1 helicopter or similar. The important factor will be having suitable aircraft available to respond quickly and effectively around the state when most needed.

7.5 State Emergency Centre (SEC) Capability

7.5.1 Finding

The SEC did not receive the best information about the location and direction of the fires because of an oversight in not sharing fire prediction maps.

7.5.2 Finding

Arrangements need to be made with the BoM to provide 24/7 capability to advise SEC decision makers about the prevailing risk.

Difficulty in getting accurate and timely information on 'Where is the fire now?' and 'Where is the fire going?' and the lack of fire prediction maps were common complaints. The Review heard these maps assist in forward planning and making strategic operational decisions and the CFS should openly provide regularly updated fire prediction maps to the SEC.

There was good coordination between DEW and CFS to produce these maps, however as previously mentioned in this Review the data was not fully shared in the SEC.

Likewise, public-facing maps need to be created that make the current location, speed, and predicted impact zone of the fire truly clear.

7.6 Plant and equipment access and supervision

7.6.1 Finding

Access to plant and equipment during a crisis was ambiguous as were the risks associated with engaging untrained personnel to enter the fireground (e.g. road construction bulldozers requisitioned to build fire breaks).

7.6.2 Finding

The CFS should consider how to deploy heavy machinery with adequate protection for plant operators in planning for severe, extreme, or catastrophic fire danger days.

In most locations, outside of the Local Government iResponda programme, there are limited pre-planned agreements covering access to plant and equipment such as bulldozers to clear fire breaks. It would be beneficial for the CFS to have clear agreements (including pre-agreed pricing) with local councils, utilities, landowners and contractors establishing equipment standards and procedures to use such equipment.

This type of plant and equipment could be placed on 'stand-by' or pre-deployed on forecast *Severe*, *Extreme*, or *Catastrophic* fire weather days. These types of heavy plant and machinery are both expensive to own and operate and the owners need to have their machinery operating at capacity as much as possible. These factors will need to be considered in any pre-planned activations for their use.

Another suggestion heard numerous times during the Review was for the early deployment of ADF heavy machinery. This concept could be explored further, noting that it would have to be tempered by the need to preserve the paid roles of commercial contractors.

A thorough risk assessment needs to be undertaken to deploy heavy machinery, particularly on active firegrounds, to ensure the safety of the operators. Fire agencies need to continue to ensure that they provide a dedicated resource to protect the operators. The work must be coordinated through the IMT to ensure required remediation works are understood and appropriately managed.

Photo courtesy of Andrew Stewart

07. Response

7.7 Public Information and Warnings

7.7.1 Finding

There was confusion about emergency messaging whereby 'emergency' was interpreted as a message to evacuate.

7.7.2 Finding

Alert SA was initiated using the NSW government 'Fires Near Me' App however the benefits of the app were not fully translated.

7.7.3 Finding

The community received insufficient information on the location of fires, direction of travel and estimated time of when the fire would reach specific locations.

7.7.4 Finding

The CFS website mapping was inadequate to advise the public about the location and direction of the fires and the 'warning message' polygon was reportedly mistaken as the fire boundary.

Providing the public with accurate public information about the fire, the risks, *Bushfire Safer Places* and *Places of Last Resort* is vital but the Review heard that the community was not always well-informed. All public messaging by all agencies and across all media platforms should point to the CFS website as the one source of truth about the current fire situation.

Numerous submissions and comments questioned the effectiveness of the current 'Alert SA' warning system and emergency messaging in general.

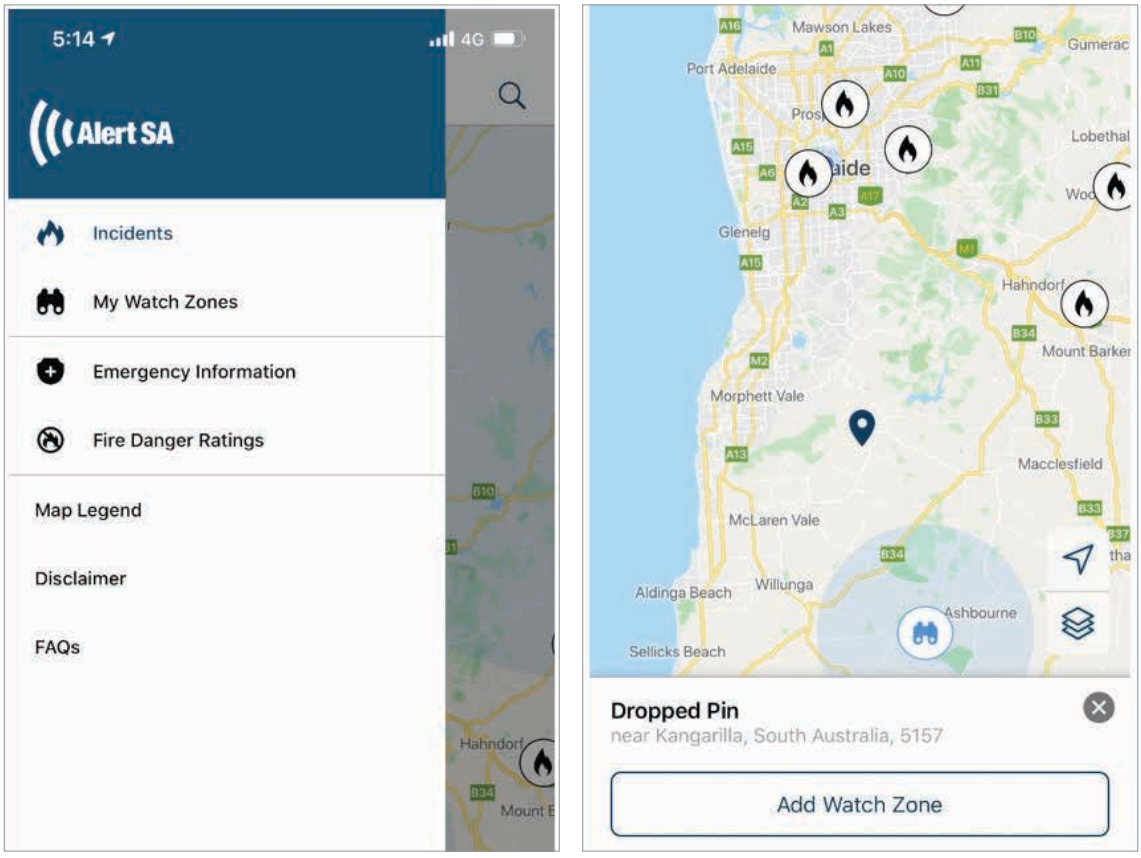


Figure 19 Alert SA App

Photo courtesy of Aaron Macumber

The original 'Alert SA' emergency warning app was withdrawn in January 2018 and was replaced in November 2019 with one based on the NSW government's 'Fires Near Me' app.

The South Australian version does not yet have the same functionality and only shows fires with emergency warning messages attached. Therefore, it does not show smaller active fires, limiting the public's ability to make informed and timely decisions. SAFECOM is preparing a second version of the app which will increase its functionality and the Review encourages this work to be implemented before the 2020-21 fire season.

Just as there were complaints about the lack of predictive maps for SEC decision making, the Review heard numerous complaints about the lack of regularly updated CFS fire prediction maps for the community. These maps are just as vital to the public. They need to clearly spell out the current location, speed and predicted impact zone of the fire along with information on current road closures and they should be available on all sources of public fire information.

In addition, this Review received comments that instructions given by radio and television announcers were confusing as they were reading from technical reports/instructions provided by the Emergency Services. The Review concludes that value adding by having a senior experienced CFS officer to translate the technical instructions to 'plain English and language' will help the community understand what it has to do.

7.7.5 Finding

IMTs and fireground leaders need access to people with local knowledge including suitably trained and qualified forest industry professionals to assist with decision making.

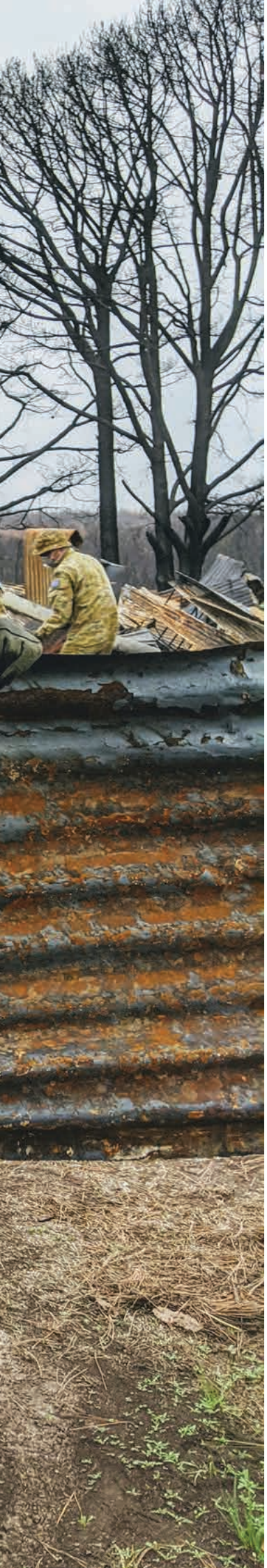
Timber plantations account for approximately 28,500ha across the Mount Lofty Ranges and Kangaroo Island. The Cudlee Creek fire burnt 996ha in the Mount Lofty Ranges and the Kangaroo Island Fires affected 95 per cent of the plantations on the island. This was a devastating blow for the forestry industry, on top of the significant impacts to agriculture and tourism, especially on Kangaroo Island.

These wide-ranging impacts demonstrate the need for effective utilisation of local knowledge to ensure that these industry impacts can be minimised wherever possible. For example, the inclusion of liaison officers from ForestrySA as part of the IMT and greater use of sector commanders with experience in plantation firefighting may helped improve the strategies and tactics used in and around areas of plantation timber.

It is important to note that the South Australian Government recently enacted Forest Industry Brigade (FIB) provisions under the FES Act which provides an opportunity for forestry involvement in IMT and fireground leadership to evolve and mature.

Photo courtesy of ADF

...adequate mental health and other supports to firefighters and bushfire affected communities is needed to meet an expected increase in demand for services.



08. Recovery

The scale of the fires and their duration created particular difficulties in providing appropriate support to victims and there have been far-reaching impacts on the welfare of people and wildlife.

Transition

The transition from operational response to recovery was considered by most stakeholders to be too slow to effectively help the victims of the bushfires.

Damage assessment

While there is strong demand for Rapid Damage Assessment (RDA), the processes involved cannot keep up and the RDA) is not providing a level of accuracy or consistency to aid decision makers or government officials. This has resulted in the slower coordination of recovery activities.

Welfare

As expected, the psychological impacts of the 2019-20 fire season on fire and incident management crews resulted in the highest recorded levels since 2005 of access to psychological support services for fatigue, stress and trauma, and critical incident stress responses. The number of burnovers was the highest ever recorded, adding to the stress and trauma experienced by fire crews.

Fire victims are also likely to experience trauma over a prolonged period. Hence the Review urges the provision of ongoing adequate mental health and other supports to firefighters and bushfire affected communities to meet an expected increase in demand for services.

The State Recovery Office is recording community experiences to help the recovery process and prepare the community for the next disaster through sharing experiences both positive and negative and there is a national project to collect stories about the 2019-20 bushfires to form part of Australia's historical record.

08. Recovery

8.1 Recovery planning

8.1.1 Finding

The transition from operational response to recovery was considered too slow.

The Review heard that the transition from operational response to recovery was considered too slow to be effective for the victims of the bushfires. The State Recovery Office was not prepared for the scale and magnitude of simultaneous events and synchronising and coordinating other government departments and non-government agencies was a big challenge. The lack of long-term recovery planning was noted.

The SEMP defines the recovery process as starting while response activities are in progress, gaining momentum as the response phase nears completion. The responsibility for managing and co-ordinating response and recovery operations under the EM Act and the SEMP is with the State Coordinator through an Assistant State Coordinator – Recovery.

This person is responsible for managing and coordinating recovery processes, and for advising the government on recovery capability and activities however, from submissions received by this Review – the role needs a long-term outlook. The Review acknowledges that the state government created the role of State Recovery Lead in mid-January 2020 to help address this issue.

The Review noted that the Australian government initiated a National Bushfire Recovery agency following the events of last summer. It is hoped that some of the matters raised with this Review might be addressed by a coordinated arrangement between the South Australian government and the new agency.

8.2 Rapid Damage Assessment (RDA)

8.2.1 Finding

Rapid Damage Assessment (RDA) is not providing a level of accuracy or consistency to help decision makers or government officials inform the community about the impacts of an event.

RDA should take place in the immediate aftermath of an incident providing a quick evaluation of the impacted area. RDA gathers information on the status of infrastructure, utilities, wildlife, and lives. The demand for damage assessment information

Photo courtesy of ADF

Photo courtesy of Kirstin Abley

is increasing at a rapid rate that far exceeds the ability of the data to be captured, quality controlled and released in a planned and accurate manner (SAPOL Submission, 2020). Social media increases the challenge to provide authenticated information to the community from government agencies.

> The demand for damage assessment information is increasing at a rapid rate that far exceeds the ability of the data to be captured...

As outlined in the SEMP Part 2 6.7, the impact assessment process should begin during the response phase of the emergency. The Damage Assessment Support Plan outlines the responsibilities, authorities, and mechanisms to gather information about the damage and community losses due to an incident. This plan is in place to ensure that information is collected and is used to inform stakeholders who have a role in supporting recovery operations.

Damage assessment involves initial collection, detailed collection and recovery as well as consequence management. Data collection is the responsibility of the Control Agency and needs to be checked prior to release to the State Recovery Office to support ongoing recovery actions. With increased demand from government and the public for this information, the consequences of releasing unchecked or incorrect information is substantial. The Review heard RDA was not providing a level of accuracy or consistency to aid decision makers which resulted in slower coordination of recovery activities.

8.3 Water replenishment and Business Continuity

8.3.1 Finding

More needs to be done to clarify the process for replenishing water and other aspects of business continuity in the recovery process.

Recovery activities under the SEMP include coordinating supply and distribution of emergency fodder, water, fencing and other materials or services, and restoring public utilities such as electricity, gas, water, sewerage. Water replenishment was generally inadequate, with victims having limited access to clean drinking water or water supply. However, the ADF were particularly useful in helping to manage water supply on

Photo courtesy of Kirstin Abley

08. Recovery

Photo courtesy of ADF

Kangaroo Island following the fire damage to the Middle River Water Treatment Plant.

Under the SEMP, recovery activities include assessing the 'natural' component or the impact on a healthy and functioning environment, including air and water quality; land degradation and contamination; plant and wildlife damage/loss; and national parks, cultural and heritage sites. Water and waste service form part of the 'built' component of recovery activities.

The timing of safe access to properties after the bushfires had an impact on businesses and farmers not having access to running water or electricity to restart business or salvage crops, perishable stock or livestock.

The Review also heard that more needs to be done to ensure water replenishment as part of the state recovery process and other aspects of business continuity as this became an issue for some property owners.

8.4 Welfare

8.4.1 Finding

The psychological impacts of the 2019-20 fire season on fire and incident management crews resulted in the highest recorded levels since 2005 of access to psychological support services.

It comes as no surprise that there has and will be psychological impacts of the 2019-20 bushfire season on fire and incident management crews. The season was brutal, with many firefighters combatting campaign fires in succession with some also providing support to fires interstate, and being exposed to extreme fire behaviour. Firefighters were working 12-hour shifts on the fireground and many suffered fatigue and exhaustion. Requests for access to psychological support services has been recorded at the highest levels since 2005 for fatigue, stress, trauma, and several critical incident stress responses.

> Requests for access to psychological support services has been recorded at the highest levels since 2005...

Reported Burn Overs, Injuries and Psychological Support - 2019/20 Fire Season*

Reports from Vehicles in Burn Overs	23
HIRM Injury Reports	143
HIRM Reports Hazard and No Injury**	36
Notifiable Incidents	3
Workers Compensation Claims	40
Critical Incident Stress Responses #	48
Counselling Referrals	150
Welfare check calls (not including IMTs)	1464

** Data includes CFS volunteers, MFS and DEW staff only*

*** One report includes multiple individuals, number not specified*

 # Psychological group debriefing Sessions for crews who experienced burnovers or entrapment

SAFECOM should consider increasing the resourcing to the Stress Prevention and Management (SPAM) service to ensure that it can provide support and assistance to Emergency Services personnel in an environment where the number of major incidents is likely to increase.

8.4.2 Finding

The number of burnover incidents reported during the 2019-20 fire season is the highest recorded.

The number of burnover incidents reported during the 2019-20 fire season is the highest recorded[5] and would contribute to the number of psychological support services accessed. A burnover is described as a section of fire that overruns personnel and/or equipment (AFAC Bushfire Glossary 2012) and can be extremely traumatic. The Review heard that a burnover on Kangaroo Island in January 2020 resulted in injuries, including smoke inhalation and psychological injury to the crew (Moose Dunlop OAM, Brigade Captain, 2020). It could have resulted in the death or serious injury of several firefighters.

> The Salvation Army noted that the effect of trauma can take many months to emerge and can manifest in several ways.

The welfare of victims impacted by the bushfires should also be considered by appropriate organisations. Under Section 7(d) of the *Local Government Act 1999,* council functions include providing for the welfare, wellbeing and interests of individuals and groups within its community. The Salvation Army noted that the effect of trauma can take many months to emerge and can manifest in several ways (The Salvation Army, Submission, 2020). Trauma can exacerbate existing issues or be the catalyst for new challenges. It is therefore vital to provide ongoing adequate mental health and other social supports to firefighters and bushfire affected communities to meet an expected increase in demand for services.

5 Note that burnovers were only recognised post 1998 after the Linton fire in Victoria, in which five firefighters died.

08. Recovery

8.4.3 Finding

The impact of bushfire on wildlife is not well understood and requires a leadership role by DEW.

The bushfires not only had an impact on people, homes, and businesses but also on the environment, wildlife, and livestock, with 75 per cent of the national livestock losses experienced in South Australia (PPSA, Submission, 2020). The Review heard that the impact of bushfire on wildlife is not well understood and requires a leadership role in managing injured wildlife recovery post-incidents to be adopted by DEW.

> The impact of bushfire on wildlife is not well understood...

Current arrangements for wildlife in emergencies sit with Department of Primary Industries and Regions SA (PIRSA), not with DEW which is generally responsible for wildlife management and conservation under the *National Parks and Wildlife Act 1972*.

8.4.4 Finding

The State Recovery Office has an excellent initiative to record community experiences to help the recovery process and prepare the community for the next disaster.

The State Recovery Office in the Department of Human Services has an excellent initiative to record community experiences to help the recovery process and prepare the community for the next disaster through sharing positive and negative experiences.

The Review also noted that the Bushfire Royal Commission has recently launched the 2019-20 Bushfire History Project seeking stories and personal experiences to form part of Australia's historical record. The Review suggests that these accounts are used as 'learned experiences' from members of the community who heeded the messages and appropriately prepared themselves and their properties for what was arguably the worse bushfires in South Australia's history.

Photo courtesy of CFS

Photo courtesy of Chris Jones

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Photo courtesy of Mark Roberts

Appendices

Appendix 1

MEDIA RELEASE | Government of South Australia

Hon Steven Marshall MP
Premier

Hon Corey Wingard MP
Minister for Police, Emergency Services and Correctional Services

28 January 2020

Independent review into South Australia's 2019/20 bushfire season

The State Government has announced an independent review will be conducted into the unprecedented 2019/20 bushfire season with a focus on both the Kangaroo Island and Cudlee Creek bushfires.

The intent of the review, which is to start immediately, is to look into South Australia's preparedness for dealing with significant bushfire activity and what can be done to mitigate the impact of bushfires on our communities into the future.

The State Government has asked former Australian Federal Police Commissioner Mick Keelty to lead the review with the support of the South Australian Emergency Services Commission (SAFECOM) and experts from across our State's emergency services sector.

Premier Steven Marshall said although the season isn't over yet and there remains a risk of further bushfire activity in the coming months, it's important to start looking into how the State can adapt and learn from recent events.

"This season has been particularly difficult and devastating for dozens of communities with huge losses never experienced before," the Premier said.

"This is about ensuring our State is as ready and prepared as we can be for further significant bushfires.

"We know there is still a long road to recovery and that our dedicated firefighters are still on high alert, but if we can take something valuable from what we have lived through then we will be better placed to respond in years to come."

Minister for Emergency Services Corey Wingard said the review will have a broad scope and will look into preparation, planning, community resilience, response and recovery.

"There are many areas in which we need to focus our attention to ensure we are appropriately positioned to respond to and recover from significant natural disaster events," the Minister said.

MEDIA RELEASE | Government of South Australia

"Our emergency services have done an outstanding job these past few months and this inquiry will help identify any learnings that can be applied next season."

Mick Keelty said the fires across southern and eastern Australia this bushfire season have already had a devastating impact on communities such as Kangaroo Island and the Adelaide Hills.

Mr Keelty will be able to draw upon his significant operational experience and the reviews he has conducted after previous bushfire seasons on behalf of other States.

"I look forward to the opportunity of working with the South Australian Government and those involved in the firefighting operations to review and analyse the bushfire season to improve bushfire preparedness for the future," Mr Keelty said.

Findings of the review are anticipated to be delivered by the end of June 2020 well ahead of our next bushfire season.

Appendix 1

TERMS OF REFERENCE
2019/2020 BUSHFIRE REVIEW

Introduction

1. The extraordinary circumstances of this fire season necessitate broad inquiry and review. Following events that have recently been felt, not only in South Australia but across the nation, there is national focus on bushfire risk. The proposed review will be broad and cover twelve factors across Prevention, Preparedness, Response and Recovery (PPRR) that all impact positively on reducing the impact of bushfire and keeping communities safer.

Discussion

2. A combination of drought conditions, catastrophic fire danger weather over several days, coupled with extended periods of severe and extreme fire danger periods as well as ignitions in remote and inaccessible areas all combined to create fire behaviour and conditions that made fires unstoppable and in many circumstances homes and assets un-defendable.

3. The volunteers of the South Australian Country Fire Service (CFS), supported by a range of personnel from many agencies conducted outstanding services to the South Australian Community to protect life and property in a time of greatest needs.

4. Tragically the lives of three people have been taken and whilst their deaths will be subject to coronial inquiry, any lesson learned from these recent fire events which can assist to avoid the reoccurrence of such loss should also be taken in to account.

5. The South Australian Fire and Emergency Services Commission (SAFECOM) is established under the *Fire and Emergency Services Act 2005* (the Act) to lead the governance, strategic and policy aspects of fire and emergency services. Under section 8 of the Act, 'functions and powers' SAFECOM is responsible, for monitoring performance and taking corrective action as well as ensuring emergency services regularly review and revise as necessary any plans, structures, systems targets and practices to address changing circumstances and to improve emergency services.

6. The scope of the review includes the relevant areas of SAFECOM, CFS, the South Australian Metropolitan Fire Services (MFS) and the South Australian State Emergency Services (SES), the scope will also cover State Emergency Management Plan (SEMP), emergency management communications and collaboration between other Government agencies such as the South Australian Police (SAPOL) and the Department of the Premier and Cabinet (DPC).

7. A number of areas and issues for review are set out under in this Terms of Reference, these include bushfire ignitions, firefighting operations by skilled and motivated personnel, effective firefighting operations with the necessary equipment and resources, and extinguishing bushfires when they occur.

8. The community and government's recovery from the effects of bushfires will not form part of the review, however Rapid Damage Assessment and the State's current arrangements of the transition from response to recovery will be examined.

Terms of Reference, Areas of focus

Prevention

1. Reducing Bushfire ignitions
    - Electricity Infrastructure;
    - Arson and Operation Nomad;
    - Machinery and power tools;
    - Lightning strikes and detection; and
    - Hazard Reduction

2. Community Preparation and resilience
    - Community Education and engagement;
    - Home and contents insurance'
    - Volunteer training, development, coordination, support and welfare; and
    - Farm firefighting units.

Preparation

3. State Bushfire Plan and State Bushfire Coordinating Committee
    - Developing a new state bushfire plan;
    - The role of the state bushfire committee; and
    - Developing policies and standards to reduce bushfire risk.

4. State Emergency Management Plan including Extreme Heat Planning
    - Review of emergency planning arrangements

5. State Development and Control planning
    - Bush fire zoning; and
    - Local government planning, roles in emergency management.

Response

6. Call taking and dispatch
    - 000 and dispatch of resources;
    - Preplanning of strike teams; and
    - Links to public information and warnings.

7. Equipment and resources
    - CFS/MFS appliances, communications and safety systems;
    - Technology such as Automatic Vehicle Location (AVL), mapping, line scanning;
    - Aviation resources including Large Aerial Tankers; and
    - Logistics arrangements such as Humanihuts and retardant.

Appendix 1

8. Incident management and emergency coordination
    - Incident management teams and facilities;
    - Operational alignment of control agency and the State Coordinator;
    - Functions and coordination between the State Control Centre, State Emergency Centre, State Emergency Information Call Centre Capability (SEICCC) and the State Crisis Centre; and
    - Reporting to government.

9. Pubic Information and Warnings
    - Alert SA;
    - Information Management systems to support improved messaging; and
    - Coordination across Government messaging.

10. Interstate Deployments
    - Support to other states; and
    - Coordination of resource sharing arrangements.

Recovery

11. Rapid Damage Assessment,
    - Aerial surveillance and remote pilot aircraft; and
    - Messaging of damage impact.

12. Transitional arrangements to recovery
    - Australian Defence Force Support;
    - Commonwealth Assistance; and
    - Leadership and Coordination.

Appendix 2

MEDIA RELEASE

25 March 2020

SOUTH AUSTRALIA BUSHFIRE REVIEW

The rapidly changing response to the Coronavirus (COVID-19) will mean that Community forums in South Australia's fire-affected communities at Cudlee Creek, Keilira (Kingston), Kingscote, Parndana, Port Lincoln and Yorketown will need to to be modified in line with COVID-19 social distancing restrictions.

The Inquiry Team has already processed a significant amount of material forward from the community through the 'Your Say' websites and interviews have commenced with key agencies involved in fighting the fires.

In addition, protocols have been established between the Inquiry head, Mr Mick Keelty AO and the SA Deputy State Coroner and the SA Police who are investigating the cause of deaths and the ignition of the fires.

The social distancing restrictions and travel restrictions will mean that a different approach will need to be adopted to undertake the Inquiry.

The public meetings will not proceed however the Inquiry Team will contact people through use of technologies such as video streaming and teleconferencing.

"We have extended the deadline for submissions for agencies because there has been a change to staff numbers in the affected agencies and some people are now working from home. We have also reduced the size of the Inquiry Team and are operating in line with the recommendations of both the State and Commonwealth Governments as the response to COVID-19 evolves," Mr Keelty said.

"The review team will continue to monitor government and relevant authority recommendations in relation to COVID-19 and follow any necessary instructions," Mr Keelty added.

Minister for Police and Emergency Services, Mr Corey Wingard said: "It is important that the Bushfire Inquiry proceeds in order to prepare us for the upcoming 2020/21 season. The use of technology to conduct the inquiry while keeping people safe is a further test of the resilience of our community to adapt to changing circumstances".

For more information, including the terms of reference for the review, please visit the SAFECOM website: www.safecom.sa.gov.au

Appendix 3: List of Interviewees

8 April 2020

Department for Environment and Water (DEW)
Mr John Schutz, Chief Executive
Mr Mike Williams, Executive Director, National Parks & Wildlife
Mr Grant Pelton, Director National Parks and Crown Lands Programmes
Ms Fiona Gill, Director, Fire and Flood
Ms Emma Finnie, Senior Policy Officer, Water Security, Policy and Planning

9 April 2020

SA Country Fire Service
Mr Nathan Watts, Group Officer, Heysen Group,

Adelaide Hills Council
Ms Jan-Claire Wisdom, Mayor
Mr Andrew Aitken, Chief Executive Officer
Mr Marc Salver, Director Development and Regulatory Services
Mr Peter Bice, Director Infrastructure and Operations
Mr David Waters, Director Bushfire Recovery

SA Country Fire Service
Mr Brett McLaren, Group Officer, Lacepede CFS Group
Mr Peter Wickes AFSM, Group Officer, Onkaparinga CFS Group

14 April 2020

SA Country Fire Service
Mr Patrick Ross, Group Officer, Lucindale CFS Group
Mr Terry May, Group Officer, Kangaroo Island CFS Group

15 April 2020

South Australia Police
Deputy Commissioner Ms Linda Williams APM

SA State Emergency Service
Mr Chris Beattie, Chief Officer

SA Country Fire Service
Mr Steve Cornwall, Group Officer, Southern Yorke CFS Group
Mr Darryl Napper, Group Officer, Tatiara CFS Group

16 April 2020

SA Country Fire Service
Mr Des Ford AFSM, Group Officer, East Torrens CFS Group
Mr Ian Davey, Deputy Group Officer, Caralue CFS Group
Mr Rick Drury, Group Officer, Gumeracha CFS Group

Kangaroo Island Council
Mr Michael Pengilly, Mayor

17 April 2020

SES Volunteer Association
Mr Warren Hicks, Chair
Mr Peter Codrington, Deputy Chair
Ms Susan Caracoussis, Executive Officer

South Australia Police
Assistant Commissioner Mr Noel Bamford APM

Kangaroo Island Council
Mr Greg Georgopoulos, Chief Executive Officer

SA Country Fire Service
Mr Rodney Lade, Deputy Group Officer, Kangaroo Island CFS Group

20 April 2020

SA Country Fire Service
Mr Kym Eagle, Group Officer, Lower Eyre Peninsula CFS Group
Mr Dennis Turner AFSM

Mr Shane Wiseman AFSM

21 April 2020

Yorke Peninsula Council
Mr Darren Braund, Mayor
Mr Andrew Cameron, Chief Executive Officer
Ms Natalie McDonald, Executive Assistant
Mr Roger Brooks, Director Development Services

Mr John Symons

Department for Human Services
Mr Alex Zimmerman, Recovery Coordinator, Cudlee Creek

22 April 2020

Kangaroo Island Council
Mr John Fernandez, Technical Programs Manager
Mr Alan Harvey, Director Infrastructure (seconded from Burnside City Council)
Ms Nicki Putland, Director of Corporate Services

23 April 2020

Department for Environment and Water
Mr Joe Tilley AFSM, Regional Fire Management Officer

Mr Dave Dowie

Premier's Climate Change Council
Mr Martine Haese, Chair
Mr Neil McFarlane, Director, Climate Change, Coast and Marine Branch, DEW

24 April 2020

Aerotech and Aerotech Helicopters
Mr Sam McCabe, Managing Director
Mr Chris Boyd, General Manager

Insurance Council of Australia
Mr Karl Sullivan, Head of Risk and Operations

27 April 2020

Institute of Foresters of Australia
Mr Gary Morgan AM AFSM, Chair Forest Fire Management Committee

City of Port Lincoln
Mr Brad Flaherty, Mayor, and Chair of Zone Emergency Committee

United Firefighters Union (UFU) of South Australia
Ms Max Adlam, State Secretary, UFU
Mr Chas Thomas, President
Mr Gideon Douglas, State Councillor
Mr Séamus (James) Krumrey-Quinn, Industrial Officer

Conservation Council of South Australia
Mr Craig Wilkins, Chief Executive
Mr Tim Vale, former Bushfire Management Officer

28 April 2020

CFS Volunteers Association
Ms Sonia St Alban, Executive Director

SA Country Fire Service
Mr Ray Jackson, Regional Commander, CFS Region 3

South Australian Water Corporation (SA Water)
Mr David Ryan, Chief Executive Officer
Mr Shane Pritchard, Business Planning, Continuity and Resource Manager
Mr James Crocker, Senior Manager Wastewater, Environment and Research

29 April 2020

Department for Environment and Water
Mr Ian Tanner AFSM, A/Manager Fire, Adelaide Mount Lofty Ranges

South Australia Police
Superintendent Mr Mark Fairney APM
Senior Sergeant First Class Mr Russell Dippy

30 April 2020

Forestry SA
Mr Peter Merry, Commercial Operations Manager
Ms Monique Blason, Manager Community Services
Mr Dan Brind, Fire Operations Manager
Mr Luke Hein, Ranger

Local Government Association
Mr Sam Telfer, President and Mayor of Tumby Bay District Council
Mr Scott Loechel, Manager LG Emergency Management Operations
Ms Lisa Teburea, Executive Director Public Affairs

1 May 2020

SA Country Fire Service
Ms Fiona Dunstan, Manager Information Operations

South Australia Police
Detective Superintendent Ms Christine Baulderstone

SA Metropolitan Fire Service
Mr Michael Morgan AFSM, Chief Officer

Appendix 3: List of Interviews

4 May 2020

Office for Data Analytics, Department for Premier and Cabinet
Mr Peter Worthington-Eyre, Chief Information Officer and Executive Director

Department for Environment and Water
Mr Mike Wouters, Manager Fire Science and Knowledge, Fire and Flood
Ms Fiona Gill, Director Fire and Flood

5 May 2020

Native Vegetation Council
Ms Emily Jenke, Presiding Member
Mr Maurice Roche, Member (Conservation Council SA Representative)
Ms Merridie Martin, Director Native Vegetation and Heritage, DEW
Mr Adam Schutz, Coordinator Assessments and Stakeholder Liaison, Native Vegetation Branch, DEW

5 May 2020

Department for Environment and Water
Mr Tim Groves, Fire Management Officer, Burning on Private Lands Project
Mr Derek Snowball, Fire Management Officer, Burning on Private Lands Project
Mr Damon Ezis, A/Manager, Planning, Fire and Flood

Department for Environment and Water
Mr Sam Sanderson AFSM, Manager Fire Operations, Fire and Flood
Mr Damon Ezis, A/Manager, Planning, Fire and Flood

13 May 2020

Bureau of Meteorology
Mr John Nairn, State Manager, South Australia
Mr Matt Collopy, Weather Services Manager, South Australia
Mr Todd Smith, General Manager, National Operations
Mr Barry Hanstrum, National Inquiries Co-ordinator

14 May 2020

Department for Premier and Cabinet
Air Commodore Ms Margot Forster CSM, State Recovery Lead

Appendix 4: List of Agency/Organisation Submissions

Adelaide Hills Council

Aerotech and Aerotech Helicopters

Air Affairs Australia

Airborne Research Australia

Apple & Pear Growers Association of SA and Cherry Growers Association of SA *(joint submission)*

Australasian Fire and Emergency Service Authorities Council

Australian Business Roundtable Disaster and Resilience & Safer Communities

Australian Communications Consumer Action Network

Australian Forest Products Association

Australian Meteorological and Oceanographic Society

Barossa Council

Bureau of Meteorology

Bushfire and Natural Hazards Cooperative Research Centre

City of Mitcham

Conservation Council of SA

Country Fire Service Volunteer Association

Country Women's Association SA

Department for Environment and Water

ForestrySA

Grain Producers SA

Grattan Institute

Green Triangle Forest Industries Hub

Historical Radio Society of Australia

Institute of Foresters of Australia and Australian Forest Growers *(joint submission)*

KI Eco Action

Local Government Association of SA

Native Vegetation Council

Natural Resources Adelaide and Mount Lofty Ranges

Nature Conservation Society of SA

Office of the Commissioner for Kangaroo Island

Onefortyone Plantations

PF Olsen Australia

Premier's Climate Change Council

Primary Producers SA

Royal Australasian College of Surgeons

SA Metropolitan Fire Service

SA Police

SA Power Networks

SA State Emergency Services

South Australian Veterinary Emergency Management (SAVEM) Inc.

Tatiara District Council

Telstra

The Salvation Army Australia

The University of Adelaide

United Firefighters Union of SA

Appendix 5: List of Findings

4.1 Weather/scale of incidents

4.1.1 No level of hazard reduction would have prevented the fires experienced during the 2019-20 summer. However, a risk reduction target linked to prioritised objectives is still needed to minimise the impact upon individual communities.

4.1.2 Overnight conditions during these fires meant that unlike previous occasions there was no respite for firefighters and decision makers.

4.2 Reviews recommendations not enacted

4.2.1 Not all accepted recommendations from previous reviews have been implemented.

4.3 Role of SAFECOM

4.3.1 The Review heard that SAFECOM's role is unclear and there are concerns about 'mission creep' beyond its legislated function of enabling the Emergency Services sector under the Board's direction.

4.4 SAFECOM Board Structure

4.4.1 Contrary to accepted governance conventions, the SAFECOM CE chairs the SAFECOM Board which raises questions about whether it delivers the best outcomes.

4.5 State emergency planning arrangements

4.5.1 The State Emergency Planning Framework is effective if it is followed and agencies do not improvise or cut corners.

4.5.2 The SEC's decision making was impeded by having less senior staff rostered overnight who were not authorised to make decisions on behalf of their agency.

5.1 Bushfire Management Planning Framework

5.1.1 2009 amendments to the Fire and *Emergency Services Act 2005* introducing a bushfire management framework for prevention and mitigation have not been fully implemented. For example the SBMP 2010 is incomplete, outdated and has no lawful force or effect.

5.1.2 The State Bushfire Management Committee should have a statutory requirement to report annually to State Parliament and its membership should have an appropriate level of expertise and authority.

5.1.3 The CFS is not adequately resourced at central or regional levels to manage and implement the bushfire management planning framework.

5.2 State bushfire management plan – role and status, reporting, accountability

5.2.1 The State Bushfire Management Plan is intended to provide strategic coordination and guidance on all elements of bushfire management across PPRR but this does not appear to be its function in South Australia.

5.3 Bushfire management planning process

5.3.1 Fire management plans in the CFS and state land management agencies have different risk assessment processes and these plans are not integrated.

5.3.2 Risk assessments in existing Bushfire Management Area Plans do not comply with the international standard for risk management (ISO 31000) or NERAG and there are no clear lines of accountability for mitigating risks.

5.3.3 DEW has developed an excellent spatial tool which can assist stakeholders to understand the relationship between fuel hazard and fire behaviour, and property and landscape risk.

5.4 Native vegetation management and codification

5.4.1 The Native Vegetation Council (NVC) is criticised for being slow to respond to hazard reduction applications but the problem appears to be with the community's understanding of the process.

5.4.2 The processes involved in seeking approvals for fuel reduction strategies are confusing and poorly understood by the community and the CFS needs greater capacity to support native vegetation management.

5.5 Hazard reduction – prescribed burning, compliance, shared responsibility

5.5.1 The level of fuel reduction permitted on private land is unclear and there is an inconsistent approach to compliance action (Section 105 Notices) to reduce fuel hazards.

5.5.2 Fuel reduction strategies such as prescribed burns tend to be short term and are incorrectly viewed as the panacea for reducing bushfire risks.

5.5.3 The community does not appear to understand that public land management agencies are only responsible for part of the total fuel hazard in South Australia (e.g. 39% in Mount Lofty Ranges) and prescribed burns are needed on both public and private land to reduce risks.

5.6 Data for risk intelligence

5.6.1 Better systems are needed to share data across emergency and land management agencies to support the flow of information to IMTs and the SEC.

5.6.2 Existing risk intelligence data for bushfire prone land is not in real time whereas other governments have risk data readily available to the public.

6.1 SAPOL Operation NOMAD

6.1.1 SAPOL's Operation Nomad is an effective strategy to minimise risk during periods of high fire danger but additional public information is needed about high-risk activities.

6.2 Insurance and Community Preparednes

6.2.1 Many properties and businesses were not insured — the reasons for which are not yet determined. Stamp duty concessions on insurance could be provided to reduce costs.

6.2.2 Agencies should reinforce the message that individuals must take responsibility for preparing their own homes and having a bushfire plan, and that assistance through the '000' emergency call centre may be limited during a crisis.

6.3 Incident Management Team Facilities

6.3.1 Facilities for IMTs in a campaign event do not meet accepted guidelines and impede the teams' effectiveness in delivering SEC directions and operational demands.

6.4 Evacuation planning

6.4.1 Places of last resort are not well understood by the community in terms of what possessions (including pets) should be taken to these locations.

6.4.2 There is insufficient preparation around evacuations including assessment of suitable routes to designated locations to reduce risks.

6.4.3 Asset protection priorities must be made clear to reduce the loss of critical infrastructure such as telephone towers, with memoranda of understanding (MOUs) between EM agencies and providers.

6.5 Regionally specific operations planning

6.5.1 Kangaroo Island burns differently to mainland firegrounds which needs to be reflected in logistics and resilience planning and preparation.

6.6 ADF deployment arrangements and capability

6.6.1 There is insufficient understanding of when and how the ADF can assist the civilian authorities.

6.6.2 While there was widespread community appreciation for the morale boosting efforts of the ADF their assistance had mixed reactions. Some saw advantages while others did not know how to use defence personnel without displacing local tradespeople/contractors.

6.7 AVL and resource management

6.7.1 AVL capability is urgently needed for both the vehicle fleet and the portable radios used by CFS, MFS, DEW and SES crews.

6.8 Fleet appropriateness/fit for purpose

6.8.1 There is an urgent need to review the age and appropriateness of the bushfire vehicle fleet in CFS, MFS, SES and DEW, ensuring all vehicles are fitted with Burnover Protection Systems (BOPS).

6.9 Capability development

6.9.1 Better succession planning and recruitment is required as well as additional training and development for leaders who are often given just-in-time training for key roles.

6.9.2 More training is required for 'mopping up' activities supported by ready access to handheld thermal imagery technology.

6.10 Interstate deployment capability

6.10.1 Deploying personnel to interstate fires through the AFAC arrangements resulted in organisational fatigue during the 2019-20 bushfire season which was characterised by campaign fires.

Appendix 5: List of Findings

6.11 Lightning Tracking and Rapid Response

6.11.1 Real time access to lightning tracking is needed to assist with early detection and rapid response to lightning strike ignitions.

6.11.2 Pre-planning is required to deploy early aerial reconnaissance, specialist remote ground crews for inaccessible terrain and heavy plant where dry lightning is forecast.

6.12 Adequate staffing in peri-urban and expanding areas

6.12.1 The call rate to all hazards continues to grow in peri-urban areas of townships raising the need to review the principles for deploying fire and rescue services.

6.12.2 Standard equipment between agencies needs to be interoperable —there are differences and incompatibility between MFS and CFS radios, radio frequencies, Personal Protective Equipment (PPE), masks, trucks, maps, training, helmets, hose couplings and breathing apparatus.

6.13 Communications and ICT

6.13.1 Limited telecommunications connectivity and Government Radio Network data capability impedes CFS, Forest Industry Brigades and FFU communications and community messaging.

6.13.2 ICT systems are inconsistent across the CFS — some volunteers are successfully using brigade management systems like BART but it has not been officially endorsed by the CFS or accepted service-wide.

6.13.3 Information from the CFS CRIIMSON database had to be manually extracted and uploaded onto the systems used by other emergency management agencies delaying information transfers.

6.13.4 A common operating picture was difficult to obtain and it is not supported by integrated ICT systems across agencies.

6.13.5 Given the Australian Broadcasting Corporation (ABC) is the emergency broadcaster, any move to a new location for emergency management operations needs to include a position for ABC management.

7.1 Farm Firefighting Units (FFUs)

7.1.1 Deployment of FFUs is inconsistent and are not properly recorded. This makes resource management difficult and creates liability exposure should death or injury occur.

7.1.2 FFUs are a valuable resource but those who operate them are at as much risk of being seriously injured or killed as other emergency responders and their assistance to the community could be better managed using AIIMS.

7.2 Crew accommodation/Humanihut

7.2.1 There was insufficient space to accommodate the number of responders brought in to deal with the fires which needs to be addressed for future emergencies.

7.2.2 One Humanihut was insufficient to accommodate the response operations on Kangaroo Island.

7.3 Turkey Lane Airstrip

7.3.1 The landing strip at Turkey Lane on Kangaroo Island is not fit for purpose during emergencies causing damage to SA Water infrastructure and some propeller aircraft.

7.4 Aviation Resources

7.4.1 Aviation line scanning and tactical firefighting resources are inadequate to meet contemporary demands.

7.4.2 The use of northern hemisphere-based firefighting aircraft is becoming problematic as the bushfire season is extending in both hemispheres making it difficult to call on additional resources from overseas.

7.5 State Emergency Centre (SEC) Capability

7.5.1 The SEC did not receive the best information about the location and direction of the fires because of an oversight in not sharing fire prediction maps.

7.5.2 Arrangements need to be made with the BoM to provide 24/7 capability to advise SEC decision makers about the prevailing risk.

7.6 Plant and equipment access and supervision

7.6.1 Access to plant and equipment during a crisis was ambiguous as were the risks associated with engaging untrained personnel to enter the fireground (e.g. road construction bulldozers requisitioned to build fire breaks).

7.6.2 The CFS should consider how to deploy heavy machinery with adequate protection for plant operators in planning for severe, extreme, or catastrophic fire danger days.

7.7 Public Information and Warnings

7.7.1 There was confusion about emergency messaging whereby 'emergency' was interpreted as a message to evacuate.

7.7.2 Alert SA was initiated using the NSW government 'Fires Near Me' App however the benefits of the app were not fully translated.

7.7.3 The community received insufficient information on the location of fires, direction of travel and estimated time of when the fire would reach specific locations.

7.7.4 The CFS website mapping was inadequate to advise the public about the location and direction of the fires and the 'warning message' polygon was reportedly mistaken as the fire boundary.

7.7.5 IMTs and fireground leaders need access to people with local knowledge including suitably trained and qualified forest industry professionals to assist with decision making.

8.1 Recovery planning

8.1.1 The transition from operational response to recovery was considered too slow.

8.2 Rapid Damage Assessment (RDA)

8.2.1 Rapid Damage Assessment (RDA) is not providing a level of accuracy or consistency to help decision makers or government officials inform the community about the impacts of an event.

8.3 Water replenishment and Business Continuity

8.3.1 More needs to be done to clarify the process for replenishing water and other aspects of business continuity in the recovery process.

8.4 Welfare

8.4.1 The psychological impacts of the 2019-20 fire season on fire and incident management crews resulted in the highest recorded levels since 2005 of access to psychological support services.

8.4.2 The number of burnover incidents reported during the 2019-20 fire season is the highest recorded.

8.4.3 The impact of bushfire on wildlife is not well understood and requires a leadership role by DEW.

8.4.4 The State Recovery Office has an excellent initiative to record community experiences to help the recovery process and prepare the community for the next disaster.

Appendix 6: List of Recommendations

Recommendation 1

Implement previous review recommendations for bushfire management including those relating to the 2009 amendments to the *Fire and Emergency Services Act 2005*, State Bushfire Coordination Committee operation, State Bushfire Management Plan, as well as urgent completion of Codes of Practice for fuel hazard reduction on all land tenures, and redevelopment of Bushfire Management Area Plans accompanied by effective community engagement to build an understanding of risk.

Recommendation 2

Align risk assessment tools and processes to Risk Management Standard ISO 31000 and the National Emergency Risk Assessment Guidelines (NERAG) and communicate these on public-facing platforms. Make Bushfire Management Area Plans (BMAP) accountable for managing and reporting on region-specific risk and identifying critical infrastructure such as mobile phone towers as key risks.

Recommendation 3

Consider amending the *Fire and Emergency Services Act 2005* to align SAFECOM Board operations with accepted governance standards with the Minister appointing an Independent Chair of the SAFECOM Board. The SAFECOM Chief Executive (CE) should report to the Board and maintain SAFECOM's role at the direction of the Board. Alternatively, SAFECOM could be abolished, moving to a model of a Department of Fire and Emergency Services where the departmental head reports to the Minister but the value proposition of any such machinery of government change would need to be thoroughly examined.

Recommendation 4

Invest in upgrading and integrating ICT platforms to eliminate manual data transfers, and ensure IT and radio communication interoperability across the agencies, together with a dedicated focus on the development of a coordinated risk intelligence capability to provide all stakeholders with a common operating picture and rapid damage assessments.

Recommendation 5

Clarify and streamline processes and educate the community about their roles and responsibilities in managing native vegetation to improve hazard reduction on both public and private land. Provide additional resources to manage fuel in a shorter off fire season and develop a risk reduction target linked to prioritised objectives.

Recommendation 6

Consider removing stamp duty from home insurance to encourage a wider section of the community to take out insurance. South Australian government agencies should share their risk modelling data with the Insurance Council of Australia.

Recommendation 7

Prepare to 'scale up' capability during major bushfire events with senior representatives (including BoM staff) in the SEC 24/7, ensure adequate facilities for IMTs, base camps (e.g. Humanihuts) and recovery centres. Consider the resource implications of providing firefighters to interstate operations.

Recommendation 8

Engage with the Australian Defence Force (ADF) once or twice a year to understand the capabilities that could potentially be deployed. Educate IMTs about how to deploy ADF assistance effectively and develop a streamlined 'call out' procedure.

Recmmendation 9

Invest in fireground leadership and incident management training for CFS, SES and MFS personnel to improve safety on the fireground. Invest in greater technological interoperability such as AVL, Thermal Imagery, Burnover Protection Systems (BOPS), lightning tracking and appropriate vehicle fleets for bushfire conditions including at the peri-urban interface.

Recommendation 10

Incorporate Farm Firefighting Units (FFUs) into the Australasian Inter Service Incident Management System (AIIMS) so that IMTs are aware of their presence on the fireground and their welfare and risks are understood.

Recommendation 11

Develop and practice procedures for the CFS, DEW and local governments to access and deploy heavy plant and machinery for fuel reduction operations both before and during bushfires.

Recommendation 12

Review the use of aviation assets including facilities to operate them given the increased pressure from extended fire seasons on northern and southern hemisphere resources. Review line scanning capability with a view to providing real time data to the IMTs on where fires are burning using aviation assets as an intelligence tool rather than just a fire suppression capability.

Recommendation 13

Better coordinate public information and warnings including evacuation plans and provide a single source of information about, the location and direction of fires, how and when to use *Safer Places, Places of Last Resort*, relief and recovery centres and directed evacuations.

Recommendation 14

Clarify business continuity and restoration of critical infrastructure in the planning and response phases to facilitate water replenishment, fireground remediation and access to businesses (including farming properties).

Recommendation 15

Collate data and research the impact of bushfires upon communities, firefighters and animals (both native and domestic) to identify appropriate medium and long-term welfare and support requirements.

Appendix 7

Government of South Australia

Level 3,
60 Waymouth Street
Adelaide SA 5000

GPO Box 2706
Adelaide SA 5001
DX 206

Tel 8115 3900
Fax 8115 3908

ABN 95 437 863 949

www.safecom.sa.gov.au

Reference: ESS-20-313

Royal Commission into Natural Disaster Arrangements
Locked Bag 2000
MANUKA ACT 2603

Dear Sir

INDEPENDENT REVIEW INTO SOUTH AUSTRALIA'S 2019/2020 BUSHFIRE SEASON

I refer to your letter dated 26 May 2020.

Our Independent Review (the Review) has now been completed and forwarded to the South Australian Minister for Police and Emergency Services, the Hon Corey Wingard MP.

The Review took the approach of a 'Desktop Review' given the current COVID-19 restrictions.

Having said that, the Review received 576 submissions, conducted over 60 online interviews (some with multiple attendees) and sent over 100 targeted surveys.

There are more than 70 findings and there are 15 Recommendations arising from the Review for the SA government to consider. The Recommendations relate to inaction on previous reviews as well as providing clarity around the role of the South Australian Fire and Emergency Services Commission (SAFECOM). Other Recommendations seek improvements in:

- vehicle fleets;
- radio communications;
- interoperability of ICT platforms;
- roles and responsibilities for land management including hazard reduction;
- communication around hazard reduction undertakings and processes;
- safety of volunteer and salaried personnel;
- clarity around evacuation messaging;
- addressing the long-term impact of bushfires on personnel; and
- understanding and addressing the impact upon domestic and native animals.

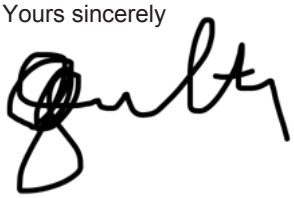
We did not address some of the matters thought to be the subject of the deliberations of the Royal Commission such as:

- Co-ordination and suitability of aerial firefighting capability through the National Aerial Firefighting Centre (NAFC);
- Co-ordination and negative impact of cross jurisdictional deployment of firefighters through the Australasian Fire and Emergency Service Authorities Council (AFAC) arrangements resulting in 'organisational fatigue';
- Streamlining access to the Australian Defence Force (ADF) capability and understanding what is available;

- Further research on pyro convection activity, its frequency and its influence upon bushfire behaviour in a warming climate;
- The need for an Australian Standard on property risk and resilience for bushfire prone areas; and
- Remuneration for volunteers and/or subsidisation for employers releasing volunteers from their workforce as a means of increasing volunteer numbers.

Once the Minister approves the release of the Review, we will of course provide you with a copy. I am happy to discuss any of the matters raised in this correspondence and anytime suitable to your office.

Yours sincerely



M J Keelty AO

16 June 2020

Appendix 8: Letter to the Chief Officer of CFS

Government of South Australia

Level 3,
60 Waymouth Street
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Adelaide SA 5001
DX 206

Tel 8115 3900
Fax 8115 3908

ABN 95 437 863 949

www.safecom.sa.gov.au

Reference: ESS-20-313

Chief Officer Mark Jones
South Australian Country Fire Service (SACFS)
GPO Box 2468
Adelaide SA 5001

Dear Chief Officer Jones

INDEPENDENT REVIEW INTO SOUTH AUSTRALIA'S 2019/2020 BUSHFIRE SEASON

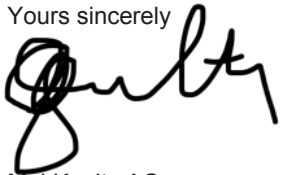
As we have discussed, the Independent Review into the 2019/2020 South Australian Bushfire Season (the Review) has carefully examined the full gambit of the fire season, including the major fires across the State, the support to interstate agencies, and the work of agencies in the preparation and preparedness space. It is important to acknowledge that the Review was not designed to find evidence of wrongdoing (perceived or otherwise); indeed the unprecedented scale of the fire season and the threat that the community and authorities faced means that it is commendable that so many lives, homes, townships and businesses were saved.

Due to the significant impacts of COVID-19, the Review Team has focused on a strategic 'desktop review' of the fire season. However, during the course of the public submissions and formal interviews, issues and opportunities at a tactical level were identified. It was decided that the Review needed to remain focused on the strategic recommendations and that many of the tactical and agency level matters would be best served through confidential referral to the respective agencies.

In light of this, the Review has attached redacted submissions that addressed these themes so that the South Australian Country Fire Service (SACFS) can include the feedback into its formal lessons learnt process. These issues are not intended as criticisms by the Review but are instead identified opportunities for SACFS based on feedback from the community.

I trust this information will be useful to the continued improvement process that the SACFS is committed to.

Yours sincerely



M J Keelty AO

10 June 2020

Attachments:

1. Redacted submissions

Appendix 9: Operational Synopsis

3.2 Monday 11 November 2019

3.2.1 Duck Ponds

Total Fire Bans (TFBs) 11th November declared in 7 of the 15 Fire Ban Districts

West Coast	SEVERE
Eastern Eyre Peninsula	SEVERE
Lower Eyre Peninsula	**EXTREME**
Flinders	SEVERE
Mid North	SEVERE
Mount Lofty Ranges	SEVERE
Yorke Peninsula	SEVERE

Summary of Major Incidents

District	Incident	Warning Level	Losses and injuries	Saves
Mt Lofty Ranges	Ashbourne	Watch and Act	Nil	
Yorke Peninsula	Foul Bay	Advice	Nil	
Lower Eyre Peninsula	White Hut	Emergency	Nil	
Lower Eyre Peninsula	Duck Ponds	Emergency	4 assets destroyed Nil injuries	41 properties
Mt Lofty Ranges	Lobethal	Advice	Nil	
Mt Lofty Ranges	Eden Valley	Advice	Nil	

Duck Ponds Fire – Lower Eyre Peninsula

Time (hrs)	Key event
12 Nov 16:03	*Fire reported.* Multiple calls to 000; GFDI Catastrophic. TFB Response. PRZ Aircraft Response
16:11	Additional aircraft responded to LEP
16:23	Emergency Warning Message issued
16:55	SA Power Networks advise disconnection of power due to conditions in LEP
17:17	Region 1 Strike Team deployed to Pt Lincoln for nightshift
17:24	Level 3 Incident Management Team deployed to Pt Lincoln
17:36	Red Flag Warning: Wind change expected 18:30hrs
19:43	Forward Rate of Spread altered
19:59	Fire warning downgraded from Emergency to Watch and Act
13 Nov 02:54	Fire contained
04:53	Fire controlled
21 Nov	Fire declared safe

Appendix 9: Operational Synopsis

3.3 Wednesday 20 November 2019

3.3.1 Yorketown

TFBs 20th November declared in 15 of the 15 Fire Ban Districts (State-wide)

North West Pastoral	SEVERE
North East Pastoral	SEVERE
West Coast	**CATASTROPHIC**
Eastern Eyre Peninsula	**CATASTROPHIC**
Lower Eyre Peninsula	**CATASTROPHIC**
Flinders	**EXTREME**
Mid North	**CATASTROPHIC**
Mount Lofty Ranges	**CATASTROPHIC**
Adelaide Metropolitan	SEVERE
Yorke Peninsula	**CATASTROPHIC**
Kangaroo Island	**CATASTROPHIC**
Riverland	SEVERE
Murraylands	SEVERE
Upper South East	SEVERE
Lower South East	**EXTREME**

Yorketown Fire – Yorke Peninsula

Time (hrs)	Key event
20 Nov 15:17	*Fire reported.* Multiple calls to 000; GFDI Catastrophic. Automatic upgrade to 2nd Alarm.
15:29	Strike Teams responded
15:39	Aircraft responded
16:09	Emergency Warning Message issued
16:11	Additional aircraft responded
19:07	Head of fire burns to coast
17:36	Red Flag Warning: Wind change expected 18:30hrs
23:48	Watch and Act Message issued
21 Nov 05:11	Very strong wind change hits fire ground and two sections of fire break out burning towards Edithburgh
05:21	Emergency Warning Message issued
06:30	Fire impacting Edithburgh
07:40	Forward rate of spread halted
10:24	Large Air Tanker drops on fireground to secure edge around Edithburgh
17:41	Fire Contained
22 Nov 18:48hrs	Fire Controlled
29 Nov 13:22	Fire SAFE

3.4 Friday 20 December 2019

3.4.1 Cudlee Creek

3.4.2 Duncan and Menzies

TFBs 20th December declared in 15 of the 15 Fire Ban Districts (State-wide)

North West Pastoral	SEVERE
North East Pastoral	SEVERE
West Coast	SEVERE
Eastern Eyre Peninsula	**EXTREME**
Lower Eyre Peninsula	**CATASTROPHIC**
Flinders	SEVERE
Mid North	**CATASTROPHIC**
Mount Lofty Ranges	**CATASTROPHIC**
Adelaide Metropolitan	SEVERE
Yorke Peninsula	**CATASTROPHIC**
Kangaroo Island	**CATASTROPHIC**
Riverland	SEVERE
Murraylands	SEVERE
Upper South East	SEVERE
Lower South East	**EXTREME**

Summary of Major Incidents

District	Incident	Warning Level	Losses and injuries	Saves
Mount Lofty Ranges	Cudlee Creek	Emergency	1 fatality 51 fire fighter injuries 98 dwellings and 542 outbuildings 325 vehicles 3852 stock	938 properties
Adelaide Metropolitan	Angle Vale	Emergency	1 derelict dwelling 10 outbuildings	
Yorke Peninsula	Maitland	Emergency	Nil	
Murraylands	Lamaroo	Emergency	Nil	
Kangaroo Island	Duncan; Menzies	Emergency	1 dwellings/sheds destroyed	
Murraylands	Coonalpyn	Emergency	Nil	

Appendix 9: Operational Synopsis

Cudlee Creek Fire – Mount Lofty Ranges

Time (hrs)	Key event
20 Dec 09:17	*Fire reported.* Multiple calls to 000; Aircraft automatically responded
09:19	Response upgraded
09:26	Response upgraded
09:27	Aircraft arrive to support ground crews
09:36	Emergency Warning Message issued
10:13	Additional Aircraft responded. 1 minute later flame heights in excess of 30m reported
10:50	Fire Behaviour Analyst indicates that pyroconvective fire behaviour likely
11:22	Level 3 Incident declared
11:28 11:32	Additional aircraft responded
11:55	Pyroconvective cloud forming above fireground
12:30	Lobethal under imminent threat
12:50	Woodside under imminent threat
13:22	Watch and Act Message issued on right flank of fire to advise of forecast wind change
14:42	Claremont Airbase Impacted
14:45	Nearby town of Brukunga imminent threat
15:58	Storm cells forming with lighting to North, West, and South of Cudlee Creek fireground
17:50	Large Air Tankers perform final drops around Gumeracha Hospital before returning to Victoria
18:31	Harrogate area imminent threat
19:23	Mount Torrens imminent threat
21 Dec 00:50	Conditions finally moderate across fireground
25 Dec 18:11	Forward Rate of Spread halted across fireground
31 Dec 12:06	Fire Contained
03 Jan 20:46	Fire Controlled
22 Jan 12:48	Fire SAFE

Duncan and Menzies Fires – Kangaroo Island

Time (hrs)	Key event
20 Dec 15:10	Duncan Complex of Fires reported to '000'
15:23	Menzies Complex of Fires reported to '000'
15:37	Dudley East fire reported to '000'
15:41	Watch and Act Message issued
17:02	Aircraft responded to Kangaroo Island
17:03	Emergency Warning Message issued for the Dudley East fire
18:40	Emergency Warning Message issued for the Menzies Fire Complex
19:00	Dudley East Fire declared out
20:32	Emergency Warning Message issued across broad area to cover the multiple fires on the North Coast of Kangaroo Island

Time (hrs)	Key event
08:34	Emergency Warning Message issued for the Menzies Complex of Fires
08:44	Multiple aircraft responded to Kangaroo Island
09:51	Watch and Act Message issued for all Kangaroo Island fires
11:57	New fire located by aircraft west of Parndana
17:18	Emergency Warning Message issued for the Duncan Fire
22 Dec 10:06	Additional aircraft dispatched to support existing aircraft due to high levels of fire activity
14:06	Forward Rate of Spread stopped at the Menzies Fire Complex
23 Dec 15:45	Menzies Fire Complex declared Contained
29 Dec 15:36	Menzies Fire Complex declared SAFE
03 Jan	Duncan and Menzies Firegrounds incorporated into the Ravine Fire.

3.5 30 December 2019

3.5.1 Ravine Fires, Kangaroo Island

TFBs 30th December declared in 15 of the 15 Fire Ban Districts (State-wide)

North West Pastoral	SEVERE
North East Pastoral	SEVERE
West Coast	SEVERE
Eastern Eyre Peninsula	SEVERE
Lower Eyre Peninsula	SEVERE
Flinders	SEVERE
Mid North	**CATASTROPHIC**
Mount Lofty Ranges	**CATASTROPHIC**
Adelaide Metropolitan	SEVERE
Yorke Peninsula	**CATASTROPHIC**
Kangaroo Island	SEVERE
Riverland	SEVERE
Murraylands	**EXTREME**
Upper South East	SEVERE
Lower South East	**EXTREME**

Appendix 9: Operational Synopsis

Summary of Major Incidents

District	Incident	Warning Level	Losses and injuries	Saves
Kangaroo Island	Ravine Fires	Emergency	2 fatalities 33 fire fighter injuries 87 dwellings and 332 outbuildings 322 vehicles 59 730 stock	335 properties
Lower South East	Keilira	Watch and Act	1 dwelling 5 outbuildings 3, 666 stock	
Eastern Eyre Peninsula	Miltalie	Watch and Act	Damage to an electrical sub station	

Ravine Fires – Kangaroo Island

Time (hrs)	Key event
30 Dec 04:59	Fires reported as lightning strikes by National Parks personnel.
06:10	Watch and Act Message issued
06:33	SAPOL enacting road closures in area
06:49	Aircraft responded to investigate fires
07:00	Tourism operators informed of Flinders Chase Park closure
10:47	Additional aircraft responded
12:25	Emergency Warning Message issued for Ravine 1 Fires
14:14	Second fire spotted 3 miles west of Ravine 1 Fires. Designated Ravine 2.
14:31	Aircraft prioritised to new fire (Ravine 2), burning well within the Ravine Wilderness Protection Area
17:09	LAT drops occur on head of Ravine 2 fire
19:35	Emergency Alert issued for Ravine 1 and 2 fires
23:32	Ravine 2 Fire continuing to burn aggressively, crosses Playford Highway burning in northerly direction
31 Dec 03:03	Ravine 1 fire largely burning within itself. Ravine 2 is burning in blue gum plantation north towards Cape Torrens
17:04	Aircrane commences operations on Ravine Fires
01 Jan 08:27	Breakout in the DeMole Estate area. Aircraft tasked to support.
02 Jan 15:15	Incident Management Team changeover underway
16:53	Accommodation providers on western and southern KI advised to leave ahead of 3rd Jan. IMT liaises directly with all accommodate providers in the South and West that are likely to be impacted and advise them to not be there on the 3rd
03 Jan 06:00	Ravine 2 has broken out on North Coast. Finger burning in South West direction
10:31	20m+ flame heights observed on breakout. Further spot over also burning aggressively
12:51	Emergency Warning Message issued. Watch and Act to be issued along Eastern Boundary to account for forecast wind change
14:44	Road closures pushed further east, roughly north-south line from Stokes Bay to Vivonne Bay, restricting access to western half of Kangaroo Island

Time (hrs)	Key event
15:24	Pyro-cumulous observed forming on radar
16:19	Red Flag Warning issued due to wind change and significant fire front burning in easterly direction
18:11	Emergency Alert extended to Vivonne Bay, and Watch and Act pushed further east
19:35	Emergency Alert to be extended to cover Parndana
20:00	IMT undertake emergency relocation to Kingscote due to possible fire impact on Parndana
21:32	IMT established in DEW facility in Kingscote
22:15	40-55kph winds still present, fire front has progressed but intel is limited. Reports that Menzies fire has also broken containment
23:34	Fire Alarms activate at Turkey Lane Water Treatment facility indicating possible fire impact. CCTV footage confirms impact
04 Jan 09:55	Conditions began to ease at 0400hrs. 100% cloud cover and light rainfall in parts.
10:17	Watch and Act Message issued
13:18	Assessment confirms that Turkey Lane Airstrip is closed due to fire impact
14:22	Australian Defence Force deploys liaison team to Kingscote
05 Jan 19:23	Loss of '000' in some areas due to fire impact on communications and power infrastructure. Alternate communications procedures activated
06 Jan 08:23	Preparations required by Wednesday 8th January to deal with elevated fire weather forecast for the 9th January
18:02	Multiple areas of concern successfully back burnt to create stronger control lines
07 Jan 11:15	Aircraft responded to Stokes Bay area. Flare up threatening property in the area
17:10	Further flare ups in Stokes Bay area. Multiple aircraft responded
21:35	Bureau of Meteorology Automatic Weather Site at Cape Borda impacted by fire
08 Jan 08:38	Planning for Large Air Tanker drops underway
09 Jan 10:01	Watch and Act Message (via Emergency Alerts) issued for Parndana area
10:34	Assets under threat Stokes Bay
13:45	Large fire break out in Bark Hut area. Too dangerous for aircraft at this time
14:18	Fire breakout in South East, heading towards Vivonne Bay
14:24	Fire breakout heading towards Parndana, assets not under threat yet
14:35	Emergency Warning Message
15:23	Fire burns to coast at Vivonne Bay. Other breakout has burnt around Parndana and passed west. With wind change Parndana will be directly threatened
15:38	Emergency Warning Message issued
16:02	Spot fires occurring near Parndana
19:46	Threats across the fireground with 30m+ flame heights reported
10 Jan 00:35	Fire remains erratic, red flag warnings issued
06:17	Restrictions on Ferry Access to Kangaroo Island established
16:36	Fire behaviour eased. Bushfire Advice Message issued.
21 Jan 20:20	Fire Contained
31 Jan 18:48	Fire Controlled
06 Feb 17:00	Fire SAFE

Appendix 9: Operational Synopsis

TFBs 3rd January declared in 9 of the 15 Fire Ban Districts (State-wide)

West Coast	**EXTREME**
Eastern Eyre Peninsula	SEVERE
Lower Eyre Peninsula	**EXTREME**
Mid North	SEVERE
Mount Lofty Ranges	**EXTREME**
Yorke Peninsula	**EXTREME**
Kangaroo Island	**EXTREME**
Murraylands	SEVERE
Lower South East	**EXTREME**

Total Fire Bans 9rd January (TFBs) declared in 6 of the 15 Fire Ban Districts.

Lower Eyre Peninsula	SEVERE
Mid North	SEVERE
Mount Lofty Ranges	SEVERE
Yorke Peninsula	SEVERE
Kangaroo Island	SEVERE
Lower South East	SEVERE

3.5.2 Keilira Fire, South East

Time (hrs)	Key event
30 Dec 08:3	Keilira fire reported to '000'
09:01	Bushfire Advice Message issued
10:59	Incident upgraded to bring in more resources
11:20	Additional aircraft requested
12:19	Watch and Act Message issued
13:10	Additional aircraft responded
13:45	Red Flag Warning issued regarding Eastern Flank
13:52	LAT dispatched to incident
15:00	Level 2 Incident declared
15:09	Level 3 Rapid IMT deployed
15:23	Watch and Act Message issued to account for wind change
15:41	Fire burning at least 1 hour ahead of prediction
17:31	Rapid IMT arrive Lucindale
18:36	Riddoch Highway closed due to smoke/visibility
19:42	All aircraft released due to last light
21:48	Watch and Act Message issued
31 Dec 10:05	Fire conditions eased. Crews gaining upper hand. Bushfire Advice Message issued.
03 Jan 20:18	Fire Contained
09 Jan 15:36	Fire SAFE

3.5.3 Miltalie Fire, Eyre Peninsula

Time (hrs)	Key event
30 Dec 11:52	Miltalie fire reported to '000'
12:38	Notification to Electranet that fire is in close proximity to main transmission lines that feed the Eyre Peninsular
13:28	Notification to Iron Duke Mine that fire is the area
14:09	Incident upgraded to bring in more resources
14:13	Aircraft responded
15:21	Level 2 Incident declared
16:11	Lincoln Highway closed
17:15	Electranet request access to fireground to undertake inspections
18:50	Generator required for Whites Knob phone tower. Cleve without mobile phone service
20:06	Iron Duke Mine advised to prepare for possible fire impact on Friday due to forecast weather
20:20	Generator organised with Whites Knob
31 Dec 00:32	Bushfire Advice Message issued
15:49	Breakouts on fireground. Fire burning well.
16:40	Aircraft responded
17:43	Watch and Act Message issued
19:14	All aircraft released
20:20	Bushfire Advice Message issued
05 Jan 08:23	Fire Controlled
11:13	Fire Contained
09 Jan 12:06	Fire SAFE

Appendix 10: Meteorological Reports

Meteorological Report on the Cudlee Creek Bushfire, Adelaide Hills, 20 December 2019

Meteorological Report on the Ravine Bushfire, Kangaroo Island, 3 January 2020

Meteorological Reports on the Cudlee Creek Bushfire, Adelaide Hills (for 20 December 2019) and the Ravine Bushfire, Kangaroo Island (for 3 January 2020) are being finalised at the time of printing this report and are therefore proposed to be published electronically when they become available.

Appendix 11: Fire Weather Forecasts

Australian Government
Bureau of Meteorology

IDS65006
Australian Government Bureau of Meteorology
South Australia

Fire Weather Forecast for South Australia for Monday 11 November 2019

Issued at 3:35 pm CDT on Sunday 10 November 2019.

FORECASTS ARE ISSUED REGULARLY: PLEASE ENSURE YOU HAVE THE LATEST VERSION

Summary

District	District FFDI	District GFDI	District Rating	Percent Coverage	Fire Weather Warning
North West Pastoral	91	30	Very High	52	
North East Pastoral	79	24	High	95	
West Coast	97	73	Severe	93	Y
Eastern Eyre Peninsula	95	71	Severe	83	Y
Lower Eyre Peninsula	101	125	Extreme	32	Y
Flinders	78	54	Severe	28	Y
Mid North	83	84	Severe	93	Y
Mount Lofty Ranges	69	32	Severe	75	Y
Adelaide Metropolitan	65	20	High	47	
Yorke Peninsula	81	80	Severe	75	Y
Kangaroo Island	49	5	Very High	80	
Riverland	75	41	Very High	100	
Murraylands	72	31	Very High	46	
Upper South East	63	9	Very High	0	
Lower South East	49	1	Very High	76	

* Ratings are provided in conjunction with Fire Authorities.
* District FDI is the representative peak FDI in the district for that fuel type. 10% of the district has a max FDI higher than this value.
* Percent Coverage is the percentage of the District that falls in or above the District Rating threshold.

Monday

Significant fire weather day with Severe to Extreme fire danger across parts of the State. Hot to very hot and dry with north to northwesterly winds increasing to 40-50 km/h during the morning ahead of a gusty southwesterly wind change expected during the afternoon and evening. West to northwesterly winds increasing to 50-60 km/h about the Lower Eyre Peninsula during the middle of the day ahead of the change. Dry apart from a slight chance of an afternoon and evening shower in the south, mainly near southern coasts. A slight risk of dry lightning across southern parts of the State during the day. Areas of raised dust over western and central parts.

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Appendix 11: Fire Weather Forecasts

District Weather Elements for Monday 11 November 2019

Issued at 3:35 pm CDT on Sunday 10 November 2019.

District	TAL	cHaines	Prob Rain >5mm	1500m Wind (km/h)	3000m Wind (km/h)	Mix Height (m)
North West Pastoral	0	12	0	NW 40	W 35	4000
North East Pastoral	0	11	0	NW 40	WNW 40	2800
West Coast	1	12	0	NW 55	W 45	2600
Eastern Eyre Peninsula	1	12	0	NW 55	WNW 55	3500
Lower Eyre Peninsula	1	11	0	NW 75	WNW 70	1900
Flinders	0	11	0	NW 45	W 40	2800
Mid North	1	11	0	NW 50	WNW 50	3200
Mount Lofty Ranges	1	11	< 5	NW 60	WNW 60	2400
Adelaide Metropolitan	1	11	< 5	NW 45	WNW 55	2400
Yorke Peninsula	1	11	0	NW 50	WNW 50	2400
Kangaroo Island	1	11	0	WNW 70	WNW 65	1300
Riverland	1	12	0	NW 45	WNW 55	3400
Murraylands	1	11	< 5	NW 45	WNW 55	3300
Upper South East	1	11	< 5	NW 45	NW 55	2600
Lower South East	1	10	< 5	WNW 65	NW 70	1800

Detailed District Forecast for Monday 11 November 2019

Issued at 3:35 pm CDT on Sunday 10 November 2019.

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
North West Pastoral	**F**	91	100	07	15	100	09	11	73	10	7	0		
	G	30	52	10	8	0			0			0		
North East Pastoral	**F**	79	100	09	15	100	11	9	23	15	3	0		
	G	24	9	15	2	0			0			0		
West Coast	**F**	97	100	07	11	100	09	8	92	10	6	1	11	1
	G	73	100	08	9	93	10	7	0			0		
Eastern Eyre Peninsula	**F**	95	100	08	13	100	10	10	94	11	6	2	15	1
	G	71	100	09	11	83	10	8	0			0		
Lower Eyre Peninsula	**F**	101	100	08	10	96	10	8	85	11	6	13	13	1
	G	125	100	08	10	90	09	9	32	12	4	< 1	NA	NA
Flinders	**F**	78	100	08	16	100	10	10	23	14	3	0		
	G	54	100	10	12	28	15	3	0			0		
Mid North	**F**	83	100	09	14	100	10	10	72	14	3	0		
	G	84	100	09	13	93	10	8	0			0		

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	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Mount Lofty Ranges	**F**	69	96	09	11	75	10	7	< 1	NA	NA	0		
	G	32	19	10	8	< 1	NA	NA	0			0		
Adelaide Metropolitan	**F**	65	100	09	10	90	11	6	0			0		
	G	20	0			0			0			0		
Yorke Peninsula	**F**	81	100	09	11	96	10	8	37	13	3	0		
	G	80	100	08	11	75	10	8	0			0		
Kangaroo Island	**F**	49	80	10	7	6	13	1	0			0		
	G	5	0			0			0			0		

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Riverland	**F**	75	100	09	15	100	12	8	18	16	1	0		
	G	41	100	12	7	0			0			0		
Murraylands	**F**	72	100	09	11	100	10	8	1	15	0	0		
	G	31	46	11	6	0			0			0		
Upper South East	**F**	63	100	09	11	89	12	6	0			0		
	G	9	0			0			0			0		
Lower South East	**F**	49	76	10	8	2	14	2	0			0		
	G	1	0			0			0			0		

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Appendix 11: Fire Weather Forecasts

Location Forecasts at Time of Maximum Fire Danger Index for Monday 11 November 2019

Issued at 3:35 pm CDT on Sunday 10 November 2019.

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
North West Pastoral														
Woomera	15	37	6	NW	30	50	37	100	10	G	SSW	30	50	19-23
North East Pastoral														
Leigh Creek	14	34	7	NNW	30	45	35	100	10	G				
West Coast														
Ceduna	11	36	7	NNW	40	65	38	100	10	G	WSW	45	65	12-16
Wudinna	11	34	8	NNW	45	70	39	100	10	G	WSW	35	55	14-18
Eastern Eyre Peninsula														
Whyalla	11	32	10	NNW	40	65	37	100	10	G	SSW	40	65	17-21
Cleve Airport	15	37	6	WNW	45	70	37	100	10	G	W	35	55	15-19
Lower Eyre Peninsula														
Cummins	14	34	11	WNW	55	85	35	85	10	G	W	45	70	13-17
Port Lincoln Airport	14	32	13	WNW	55	90	34	91	10	G	W	45	70	13-17
Flinders														
Hawker	16	34	6	NW	35	55	34	100	10	G	SSW	25	40	21-01
Port Augusta	16	37	6	NW	35	50	38	100	10	G	S	35	60	20-24
Mid North														
Port Pirie Airport	12	31	12	NNW	40	60	36	99	10	G	SSW	35	55	18-22
Clare	15	33	7	NW	40	65	33	94	10	G	SW	30	45	18-22
Roseworthy	15	37	7	NW	35	55	37	95	10	G	SW	25	35	17-21

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Mount Lofty Ranges														
Mount Crawford	15	30	11	WNW	45	70	30	70	9	F	WSW	20	35	17-21
Kuitpo	15	30	12	NW	45	65	30	65	8	F	W	30	45	16-20
Strathalbyn	15	34	10	NW	40	65	34	80	10	F	SSW	30	45	16-20
Adelaide Metropolitan														
Edinburgh Airport	14	34	11	NW	35	55	35	86	10	G	SW	30	50	17-21
Adelaide Airport	12	28	19	NW	35	60	31	74	10	G	SSW	30	50	16-20
Yorke Peninsula														
Maitland	13	32	10	NNW	45	70	35	93	10	G	SW	35	55	16-20
Edithburgh	13	32	11	NW	45	70	33	85	10	G	SSW	40	65	15-19
Kangaroo Island														
Kingscote Airport	14	31	15	NW	35	55	31	62	10	F	W	35	55	14-18
Cape Borda	11	23	41	N	30	50	24	47	9	F	S	35	60	13-17

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Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Riverland														
Renmark	16	36	6	NW	30	50	36	99	10	G	SW	30	50	22-02
Loxton	16	36	6	NW	30	45	35	97	10	G	SW	35	50	21-01
Murraylands														
Murray Bridge Airport	15	36	8	WNW	35	55	35	93	10	G	SSW	30	50	18-22
Lameroo	16	36	7	WNW	30	50	35	86	10	G	SW	35	50	19-23
Upper South East														
Meningie	14	32	12	NW	40	60	32	73	10	G	WSW	35	55	17-21
Keith AWS	14	35	10	NW	35	50	35	65	10	G	SW	25	40	18-22
Lower South East														
Naracoorte	14	31	16	WNW	40	65	31	25	9	F	WSW	30	50	17-21
Coonawarra	14	28	22	WNW	40	60	28	25	8	F	WSW	25	35	17-21
Mount Gambier Airport	14	27	24	NW	40	60	27	13	5	F	WSW	20	35	17-21

Note

Point locations are extracted from the forecast policy issued by the Bureau of Meteorology. They are designed to be representative of the area within the vicinity of the location but do not take into account local variations due to topography and elevation.

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Appendix 11: Fire Weather Forecasts

Australian Government
Bureau of Meteorology

IDS65006
Australian Government Bureau of Meteorology
South Australia

Fire Weather Forecast for South Australia for Wednesday 20 November 2019

Issued at 3:45 pm CDT on Tuesday 19 November 2019.

FORECASTS ARE ISSUED REGULARLY: PLEASE ENSURE YOU HAVE THE LATEST VERSION

Summary

District	District FFDI	District GFDI	District Rating	Percent Coverage	Fire Weather Warning
North West Pastoral	150	69	Severe	85	Y
North East Pastoral	121	44	Severe	1	Y
West Coast	161	153	Catastrophic	13	Y
Eastern Eyre Peninsula	161	154	Catastrophic	18	Y
Lower Eyre Peninsula	171	240	Catastrophic	80	Y
Flinders	132	107	Extreme	24	Y
Mid North	131	157	Catastrophic	17	Y
Mount Lofty Ranges	115	58	Catastrophic	39	Y
Adelaide Metropolitan	113	55	Severe	23	Y
Yorke Peninsula	144	189	Catastrophic	65	Y
Kangaroo Island	100	24	Catastrophic	14	Y
Riverland	120	78	Severe	96	Y
Murraylands	109	60	Severe	40	Y
Upper South East	95	21	Severe	0	Y
Lower South East	77	1	Extreme	15	Y

* Ratings are provided in conjunction with Fire Authorities.
* District FDI is the representative peak FDI in the district for that fuel type. 10% of the district has a max FDI higher than this value.
* Percent Coverage is the percentage of the District that falls in or above the District Rating threshold.

Wednesday

Significant fire weather with catastrophic conditions forecast for 7 districts. Very hot and dry throughout with strong and gusty north to northwesterly winds 40-50 km/h, reaching near 50-65 km/h at times in the south and west. A cooler and gusty southerly change 35-45 km/h moving across the west in the late afternoon and evening potentially reaching up to 65 km/h immediately on the change in the north and west. Areas of raised dust ahead and behind the change during the afternoon and evening. The chance of an evening thunderstorm in the far northwest.

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District Weather Elements
for Wednesday 20 November 2019

Issued at 3:45 pm CDT on Tuesday 19 November 2019.

District	TAL	cHaines	Prob Rain >5mm	1500m Wind (km/h)	3000m Wind (km/h)	Mix Height (m)
North West Pastoral	1	13	0	N 65	N 60	5600
North East Pastoral	0	13	0	N 45	N 45	5400
West Coast	0	13	0	N 75	NNW 65	5400
Eastern Eyre Peninsula	0	13	0	NNW 75	NNW 80	5300
Lower Eyre Peninsula	0	13	0	NNW 80	NNW 85	5100
Flinders	0	13	0	N 55	N 55	5600
Mid North	0	13	0	NNW 60	NNW 60	5600
Mount Lofty Ranges	0	13	0	NNW 70	NNW 70	4800
Adelaide Metropolitan	0	13	0	NNW 70	NNW 70	4300
Yorke Peninsula	0	13	0	NNW 75	NNW 80	4300
Kangaroo Island	0	13	0	NNW 85	NNW 90	1400
Riverland	0	13	0	NNW 50	NNW 50	5600
Murraylands	0	13	0	NNW 50	NNW 50	5600
Upper South East	0	13	0	NW 45	NW 55	4900
Lower South East	0	13	0	NW 55	NW 70	3400

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Appendix 11: Fire Weather Forecasts

Detailed District Forecast
for Wednesday 20 November 2019

Issued at 3:45 pm CDT on Tuesday 19 November 2019.

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
North West Pastoral	**F**	150	100	00	24	100	08	15	100	09	13	100	10	9
	G	69	100	09	13	85	10	7	0			0		
North East Pastoral	**F**	121	100	00	24	100	09	14	100	10	11	63	12	7
	G	44	75	10	10	1	15	1	0			0		
West Coast	**F**	161	100	00	24	100	09	15	100	09	12	100	10	9
	G	153	100	08	15	100	09	12	99	10	6	13	13	2
Eastern Eyre Peninsula	**F**	161	100	03	21	100	08	16	100	09	15	100	10	9
	G	154	100	08	16	100	09	15	99	12	7	18	14	2
Lower Eyre Peninsula	**F**	171	100	05	18	100	09	15	99	09	11	97	10	9
	G	240	100	07	17	100	09	15	89	10	9	80	11	7
Flinders	**F**	132	100	00	24	100	09	15	100	10	10	95	12	7
	G	107	100	09	15	100	10	9	24	13	4	0		
Mid North	**F**	131	100	06	18	100	09	15	100	10	10	94	12	7
	G	157	100	08	16	100	09	14	69	11	8	17	14	4

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Mount Lofty Ranges	**F**	115	100	07	17	100	09	15	91	10	13	39	11	8
	G	58	44	09	15	16	11	9	3	15	2	0		
Adelaide Metropolitan	**F**	113	100	07	17	100	09	15	100	11	9	61	14	4
	G	55	71	11	10	23	13	5	0			0		
Yorke Peninsula	**F**	144	100	07	17	100	09	15	99	10	11	92	11	8
	G	189	100	08	16	100	09	15	88	11	8	65	14	4
Kangaroo Island	**F**	100	100	09	14	90	10	8	55	12	6	14	13	3
	G	24	10	12	5	0			0			0		

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	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Riverland	**F**	120	100	08	16	100	10	13	100	11	10	97	13	6
	G	78	100	10	13	96	12	9	0			0		
Murraylands	**F**	109	100	08	16	100	10	14	100	11	9	61	13	5
	G	60	89	09	13	40	13	6	0			0		
Upper South East	**F**	95	100	09	15	100	10	13	98	13	6	6	14	3
	G	21	7	13	5	0			0			0		
Lower South East	**F**	77	100	09	15	77	11	8	15	13	4	0		
	G	1	0			0			0			0		

Location Forecasts at Time of Maximum Fire Danger Index for Wednesday 20 November 2019

Issued at 3:45 pm CDT on Tuesday 19 November 2019.

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
North West Pastoral														
Woomera	14	42	5	N	50	80	43	100	10	G				
North East Pastoral														
Leigh Creek	15	42	6	N	45	65	42	100	10	G				
West Coast														
Ceduna	11	42	5	N	50	85	45	100	10	G	SW	40	60	17-21
Wudinna	13	43	5	N	55	85	44	100	10	G	SW	30	50	21-01
Eastern Eyre Peninsula														
Whyalla	16	44	5	NNW	50	80	44	100	10	G				
Cleve Airport	14	42	5	NNW	50	85	42	100	10	G				
Lower Eyre Peninsula														
Cummins	14	44	4	NNW	55	90	44	91	10	G	SSW	30	45	19-23
Port Lincoln Airport	13	43	6	NNW	55	90	44	98	10	G	SSW	35	55	19-23
Flinders														
Hawker	14	42	6	NNW	45	70	42	100	10	G				
Port Augusta	15	44	5	NNW	45	75	44	100	10	G				
Mid North														
Port Pirie Airport	15	42	6	NNW	40	65	42	99	10	G				
Clare	16	40	6	NNW	45	75	41	94	10	G				
Roseworthy	16	44	5	NW	45	70	44	95	10	G				

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Appendix 11: Fire Weather Forecasts

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Mount Lofty Ranges														
Mount Crawford	16	39	6	NW	45	65	39	72	9	F				
Kuitpo	15	38	9	NW	40	65	38	68	9	F				
Strathalbyn	15	42	7	NW	45	70	42	80	10	F				
Adelaide Metropolitan														
Edinburgh Airport	16	42	6	NW	45	65	42	91	10	G				
Adelaide Airport	17	41	8	NW	40	65	41	78	10	G				
Yorke Peninsula														
Maitland	16	41	6	NNW	55	85	41	94	10	G				
Edithburgh	16	42	6	NNW	55	85	43	85	10	G				
Kangaroo Island														
Kingscote Airport	15	40	10	N	45	75	39	67	10	F	S	30	50	21-01
Cape Borda	13	33	19	N	35	60	34	47	9	F	S	35	55	19-23

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Riverland														
Renmark	17	43	5	NNW	35	55	44	99	10	G				
Loxton	17	42	6	NNW	35	55	44	97	10	G				
Murraylands														
Murray Bridge Airport	14	44	6	NW	35	60	44	93	10	G				
Lameroo	14	43	7	NNW	35	55	44	87	10	G				
Upper South East														
Meningie	15	42	9	WNW	45	70	42	80	10	G				
Keith AWS	15	44	7	NW	35	55	44	73	10	G				
Lower South East														
Naracoorte	15	41	9	NNW	30	45	41	27	10	F				
Coonawarra	15	39	11	N	25	40	39	26	10	F				
Mount Gambier Airport	15	37	14	N	30	45	38	14	7	F				

Note

Point locations are extracted from the forecast policy issued by the Bureau of Meteorology. They are designed to be representative of the area within the vicinity of the location but do not take into account local variations due to topography and elevation.

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Bureau of Meteorology

IDS65006
Australian Government Bureau of Meteorology
South Australia

Fire Weather Forecast for South Australia for Friday 20 December 2019

Issued at 3:50 pm CDT on Thursday 19 December 2019.

FORECASTS ARE ISSUED REGULARLY: PLEASE ENSURE YOU HAVE THE LATEST VERSION

Summary

District	District FFDI	District GFDI	District Rating	Percent Coverage	Fire Weather Warning
North West Pastoral	123	54	Severe	16	Y
North East Pastoral	104	28	Severe	0	
West Coast	120	90	Severe	67	Y
Eastern Eyre Peninsula	128	102	Extreme	11	Y
Lower Eyre Peninsula	127	150	Catastrophic	10	Y
Flinders	92	55	Severe	45	Y
Mid North	136	160	Catastrophic	20	Y
Mount Lofty Ranges	130	142	Catastrophic	83	Y
Adelaide Metropolitan	116	81	Severe	100	Y
Yorke Peninsula	124	155	Catastrophic	15	Y
Kangaroo Island	107	128	Catastrophic	27	Y
Riverland	120	75	Severe	100	Y
Murraylands	131	95	Severe	100	Y
Upper South East	130	74	Severe	56	Y
Lower South East	144	13	Catastrophic	97	Y

* Ratings are provided in conjunction with Fire Authorities.
* District FDI is the representative peak FDI in the district for that fuel type. 10% of the district has a max FDI higher than this value.
* Percent Coverage is the percentage of the District that falls in or above the District Rating threshold.

Friday

Catastrophic fire danger, strong northwesterly winds with extreme temperatures and scattered dry lightning ahead of a strong and gusty southwest to southerly change.

Very hot with very low relative humidity, northeast to northerly winds 20-35 km/h, becoming north to northwesterly and strengthening to 35-50 km/h with gusts to around 70 km/h from mid morning. A squally, cooler southwest to southerly wind change 30-55 km/h will move over the west during the morning and early afternoon, central and southeast districts mid-late afternoon and eastern/northeastern districts during the evening.

Gusty thunderstorms with little rainfall forecast across all districts, most likely through northern central areas. Areas of raised dust.

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Appendix 11: Fire Weather Forecasts

District Weather Elements
for Friday 20 December 2019

Issued at 3:50 pm CDT on Thursday 19 December 2019.

District	TAL	cHaines	Prob Rain >5mm	1500m Wind (km/h)	3000m Wind (km/h)	Mix Height (m)
North West Pastoral	2	13	5	NNW 40	NNW 30	5100
North East Pastoral	2	12	< 5	NNW 35	N 30	4900
West Coast	1	13	< 5	NNW 55	NW 45	2200
Eastern Eyre Peninsula	2	13	10	NNW 60	NNW 55	5300
Lower Eyre Peninsula	1	13	< 5	NNW 70	NW 50	3200
Flinders	2	13	10	NNW 40	NNW 35	5100
Mid North	2	13	10	NNW 50	NNW 45	5400
Mount Lofty Ranges	1	13	10	NNW 65	NNW 55	4900
Adelaide Metropolitan	1	13	10	NNW 60	NNW 55	4500
Yorke Peninsula	1	13	10	NNW 65	NNW 55	4100
Kangaroo Island	1	13	< 5	NNW 75	NW 70	1400
Riverland	2	13	< 5	NNW 45	NNW 40	5200
Murraylands	1	13	5	NNW 55	NNW 50	5300
Upper South East	1	13	< 5	NNW 60	NW 55	5200
Lower South East	1	13	< 5	NW 70	NW 65	4000

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Detailed District Forecast for Friday 20 December 2019

Issued at 3:50 pm CDT on Thursday 19 December 2019.

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
North West Pastoral	**F**	123	100	00	24	100	01	17	99	09	10	64	10	8
	G	54	97	09	11	16	14	1	0			0		
North East Pastoral	**F**	104	100	00	24	100	08	13	79	10	9	15	11	6
	G	28	28	10	7	0			0			0		
West Coast	**F**	120	100	00	20	94	08	10	77	09	8	35	10	6
	G	90	98	07	11	67	09	8	< 1	NA	NA	0		
Eastern Eyre Peninsula	**F**	128	100	00	21	100	06	12	100	09	9	94	10	6
	G	102	100	07	13	100	09	10	11	11	1	0		
Lower Eyre Peninsula	**F**	127	100	02	15	99	07	9	89	08	7	58	09	4
	G	150	100	05	13	99	07	9	64	09	5	10	10	1
Flinders	**F**	92	100	00	23	100	07	12	83	09	7	< 1	NA	NA
	G	55	100	07	14	45	09	6	0			0		
Mid North	**F**	136	100	00	22	100	07	12	100	09	8	79	10	7
	G	160	100	02	18	100	08	12	79	09	8	20	11	2

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Mount Lofty Ranges	**F**	130	100	00	20	100	07	11	97	09	8	83	09	7
	G	142	100	04	15	100	07	10	71	09	7	4	10	2
Adelaide Metropolitan	**F**	116	100	00	19	100	07	11	100	09	7	76	10	6
	G	81	100	07	11	100	10	7	0			0		
Yorke Peninsula	**F**	124	100	00	19	100	07	11	98	09	8	76	10	5
	G	155	100	02	17	100	08	10	88	09	6	15	10	3
Kangaroo Island	**F**	107	100	02	13	97	08	8	69	09	5	27	10	2
	G	128	100	04	14	100	08	9	50	10	5	0		

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Appendix 11: Fire Weather Forecasts

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Riverland	**F**	120	100	00	23	100	08	14	100	10	9	100	11	7
	G	75	100	08	14	100	11	7	0			0		
Murraylands	**F**	131	100	00	22	100	08	12	100	10	9	99	10	6
	G	95	100	08	13	100	09	10	2	11	1	0		
Upper South East	**F**	130	100	00	20	100	08	11	100	10	8	98	11	6
	G	74	89	08	12	56	09	8	0			0		
Lower South East	**F**	144	100	06	13	100	08	10	100	10	8	97	11	6
	G	13	3	10	3	0			0			0		

Location Forecasts at Time of Maximum Fire Danger Index for Friday 20 December 2019

Issued at 3:50 pm CDT on Thursday 19 December 2019.

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
North West Pastoral														
Woomera	11	44	13	NNW	40	60	47	100	10	G	S	30	50	17-21
North East Pastoral														
Leigh Creek	10	43	13	N	35	55	45	100	10	G	E	10	15	21-01
West Coast														
Ceduna	10	42	10	W	35	55	42	100	10	G	SW	40	65	08-12
Wudinna	10	46	11	NNW	45	75	47	100	10	G	SW	50	80	11-15
Eastern Eyre Peninsula														
Whyalla	12	47	10	NNW	40	65	48	100	10	G	SSW	45	75	15-19
Cleve Airport	11	46	10	NNW	50	75	47	100	10	G	S	40	65	12-16
Lower Eyre Peninsula														
Cummins	10	45	10	NW	45	70	46	100	10	G	W	40	65	09-13
Port Lincoln Airport	10	44	11	NW	50	75	45	100	10	G	W	45	70	09-13
Flinders														
Hawker	11	44	11	NNW	35	55	45	100	10	G	SSW	35	60	18-22
Port Augusta	13	48	10	NNW	35	55	49	100	10	G	SSE	45	75	17-21
Mid North														
Port Pirie Airport	14	46	12	NNW	35	60	46	100	10	G	SW	40	65	15-19
Clare	11	44	9	NNW	45	70	45	100	10	G	SSW	35	60	15-19
Roseworthy	11	47	7	NNW	45	75	48	100	10	G	SW	40	60	14-18

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Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Mount Lofty Ranges														
Mount Crawford	11	42	9	NNW	45	70	43	90	10	F	WSW	40	60	14-18
Kuitpo	12	43	10	NW	45	70	43	94	10	F	W	35	55	13-17
Strathalbyn	12	46	8	NW	45	75	46	97	10	G	SSW	45	65	14-18
Adelaide Metropolitan														
Edinburgh Airport	12	46	8	NW	45	65	47	100	10	G	SW	40	65	14-18
Adelaide Airport	12	45	12	NW	40	65	45	100	10	G	SSW	35	55	13-17
Yorke Peninsula														
Maitland	11	44	11	NNW	45	70	45	100	10	G	SW	40	65	13-17
Edithburgh	11	44	11	NNW	50	80	45	100	10	G	WSW	50	80	12-16
Kangaroo Island														
Kingscote Airport	12	43	12	NW	45	70	43	100	10	G	SW	50	80	12-16
Cape Borda	09	33	24	NNE	40	65	35	100	10	G	SW	45	70	11-15

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Riverland														
Renmark	14	48	7	NNW	35	55	48	100	10	G	SSW	35	55	18-22
Loxton	12	46	9	NNW	35	60	47	100	10	G	SSW	35	60	17-21
Murraylands														
Murray Bridge Airport	12	46	7	NNW	45	65	48	100	10	G	SSW	45	65	14-18
Lameroo	13	46	8	NNW	45	65	47	100	10	G	SW	40	65	15-19
Upper South East														
Meningie	14	45	9	WNW	40	65	45	97	10	G	SW	50	80	13-17
Keith AWS	16	45	10	WSW	45	75	48	88	10	G				
Lower South East														
Naracoorte	15	47	8	WNW	50	75	47	33	10	F	W	50	85	13-17
Coonawarra	15	45	8	WNW	50	80	46	39	10	F	W	50	85	13-17
Mount Gambier Airport	15	44	8	WNW	50	80	45	32	9	F	W	45	70	13-17

Note

Point locations are extracted from the forecast policy issued by the Bureau of Meteorology. They are designed to be representative of the area within the vicinity of the location but do not take into account local variations due to topography and elevation.

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Appendix 11: Fire Weather Forecasts

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IDS65006
Australian Government Bureau of Meteorology
South Australia

Fire Weather Forecast for South Australia for Monday 30 December 2019

Issued at 3:09 pm CDT on Sunday 29 December 2019.

FORECASTS ARE ISSUED REGULARLY: PLEASE ENSURE YOU HAVE THE LATEST VERSION

Summary

District	District FFDI	District GFDI	District Rating	Percent Coverage	Fire Weather Warning
North West Pastoral	105	38	Severe	0	
North East Pastoral	115	43	Severe	0	
West Coast	81	52	Severe	17	Y
Eastern Eyre Peninsula	117	91	Severe	96	Y
Lower Eyre Peninsula	69	78	Severe	53	Y
Flinders	101	81	Severe	99	Y
Mid North	129	175	Catastrophic	49	Y
Mount Lofty Ranges	114	160	Catastrophic	26	Y
Adelaide Metropolitan	100	84	Severe	42	Y
Yorke Peninsula	111	160	Catastrophic	24	Y
Kangaroo Island	46	62	Severe	41	Y
Riverland	127	98	Severe	100	Y
Murraylands	131	114	Extreme	38	Y
Upper South East	94	66	Severe	77	Y
Lower South East	88	60	Extreme	57	Y

* Ratings are provided in conjunction with Fire Authorities.
* District FDI is the representative peak FDI in the district for that fuel type. 10% of the district has a max FDI higher than this value.
* Percent Coverage is the percentage of the District that falls in or above the District Rating threshold.

Monday

High end fire weather day with Severe to Catastrophic fire danger across the State. Very hot and dry. Gusty north to northwesterly winds increasing to 40-55 km/h after sunrise, ahead of a strong and gusty southwesterly change around 35-50 km/h. The wind change is expected near Ceduna mid morning, Adelaide and the southeast early to mid afternoon and Woomera to Renmark early evening. Winds becoming south to southwesterly and gradually easing to 20-30 km/h around 2-3 hours behind the change. Gusty thunderstorms with little rainfall are possible across most of the State, apart from the far southwest. Areas of raised dust are also likely. Wind gusts of around 70-90 km/h are possible ahead and near the change, and also with thunderstorms.

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District Weather Elements for Monday 30 December 2019

Issued at 3:09 pm CDT on Sunday 29 December 2019.

District	TAL	cHaines	Prob Rain >5mm	1500m Wind (km/h)	3000m Wind (km/h)	Mix Height (m)
North West Pastoral	1	12	< 5	NW 50	WNW 45	4300
North East Pastoral	1	12	< 5	NNW 40	NW 35	4400
West Coast	1	12	< 5	NW 65	WNW 60	1500
Eastern Eyre Peninsula	1	11	< 5	NW 65	NW 65	4100
Lower Eyre Peninsula	1	11	< 5	NW 80	NW 75	1600
Flinders	1	12	< 5	NNW 45	NW 40	4500
Mid North	1	12	< 5	NW 60	NW 50	4500
Mount Lofty Ranges	1	11	5	NW 75	NW 75	3300
Adelaide Metropolitan	1	11	10	NW 70	NW 75	2700
Yorke Peninsula	1	11	< 5	NW 70	NW 70	2300
Kangaroo Island	1	11	< 5	NW 75	NW 85	1400
Riverland	1	12	5	NW 55	NW 50	4700
Murraylands	1	11	10	NW 60	NW 60	4200
Upper South East	1	11	10	NW 70	NW 75	3600
Lower South East	1	11	10	NW 80	NW 85	2700

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Appendix 11: Fire Weather Forecasts

Detailed District Forecast
for Monday 30 December 2019

Issued at 3:09 pm CDT on Sunday 29 December 2019.

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
North West Pastoral	**F**	105	100	00	24	97	08	13	78	09	10	26	10	3
	G	38	70	09	11	0			0			0		
North East Pastoral	**F**	115	100	00	24	100	08	12	89	10	9	24	10	6
	G	43	50	09	10	0			0			0		
West Coast	**F**	81	87	07	10	65	09	5	23	10	2	0		
	G	52	78	09	8	17	09	1	0			0		
Eastern Eyre Peninsula	**F**	117	100	07	12	100	09	9	95	09	6	32	10	3
	G	91	100	08	11	96	09	7	4	12	1	0		
Lower Eyre Peninsula	**F**	69	98	08	8	56	09	3	4	10	1	0		
	G	78	100	08	10	53	09	3	0			0		
Flinders	**F**	101	100	00	20	100	08	12	98	09	8	14	11	4
	G	81	100	07	13	99	09	8	0			0		
Mid North	**F**	129	100	06	13	100	08	10	100	09	8	97	10	5
	G	175	100	07	13	100	08	10	99	09	7	49	10	3

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Mount Lofty Ranges	**F**	114	100	06	11	96	08	7	61	10	5	26	10	3
	G	160	100	07	11	90	08	7	41	10	4	16	10	3
Adelaide Metropolitan	**F**	100	100	07	10	76	10	5	38	11	2	14	11	1
	G	84	100	10	7	42	11	3	0			0		
Yorke Peninsula	**F**	111	100	07	11	97	09	7	64	09	5	32	10	3
	G	160	100	08	12	99	09	8	56	09	4	24	10	2
Kangaroo Island	**F**	46	99	08	6	6	10	1	0			0		
	G	62	100	08	8	41	09	1	0			0		

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	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Riverland	**F**	127	100	08	14	100	09	11	100	10	9	99	10	7
	G	98	100	08	13	100	09	10	3	11	1	0		
Murraylands	**F**	131	100	07	12	100	09	10	98	10	6	82	10	5
	G	114	100	08	10	99	09	6	38	10	2	0		
Upper South East	**F**	94	100	07	11	99	09	7	86	10	6	2	13	1
	G	66	99	09	8	77	10	6	0			0		
Lower South East	**F**	88	100	07	10	99	09	7	57	10	5	0		
	G	60	70	08	9	43	09	6	0			0		

Location Forecasts at Time of Maximum Fire Danger Index for Monday 30 December 2019

Issued at 3:09 pm CDT on Sunday 29 December 2019.

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
North West Pastoral														
Woomera	11	41	12	NNW	50	75	45	100	10	G	SSW	45	65	16-20
North East Pastoral														
Leigh Creek	12	42	11	NNW	35	55	43	100	10	G	SSW	30	45	20-24
West Coast														
Ceduna	09	36	25	WSW	40	65	37	100	10	G	SSW	40	65	07-11
Wudinna	10	42	12	W	40	65	43	100	10	G	SW	30	50	09-13
Eastern Eyre Peninsula														
Whyalla	12	43	13	NNW	50	75	43	100	10	G	S	50	75	12-16
Cleve Airport	10	41	13	NNW	45	75	42	100	10	G	S	30	50	09-13
Lower Eyre Peninsula														
Cummins	11	39	20	SW	35	50	39	100	10	G				
Port Lincoln Airport	09	36	25	WNW	45	70	36	100	10	G	SSW	40	60	07-11
Flinders														
Hawker	12	41	11	NNW	40	65	42	100	10	G	S	35	55	17-21
Port Augusta	12	41	14	NNW	40	65	45	100	10	G	S	45	70	14-18
Mid North														
Port Pirie Airport	14	42	12	W	45	75	44	100	10	G	SW	45	70	13-17
Clare	12	42	10	NW	50	85	41	100	10	G	SSW	40	65	13-17
Roseworthy	11	43	12	NNW	55	85	43	100	10	G	SW	35	55	12-16

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Appendix 11: Fire Weather Forecasts

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Mount Lofty Ranges														
Mount Crawford	11	39	13	NW	55	90	39	91	10	G	WSW	35	50	12-16
Kuitpo	11	37	18	NW	45	70	37	94	10	G	SSW	30	45	11-15
Strathalbyn	11	41	14	NW	50	75	41	98	10	G	SSW	40	65	11-15
Adelaide Metropolitan														
Edinburgh Airport	11	42	13	NNW	50	80	41	100	10	G	SW	35	55	11-15
Adelaide Airport	13	38	26	W	40	65	40	100	10	G	SW	40	65	11-15
Yorke Peninsula														
Maitland	10	40	15	N	55	85	40	100	10	G	SW	35	60	10-14
Edithburgh	11	39	23	W	40	65	39	100	10	G	WSW	35	55	09-13
Kangaroo Island														
Kingscote Airport	10	37	27	NW	40	65	37	100	10	G	SSW	35	55	08-12
Cape Borda	10	32	34	SW	40	65	32	100	10	G				

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Riverland														
Renmark	12	45	8	NNW	45	70	45	100	10	G	SSW	40	65	16-20
Loxton	12	44	8	NW	45	70	44	100	10	G	SSW	35	55	15-19
Murraylands														
Murray Bridge Airport	11	42	12	NW	50	80	43	100	10	G	SSW	40	65	12-16
Lameroo	13	44	10	NW	50	80	44	100	10	G	SW	35	55	14-18
Upper South East														
Meningie	13	38	21	W	50	75	40	97	10	G	SSW	45	70	11-15
Keith AWS	13	43	12	WNW	45	70	44	97	10	G	SW	35	60	12-16
Lower South East														
Naracoorte	13	41	14	NW	45	70	42	93	10	F	SW	35	55	12-16
Coonawarra	13	39	16	WNW	45	70	40	88	10	F	WSW	30	50	12-16
Mount Gambier Airport	11	39	19	NW	45	75	39	58	10	F	W	35	55	11-15

Note

Point locations are extracted from the forecast policy issued by the Bureau of Meteorology. They are designed to be representative of the area within the vicinity of the location but do not take into account local variations due to topography and elevation.

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Australian Government
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IDS65006
Australian Government Bureau of Meteorology
South Australia

Fire Weather Forecast for South Australia for Friday 3 January 2020

Issued at 3:46 pm CDT on Thursday 2 January 2020.

FORECASTS ARE ISSUED REGULARLY: PLEASE ENSURE YOU HAVE THE LATEST VERSION

Summary

District	District FFDI	District GFDI	District Rating	Percent Coverage	Fire Weather Warning
North West Pastoral	113	42	**Very High**	69	
North East Pastoral	87	19	**High**	94	
West Coast	125	102	**Extreme**	14	Y
Eastern Eyre Peninsula	99	70	**Severe**	90	Y
Lower Eyre Peninsula	113	129	**Extreme**	80	Y
Flinders	88	38	**Very High**	96	
Mid North	95	78	**Severe**	74	Y
Mount Lofty Ranges	84	64	**Extreme**	51	Y
Adelaide Metropolitan	78	36	**Very High**	100	
Yorke Peninsula	110	119	**Extreme**	44	Y
Kangaroo Island	87	90	**Extreme**	64	Y
Riverland	77	28	**Very High**	80	
Murraylands	90	55	**Severe**	21	Y
Upper South East	82	40	**Very High**	85	
Lower South East	77	30	**Extreme**	26	Y

* Ratings are provided in conjunction with Fire Authorities.
* District FDI is the representative peak FDI in the district for that fuel type. 10% of the district has a max FDI higher than this value.
* Percent Coverage is the percentage of the District that falls in or above the District Rating threshold.

Friday

Elevated fire danger across most of the State. Very hot and dry conditions throughout with northeast to northwesterly winds increasing to 30-45 km/h after sunrise, reaching 40-50 km/h in the west, ahead of a milder, fresh to strong and gusty southwest to southerly change around 40-55 km/h. The change is expected near Ceduna to Port Lincoln early-mid afternoon, Port Augusta to Adelaide during the evening and across eastern districts after midnight. Areas of raised dust in the west. Showers and possible gusty thunderstorms developing in the west.

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Appendix 11: Fire Weather Forecasts

District Weather Elements for Friday 3 January 2020

Issued at 3:46 pm CDT on Thursday 2 January 2020.

District	TAL	cHaines	Prob Rain >5mm	1500m Wind (km/h)	3000m Wind (km/h)	Mix Height (m)
North West Pastoral	1	13	5	NNW 45	NW 35	4100
North East Pastoral	0	13	0	NNW 25	NNW 25	4000
West Coast	1	12	15	NW 60	NW 45	3200
Eastern Eyre Peninsula	1	13	< 5	NNW 45	WSW 30	4100
Lower Eyre Peninsula	1	12	10	NW 55	WNW 40	3500
Flinders	0	13	0	NNW 25	W 25	4100
Mid North	0	13	0	N 30	WNW 25	3900
Mount Lofty Ranges	0	12	0	NNW 35	WNW 25	3300
Adelaide Metropolitan	0	12	0	N 35	WNW 30	3200
Yorke Peninsula	1	12	< 5	NNW 40	W 25	3300
Kangaroo Island	1	11	< 5	NW 55	WNW 40	2700
Riverland	0	13	0	N 30	WNW 30	3700
Murraylands	0	12	0	N 30	WNW 30	3600
Upper South East	0	12	0	N 30	NW 35	3400
Lower South East	0	12	0	NNW 35	NW 40	3200

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Detailed District Forecast for Friday 3 January 2020

Issued at 3:46 pm CDT on Thursday 2 January 2020.

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
North West Pastoral	**F**	113	100	00	24	100	08	14	97	09	11	44	10	7
	G	42	69	09	10	< 1	NA	NA	0			0		
North East Pastoral	**F**	87	100	00	24	100	08	13	89	11	7	0		
	G	19	0			0			0			0		
West Coast	**F**	125	100	00	19	100	08	10	93	09	8	77	10	6
	G	102	100	01	14	95	09	8	14	10	2	0		
Eastern Eyre Peninsula	**F**	99	100	05	16	100	08	12	99	09	9	9	11	4
	G	70	100	08	13	90	09	10	0			0		
Lower Eyre Peninsula	**F**	113	100	07	12	98	08	9	93	09	8	72	10	5
	G	129	100	07	12	98	09	9	80	10	8	0		
Flinders	**F**	88	100	00	24	100	08	12	79	11	7	0		
	G	38	96	08	14	0			0			0		
Mid North	**F**	95	100	00	23	100	09	12	61	10	8	< 1	NA	NA
	G	78	100	08	15	74	10	8	0			0		

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Mount Lofty Ranges	**F**	84	100	02	21	100	09	11	51	11	7	0		
	G	64	99	09	15	65	10	8	0			0		
Adelaide Metropolitan	**F**	78	100	03	20	100	09	11	42	12	4	0		
	G	36	100	10	8	0			0			0		
Yorke Peninsula	**F**	110	100	07	15	100	09	12	97	10	9	52	11	4
	G	119	100	08	14	99	09	11	44	10	3	0		
Kangaroo Island	**F**	87	100	08	12	94	10	9	64	11	6	0		
	G	90	99	08	11	90	10	8	0			0		

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Appendix 11: Fire Weather Forecasts

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Riverland	**F**	77	100	09	15	100	10	11	30	13	4	0		
	G	28	80	11	5	0			0			0		
Murraylands	**F**	90	100	08	15	100	10	10	76	11	6	0		
	G	55	100	10	9	21	11	3	0			0		
Upper South East	**F**	82	100	09	15	100	10	10	74	12	5	0		
	G	40	85	10	8	< 1	NA	NA	0			0		
Lower South East	**F**	77	100	09	15	99	10	9	26	13	4	0		
	G	30	30	10	6	0			0			0		

Location Forecasts at Time of Maximum Fire Danger Index for Friday 3 January 2020

Issued at 3:46 pm CDT on Thursday 2 January 2020.

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
North West Pastoral														
Woomera	11	40	6	N	35	50	45	100	10	G	SSW	40	60	19-23
North East Pastoral														
Leigh Creek	11	42	4	N	25	45	45	100	10	G				
West Coast														
Ceduna	11	44	7	N	45	75	45	100	10	G	SW	50	80	12-16
Wudinna	17	39	14	WSW	45	75	46	100	10	G				
Eastern Eyre Peninsula														
Whyalla	11	38	7	N	35	55	45	100	10	G	SSW	40	65	18-22
Cleve Airport	11	39	8	N	40	65	45	100	10	G	WSW	35	55	16-20
Lower Eyre Peninsula														
Cummins	10	38	7	N	45	75	45	100	10	G	SW	35	55	14-18
Port Lincoln Airport	11	42	9	N	35	60	44	100	10	G	SSW	30	45	14-18
Flinders														
Hawker	15	44	3	NW	25	35	44	100	10	G	S	25	40	21-01
Port Augusta	22	39	18	SSW	40	60	46	100	10	G				
Mid North														
Port Pirie Airport	12	43	6	NNW	30	45	45	100	10	G	SSW	35	55	19-23
Clare	12	40	5	N	30	50	42	100	10	G	SW	30	45	20-24
Roseworthy	12	43	6	NNE	30	50	45	100	10	G	SW	30	45	20-24

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Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Mount Lofty Ranges														
Mount Crawford	15	40	5	NNW	20	35	40	91	10	F	WSW	35	50	20-24
Kuitpo	15	39	6	NW	25	40	39	94	10	F	WSW	20	35	19-23
Strathalbyn	12	41	7	NNE	30	50	42	98	10	F	SSW	25	40	19-23
Adelaide Metropolitan														
Edinburgh Airport	11	40	8	NNE	30	45	44	100	10	G	SW	35	55	19-23
Adelaide Airport	12	38	7	N	30	45	42	100	10	G	SW	35	55	19-23
Yorke Peninsula														
Maitland	12	42	6	N	40	65	44	100	10	G	SW	35	60	18-22
Edithburgh	12	40	12	NNE	30	45	42	100	10	G	SW	35	55	17-21
Kangaroo Island														
Kingscote Airport	14	40	10	N	35	55	41	100	10	F	SW	30	50	17-21
Cape Borda	13	33	24	NNE	40	60	35	100	10	G	W	30	45	15-19

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Riverland														
Renmark	14	43	5	NNE	20	35	45	100	10	G				
Loxton	13	41	6	N	20	35	44	100	10	G				
Murraylands														
Murray Bridge Airport	12	40	10	NNE	40	55	44	100	10	G	SW	30	45	20-24
Lameroo	14	42	5	N	25	40	43	100	10	G				
Upper South East														
Meningie	12	39	9	N	35	55	42	97	10	G	SW	35	55	20-24
Keith AWS	13	42	6	N	25	45	43	97	10	G				
Lower South East														
Naracoorte	15	42	6	NNW	20	35	42	96	10	F				
Coonawarra	16	41	6	NNW	20	30	41	89	10	F				
Mount Gambier Airport	16	40	8	N	20	35	40	58	10	F				

Note

Point locations are extracted from the forecast policy issued by the Bureau of Meteorology. They are designed to be representative of the area within the vicinity of the location but do not take into account local variations due to topography and elevation.

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Appendix 11: Fire Weather Forecasts

Australian Government
Bureau of Meteorology

IDS65006
Australian Government Bureau of Meteorology
South Australia

Fire Weather Forecast for South Australia for Thursday 9 January 2020

Issued at 4:00 pm CDT on Wednesday 8 January 2020.

FORECASTS ARE ISSUED REGULARLY: PLEASE ENSURE YOU HAVE THE LATEST VERSION

Summary

District	District FFDI	District GFDI	District Rating	Percent Coverage	Fire Weather Warning
North West Pastoral	58	12	**High**	15	
North East Pastoral	63	15	**High**	19	
West Coast	52	23	**High**	92	
Eastern Eyre Peninsula	62	28	**Very High**	38	
Lower Eyre Peninsula	63	57	**Severe**	35	Y
Flinders	55	26	**Very High**	16	
Mid North	60	50	**Severe**	10	Y
Mount Lofty Ranges	68	55	**Severe**	98	Y
Adelaide Metropolitan	59	28	**Very High**	33	
Yorke Peninsula	67	53	**Severe**	16	Y
Kangaroo Island	51	49	**Severe**	22	Y
Riverland	48	17	**High**	75	
Murraylands	61	24	**High**	98	
Upper South East	56	21	**High**	100	
Lower South East	50	16	**Severe**	15	Y

* Ratings are provided in conjunction with Fire Authorities.
* District FDI is the representative peak FDI in the district for that fuel type. 10% of the district has a max FDI higher than this value.
* Percent Coverage is the percentage of the District that falls in or above the District Rating threshold.

Thursday

Elevated fire danger with Severe fire danger across central and southern parts. Hot about southern coasts, very hot elsewhere. Northeast to northwesterly winds 25-40 km/h, with gusty northeasterly winds 40-50 km/h about elevated terrain and down-slope areas in the morning. A gusty southwesterly wind change 30-45 km/h moving across the west and south during the afternoon and evening, bringing cooler, more humid conditions. Possible showers in the south and west. The chance of a thunderstorm in the far west during the late afternoon and evening.

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District Weather Elements for Thursday 9 January 2020

Issued at 4:00 pm CDT on Wednesday 8 January 2020.

District	TAL	cHaines	Prob Rain >5mm	1500m Wind (km/h)	3000m Wind (km/h)	Mix Height (m)
North West Pastoral	1	11	< 5	N 25	NNW 35	3600
North East Pastoral	0	12	0	N 20	NW 35	3700
West Coast	1	10	< 5	N 20	NNW 35	3000
Eastern Eyre Peninsula	0	11	0	N 30	NNW 30	3800
Lower Eyre Peninsula	0	9	< 5	NW 25	NNW 35	3200
Flinders	0	11	0	N 30	NW 40	3600
Mid North	0	11	0	N 20	NW 35	3700
Mount Lofty Ranges	0	11	0	NNW 25	NW 35	3300
Adelaide Metropolitan	0	11	0	NNW 20	NW 35	3200
Yorke Peninsula	0	11	0	NNW 25	NNW 40	3400
Kangaroo Island	0	9	< 5	NNW 25	NW 35	2300
Riverland	0	11	0	NNW 20	NW 40	3100
Murraylands	0	11	0	NNW 20	NW 35	3100
Upper South East	0	11	0	N 20	NW 35	2800
Lower South East	0	11	0	N 20	NNW 35	2500

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Appendix 11: Fire Weather Forecasts

Detailed District Forecast
for Thursday 9 January 2020

Issued at 4:00 pm CDT on Wednesday 8 January 2020.

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
North West Pastoral	**F**	58	100	08	15	41	10	9	0			0		
	G	12	0			0			0			0		
North East Pastoral	**F**	63	100	00	24	72	08	12	< 1	NA	NA	0		
	G	15	< 1	NA	NA	0			0			0		
West Coast	**F**	52	89	09	12	23	11	5	0			0		
	G	23	6	11	6	0			0			0		
Eastern Eyre Peninsula	**F**	62	100	09	15	92	11	8	0			0		
	G	28	38	11	6	0			0			0		
Lower Eyre Peninsula	**F**	63	100	09	11	83	11	7	0			0		
	G	57	100	09	10	35	13	3	0			0		
Flinders	**F**	55	100	00	22	20	08	10	0			0		
	G	26	16	09	7	0			0			0		
Mid North	**F**	60	100	07	15	50	10	9	0			0		
	G	50	86	06	13	10	09	3	0			0		

	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Mount Lofty Ranges	**F**	68	100	00	20	98	11	7	1	16	1	0		
	G	55	100	04	14	14	15	3	0			0		
Adelaide Metropolitan	**F**	59	100	00	23	95	11	7	0			0		
	G	28	33	09	3	0			0			0		
Yorke Peninsula	**F**	67	100	07	14	94	10	9	< 1	NA	NA	0		
	G	53	100	08	13	16	15	2	0			0		
Kangaroo Island	**F**	51	100	08	11	21	11	4	0			0		
	G	49	99	08	11	3	11	1	0			0		

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	Fuel Type	Dist FDI	FFDI > 25 GFDI > 25			FFDI > 50 GFDI > 50			FFDI > 75 GFDI > 100			FFDI > 100 GFDI > 150		
			%	Start	Hrs	%	Start	Hrs	%	Start	Hrs	%	Start	Hrs
Riverland	**F**	48	100	11	11	1	16	1	0			0		
	G	17	0			0			0			0		
Murraylands	**F**	61	100	09	13	73	12	7	0			0		
	G	24	9	11	6	0			0			0		
Upper South East	**F**	56	100	10	12	83	13	6	0			0		
	G	21	1	12	2	0			0			0		
Lower South East	**F**	50	100	10	11	15	14	3	0			0		
	G	16	0			0			0			0		

Location Forecasts at Time of Maximum Fire Danger Index for Thursday 9 January 2020

Issued at 4:00 pm CDT on Wednesday 8 January 2020.

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
North West Pastoral														
Woomera	16	43	11	NNW	20	35	43	100	7	G				
North East Pastoral														
Leigh Creek	08	31	18	E	40	65	44	100	10	G				
West Coast														
Ceduna	16	36	22	SW	30	45	40	100	9	G				
Wudinna	18	37	18	SW	30	45	43	100	10	G				
Eastern Eyre Peninsula														
Whyalla	16	42	11	N	25	40	42	100	9	G	SW	30	45	19-23
Cleve Airport	19	36	21	SW	35	60	42	100	9	G				
Lower Eyre Peninsula														
Cummins	16	38	17	W	35	55	41	100	10	G				
Port Lincoln Airport	15	39	18	NW	35	55	39	100	10	G	S	30	50	14-18
Flinders														
Hawker	10	33	15	ENE	40	65	42	100	8	G				
Port Augusta	15	44	11	NNW	25	40	44	100	7	G	S	35	50	21-01
Mid North														
Port Pirie Airport	16	42	13	NW	20	35	42	100	9	G	SSW	25	35	20-24
Clare	09	28	17	NE	35	60	40	100	9	G	S	25	40	20-24
Roseworthy	10	33	17	NE	35	60	43	100	10	G	SW	20	35	19-23

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Appendix 11: Fire Weather Forecasts

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Mount Lofty Ranges														
Mount Crawford	15	37	10	N	20	35	38	100	10	F	SW	20	35	20-24
Kuitpo	16	38	10	WNW	30	45	37	100	10	F	SW	15	30	18-22
Strathalbyn	16	40	8	WNW	25	40	40	100	10	F	SSW	20	30	19-23
Adelaide Metropolitan														
Edinburgh Airport	10	33	17	NE	35	55	41	100	10	G	SSW	25	40	19-23
Adelaide Airport	16	39	11	SSW	25	40	39	100	10	G	S	25	40	18-22
Yorke Peninsula														
Maitland	11	39	11	N	30	45	42	100	10	G	SW	30	50	17-21
Edithburgh	09	29	22	NE	35	55	37	100	10	G	SW	25	40	17-21
Kangaroo Island														
Kingscote Airport	13	35	18	NNE	30	45	37	100	10	F	W	20	35	16-20
Cape Borda	10	29	22	NE	35	60	33	100	10	G	W	25	45	15-19

Regions	Time	Temp	RH	Wind (km/h)			Max Temp	Cur %	DF	MaxFDI Fuel	Wind Change (km/h)			
				Dir	Spd	Gust					Dir	Spd	Gust	Time
Riverland														
Renmark	18	40	12	N	15	25	40	100	10	G				
Loxton	13	36	14	NE	15	25	40	100	9	G				
Murraylands														
Murray Bridge Airport	16	41	9	NNE	25	40	41	100	10	G	SSW	20	35	19-23
Lameroo	18	39	11	NNW	20	30	40	100	10	G				
Upper South East														
Meningie	13	37	13	N	25	40	39	100	10	G	SW	30	45	19-23
Keith AWS	16	41	10	N	20	35	41	100	10	G	WSW	20	35	21-01
Lower South East														
Naracoorte	17	39	11	NNW	15	20	39	100	10	F				
Coonawarra	16	38	11	NW	15	20	38	100	10	F				
Mount Gambier Airport	16	38	10	NNW	15	20	38	100	10	F				

Note

Point locations are extracted from the forecast policy issued by the Bureau of Meteorology. They are designed to be representative of the area within the vicinity of the location but do not take into account local variations due to topography and elevation.

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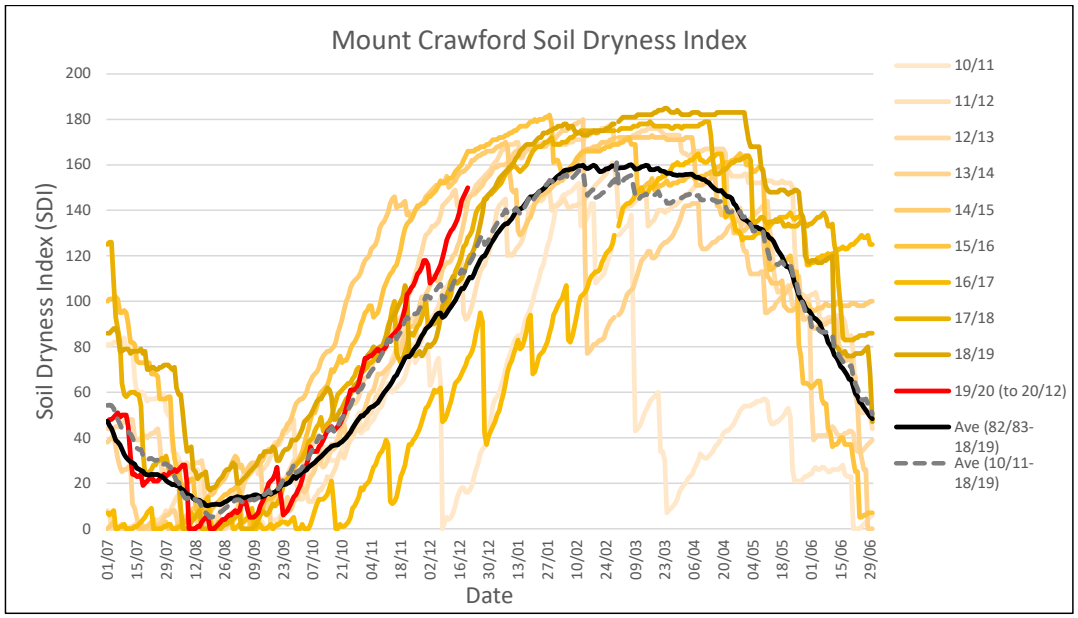
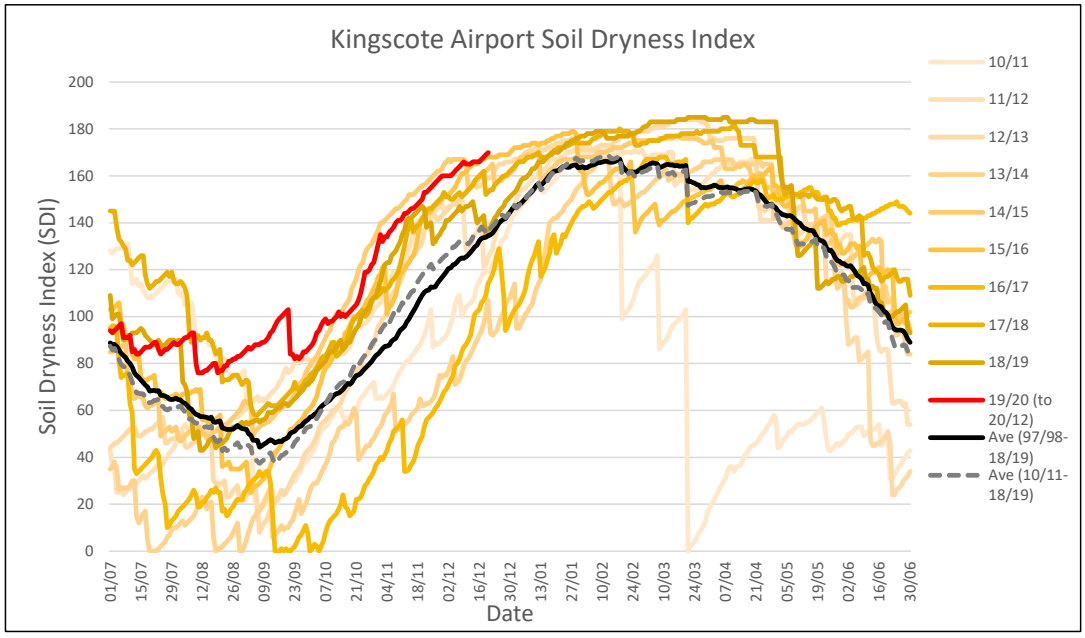
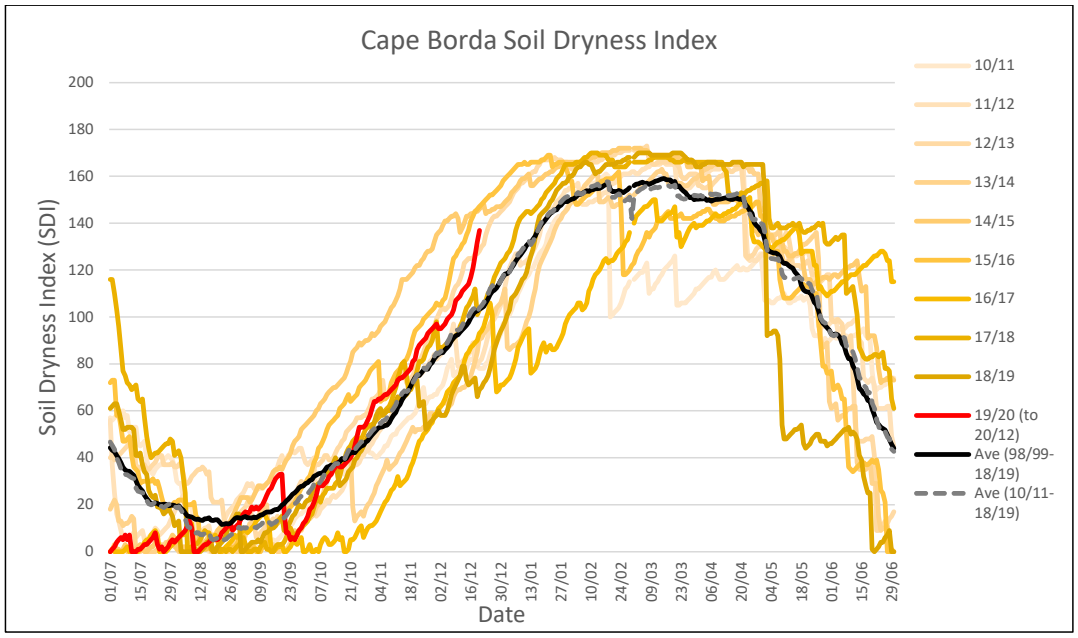
Appendix 12: Soil Dryness Index Plots

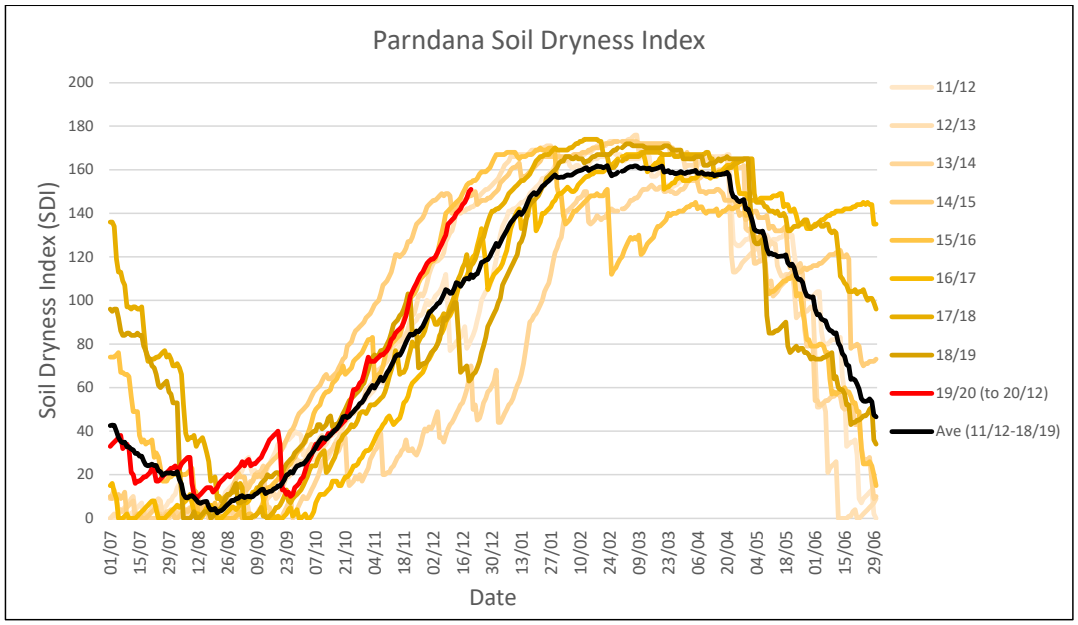
Ten year Mount Soil Dryness Index for selected stations

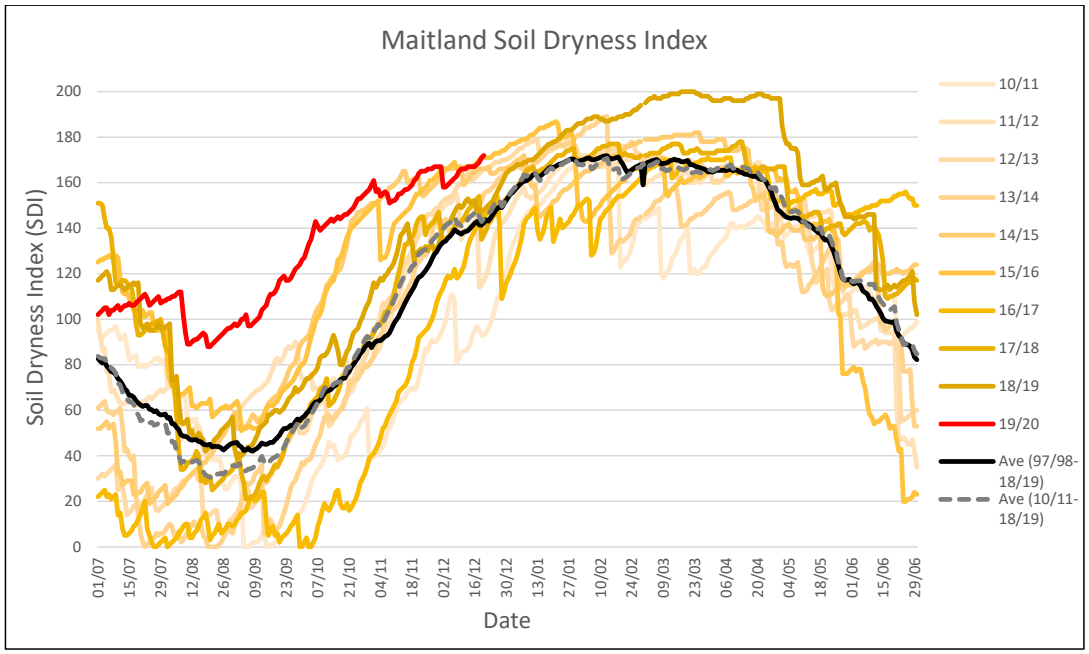


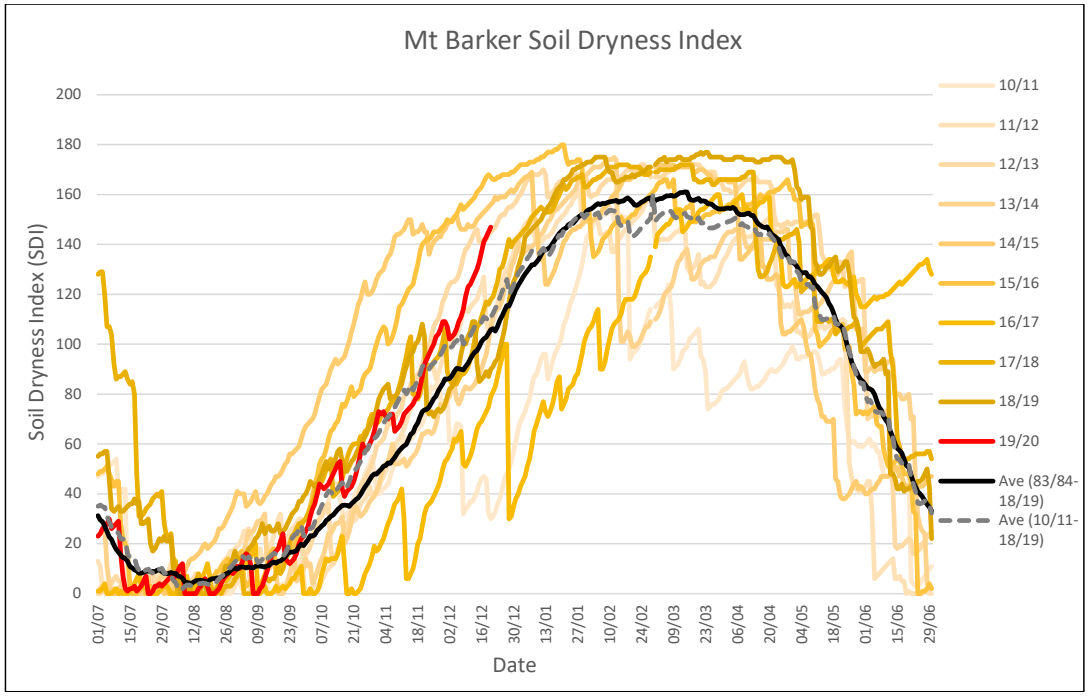


Appendix 12: Soil Dryness Index Plots

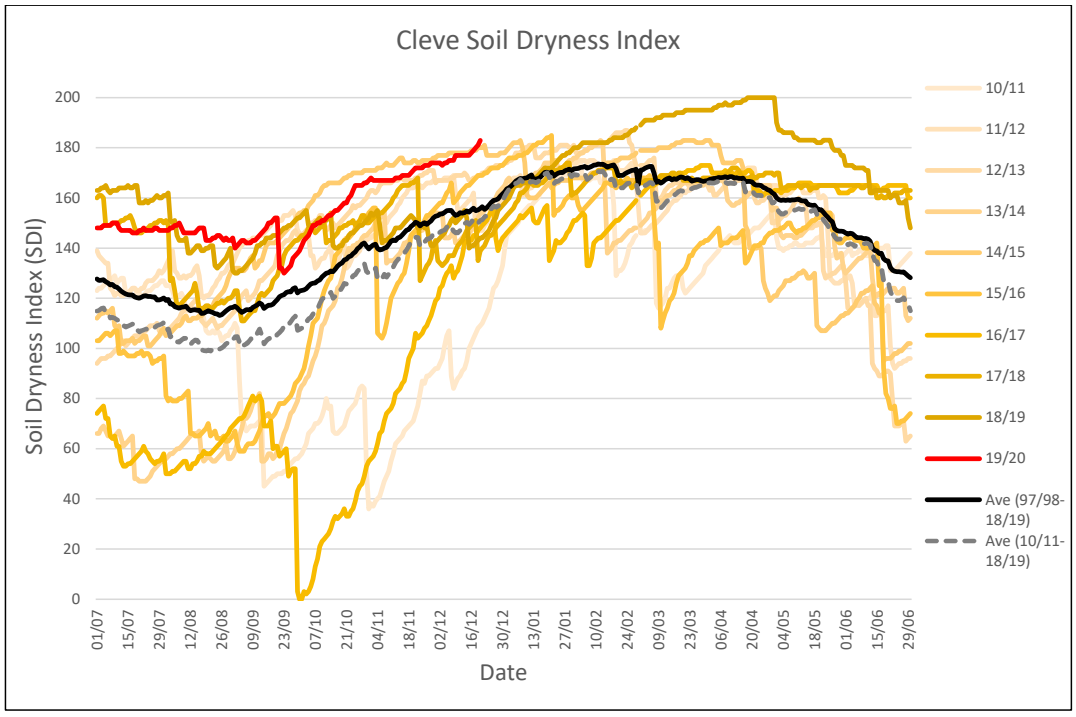


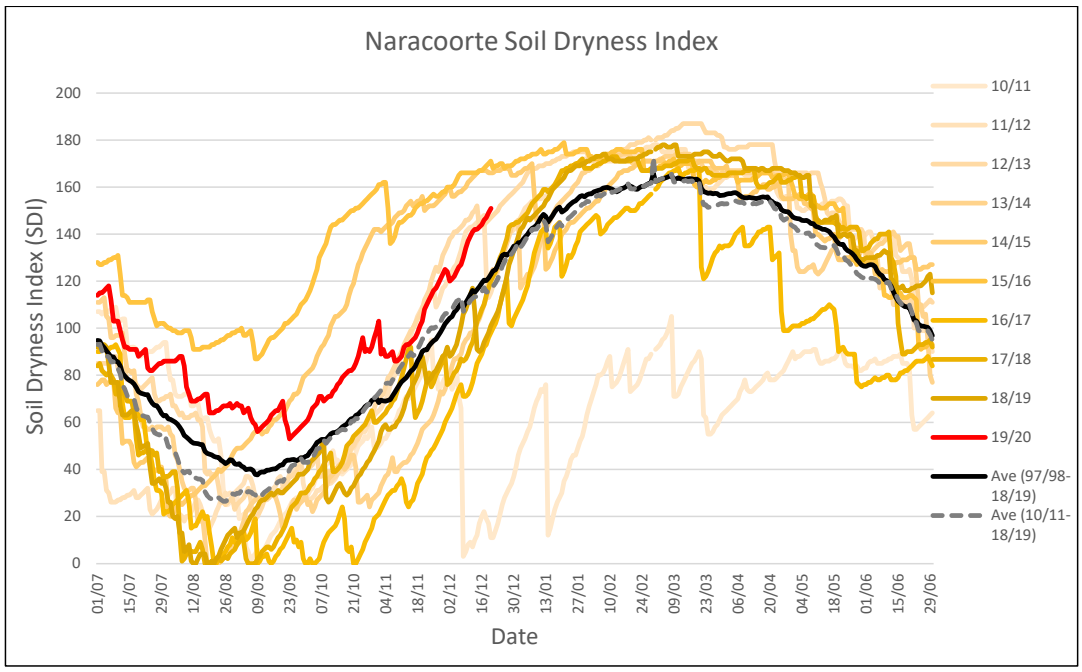


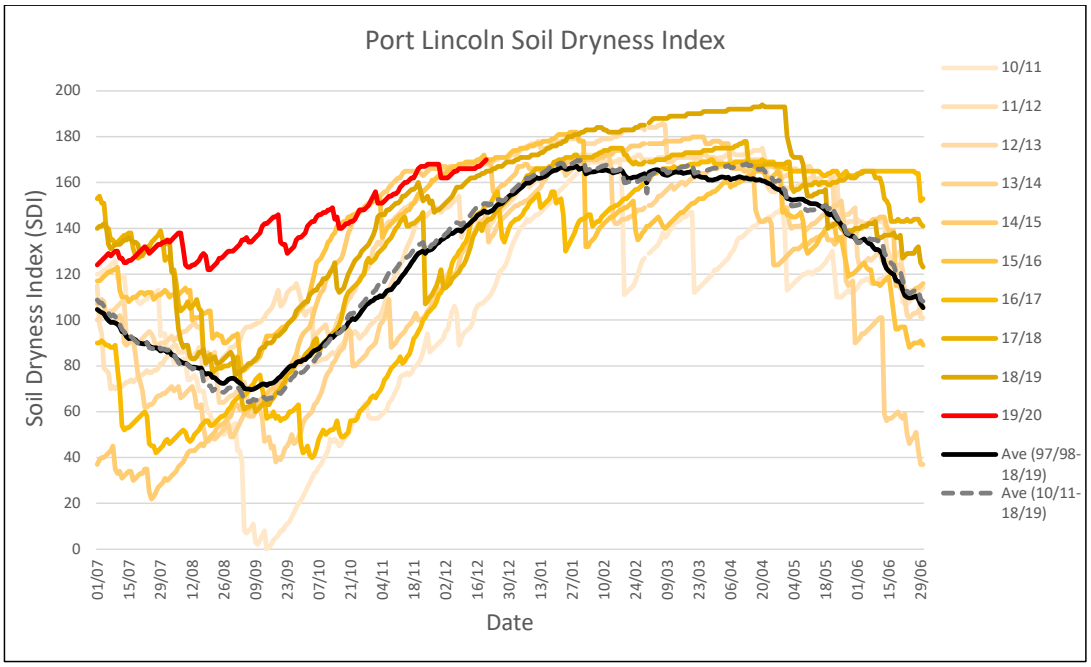

Maitland Soil Dryness Index
Soil Dryness Index (SDI)
0
20
40
60
80
100
120
140
160
180
200
01/07
15/07
29/07
12/08
26/08
09/09
23/09
07/10
21/10
04/11
18/11
02/12
16/12
30/12
13/01
27/01
10/02
24/02
09/03
23/03
06/04
20/04
04/05
18/05
01/06
15/06
29/06
Date
10/11
11/12
12/13
13/14
14/15
15/16
16/17
17/18
18/19
19/20
Ave (97/98-18/19)
Ave (10/11-18/19)


Mt Barker Soil Dryness Index
Soil Dryness Index (SDI)
0
20
40
60
80
100
120
140
160
180
200
01/07
15/07
29/07
12/08
26/08
09/09
23/09
07/10
21/10
04/11
18/11
02/12
16/12
30/12
13/01
27/01
10/02
24/02
09/03
23/03
06/04
20/04
04/05
18/05
01/06
15/06
29/06
Date
10/11
11/12
12/13
13/14
14/15
15/16
16/17
17/18
18/19
19/20
Ave (83/84-18/19)
Ave (10/11-18/19)

Appendix 12: Soil Dryness Index Plots






Port Lincoln Soil Dryness Index
Soil Dryness Index (SDI)
200
180
160
140
120
100
80
60
40
20
0
01/07
15/07
29/07
12/08
26/08
09/09
23/09
07/10
21/10
04/11
18/11
02/12
16/12
30/12
13/01
27/01
10/02
24/02
09/03
23/03
06/04
20/04
04/05
18/05
01/06
15/06
29/06
Date
10/11
11/12
12/13
13/14
14/15
15/16
16/17
17/18
18/19
19/20
Ave (97/98-18/19)
Ave (10/11-18/19)

Appendix 13: Letter of Transmission

Government of South Australia

Level 3,
60 Waymouth Street
Adelaide SA 5000

GPO Box 2706
Adelaide SA 5001
DX 206

Tel 8115 3900
Fax 8115 3908

ABN 95 437 863 949

www.safecom.sa.gov.au

Reference: ESS-20-313

Minister Corey Wingard MP
Minister for Police, Emergency Services and Correctional Services
and the Minister for Recreation, Sport and Racing
GPO Box 668
ADELAIDE SA 5001

Dear Minister

INDEPENDENT REVIEW INTO SOUTH AUSTRALIA'S 2019-2020 BUSHFIRE SEASON

Attached is the report of the Independent Review into South Australia's 2019-20 Bushfire Season (the Review) requested by you on 28 January 2020.

As advised to you and subsequently communicated by you to the community on 25 March 2020, the Review was undertaken as a 'Desktop Review' given the restrictions surrounding the COVID-19 pandemic.

Despite the restrictions in being able to conduct 'town hall' style community meetings, the Review received 576 submissions, conducted over 60 video style conference (some with multiple attendees) and processed over 100 targeted surveys. This work compares extremely favourable to commissions or inquiries of a similar nature given the significant input into this Review that required careful consideration and analysis.

On this point, I would like to highlight the efforts of the members of the Review Team:

- M/s Lorraine Dilag – SAFECOM – Principal Audit & Risk and Compliance Officer
- M/s Anthea Howard – SAFECOM – Senior Project Officer
- M/s Danielle Boddington – DEW – Senior Regional Fire Management Officer
- M/s Louise Gardner – MFS – Executive Management Officer
- Chief Inspector Seamus Mc Daid – SAPOL
- Director Brett Loughlin – CFS – Director, Preparedness Operations

The Review was not an investigation or a formal inquiry and relied upon co-operation of individuals rather than any legislation in order to be undertaken. The South Australian Coroner and SA Police were engaged by the Review in order to not crossover their important work in determining the cause(s) of the fires and the subsequent cause(s) of death.

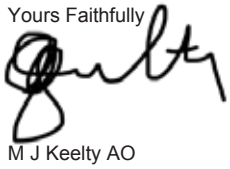
Importantly, the Review did not look into the critical role of building planning and development which will be important in as the State approaches how it balances the risks associated with building and development practices while facing a warming climate.

The Review identified several issues of national or cross-jurisdictional importance highlighted to the national Bushfire Royal Commission. A list of those issues is found in the correspondence to the Royal Commission appended to the Report.

Finally, it has to be said that, despite the tragic losses, it was a remarkable effort by everyone involved to manage the impact of what was arguably the worst bushfires ever experienced in South Australia. This Review is an attempt to improve on those magnificent efforts for what is likely to be a challenging future.

I wish you well and thank you for the opportunity to assist in this way.

Yours Faithfully



M J Keelty AO

16 June 2020

Attachments: Independent Review into South Australia's 2019-20 Bushfire Season

Abbreviations

ADF	Australian Defence Force
AFAC	Australasian Fire and Emergency Service Authorities Council
AIIMS	Australasian Inter-Service Incident Management System
AVL	Automatic Vehicle Location
BBCA	Bushfire Building Council of Australia
BMAP	Bushfire Management Area Plan
BNHCRC	Bushfire and Natural Hazards Cooperative Research Centre
BOPS	Burnover Protection Systems
Bushfire Royal Commission	Royal Commission into National Disaster Arrangements
CAD	Computer Aided Dispatch
CEO	Chief Executive Officer
CFS	South Australian Country Fire Service
DEW	Department for Environment and Water
DPTI	Department of Planning Transport and Infrastructure
EWM	Emergency Warning Messages
FDS	Fire Danger Season
FDW	Fire Danger Warning
FFU	Farm Firefighting Unit
FIB	Forest Industry Brigade
FSA	ForestrySA
GFDI	Grass Fire Danger Index
GRN	Government Radio Network
HAZMAT	Hazardous Materials
ICT	Information and Communications Technology
IMT	Incident Management Team
IT	Information Technology
MFS	South Australian Metropolitan Fire Service
MFSG	Mapping Functional Support Group
NERAG	National Emergency Risk Assessment Guidelines (NERAG)
NRSC	National Resource Sharing Centre
NSWRFS	NSW Rural Fire Service
NVC	Native Vegetation Council
PIRSA	Primary Industries and Regions SA
PPE	Personal Protective Equipment
PPRR	Prevention; Preparedness; Response and Recovery
PRZ	Primary Response Zone
RAFT	Remote Area Firefighting Teams
SAAS	South Australian Ambulance Service
SAFECOM	South Australian Fire and Emergency Services Commission
SAPOL	South Australian Police
SBCC	State Bushfire Coordination Committee
SBMP	State Bushfire Management Plan
SEATs	Single Engine Air Tankers
SEC	State Emergency Centre
SEMP	State Emergency Plan
SES	South Australian State Emergency Service
SRZ	Secondary Response Zone
TFB	Total Fire Ban
ZEST	Zone Emergency Support Team

Government
of South Australia