Bushfire Prevention & Preparedness

ASHJO Photography

Current & future state analysis: January 2019

Queensland Fire and Emergency Services (QFES) has significantly enhanced its bushfire prevention and preparedness capability over the past four years. As a leader in emergency management in Queensland, QFES is gaining momentum and preparing for an increasingly volatile bushfire outlook.

Queensland Government

Cover shot

Attribution: ASHJO Photography

Image description: The aircraft is a Boeing 737 converted for use in aerial fire suppression. The converted aircraft is referred to as a 'Large Air Tanker' (LAT). At the time of the photo, the LAT was in use for the Stanwell/Gracemere fire near Kabra. Its use was instrumental in halting the main fire front before it impacted the town of Gracemere.

Aerial capability is a significant preparedness investment by QFES. There are a range of aircraft with varying capability on standby during the bushfire season, and agreements to access additional capability nationally, or even internationally if required.

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Executive Summary

Queensland Fire and Emergency Services (QFES) has been proactively monitoring and assessing its performance since its inception in 2014, and throughout the organisational transformation. QFES recognises that reflection and learning is an important element of an adaptive organisation. As a result, the department has continuously improved its approach to delivering value to the people of Queensland.

This report focuses on bushfire prevention and preparedness, including the recommendations of the Queensland Audit Office (QAO) Bushfire Prevention & Preparedness Audit. Bushfire prevention and preparedness is a shared responsibility in Queensland, primarily resting with land managers in terms of hazard reduction (through activities such as prescribed burns or mechanical fuel reduction). Prevention and preparedness for bushfire is undertaken for a variety of reasons, and with differing priorities between land managers. QFES plays a leadership role in coordination and information, focussing on reducing the impact of fire on communities.

Since establishment, QFES has substantially progressed its ability to advance bushfire prevention and preparedness across the state through several mechanisms. The department has invested in research and advanced analytics, created collaborative arrangements for Area Fire Management Groups, and continued to strengthen relationships with key stakeholders such as land management agencies. QFES has advanced its leadership standing, amidst an evolving operating and authorising environment.

Climate change is among the major influences on the operating and authorising environment. An increasingly warm climate is expected to continue.[1] However, the particular confluence of weather conditions during November and December 2018 was an outlier, rendering usual mitigation efforts less likely to impact bushfires during the extreme, and compounding conditions.

Bushfire management is progressing in line with scientific and technological advances. Therefore, practices will continue to be adapted and refined. Investments in bushfire analytics and aerial firefighting were key preparedness activities that enhanced management of the most recent events. QFES collaborates with the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC), and other research institutions nationally to enhance public information and warnings, bushfire risk management (including fire behaviour), community resilience and volunteering, as well as planning and capability development for catastrophic and cascading events.

QFES recognises the value of investing in, and having access to, the latest knowledge and data from research to help the department and relevant stakeholders to improve today's practices and tomorrow's planning for more prepared and adaptive communities.

Regardless of the hazard type, a comprehensive model of emergency management will support the best outcomes for Queensland communities. QFES' Strategy 2030 will guide the way forward in our complex and changing world. Preparing and strengthening our communities requires collaborative efforts between all stakeholders.

1 Bureau of Meteorology and CSIRO, '*State of the Climate 2018*', CSIRO [website] December 2018, <http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2018.pdf>, accessed 20 December 2018.

Acronyms

Acronym	Meaning
AFAC	Australasian Fire and Emergency Service Authorities Council
AFMG	Area Fire Management Group
BNHCRC	Bushfire and Natural Hazards Cooperative Research Centre
BOM	Bureau of Meteorology
BPA	Bushfire Prone Area
BRRAT	Bushfire Rapid Risk Assessment Team
CCAP	Climate Change Action Plan
CCG	Climate Change Group
CCWG	Climate Change Working Group
CSIRO	Commonwealth Scientific and Industry Research Organisation
DES	Department of Environment and Science
DET	Department of Education and Training
DMG	Disaster Management Group
DNRME	Department Natural Resources, Mines and Energy
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning
EM-SAP	Emergency Management Sector Adaptation Plan
FFDI	Forest Fire Danger Index
FFF	Fight Fire Fascination

Acronym	Meaning
GIS	Geographic Information System
LGA	Local Government Area
LIDAR	Light Detection and Ranging
MOU	Memorandum of Understanding
NCCARF	National Climate Change Adaptation Research Facility
PACSR	Police and Community Safety Review
PIO	Public Information Officer
PSBA	Public Safety Business Agency
PSU	Predictive Services Unit
QAO	Queensland Audit Office
QDMA	Queensland Disaster Management Arrangements
QERMF	Queensland Emergency Risk Management Framework
QFES	Queensland Fire and Emergency Services
QPS	Queensland Police Service
QPWS	Queensland Parks and Wildlife Service
QUT	Queensland University of Technology
REDI	Risk Exposure and Disaster Information
VBRC	Victorian Bushfires Royal Commission

Introduction

Scope

This report considers:

- the operating context and authorising environment over the period 2014-2018
- continuous improvement efforts to fulfil QFES' legislative obligations under the *Fire and Emergency Services Act 1990 and the Disaster Management Act 2003*
- the breadth of mitigation activities undertaken by QFES (prescribed burning, community engagement, land use planning, fire trail and break provisions and maintenance, capability development, predictive analytics, risk assessment etc)
- specific activities relating to the recommendations of the Queensland Audit Office performance audit on *Bushfire Prevention and Preparedness* (Report 10: 2014-15), and the 2018 follow-up audit.

Purpose

An analysis of QFES' bushfire prevention and preparedness activities since the department's inception, to help inform continuous improvement and increase stakeholder awareness of the current and future state.

Authority for bushfire prevention and preparedness

Bushfire prevention and preparedness is a shared responsibility in Queensland, primarily resting with landowners and land managers for hazard reduction. Queensland Fire and Emergency Services (QFES) has responsibility for ensuring the disaster management arrangements are effective and consistent with the Strategic Policy Framework, the State Disaster Management Plan, disaster management standards and guidelines.[2] Derived from the State Disaster Management Plan 2018, QFES is the primary agency for hazard mapping and leads and coordinates bushfire mitigation programs.[3] QFES is also the primary response agency for fires in Queensland.

> **"Rural Fire Brigade volunteers provide the community of Queensland with support in their local land management obligations; in addition to response to bushfire and any other emergency such as cyclone or flood they can assist in."**
>
> **Justin Choveaux**
> General Manager, Rural Fire Brigades Association Queensland Inc.

While QFES recognises this role, it is also important to note the shared responsibilities in delivering bushfire management and mitigation in Queensland. The use of fire in the landscape can be undertaken for a wide variety of purposes beyond bushfire prevention and preparedness, including: weed control, pasture regeneration, silviculture (forestry management) and for ecological reasons.

2 *Disaster Management Act 2004*, Divisions 4 & 4A, p. 14-16.

3 Queensland Disaster Management Committee. 'Queensland State Disaster Management Plan'. *The State of Queensland*, 2018, p. 36. ‹https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf›, accessed 20 December 2018.

In addition to the prescribed burns coordinated by QFES, many others are undertaken across the landscape. For example, Queensland Parks and Wildlife Service (QPWS) may burn in a national park to encourage biodiversity or to reduce fuel loads in line with the fire strategy for the area. Graziers may burn across their lands to promote pasture regeneration and many land managers burn to control weeds. Traditional owners burn for a variety of reasons, including to promote availability of food sources[4] and to generate carbon credits in the Gulf and Cape York areas.[5] While not having a primary purpose of community protection, these burns do have an impact on fuel loads. Some fuels are also community assets, such as grasses on grazing lands, and so balancing different priorities for prescribed burning is not always straight-forward.

QAO Audits: Bushfire Prevention and Preparedness

In 2014, the Queensland Audit Office (QAO) undertook a performance audit on *Bushfire Prevention and Preparedness* (Report 10: 2014-15). Though the report acknowledges that there is 'shared responsibility' for managing bushfire risk in Queensland, the report focused on the role of Queensland Fire and Emergency Services (QFES).

At the time of the audit, QFES was progressing recommendations from the Victorian Bushfires Royal Commission (VBRC), the Malone Review and the Police and Community Safety Review (PACSR). The QAO report also noted that QFES was undergoing '*significant organisational restructure*' and had implemented a substantial number of recommendations from the Malone and PACSR reviews. It is also worthy of mention that the QAO report highlighted that the recommendations of the VBRC, the Malone Review and the PACSR were '*poorly assessed for their applicability to Queensland*'.

4 T. Taylor, & M. Parkinson, 'The Jigija Fire Training Program: Indigenous Fire Ecology Training in the Lower Gulf of Carpentaria', *Jigija* [website], 2017, p. 1, ‹http://www.jigija.com.au/perch/resources/thejigijafiretraining-program31102017.pdf›, accessed 20 December 2018.

5 Aboriginal Carbon Foundation, 'Savanna Burning', *Aboriginal Carbon Foundation* [website], August 2016, ‹http://aboriginalcarbonfoundation.com/savanna-burning/›, accessed 12 January 2019.

The QAO report (2014-15) observed that "*bushfire risk is a 'shared responsibility' that extends beyond government...*" and that there is an "*...absence of a central authority, coordinating and overseeing mitigation activities statewide...*". Furthermore, the QAO audit report noted that Queensland "*does not have an agency responsible for managing fuel loads across the state*".[6] However, the State Disaster Management Plan assigns primary agency responsibility for bushfire mitigation and hazard mapping to QFES.[7] The 2014 report made two key recommendations with seven parts in total.

2014 QAO Audit Recommendation 1:	
QFES strengthens its oversight role as a lead agency for mitigating Queensland's bushfire risk to acceptable levels by:	
1.1	coordinating land managers' efforts to assess and mitigate bushfire risk
1.2	formalising the role of fire management groups to manage Queensland's fuel loads, including reporting planned and conducted hazard reduction burns and the effectiveness of hazard reduction burns
1.3	amending its bushfire mitigation planning to address prevention, preparedness, response and recovery and to manage Queensland's residual bushfire risk
1.4	developing and implementing a coordinated strategy to address arson, deterring would-be offenders and rehabilitating convicted offenders
1.5	working with local councils to develop and communicate local bushfire plans for communities located in high risk, bushfire-prone areas.

6 Queensland Audit Office, 'QAO Audit Report 10: Bushfire prevention and preparedness: Responsibility for fuel management', *Queensland Audit Office*, 2014, p. 19. ‹https://www.qao.qld.gov.au/reports-parliament/bushfire-prevention-and-preparedness›

7 Queensland Audit Office, QAO Audit Report 10: 'Bushfire prevention and preparedness: Responsibility for fuel management', *Queensland Audit Office*, 2014, p. 1. ‹https://www.qao.qld.gov.au/reports-parliament/bushfire-prevention-and-preparedness›

2014 QAO Audit Recommendation 2:

QFES improves engagement with communities to prepare for and respond to bushfires by:

2.1	increasing focus on monitoring the effects of educational materials it develops
2.2	reviewing and amending its bushfire warnings and alert protocols to provide clear and consistent messages to residents about the action to be taken before and during a bushfire.

Of these recommendations, QFES agreed with five of the seven parts in full. QFES partially agreed to recommendation 1.2 as landowners are responsible for managing fuel loads. QFES partially agreed to recommendation 1.4 as QFES does not have expertise in rehabilitating convicted bushfire arson offenders.

In 2018, the QAO conducted a follow-up on their 2014 audit. The report, *Follow-up of Bushfire prevention and preparedness* (Report 5: 2018-19), assessed the progress toward completion of the 2014 audit report recommendations. The progress, status and QFES' plans against each part are addressed individually in this report. However, an exploration of the context in which the audits were conducted is paramount; the next section covers the operating and authorising environment between 2014 and 2018.

Changing operating and authorising environment

During the intervening period between QAO audits, much has changed and continues to evolve within QFES, as well as in the broader operating and authorising environment. Unwavering though, is the commitment of QFES to reduce the impact of bushfire on Queenslanders.

Climate change

Climate change has already had an observable effect on fire weather in Queensland.[8, 9] **"***There has been a long-term increase in extreme fire weather and in the length of the fire season across large parts of Australia since the 1950s***"**, however the pace and scale of change is escalating.[10]

8 L. Hughes et.al, 'Escalating Queensland Bushfire Threat: Interim Conclusions', *Climate Council* [website], 2018, Key Findings, ‹https://www.climatecouncil.org.au/wp-content/uploads/2018/11/Queensland-Bushfires-and-Climate-Change_Interim-Conclusions.pdf›, accessed 5 December 2018.

9 Bureau of Meteorology and CSIRO, 'State of the Climate 2018', *CSIRO* [website] December 2018, ‹http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2018.pdf›, accessed 20 December 2018.

10 Bureau of Meteorology and CSIRO, op.cit. p 5.

Tropical and subtropical Queensland are the most affected by a 40 per cent increase in Australian weekly bushfire frequencies over the five years 2008 to 2013.[11] The Bureau of Meteorology (BOM) declared 2018 as Australia's third-hottest year on record and Queensland's fifth (**see figure 1**).[12] A volume of information and spatial data of the increasing heatwave and bushfire risk is available publicly through the Queensland Future Climate Website.[13]

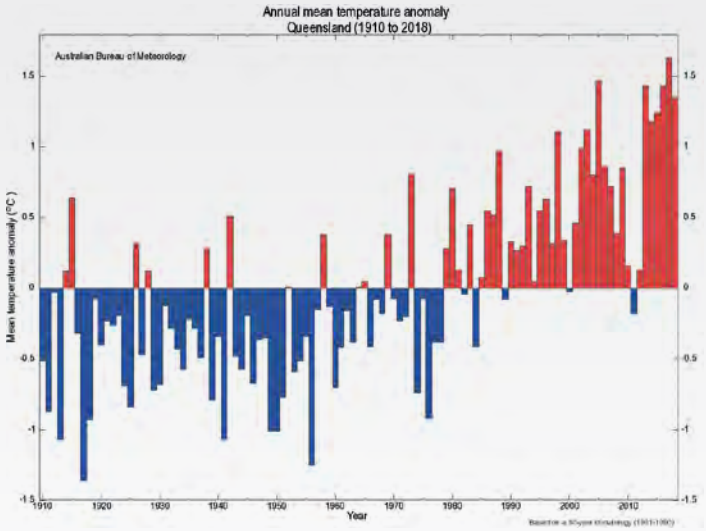


Figure 1 - Annual Mean Temperatures Anomalies for Queensland (Bom 2018)

11 R. Dutta et.al, 2016. 'Big Data Integration Shows Australian Bushfire Frequency is increasing significantly', *Royal Society of Open Science* [website], p. 4, ‹https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4785963/pdf/rsos150241.pdf›, accessed 17 December 2018.

12 Bureau of Meteorology, 'Queensland in 2018: fifth-warmest year on record', *Bureau of Meteorology* [website], 2018, ‹http://www.bom.gov.au/climate/current/annual/qld/summary.shtml›, accessed 20 January 2019.

13 Queensland Government, 'Queensland Future Climate', *The Long Paddock* [website], 1 November 2018, ‹https://longpaddock.qld.gov.au/qld-future-climate/›, accessed 12 January 2019.

Different climate variables impact the likelihood of bushfire.[14] When multiple variables are extreme and combine, for example drought, high wind and heatwave, scientists refer to this as a compound event.[15] As climate change continues, bushfire risk will very likely increase. Addressing the changing bushfire risk in Queensland is highlighted in the Emergency Management Sector Adaptation Plan (EM-SAP). The EM-SAP was launched last year after sector collaboration led by QFES, the Department of Environment and Science and the National Climate Change Adaptation Research Facility (NCCARF).[16] The EM-SAP notes "*strong evidence that Queensland will experience an increased frequency of high fire risk days, with uncertainty about the magnitude of change*".[17]

Prescribed burning in a changing climate

The historic level of prescribed burning (including Operation Cool Burn) coordinated and conducted by QFES has been informed by the longer-term fire weather typically experienced in Queensland. However, the bushfire event in November and December 2018 was a compound event comprising a rare combination of climatic conditions that meant usual planned burning efforts were less likely to have had an effect.[18] As the CSIRO raised in its submission to the 2009 Senate Inquiry into Bushfires in Australia, "*during days of extreme fire danger, bushfires will be virtually uncontrollable even if fuels are minimal*".[19]

14 Bureau of Meteorology and CSIRO, op.cit. p. 8.

15 ibid.

16 Queensland Government, 'Emergency Management Sector Adaptation Plan', *Queensland Government: Disaster Management* [website] , September 2018,‹https://www.disaster.qld.gov.au/cdmp/Pages/default.aspx›, accessed 12 January 2019.

17 op.cit., p. 19.

18 Bureau of Meteorology, 'Special Climate Statement 67 – an extreme heatwave on the tropical Queensland coast', *Bureau of Meteorology*, 2018, p.14, ‹http://www.bom.gov.au/climate/current/statements/scs67.pdf›, accessed 2 January 2019.

19 CSIRO, 'Bushfires in Australia, CSIRO Submission 09/355 prepared for the 2009 Senate Inquiry into Bushfires in Australia', *Parliament of Australia* [website], July 2009, p. 9, ‹https://www.aph.gov.au/DocumentStore.ashx?id=3d4e5dd5-9374-48e9-b3f4-4e6e96da27f5›, accessed 13 December 2018.

Prescribed burning is not always a feasible option and has less impact on the severity of fire impacts when conditions are extreme.[20,21] However, prescribed burning is often the only practical hazard reduction option to achieve the scale and effect required for Queensland. Climate change is increasing the length of fire seasons, which limits the opportunities for prescribed burning.

> **"With climate change, what we're seeing is that the summer season is getting longer so it's staying too dry for too long for [prescribed burning authorities] to undertake their prescribed burns."**[22]
>
> **Deb Sparkes**
> Coordinator for the Centre of Excellence for Prescribed Burning

In Victoria, fire services have been challenged to complete prescribed burning targets safely during 2018. Only around 30 per cent of prescribed burning programs were able to proceed, with most of the 66,000 hectares of prescribed burning condensed into a two-and-a-half-week window.[23]

20 CSIRO, 'Bushfires in Australia, CSIRO Submission 09/355 prepared for the 2009 Senate Inquiry into Bushfires in Australia', *Parliament of Australia* [website], July 2009, p. 9, ‹https://www.aph.gov.au/DocumentStore.ashx?id=3d4e5dd5-9374-48e9-b3f4-4e6e96da27f5›, accessed 13 December 2018.

21 B. McCormick, '2002-03 Bushfires: Is Fuel Reduction Burning the Answer? (Parliament of Australia Current Issues Brief no. 8)', *Parliament of Australia* [website], 2002, ‹https://www.aph.gov.au/binaries/library/pubs/cib/2002-03/03cib08.pdf›, accessed 16 December 2018.

22 K. Doyle, 'Prescribed burning debate rages as Australia finds there's no time to burn going into peak fire season', *ABC* [website], 13 September 2018, ‹https://www.abc.net.au/news/2018-09-13/is-the-prescribed-burn-window-closing-in-australia/10236048›, accessed 18 December 2018.

23 ibid.

> "With fire seasons lengthening and overlapping across the globe, we need to think of new ways of dealing with bushfires, floods, cyclones and heatwaves...the old ways of sharing resources around Australia and with the northern hemisphere may not always be possible, so we need to discover better ways to manage all our resources."[24]
>
> **Dr Richard Thornton**
> CEO Bushfire & Natural Hazards CRC

As the climatic conditions change, we must consider learnings from other states where there has been more experience with severe bushfire conditions. A New South Wales Parliamentary Bushfire Inquiry Report described that,

> "Under extreme conditions bushfires will burn across land with very low fuel loads, which would have been halted under milder conditions...Fuel reduction burns will not necessarily halt the spread of bushfires...Post burn assessments of the effectiveness of prescribed burns in the Blue Mountains in the period 1990-97 found that 30 per cent of the burns had a negative result, 40 per cent were sub-optimal and 30 per cent could be rated as effective burns."[25]

A recent BNHCRC conference paper concluded that across two simulated case studies in Tasmania and the ACT, there was

> "considerable variation in the rate of reduction in risk, including the amount of treatment [of prescribed burning] required to achieve key targets. Further, the particular combination of weather factors underpinning given fire weather conditions (e.g. temperature vs wind driven) can substantially impact the overall level of risk, as well as the response to prescribed burning."[26]

More recently, research from the University of Tasmania on the effectiveness of prescribed burning found that only by burning an unrealistically large area – up to 25 per cent – could wildfire behaviour be altered. Using fire simulation tools, 14 wildfire scenarios in Tasmania were modelled: (1) no fuel treatment, (2) maximum treatment, and (3) twelve more operationally feasible plans. The twelve realistic plans only had a "*minimal effect, if any*" on wildfire behaviour.

Prescribed burning remains a valid and important mitigation option, however QFES recognises that these methods must continue to be refined, and that a nuanced approach to bushfire prevention and preparedness is required. Multiple strategies should continue to be considered at a local level in collaboration with land managers. For example, adapting the principles of Aboriginal patch burning is an important potential strategy to improve fire management and biodiversity outcomes.[27] Further investing in ways to improve and share knowledge of prescribed burning practices, and intelligence to support their planning and conduct, is vital. QFES constantly looks for new ways to invest in its capability to enhance Queensland's resilience to all hazards, including bushfire (see QFES Strategy and Capability section).

24 D. Bruce, 'Prepare for extended severe weather season', *Australian Disaster Resilience Knowledge Hub* [website], October 2018, ‹https://knowledge.aidr.org.au/resources/ajem-oct-2018-prepare-for-extended-severe-weather-seasons›, accessed 10 December 2018.

25 B. McCormick, '2002-03 Bushfires: Is Fuel Reduction Burning the Answer? (Parliament of Australia Current Issues Brief no. 8)', *Parliament of Australia* [website], 2002, ‹https://www.aph.gov.au/binaries/library/pubs/cib/2002-03/03cib08.pdf›, accessed 16 December 2018.

26 B. Cirulis et. al., 'A systematic exploration of the potential for bushfire risk mitigation with prescribed burning', *Bushfire and Natural Hazards Cooperative Research Centre*, 2018, ‹http://www.bnhcrc.com.au/publications/biblio/bnh-4774›, accessed 19 December 2018.

27 D. Bowman, 'Aboriginal fire management - part of the solution to destructive fires', *University of Tasmania*, February 2016, ‹http://www.utas.edu.au/news/2016/2/24/43-aboriginal-fire-management-part-of-the-solution-to-destructive-fires/›, accessed 28 January 2019.

QFES climate change strategy, risk, planning and governance

Climate-related risk is identified as an enterprise-level risk for QFES. One of the key controls is a Climate Change Working Group (CCWG), which was established in April 2018. The aim of this working group is to provide an advisory role for the QFES Board of Management to ensure the department takes a comprehensive approach to addressing issues related to climate change.

The QFES CCWG developed a Position Paper for Climate Change to provide a holistic approach to the department's actions on climate change (refer Appendix A), which was approved by the QFES Board of Management in October 2018. The principles of the Position Paper will be implemented through a Climate Change Action Plan (CCAP), which is an activity in the 2018-19 Corporate Plan.

Climate change was considered in the development of the QFES Strategy 2030, which used research and stakeholder informed scenario planning to improve strategic foresight and decision-making. QFES has also developed an advanced analytics tool that forecasts operational scenarios over a 10-year period and can factor various climate projections to support decision-making.[28] The tool will assist strategic investment decisions for elements such as facility placement as well as capability and capacity requirements. A working prototype of this tool was completed in October 2018 and will continue to be matured over time.

Disaster management, land use planning and climate change

QFES collaborates and partners with leaders in science to incorporate climate projections into all hazards risk assessments. QFES led the development of the Queensland Emergency Risk Management Framework (QERMF), endorsed by the Queensland Disaster Management Committee in 2017, as the State approach to disaster management risk. The risk assessments conducted through the QERMF directly support risk-based planning within Queensland's Disaster Management Arrangements (QDMA).[29]

The QERMF facilitates robust and scientifically based risk assessments, including climate data and information. The framework enables decision-makers in disaster management groups at all levels, and throughout the sector, to reflect on anticipated climate change in disaster management plans.

QFES works on climate change for disaster management with the expertise and scientific data of the Department of Environment and Science (DES).[30] DES and QFES have recently partnered to complete a State Risk Assessment for Heatwave that will assist QFES and Queensland Health to understand future heatwave risk potential. This also includes a significant body of work being undertaken to produce climate change projections for a number of variables relevant to bushfire, which will allow future analysis of the bushfire potential in Queensland.

Effective land use planning is key to climate adaptation. QFES Sustainable Development Unit provides a technical advice agency function supporting the state interest *Natural hazards, risk and resilience – bushfire*, under *State Planning Policy 2017*, subordinate to the Planning Act 2016. In practical terms, this means that QFES provides technical advice on request to state agencies, local governments and developers regarding planning instruments and development proposals, where appropriate. This includes advice on local government planning scheme amendments, community infrastructure proposal reviews and consideration of major resource projects.

28 Observatory of Public Sector Innovation, 'Queensland Fire & Emergency Services Futures Service Demand Forecasting Model', *Organisation for Economic Co-operation and Development: Observatory of Public Sector Innovation* [website], 8 November 2018, ‹https://oecd-opsi.org/innovations/queensland-fire-emergency-services-futures-service-demand-forecasting-model/›, accessed 12 January 2019.

29 Queensland Government (Queensland Fire and Emergency Services), 'Queensland: State Natural Hazard Risk Assessment 2017', *Queensland Government: Disaster Management* [website], 30 June 2017, ‹https://www.disaster.qld.gov.au/cdmp/Documents/Emergency-Risk-Mgmt/QLD-State-Natural-Risk-Assessment-2017.pdf›, accessed 12 January 2019.

30 R. Trancoso et al., 'Heatwaves intensification in Australia: A consistent trajectory across past, present and future', *University of Queensland*, Global Change Institute; Department of Environment and Science, Queensland Government, 2018.

QFES is also working with the Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) to develop State Planning Policy guidance material for bushfire. The guidance will further support adoption of the bushfire state interest requirement, including adoption of Bushfire Prone Area (BPA) mapping. Targeted stakeholder consultation on the guidance material closed 30 November 2018.

Bushfire Prone Area Mapping

QFES commissioned CSIRO to develop a science-based approach for bushfire land use planning.[31] QFES administers the statewide BPA mapping for Queensland. The methodology underpinning BPA mapping is informed by weather data adjusted to reflect the expected climate in 2050.

The BPA mapping informs strategic and site-level, land use planning decision-making, to address the long-term implications for growing communities in proximity to BPAs. This process triggers requirements to ensure adequate bushfire mitigation measures are put in place to protect homes as well as vulnerable and essential services infrastructure.

Whole-Of-Government collaboration on climate change

QFES is also working with DES to support their implementation of the Queensland Government's Climate Change Response, which includes the Climate Transition Strategy and Climate Adaptation Strategy. The strategies aim for ambitious mitigation reduction targets of 30 per cent reduction in 2005, net greenhouse gas emissions by 2030, and net zero by 2050.

QFES has recently led and finalised the Emergency Management Sector Adaptation Plan (EM-SAP) in partnership with DES and the National Climate Change Adaptation Research Facility (NCCARF). The EM-SAP identifies sector-specific climate risks, existing activities and knowledge gaps, as well as barriers to adaptation.

31 Leonard et al., 'A new methodology for State-wide mapping of bushfire prone areas in Queensland', *CSIRO*, 2014, <https://www.qfes.qld.gov.au/opendata/Bushfire_Prone_Area_Mapping_Report_5_Feb_2014_High_Res.pdf>, accessed 21 December 2018.

QFES is an active member of the Queensland Government Inter-Departmental Committee (IDC) on Climate Change. Participating in the IDC enables the department to remain contemporary with the Queensland Government's climate change policy direction, and informed about emerging national and international trends.

With other IDC member agencies, QFES is contributing to the Government Adaptation Action Plan (GAAP). In January 2017, the GAAP required QFES to complete a 'first-pass' climate change risk assessment. Further work for the GAAP is planned for 2018-19 under the DES work program.

QFES is also a member of the Queensland Climate Ready Departmental Core Working Group. The Working Group will build on the partnerships approach and will ensure collaborative governance on climate risk. Core Partners are identified for their strong mandate for climate change related risks or criticality to the delivery of core government goods and services. QFES has both features.

Federal collaboration on climate change

QFES is a member and contributor to the Australasian Fire and Emergency Service Authorities Council (AFAC) Climate Change Group (CCG), ensuring that QFES is sharing information and potential resources with other jurisdictions.

The AFAC CCG released a discussion paper in July 2018 titled *Climate Change and the Emergency Management Sector* with a number of priorities and recommendations. The discussion paper is consistent with the QFES and Queensland disaster management sector strategies for climate change adaptation and mitigation.

Furthermore, AFAC endorsed a climate change position paper in October 2018 that largely emulates the QFES Climate Change Position Paper (see Appendix A) due to the department's extensive involvement.

National policy

In the context of a changing climate, it is increasingly necessary to ensure a joined-up national capability to respond to extreme weather events. Recognising this need, the federal government recently announced funding for national aerial firefighting and emergency communication capabilities.[32]

The Council of Australian Governments (COAG) commenced dialogue on national disaster resilience in December 2009.[33] This led to the introduction of the *National Strategy for Disaster Resilience: Building our nation's resilience to disasters* in February 2011.[34] The creation of the National Resilience Taskforce in 2017 signals heightened momentum on promoting a sustainable, coordinated and comprehensive national approach.[35] QFES has directly contributed to the work of the taskforce through membership of the steering committee. QFES has participated in the policy sprint (June 2018), which contributed to drafting the *National Risk Reduction Framework*. QFES also contributed to a separate body of work to develop the *National Disaster Preparedness Framework*.[36]

32 The Prime Minister of Australia, 'Boosting Firefighting capabilities and community preparedness' [media release], *Australian Government*, 5 December 2018, para. 3, ‹https://www.pm.gov.au/media/boosting-firefighting-capabilities-and-community-preparedness›, accessed 11 December 2018.

33 Australian Business Roundtable for Disaster Resilience and Safer Communities, 'Government policy framework', *The Australian Business Roundtable* [website], 2019, ‹http://australianbusinessroundtable.com.au/policy-partners-and-resources/government-policy-framework›, accessed 12 January 2019.

34 Australian Institute for Disaster Resilience, 'Australia's National Strategy for Disaster Resilience', *Australian Institute for Disaster Resilience* [website], 2011, ‹https://knowledge.aidr.org.au/resources/national-strategy-for-disaster-resilience/›, accessed 12 January 2019.

35 P. Barnes, and A. Bergin, 'The National Resilience Taskforce: challenges and opportunities', *The Strategist, Australian Strategic Policy Institute* [website], May 2018, ‹https://www.aspistrategist.org.au/the-national-resilience-taskforce-challenges-and-opportunities/›, accessed 12 January 2019.

36 Australian Institute for Disaster Resilience, 'Australian Disaster Resilience Conference 2018: Conference Program', *Australian Institute for Disaster Resilience* [website], ‹https://www.aidr.org.au/media/5636/adrc-program.pdf›, accessed 12 January 2019.

Also at a national level, the National Bushfire Mitigation Program funded the 2017 production of *National Guidelines for Prescribed Burning Strategic and Program Planning*,[37] led by AFAC. The guideline emphasises the "*great variety of operating environments and institutional arrangements around Australia*" as rationale for producing principles-based best practice guidance. QFES supports the concept of balancing operational, ecological and community health risks in the application of prescribed burning, and the guiding principles to support decision-making in this regard:

1. Protection of life is the highest consideration;
2. Landscape health is linked to fire and fire management;
3. Prescribed burning is a risk management tool;
4. Engagement with community and business stakeholders;
5. Prescribed burning is done in the context of measurable outcomes;
6. Informed knowledge of fire in the landscape;
7. Capability development;
8. Traditional Owner use of fire in the landscape is acknowledged;
9. An integrated approach is required across land tenures; and
10. Prescribed burning is carried out under legislative, policy and planning requirements.

In August 2018, QFES presented on stakeholder engagement, AFMG processes, predictive analytics tools and a joint AFAC/Prescribed Burning Centre of Excellence forum. The forum brought together interstate experts to learn about Queensland's collaborative practices, including examination of prescribed burning sites on the Sunshine Coast.

37 AFAC, and FFMG., 'National Guidelines for Prescribed Burning Strategic and Program Planning', *Australasian Fire and Emergency Service Authorities Council Limited*, 2017, ‹https://knowledge.aidr.org.au/media/4897/national-guidelines-for-prescribed-burning-strategic-and-program-planning.pdf›, accessed 5 December 2018.

Figure 2 - Experimental burns for grassland fuel load research

Bushfire research

Knowledge about bushfire risk reduction, as in many areas of disaster management, has improved significantly since 2014 and continues to deepen. QFES is a key partner to the BNHCRC, which has been a major contributor to this body of knowledge.

QFES was an end-user for 16 BNHCRC projects during 2017-18. Research expenditure with BNHCRC totals $1.791M for the period 2013-2021. These projects further the department's evidence-base relating to bushfire risk management (including fire behaviour), community resilience, volunteering as well as planning and capability for catastrophic and cascading events.

Improved knowledge of bushfire risk, along with science on expected climatic changes, has been incorporated into Bushfire Prone Area (BPA) mapping provided by QFES in collaboration with CSIRO. As a result of changes to the State Planning Policy in December 2013, QFES has been increasingly influential in land use planning using this science-based evaluation of bushfire hazards.

There is significant research interest in improving understanding of fuel loads and fire behaviour. QFES recently contributed to the body of knowledge, partnering with CSIRO to answer a research question that had been posed by Australian fire agencies for decades: how do fuel loads effect the rate of spread and fire behaviour in grasslands?[38] The research proved the reverse of what was understood until that point. The outcomes from the research have been incorporated into the bushfire predictive tools used by QFES.

38 M.G. Cruz, et al, 'Got to burn to learn: the effect of fuel load on grassland fire behaviour and its management implications', *International Journal of Wildland Fire* [website], October 2018, ‹https://www.publish.csiro.au/WF/WF18082›, accessed 10 January 2019.

Technology

Four years of technology advancement has resulted in significant improvements to QFES' ability to manage bushfires and bushfire risk. QFES has invested in evidence-based technology solutions for advanced analytics as well as tools for contemporary mobile and web-based information sharing.

The following platforms are just some of the technology that assists QFES to discharge its obligations for bushfire prevention and preparedness. They are explained here to provide context for the references in the QAO report and further discussion throughout this report.

Phoenix

> **The fire behaviour analytics and decision-support tool, Phoenix, was one research project instrumental in the department's intelligence suite. It was a joint venture involving BNHCRC, the University of Melbourne and the Victorian Department of Environment, Land, Water and Planning.**

Phoenix is a fire simulator that shows the spread of fire across the landscape in defined weather, fuel and slope scenarios. The simulator was developed by Dr Kevin Tolhurst AM at the University of Melbourne. With improved inputs, the model has been refined over time, to more accurately and effectively reflect the Queensland climate and landscape. Phoenix produces fire behaviour predictions used to quantify the potential impact of fire in the landscape.

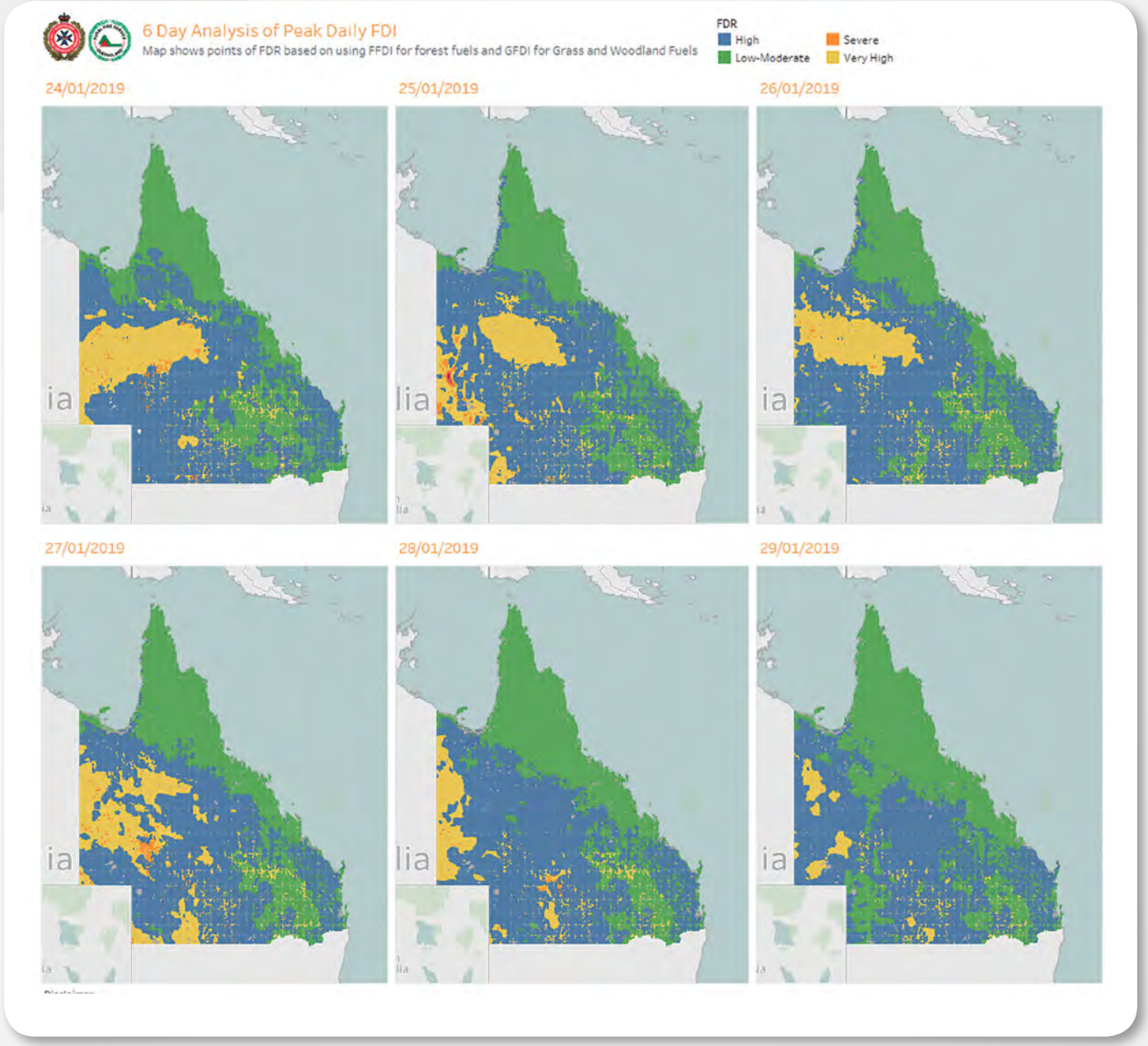
Simulation Analysis-Based Risk Evaluation (SABRE)

QFES-developed SABRE capability integrates with Phoenix and the department's many geospatial, operations and forecast weather data sets. SABRE applies fire behaviour science to these inputs to systematically provide advanced predictive analytics to staff, volunteers and partner agencies. The SABRE decision-support framework was originally built to work with Phoenix to generate predictive, probabilistic fire spread products. These products are intended to better inform incident management decisions on suppression strategy development and community warnings.

SABRE is increasingly providing advanced analytics to enable:

- **Prevention (2-12month ahead):** bushfire mitigation planning tools to optimise Cool Burn Planning based on the latest simulation-based risk methods
- **Preparedness (2-6 Days Ahead):** Providing landscape scale, hourly forecast wildfire potential at high resolution out to 6 days ahead to support optimal strategic resourcing and other critical readiness decision making
- **Response (today and tomorrow):** Near real-time fire spread prediction intelligence tools to enable improved bushfire incident risk, planning and operational decision-making.

SABRE supports a very large range of predictive tools and analytics products for prevention, preparedness, response and recovery. These products include a historical weather analysis, six day look ahead wildfire potential, six day fire weather and behaviour viewer, real time bushfire incident monitors, as well as for wildfire event, probabilistic spread predictions. Following is an example of the six day look ahead wildfire potential that assists in strategic and operational readiness and preparedness decision making (**next page**).


6 Day Analysis of Peak Daily FDI
Map shows points of FDR based on using FFDI for forest fuels and GFDI for Grass and Woodland Fuels
FDR
High
Low-Moderate
Severe
Very High
24/01/2019
25/01/2019
26/01/2019
27/01/2019
28/01/2019
29/01/2019

6 Day Forecast Analysis of Wildfire Potential (Hours Exceeding Defined Threshold of Fireline Intensity)

Assumptions: Uses PSU mapped fuel types and loads, with slope and aspect under each point (i.e. not averaged across grid) and applied correct ROS model based on fuel type.

Percentage of WAL Zone
0% 100%

Day of Select Date Range
25/01/2019
☐ Show history

Step 1 - Select Threshold Type
Fireline Intensity

Step 3 - Set Thresholds

FLI Threshold
4,000kW/m

FDI Threshold
FDI 20

Step 4 - Filter to See Points in Hr >= Threshold Range
All values

QFES Region
All

LGA Name
All

WAL Zone NAME
All

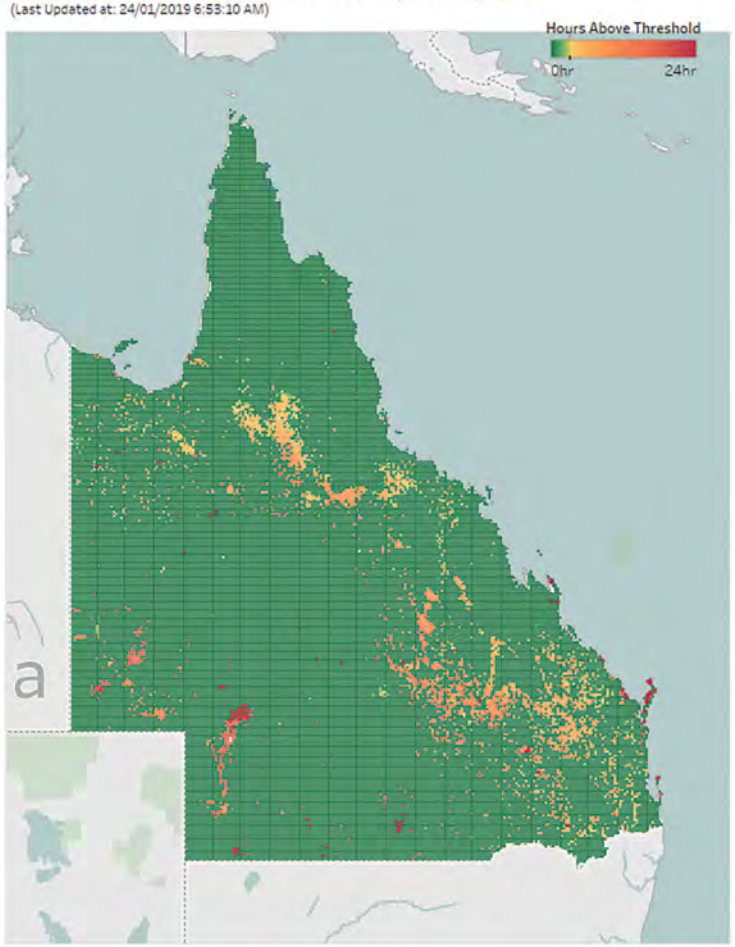
Symbol Size
If you use a filter above to just view a small area like a WAL Zone or LGA, and the points on the map are too small, you can increase the symbol size to enhance the view.

Change Symbol Size
1

1 for whole State & >80 for small areas.

Map Coloured by Hours/Day Above 4000 kW/m on 25/01/2019

(Last Updated at: 24/01/2019 6:53:10 AM)



Estimated Percentage of WAL Zone >= 3hr Above 4000 kW/m by Day

Choose Time Exceed Threshold to See Table Below Update
3hr

QFES Region	WAL Zone NAME	Thursday, 24 January 2019	Friday, 25 January 2019	Saturday, 26 January 2019	Sunday, 27 January 2019	Monday, 28 January 2019	Tuesday, 29 January 2019
BRISBANE	Greater Brisbane Zone	26%	12%	24%	24%	29%	24%
CENTRAL	Capricornia	19%	9%	16%	14%	15%	11%
	Central Coast Whitsunday	1%	1%	0%	0%	0%	0%
	Central Highlands and Coal Fields	15%	14%	14%	13%	12%	11%
	Central West	1%	1%	1%	1%	1%	1%
	Channel Country	5%	5%	5%	5%	5%	3%
	South Western Zone 5	4%	4%	4%	4%	4%	3%
FAR NORTHERN	Cape York Peninsula	0%	0%	0%	0%	0%	0%
	Eastern Coastal Strip	5%	0%	0%	0%	0%	0%
	Gulf Savannah	11%	11%	5%	1%	0%	0%
	NPA & Torres Strait	0%	0%	0%	0%	0%	0%
	Southern Wet Tropics	0%	1%	1%	1%	1%	1%
	Tablelands	1%	1%	1%	1%	1%	1%
NORTH COAST	Bundaberg Zone	36%	20%	32%	31%	33%	37%
	Maryborough Zone	37%	9%	33%	34%	38%	36%
	Sunshine Coast Zone	35%	13%	28%	28%	33%	25%
	Western Zone	41%	33%	40%	40%	41%	39%
NORTHERN	Central Eastern Coastal Strip	7%	9%	10%	2%	1%	3%
	Central West Area	9%	10%	8%	6%	1%	1%
	Gulf Shires	3%	7%	9%	8%	5%	5%
	Northern Eastern Coastal Strip	0%	0%	0%	0%	0%	0%
	South Eastern Coastal Strip	4%	7%	4%	0%	0%	1%
	South West Area	6%	6%	6%	6%	6%	6%
	Western Area	3%	3%	3%	4%	2%	3%
SOUTH EASTERN	South Eastern Zone	22%	20%	23%	29%	32%	26%
SOUTH WESTERN	South Western Zone 1	8%	9%	11%	12%	11%	10%
	South Western Zone 2	6%	13%	14%	20%	24%	23%
	South Western Zone 3	20%	20%	21%	21%	21%	22%
	South Western Zone 4	10%	9%	9%	10%	10%	9%
	South Western Zone 5	4%	4%	4%	4%	4%	3%

Wildfire Potential Guidance
The above coloured boxes indicate the percentage of points falling within each WAL Zone that are estimated to exceed the defined number of hours per day and the defined fire behaviour / index threshold you set. It's a broad area estimate only. It is designed to support State / Regional / WAL Zone level understanding of wildfire potential where you decide the thresholds defining what wildfire conditions are for your area. This tool aimes to facilitate resource allocation, pre-emptive strike teams and ICC establishment and other strategic preparedness decisions. Any questions about calculation methods please contact **PSU on (07)3635 1808 or email PSU@qfes.qld.gov.au**

As at December 2018, SABRE had 6853 users, most of which are Rural Fire Service brigade officers. SABRE users are also located with a number of local councils and QPWS. SABRE is now available to all QFES staff and volunteers. Initial, basic training is available to users via video tutorials inside the SABRE environment, but more detailed onsite training is required for advanced tool users. Additional training will be rolled-out broadly through 2019.

Together Phoenix, SABRE and the expertise of Fire Behaviour Analysts, supported the prevention of bushfire impact on people during the 2018/19 bushfire season, known as Operation Synergy. They also enabled the targeted use of 55 aerial assets to deploy over 12 million litres of water and fire suppressant.

Risk Exposure and Disaster Information Portal (REDI-Portal)

The Risk Exposure and Disaster Information Portal (REDI-portal) is used by internal and external stakeholders to inform land use planning for bushfire. It goes further than what is available on the State Planning Policy Interactive Mapping System and allows its 590 users to interrogate various datasets and features beyond the Bushfire Prone Area (BPA) mapping that are relevant for robust planning for bushfire.

REDI-Portal was initially funded in 2013 to deliver an online Queensland Natural Disaster Risk Register to assist Disaster Management Groups to identify and agree responsibility for residual risk, identify capability gaps and capability development priorities. REDI-Portal was funded through the Natural Disaster Resilience Program, through a MOU between the Commonwealth via the Department of Local Government, Community Recovery and Resilience and the Public Safety Business Agency (PSBA).

REDI-Portal and BPA mapping have recently been used for bushfire mitigation planning. However, SABRE generated bushfire risk tools based on Phoenix simulation is a more appropriate method for mitigation planning and QFES is currently enabling the methodology for this purpose.

At the time of the QAO follow up audit in 2018, REDI-Portal was in transition from legacy data sources and architecture to planned enhancements. REDI-Portal data sources have since been substantially migrated to use spatial services from custodian agencies. For example, where possible, land use data is sourced directly from the Department of Natural Resources, Mines and Energy (DNRME). When DNRME updates their spatial data, REDI-Portal receives the latest updates.

REDI-Portal no longer maintains its own, siloed, spatial databases or systems, instead relying on the enterprise geographic information system (GIS) available via PSBA. There are multiple benefits to this, the greatest being that many datasets are automatically updated as new releases become available.

Survey123

Survey123 is a form-based interface to the underlying 'ArcGIS' geospatial mapping and analytics platform. Survey123 is used to collect data via web or mobile devices. QFES uses Survey123 to capture a range of data, including fuel point observation data (as one input to fuel modelling).

Key bushfire decision-support technologies

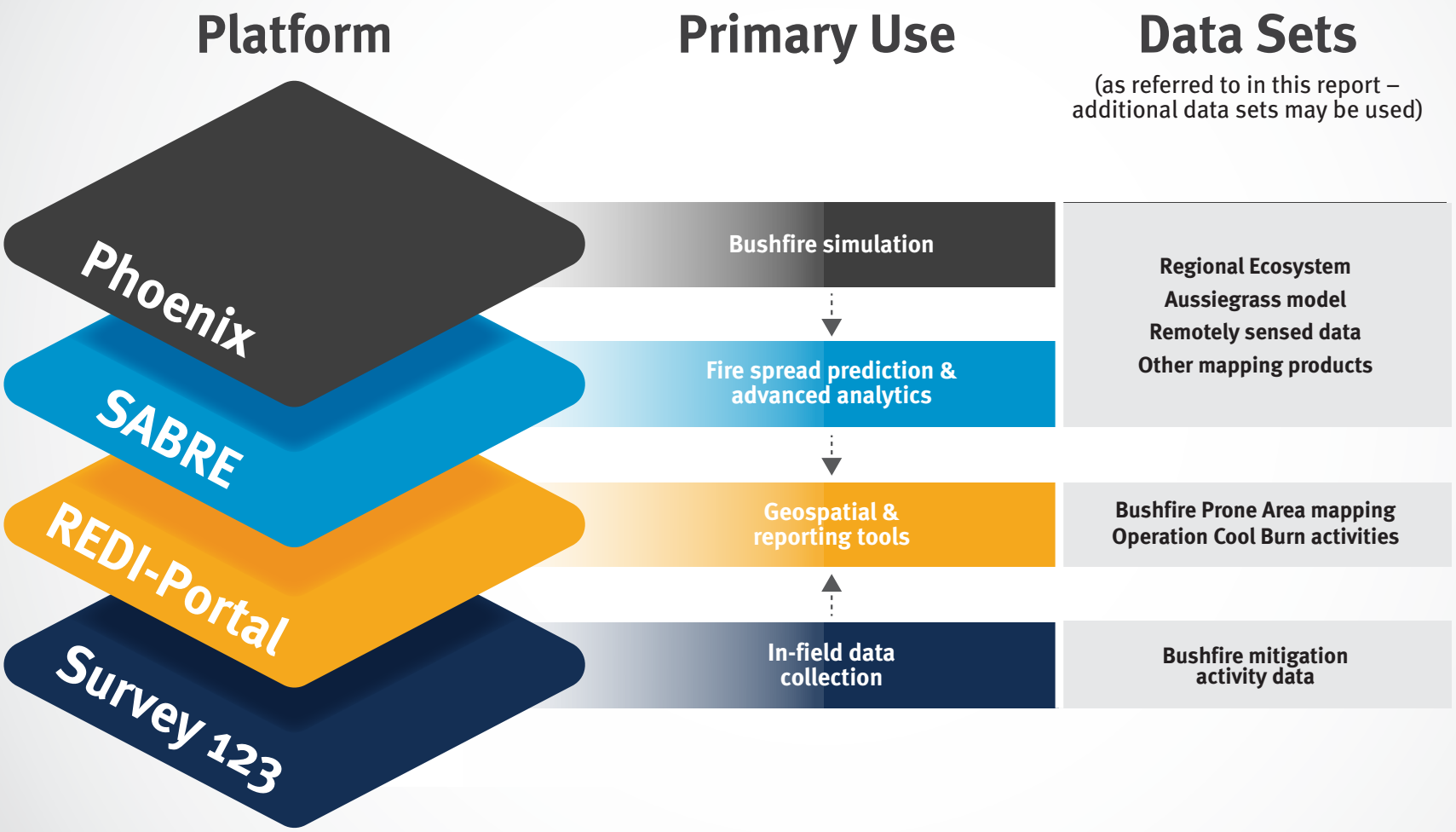


Figure 3 - Illustration of Technologies

Continuous improvement

QFES has demonstrated a commitment to learning and growth since its commencement in 2014. Commissioning a range of external and internal assessments of policy and practice, QFES will continue to evolve with the best available information to guide improvement and investment.

QFES Strategy 2030

Throughout 2018, QFES proactively examined areas for growth and improvement through participatory strategy development. Recognising the value of prevention and preparedness, QFES staff and volunteers have informed and educated communities for many years. However, more can be done. The next step of the evolution of QFES is to work alongside Queenslanders and connect people with the knowledge and services they need for strong communities.

Supporting the notion of working closer with communities, QFES engaged extensively in developing two key strategies with a long view (Strategy 2030 and the Volunteerism Strategy). The strategy design methods reflect the department's maturing approach to enabling, rather than solely providing, solutions in response to community need.

Informed by research, the guiding principles of Strategy 2030 and the strategic priorities of the Volunteerism Strategy, demonstrate the department's shift in focus from the response anchor of decades past.

Capable communities is the first of five guiding principles in the capstone Strategy 2030: local solutions to local problems achieve sustainable outcomes. QFES is committed to minimising the impact of emergency events through the strengthening of community knowledge, skill, cohesion and adaptivity, which are fundamental elements of resilience in a 'place-based' approach.

The second principle, **interoperable**, is important from a systems view to ensure that QFES can work seamlessly between services, with the community and with other sector partner organisations. **Intelligence** is about enabling event decision-making by anyone involved, impacted, or likely to be. **Sustainable** speaks to the need to balance economic, environmental and social factors weighing on decisions.

The final principle, **adaptive**, is critical to individual, community, organisational and system-level survival in complex and uncertain conditions. Organisational and individual adaptivity is essential when confronted with extreme events or events where there are no known frames of reference. Agile mindsets are required to enhance our capacity to respond effectively to events that are novel in scale, speed or duration.

> "The complexities of managing fire in the landscape has significantly changed in recent years. The 2018 wildfire season demonstrated the potential bushfires have to disrupt communities across the state.
>
> These events demonstrate the invaluable contribution staff play in managing, developing and supporting the volunteer workforce who play a significant role in mitigation and suppression activities across the state.
>
> The strategic direction outlined that QFES is following will enhance QFES's ability in bushfire mitigation and suppression. We look forward to working collaboratively with QFES to continue minimising the effects of bushfire on all Queenslanders."

Superintendent Tony Hazel AFSM
Rural Fire Service Together Union President

Capability investment

Three strategic capabilities are identified in Strategy 2030 as necessary for delivery of exceptional public value and to enact the guiding principles. These are:

- communication and engagement
- capability integration
- strategic and operational intelligence.

The strategic capabilities are important to the effectiveness of bushfire prevention and preparedness as they are for the success of the range of emergency management accountabilities of the department. By investing in, and growing these capabilities, QFES will be increasingly well positioned to embrace the challenges and opportunities of the future.

The QFES evolution importantly encompasses digital transformation, aimed at enabling greater situational awareness.[39] The QFES investment in bushfire predictive analytic capability is discussed throughout this report. In 2018, to support the effective use of our information-rich environments, QFES provided awareness sessions on the constraints of traditional rules-based decision-making to staff. QFES recognises that skills-based learning[40] is a vital investment in our human capital.

The changing capabilities of QFES are discussed in a recent BNHCRC research paper, which observes the broad-ranging business changes required, and well-progressed, to enable contemporary service delivery.[41]

39 T. Wildermuth, 'Catastrophe Thinking, Fast and Slow', *Washington Journal for Environmental Law and Policy* [online journal], No.7, ‹https://digital.lib.washington.edu/dspace-law/bitstream/handle/1773.1/1708/7WJELP251.pdf?sequence=1&isAllowed=y›, accessed 6 December 2018.

40 L. Friedman et al., 'Training Situational Awareness Through Pattern Recognition in a Battlefield Environment', *Journal of Military Psychology* [online journal], No. 3, ‹https://www.tandfonline.com/doi/abs/10.1207/s15327876mp0302_3›, accessed 6 December 2018.

41 N. Maharaj, & B. Rasmussen, 'Changing Capabilities of Emergency Service Organisations: Case study synthesis', *Bushfire and Natural Hazards Cooperative Research Centre* [website], August 2018,‹https://www.bnhcrc.com.au/sites/default/files/managed/downloads/changing_capabilites_report_final_0.pdf›, accessed 21 December 2018.

Preparing and strengthening our communities is a whole-of-QFES effort. The organisational transformation, taking the next steps through Strategy 2030 and the Volunteerism Strategy, is key to supporting the best outcomes for Queensland, regardless of the hazard type. A comprehensive model of emergency management will serve Queensland communities best in the context of a rapidly changing world.

Operational preparedness

QFES launched a Volunteerism Strategy in 2018. The strategy aims to embed volunteers, volunteering and volunteerism deeper in the QFES culture and ethos. Consistent with the Volunteerism Strategy, QFES has invested substantially in improving conditions, and access to information, for volunteers that will support greater community capability in to the future.

> **Additional funding for Rural Fire Service fuel and maintenance has enabled more volunteer time to be spent on prevention and preparedness activities rather than fundraising.**

QFES has brought forward its fleet replacement program to continue to enhance the Rural Fire Service fleet. This has led to the delivery of 64 appliances in 2017-18, and 119 appliances will delivered in 2018-19. Volunteer consultation is increasing through a technical strategic working group and through development of prototypes, which are toured across broad areas for local feedback. This process is known as 'Fit for task vehicle design' and was explained to rural fire brigade volunteers in the Rural Fire Brigades Association of Queensland magazine 'Smoke Signals'.[42]

Also supporting operational preparedness, some major changes, enhancements and investment in the aviation capability have occurred during 2018. These improvements have positively altered the operating model of aviation within QFES.

The most significant shift has been an increase in the number of National Aerial Firefighting Centre (NAFC) contracted aircraft engaged for the fire season. This has seen an increase from three contracts located at Archerfield airport, to eight contracts divided between Toowoomba and Bundaberg airports. Historically, the Bundaberg area and surrounds have seen a large volume of high-risk incident responses, which now benefit from aircraft within closer proximity.

The purchase and development of a hangar at Toowoomba Regional Airport has provided QFES State Air Operations Unit a hub for operations outside of busy Brisbane airspace, for training and innovation support. It also provides coverage across a greater landmass.

The recent fire season demonstrated the value of these investments for fire suppression, intelligence gathering and situational awareness.

Below is a 'linescan', which is an example of how aerial capability and intelligence work hand in hand to improve situational awareness.

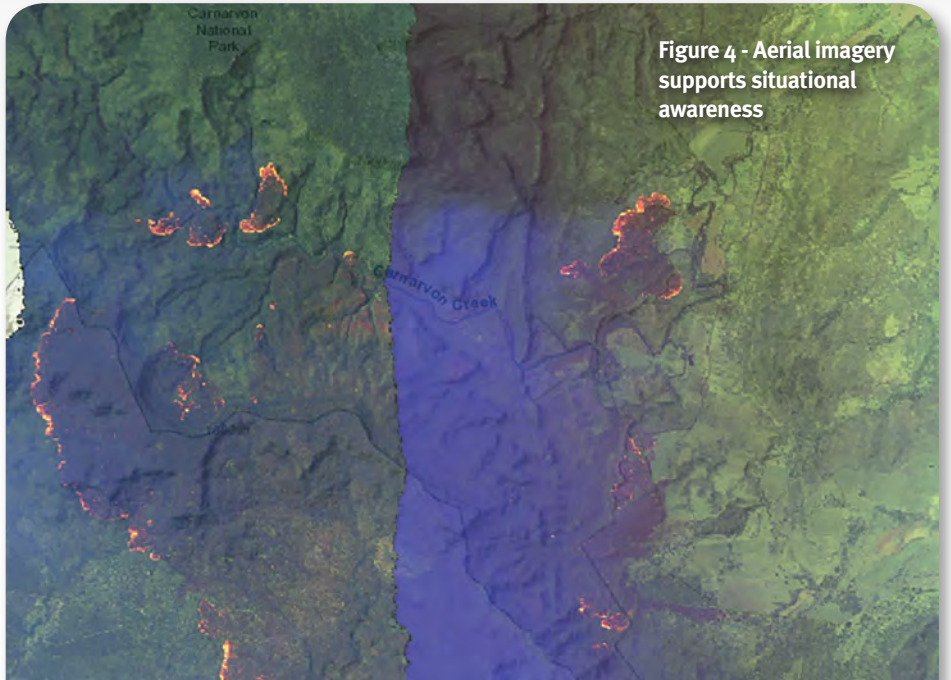


Figure 4 - Aerial imagery supports situational awareness

42 'Fit for Task – Vehicle Design', Smoke Signals, *Rural Fire Brigades Association of Queensland*, Summer 2018, ‹https://www.rfbaq.org/smoke-signals/summer-2018/#p=8›, accessed 18 January 2018, p. 8.

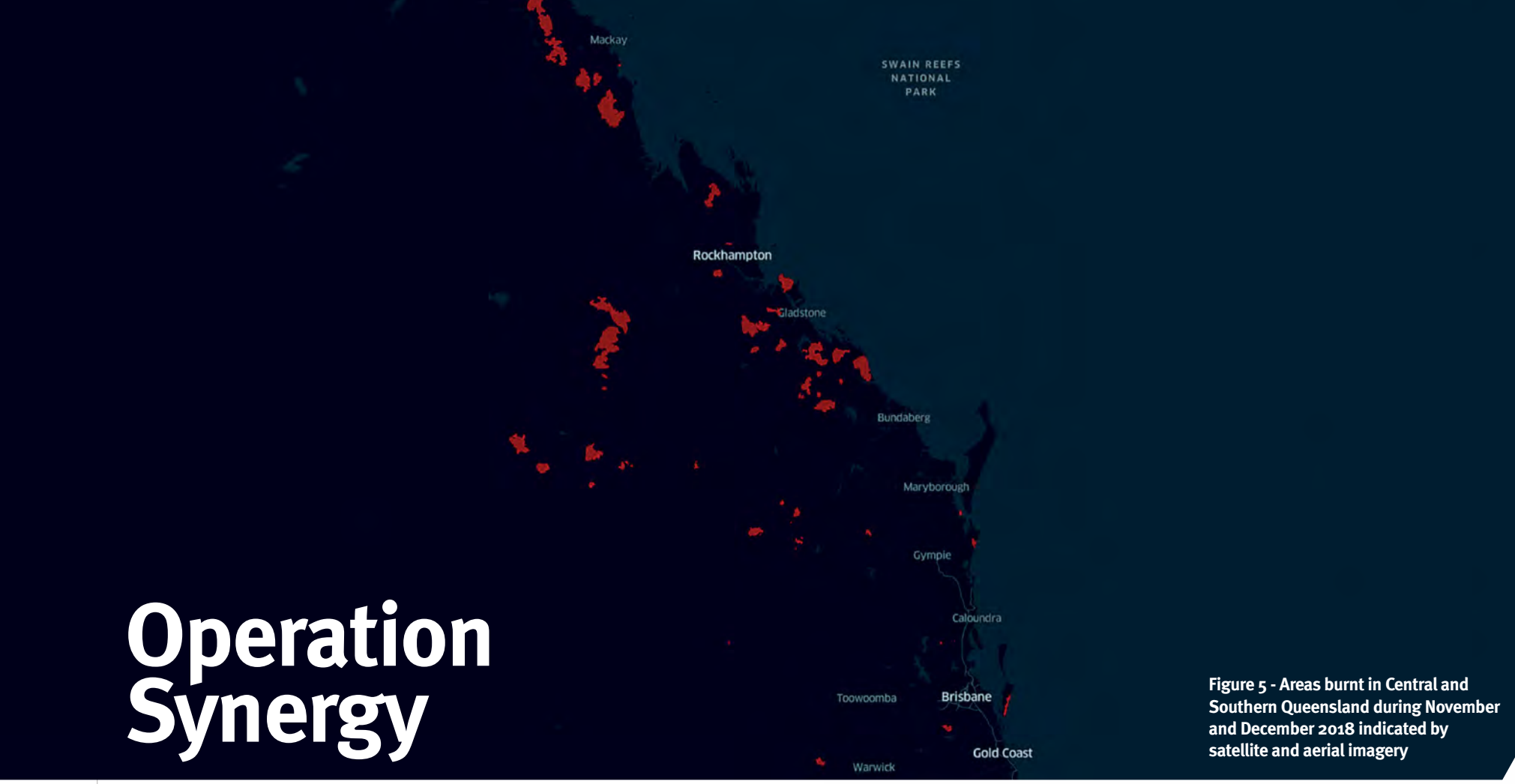


Figure 5 - Areas burnt in Central and Southern Queensland during November and December 2018 indicated by satellite and aerial imagery

Operation Synergy

The 2018/19 bushfire season is known as Operation Synergy. The name was chosen to reflect the outcome produced when all areas of QFES and its partners collaborate effectively during operations (see Appendix B).

Between August and December 2018, more than four million hectares (2.3 per cent) of Queensland was burnt. The peak period of 'anomalous' high temperatures extended from 24 to 28 November, fuelling widespread fire events that totalled more than 1.4 million hectares between 22 November and 6 December.[43]

43 Bureau of Meteorology, 'Special Climate Statement 67 – an extreme heatwave on the tropical Queensland coast', *Bureau of Meteorology* [website], 2018, ‹http://www.bom.gov.au/climate/current/statements/scs67.pdf›, accessed 15 December 2018.

Heatwave 24 November to 1 December 2018

The 2018-19 fire season in Queensland was extraordinary, though follows a general trend of an increasingly warm climate.[44]

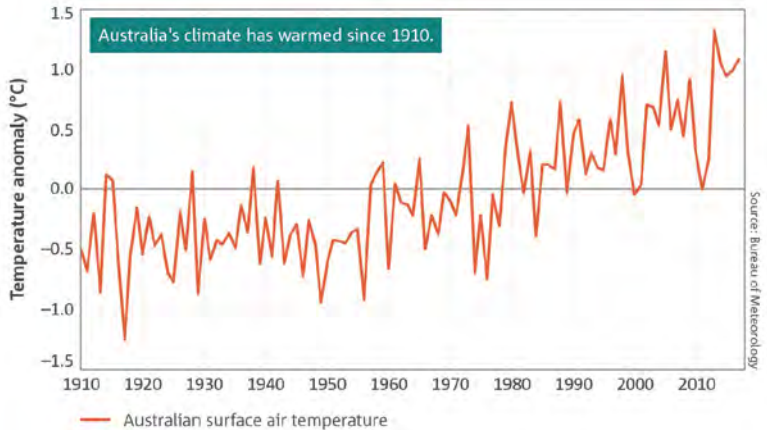


Figure 6 - Anomalies in annual temperature over land in the Australian region. Anomalies are the departures from the 1961–1990 standard averaging period

The compounding fire weather conditions and resulting fire behaviour during the bushfire season, particularly during November 2018, had not been seen in the State at a similar scale.

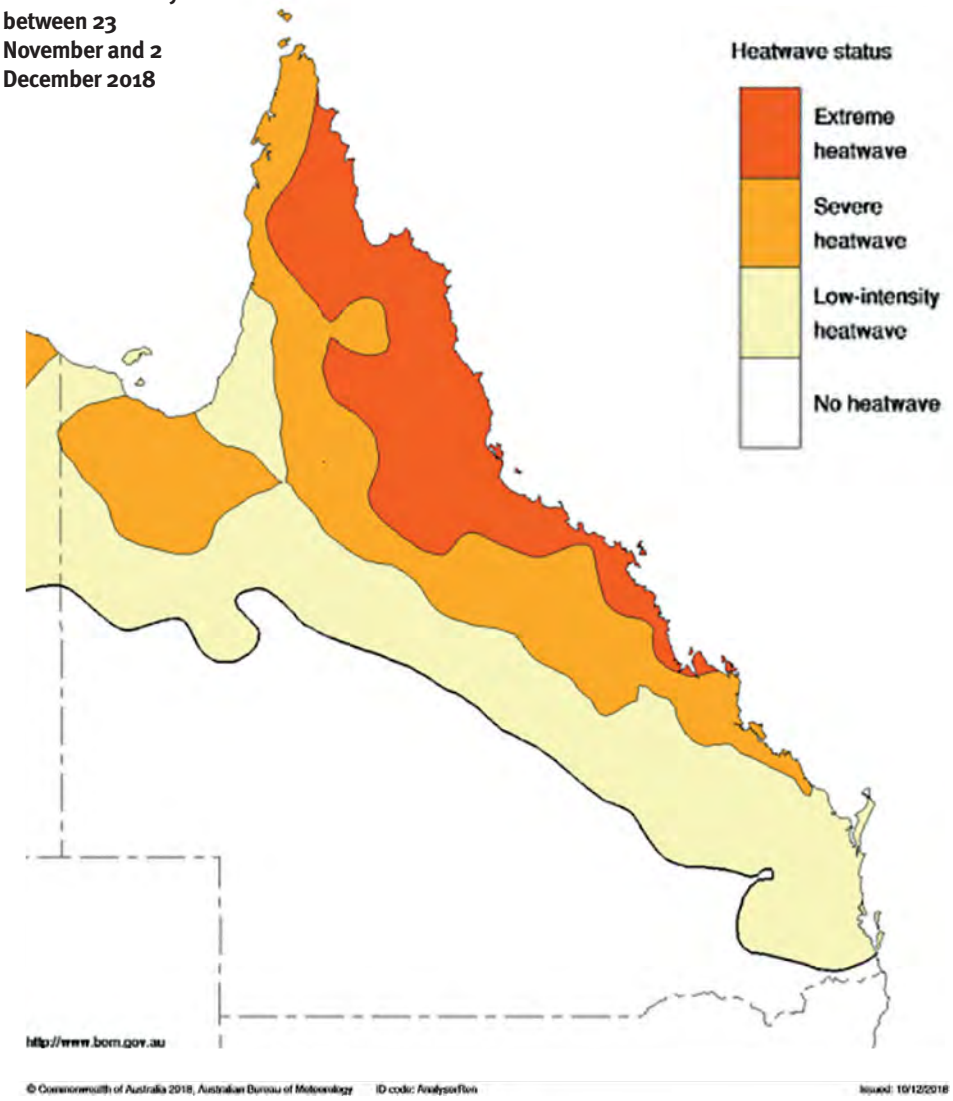
Heatwave conditions were experienced along much of the Queensland coast from 23 November. **Figure 7** shows the highest heatwave severity between 23 November and 2 December. Many locations surpassed their November maximum daily temperature records with Proserpine Airport topping the chart at 44.9˚C on 26 November.[45] Queensland Ambulance Service saw an increase of more than nine per cent in heat-related calls for service on 26 November 2018 compared to the same date in 2017.[46]

44 Bureau of Meteorology and CSIRO, 'State of the Climate 2018', *CSIRO* [website] December 2018, ‹http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2018.pdf›, accessed 20 December 2018.

45 ibid.

46 ibid.

Figure 7 - highest heatwave severity between 23 November and 2 December 2018



For the first time in Queensland, the Bureau of Meteorology's Forest Fire Danger Index (FFDI)[47] reached over 130 for the Rockhampton area seeing the 'catastrophic' category triggered for a number of hours in the QFES Central Region (see Figure 2 below).[48] The Commonwealth Scientific and Industry Research Organisation (CSIRO) notes that:

> **"an index of 100 means that fires will burn so fast and hot that control is virtually impossible".**[49]

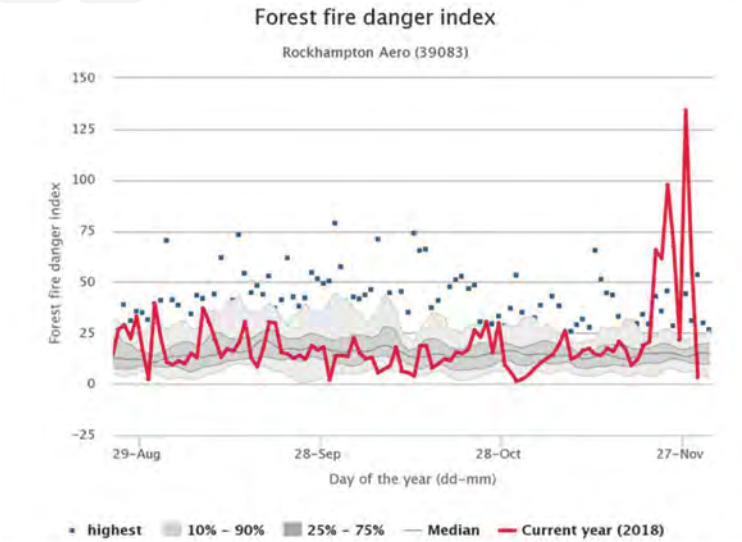


Figure 8 - Forest fire danger index for Rockhampton Aero (BOM)

47 FFDI is used in Australia for operational fire warnings based on air temperature, wind speed, relative humidity and a component representing fuel availability.
A. Dowdy et al, 'Australian Fire Weather as represented by the McArthur Forest Fire Danger Index and the Canadian Forest Fire Weather Index', *The Centre for Australian Weather and Climate Research* [website], 2009, ‹http://www.cawcr.gov.au/technical-reports/CTR_010.pdf›, accessed 11 January 2019.

48 Bureau of Meteorology, 'Special Climate Statement 67 – an extreme heatwave on the tropical Queensland coast', *Bureau of Meteorology* 2018, p.14, ‹http://www.bom.gov.au/climate/current/statements/scs67.pdf›, accessed 2 January 2019.

49 CSIRO, 'McArthur Mk5 Forest Fire Danger Meter', *CSIRO*, December 2018, ‹https://www.csiro.au/en/Research/Environment/Extreme-Events/Bushfire/Fire-danger-meters/Mk5-forest-fire-danger-meter›, accessed 3 January 2019.

The potential for elevated fire conditions this fire season was identified by QFES. The department's own network of local knowledge, overlayed with a central fire behaviour analytics capability, contributes to the *Seasonal Bushfire Outlook* BNHCRC products (refer Appendix C). Even though QFES was aware of the potential, the particular compounding conditions during late November and December were unexpected.

Preparations were well underway for the seasonal circumstances (addressed throughout this document). The mission for Operation Synergy was a unified approach with all stakeholders to enable the mission objectives of:

1. Protection of life – emergency responders and community
2. Provision of public information and warnings
3. Protection of critical assets
4. Protection of community and agricultural assets
5. Conservation of environment.

Despite conditions ranging up to catastrophic Fire Danger Ratings, the mission objectives were achieved, and significant potential losses were prevented. Key to the protection of lives and homes was QFES' preparation. This includes support and involvement from the public, QFES interoperability with its partners (including for aerial capability), and advances in fire behaviour analysis and prediction. QFES has invested in research (particularly with the BNHCRC covered earlier in the report) to improve bushfire mitigation and response.

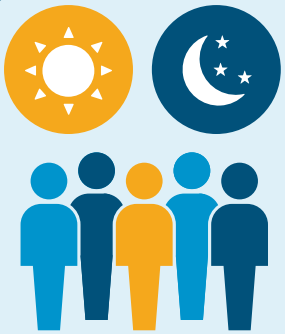
Timeline peak bushfire activity 2018/2019

1200
Interstate personnel

59
Aircraft

47 aircraft airborne simultaneously, during peak periods

3000
QFES personnel worked day and night



NOV 22

Weather teleconference with regions hosted by State Operations Centre (SOC) discusses expected heightened fire dangers, possible scenarios and level of preparedness.

NOV 23

Fire activity in the South Eastern Region triggers the first of more than 500 bushfire community warnings to be issued over the coming fortnight.

NOV 24

High level warnings issued for Undullah, Delaneys Creek, and Sheldon in Brisbane's urbanised bayside.

NOV 25

Fires at Round Hill and nearby Deepwater in Central Region prove difficult to control.

NOV 26

The State Disaster Coordination Centre (SDCC) now activated to ALERT.

QFES accepts offers of support from interstate.

NOV 27

First interstate deployment arrives in Gladstone.

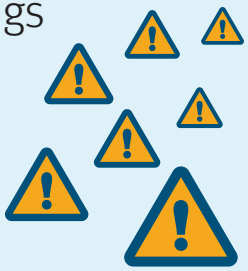
80 bushfires state-wide.

Fires reported as being 12 metres high.

NOV 28

'Catastrophic' Fire Danger Rating impacts parts of Queensland – this has never been seen before.

571
Bushfire community warnings were issued



More than **50**
emergency alerts reached over 1 million devices

17
Dwellings damaged
9 of which were destroyed
(source: Response Magazine Ed 22 p10)

More than **1.4 Million**
hectares burnt

NOV 29

Fires have posed a threat to about 130,000 people and 54,000 dwellings.

NOV 30

Fire bans in place for 37 local government areas.

Fire Communications Officers process 1117 calls in a 24-hour period.

DEC 01

11 million litres of water and fire suppressant dropped over the fires – equivalent to almost five Olympic-sized swimming pools.

DEC 02

Cyclone Owen forming off the far north coast.

New fires of interest include North Stradbroke and Karara.

DEC 03

Around 4300 hectares of land burnt on North Stradbroke Island.

DEC 04

Severe fire weather conditions begin to abate.

DEC 05

There are still 76 active QFES vehicles in the field.

Fires of interest: Agnes Water, North Stradbroke and Curtis Island.

Operation Cool Burn

Each year, QFES conducts 'Operation Cool Burn' where bushfire mitigation activities are coordinated across the state. Operation Cool Burn is a period of heightened mitigation activity, but hazard reduction burns, fireline/break maintenance and community education occur year-round. QFES has matured its relationship with its partners during Operation Cool Burn, enabling the focus to be on shared community priorities for the protection of life and property.

Figure 9 - Operation Cool Burn 2018 QFES Response Magazine article

PREPARATION

Operation Cool Burn tracks ahead using new tools and tech

Operation Cool Burn has officially commenced with Queensland fire managers having access to the latest tools and technology to better predict fire behaviour.

The annual bushfire hazard mitigation operation will see the Rural Fire Service (RFS) and Fire and Rescue Service (FRS) work with land management agencies and the public to ensure communities are better prepared in the lead up to the bushfire season.

Queensland Fire and Emergency Services (QFES) Predictive Services Unit Manager Andrew Sturgess said this year there are a number of new products and services available to better support Operation Cool Burn activities throughout the state.

"These include an online Snap Report which provides rapid and essential information to crews for fuel/hazard reduction burn planning," Mr Sturgess said.

"This new tool can be customised by the user with filters for locality, fuel type/load, slope and a choice of wildfire or hazard reduction burn guidance.

"Daily state-wide prescribed burning guidance now includes a relative humidity, peak wind speed, drought factor and curing maps.

"Another area providing improved guidance is the grass fuel map. This data underpins fire behaviour models and tools for this vegetation type and the plan is to use this same approach for woodlands with grassy understories.

"Grasslands are the most widespread vegetation type in Queensland and this seasonal product provides significant improvement for our prediction methods.

"These advancements not only benefit QFES but also allow community members to further understand and prepare for bushfire season," Mr Sturgess said.

Executive Manager Bushfire Mitigation Superintendent James Haig said bushfire preparedness is a shared responsibility to ensure properties, homes, businesses and families are ready for bushfire season.

"Operation Cool Burn not only focuses on hazard reduction burns in bushfire prone areas, but also on improved fire lines and community education," Mr Haig said.

"Protecting Queensland communities is our priority and we need to take advantage of the lower fire danger risk in the cooler months.

"While we work particularly closely with key partners such as land management agencies we encourage everyone to get involved in Operation Cool Burn by preparing a Bushfire Survival Plan," Mr Haig said.

Case Study

Stanwell/Gracemere Fire

The Stanwell, Kabra and Gracemere areas are primarily grazing land. However, some pastures were suffering from a grass disease[50] and conditions were generally dry. Although Gracemere had not been drought-declared,[51] the town received well-below average rainfall in 2018.[52]

On 25 November 2018, the Rockhampton Regional Council area was amidst an extreme heatwave with the temperature reaching 41.5°C that day. In Stanwell, a previously extinguished fire on private property re-ignited on 26 November and QFES assistance was requested. A fire ban was issued for the Rockhampton local government area from 0100hrs on 27 November 2018.

On the 28 November, under catastrophic conditions, the fire quickly became uncontrollable. Aircraft were used for water bombing and to collect information for predictive modelling. These aerial assets were available due to QFES' arrangements with the National Aerial Firefighting Centre. Preparations for the 2018 bushfire season enabled access to the largest aerial firefighting fleet ever used in Queensland.

By the afternoon of 28 November, the fire was advancing in the direction of the town of Gracemere and its 11,300 residents.[53] The combination of low humidity, below average rainfall, dry pastures, above average temperatures and very high winds, created an ideal environment for the fire's rapid spread.

50 A. McCosker, 'Grass disease causes pastures to die before graziers' eyes', *ABC Rural News* [website], 2018, ‹https://www.abc.net.au/news/rural/2018-04-13/grass-dieback-shocks-graziers/9603082›, accessed 10 January 2019.

51 Queensland Government, 'Drought Declarations', *The Long Paddock* [website], ‹https://www.longpaddock.qld.gov.au/drought/drought-declarations›, accessed 11 January 2019.

52 Bureau of Meteorology, 'Monthly Rainfall: Gracemere-Lucas St.', *Bureau of Meteorology* [website], 2018, ‹http://www.bom.gov.au/jsp/ncc/cdio/wData/wdata?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=039049›, accessed 11 January 2019.

53 '2016 Census Stats Gracemere', *Australian Bureau of Statistics* [website], ‹http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC31230›, accessed 10 January 2019.

Figure 10 - Aerial waterbombing near Gracemere

Source: ASHJO Photography

Figure 11 - Stanwell area (Source: QFES)

QFES Fire Behaviour Analysts used predictive analytic modelling software to map the potential path of this fire in partnership with other agencies. In this case, BOM provided predictive weather information, which QFES used to produce the overlays within simulation products. The modelling showed the fire was likely to impact the Gracemere township, particularly from ember attack, by 5pm that day.

At 3:16pm on 28 November 2018, QFES advised evacuating the town was necessary to prevent loss of life. Thousands of residents heeded the advice and chose to leave.

The predictive analytics imagery was released to the media to support a greater understanding of the need for evacuation. The predictive analytics produced on this fire also allayed concerns that the fire could potentially impact Rockhampton. The analysis conducted by the QFES Fire Behaviour Analysts indicated the fire would not impact Rockhampton, therefore preventing unnecessary disruption of the community from evacuation.

Intensive aerial water bombing by including the Large Air Tanker along with on the ground fire crews, worked to slow the fire. Continuous use of predictive modelling allowed both aircraft and ground crews to be deployed to maximise effectiveness.

Later that evening, it was still not safe for evacuated Gracemere residents to return to their homes. Residents who chose to stay in their properties rather than evacuate, called for emergency assistance during the night.

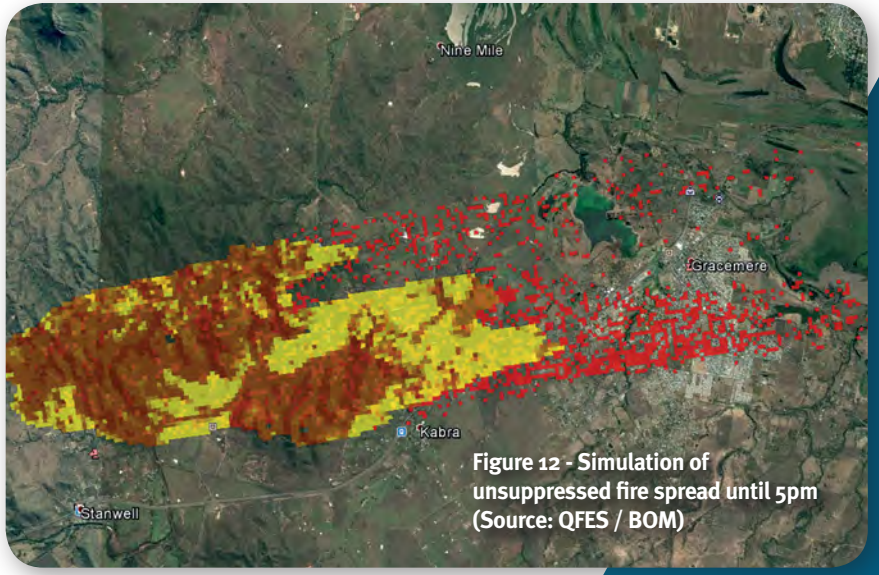


Figure 12 - Simulation of unsuppressed fire spread until 5pm (Source: QFES / BOM)

At 9am on 29 November the risk was downgraded and residents could return to their homes, but were told to remain alert. One house was reported to be lost as well as a number of sheds and outbuildings.

Figure 14 - Tractor in Kabra
(Source: QFES)

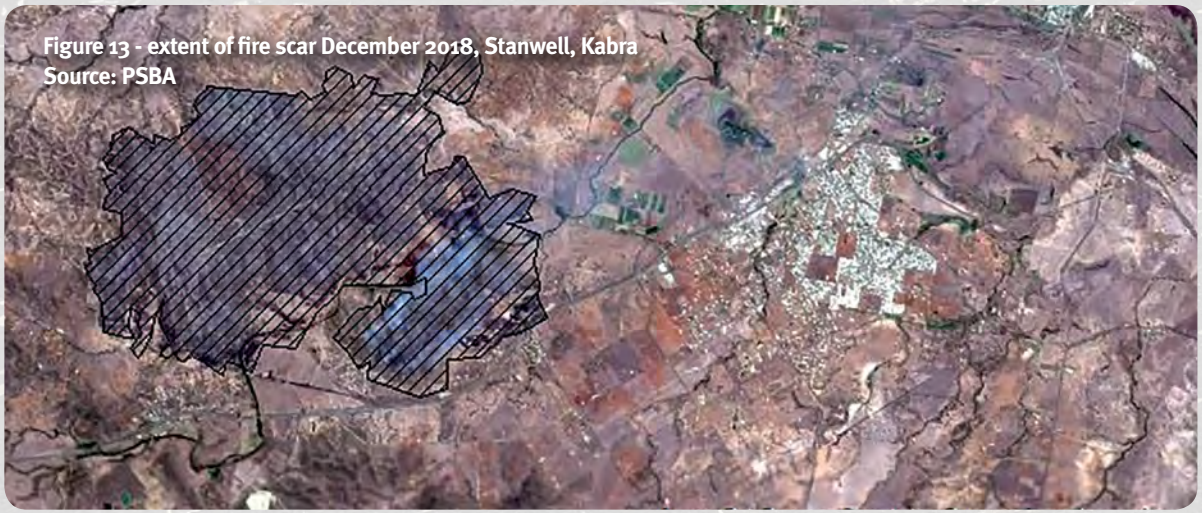


Figure 13 - extent of fire scar December 2018, Stanwell, Kabra
Source: PSBA

Action addressing QAO audit reports

2014 Recommendation 1.1

QFES strengthens its oversight role as a lead agency by mitigating Queensland's bushfire risk to acceptable levels by: *coordinating land managers' efforts to assess and mitigate bushfire risk*

QFES Action 2014-2018

As noted in the 2018 QAO follow-up report, QFES has improved its coordination efforts by re-establishing the State Interdepartmental Committee for Bushfires. QFES has also established governance mechanisms in the Office of Bushfire Mitigation and Area Fire management Groups (AFMG).

Area Fire Management Groups established

There are 51 AFMGs currently operating, which cover 64 local government areas (LGA). QFES is working with other areas to establish further AFMGs. The AFMGs allow partners and stakeholders in the AFMG area to share information about bushfire risks and mitigation priorities to reach consensus on tenure-blind, joint priorities.

QFES coordinates land managers' efforts to assess and mitigate bushfire risk through leadership of these governance arrangements. This includes chairing AFMGs and the State Interdepartmental Committee on Bushfires, and by providing tools and training to assess fuel loads. The training supports the application of an increasingly evidence-based approach with an emphasis on local place-based solutions.

AFMG membership is location-dependent, but typically includes major land managers such as traditional owners, local government/s, Queensland Parks and Wildlife Service, utilities organisations, Department of Transport and Main Roads, Queensland Rail, Department of Natural Resources, Mines and Energy, HQ Plantations, and the Department of Agriculture and Fisheries.

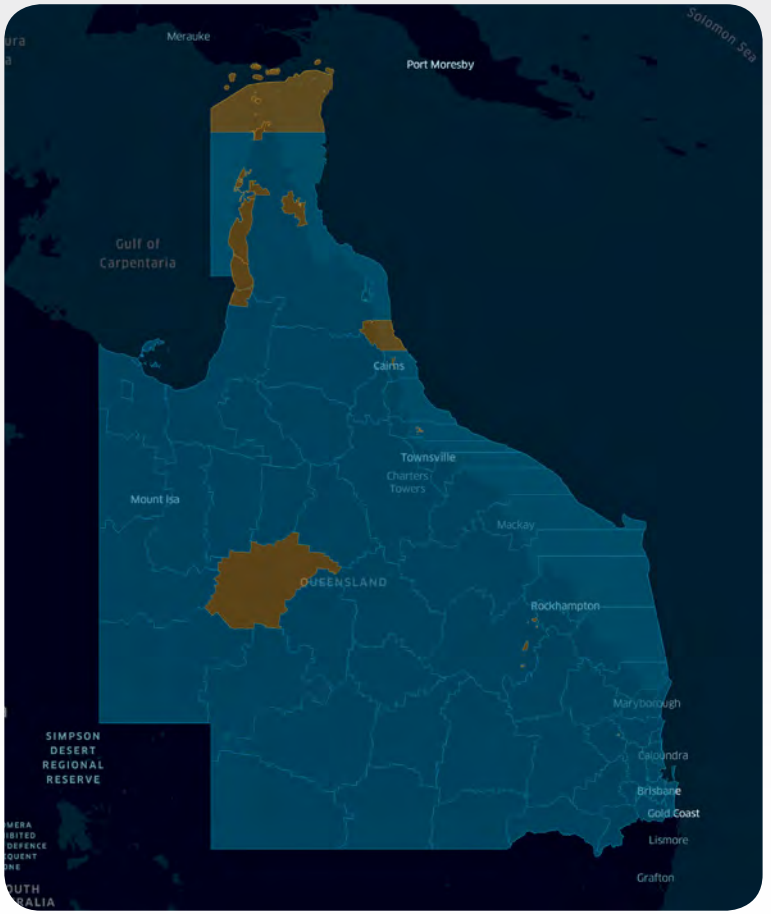


Figure 15 - Local government areas serviced by an AFMG in 2018 (indicated in blue) Source: QFES

Building relationships with traditional landowners

QFES is also building relationships with traditional landowners and building cross-cultural understanding of land management practices. An example of this is the Jigija Fire Training Program, piloted in May 2017 with extensive support from QFES. The program evolved from a close working relationship with the Carpentaria Land Council Gangalidda – Garawa Indigenous Ranger Program.

> QFES assisted Jigija's recognition as a registered training program, which has allowed greater reach in training and cultural awareness.
>
> **(see Figure 16, article from Response Magazine Article June 2017).**

The Jigija program provides lessons on comparative world views between Western and Aboriginal "*fire management practice, best practice guidelines for Aboriginal community engagement and adherence to Aboriginal cultural protocols.*"[54] QFES provides for the attendance of staff and volunteers on the program each year.

Figure 16 – Jigija program in Response Magazine June 2017

54 T. Taylor, & M. Parkinson, 'The Jigija Fire Training Program: Indigenous Fire Ecology Training in the Lower Gulf of Carpentaria', *Jigija* [website], 2017, p. 4, <http://www.jigija.com.au/perch/resources/thejigijafiretraining-program31102017.pdf>, accessed 9 January 2019.


BUILDING OUR KNOWLEDGE

Traditional fire management at Hells Gate

QFES members have taken part in a four-day pilot course in the Gulf of Carpentaria to learn about Indigenous land management and hazard mitigation burning practises.

A group of 16 QFES members representing all regions headed to the remote north-west Queensland area of Hells Gate in May to participate in the Jigija Indigenous Fire Training program, learning about traditional fire ecology and land management practices from local Indigenous rangers.

The pilot program was coordinated by the RFS and delivered by the Carpentaria Land Council Aboriginal Corporation (CLCAC) fire management team.

The course included traditional knowledge theory sessions and the opportunity for participants to observe various landscapes, fauna and vegetation and gain an understanding of traditional owners' connection to each. Students also gained practical experience in Indigenous fire management practises and the development of fire management plans incorporating traditional techniques which are described as 'mosaic burning'.

Acting Assistant Commissioner Emergency Management Wayne Hepple took part in the course and said it was a unique opportunity for QFES to partner with the CLCAC and see Indigenous land management methods in action.

"The principles we learnt over the week are actively being applied across a number of pastoral areas in the region and the beneficial results were clearly evident when we visited these sites," Mr Hepple said.

"Several times throughout the week QFES members commented on the change of mindset they now held on the use of fire in the landscape.

"The program was a great success and a credit to those involved in bringing it together as well as those who, for many years, have worked to build the strong partnerships behind this collaboration."

Far Northern Region Regional Community Educator Chris Wegger was also among the participants and said the experience had been invaluable.

"As an Indigenous staff member it was great to work, learn and share cultural connections with other Indigenous peoples working in the field of natural and cultural resource management," Mr Wegger said.

"Participants learnt how significant fire actually was to Indigenous peoples' in the managing of country and culture. Indigenous peoples use of fire both pre-colonisation and now in its contemporary form still has the same significance and benefits in promoting healthy country."

14 RESPONSE Edition 13 June 2017

www.qfes.qld.gov.au | 13 QGOV (13 74 68)

QFES steps out a

In May, around 40 QFES memb Brisbane's South Bank to raise

QFES walkers, including the entire Executive Leadership Team, were among more than 2000 participants who gathered in the dark, before setting off at 6am for a 3km walk along South Bank to support the challenge.

The event, now in its fourth year, is organised by Australia's CEO Challenge (ACEOC) and encourages community engagement in the response to and prevention of domestic and family violence. It includes a 110km run, with every kilometre representing one of the 110 lives lost each year on average due to domestic and family violence. Beginning the night

33

www.qfes.qld.gov.au | 13 QGOV (13 74 68)

Place-based approaches to emergency management

It should be noted that place-based approaches to emergency management (such as AFMGs) involves long-term strategic, collaborative efforts empowering local partners and stakeholders to deliver systematic and meaningful change.[55]

The strength of this approach is in recognising and prioritising local needs, substantiated by local knowledge, but increasingly supported by an improving evidence-based approach. QFES provides evidence such as remote-sensed fuel load data and predictive modelling of potential bushfires to assist in this regard.

The success of place-based approaches is dependent upon on local leadership, expert and practitioner knowledge along with meaningful engagement. However, there remains a tension between local interests and (potentially) competing priorities from a whole-of-state view. The social, economic and environmental values of one place may be contradictory to another, yet their prioritisation can impact other areas, or even the whole.

QFES recognises that effective place-based approaches require leadership and coordination at all levels. Connection between these levels, and visibility across the whole, is essential to ensure local prevention and preparedness is adequately contributing to risk reduction at the whole of state level. The State Interdepartmental Committee on Bushfires is fundamental to this, as is the continued enhancement of information sharing to support decision-making.

54 Queensland Council of Social Service, 'Place-based approaches', *Queensland Council of Social Services* [website], 2018, ‹https://www.qcoss.org.au/our-work/place-based-approaches›, accessed 10 December 2018.

2018 Recommended Next Steps 1.1.1

Continue working with local councils, particularly with Indigenous councils, to establish individual area fire management groups. Establishing more of these groups that better align with local councils and other key stakeholders would enable bushfire risks at the local level to be managed more effectively.

QFES 2019 Plans

Maturing and expanding Area Fire Management Groups

QFES will continue to provide leadership to Area Fire Management Groups to grow their number, strength and maturity. In 2019, QFES aims to better integrate AFMGs with the disaster management arrangements, particularly in their relationships with Local Disaster Management Groups. Integrating bushfire and disaster management planning will be key, as will be using the IDC to build a stronger focus on setting, implementing, monitoring and reporting on standards..

Qualitative feedback from AFMGs since their revamp in 2016 (including through the IDC) has been very positive. However, QFES plans to seek further feedback on the efficacy of AFMGs in meeting individual stakeholder needs. Feedback will be sought on an annual basis through a more structured process.

2018 Recommended Next Steps 1.1.2

Continue rollout and related training of new tools such as bushfire simulation products for risk-mitigation planning purposes and Survey 123 to improve assessment and mitigation of bushfire risks across the state.

QFES 2019 Plans

QFES will provide the fuel load assessment and predictive capability of Phoenix to boost support for AFMGs across Queensland in 2019. This will strengthen the evidence base for the AFMG deliberations with better information on current fuel loads. It will also support current bushfire risk assessments through predictive modelling of risk.

2014 Recommendation 1.2

QFES strengthens its oversight role as a lead agency by mitigating Queensland's bushfire risk to acceptable levels by:
Formalising the role of fire management groups to manage Queensland's fuel loads, including reporting planned and conducted hazard reductions burns and effectiveness of hazard reduction burns

QFES Action 2014-2018

Evaluating the potential effectiveness of hazard reduction burns

QFES has developed the capability to apply bushfire simulation tools to evaluate potential hazard reduction burning effectiveness. An example is the evaluation of a major, multi-agency burn conducted at Mount Tamborine.

In 2016, the Predictive Services Unit (PSU) was requested by QPWS to estimate the change in bushfire impact risk (residual risk) given the conduct of a 600-hectare hazard reduction burn in the vicinity of the Mount Tamborine township, in partnership with local council and Rural Fire Service. PSU used Phoenix and SABRE.

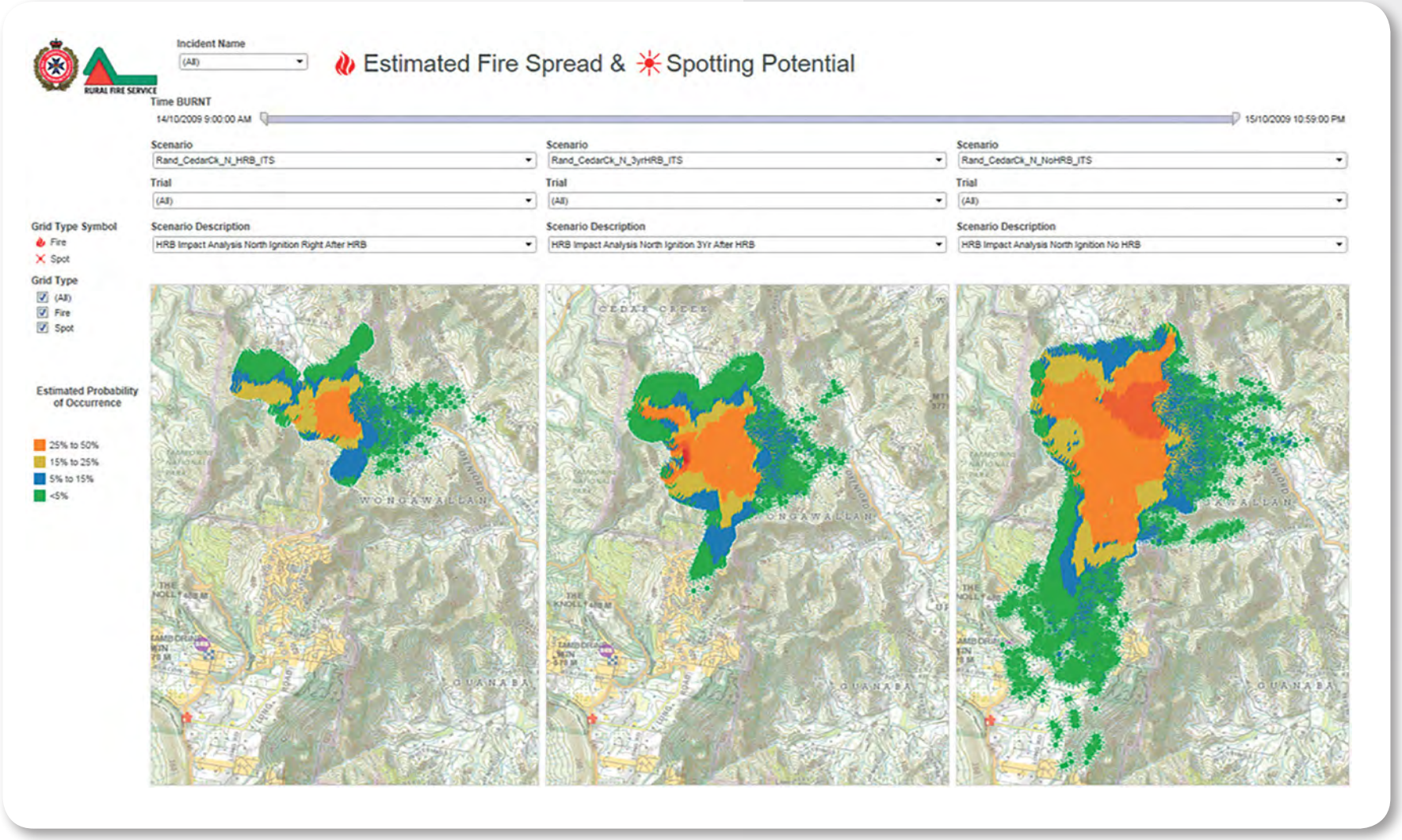
For the Tamborine planned burn, three scenarios were modelled and run through SABRE:

1. **Scenario 1** – Potential wildfire assuming no hazard reduction, long unburnt fuels.
2. **Scenario 2** – Potential wildfire assuming hazard reduction burn having been recently completed.
3. **Scenario 3** – Potential wildfire assuming hazard reduction burn conducted three years ago.

The maps below (**Figure 17**) show the SABRE output provided. The left most image shows Scenario 1, the centre image Scenario 2 and the right image Scenario 3. The risk reduction achieved by the planned burn (change between Scenarios 1 and 2) can be observed in images 2 and 3, corresponding with scenario 2 and 3.

Evaluations such as these are a recent internal service offering with greater awareness needed to improve uptake.

Figure 17 - Scenarios modelled for Mount Tamborine 2016



Formalising Area Fire Management Groups

As covered in the previous recommendation response, QFES has moved beyond the original 17 AFMGs and formalised 51, while supporting the establishment and maturing of a number of others. QFES has also expanded membership of these groups.

Together, the AFMGs can collaboratively incorporate data and local knowledge to identify priority areas for mitigation activities, including hazard reduction burns, upgrades to fire trails/breaks and/or community education. Activities are recorded via technology platforms REDI-Portal and Survey123. The introduction of REDI-Portal in 2013 aided collaboration and visibility of information across stakeholders for prevention and preparedness activity. Access to the Survey123 tool, along with training users on conducting and recording Overall Fuel Hazard Assessment Guide (the Guide), has assisted in the identification of priority areas for hazard reduction burns.

Multiple inputs required for fuel load assessment

In the first audit report, QAO noted that Queensland did not have an agency responsible for managing fuel loads, which contributed to a lack of oversight of statewide fuel load levels.[56] Improvements in availability, collection, recording and sharing fuel load data is addressing this.

56 Queensland Audit Office, 'Bushfire Prevention and Preparedness Report 10: 2014-15', *Queensland Audit Office* [website], 2014, <https://www.qao.qld.gov.au/reports-parliament/bushfire-prevention-and-preparedness>.

> "Each fuel layer is assessed simply and visually. Assessing the fuel takes only a few minutes and is based on the premise that the eye is better able to integrate local variations in fuel than systematic measurement. Each fuel layer is assessed in turn and given a hazard rating. Particular emphasis is placed on how the fuel is arranged within each of these layers. The hazard ratings are then combined to produce an Overall Fuel Hazard Rating that ranges from Low to Extreme."[57]
>
> **Overall Fuel Hazard Assessment Guide**

Partnering with the South East Queensland Fire and Biodiversity Consortium, QFES has trained over 700 QFES staff and volunteers as well as QPWS staff in the use of the standardised fuel hazard assessment process over the past seven years. Additionally, QFES delivers training on the Guide as part 'Level 1 Incident Controller Wildfire' training for Rural Fire Service Volunteers.

57 Hines et.al., 'Overall fuel hazard assessment guide: 4th edition July 2010', *Department of Sustainability and Environment* [website], Victoria, 2010, p. 2, <http://www.fireandbiodiversity.org.au/literature_173786/Overall_fuel_hazard_assessment_guide_4th_ed> accessed 8 January 2019.

Figure 18 - Stanwell area (Source: QFES)

Underpinning risk assessment with science

QFES updates fuel data in Phoenix using multiple inputs including remote-sensing data, re-accumulation modelling and field data. The Phoenix fuel load map is updated at least four times a year. Grass curing information obtained using remote-sensing is updated weekly. Grass fuel load data is obtained using the Department of Environment and Science's '*Aussiegrass*' model (factors soil types, recent and predicted rainfall, species type growth models, seasonality, stocking rates and more) and is updated four times a year. Fire history data is collated from a variety of sources including QFES air operations, local government, SEQ Water, QPWS and other land management agencies. The frequency and accuracy of updates are increasing with data availability and the capability of current systems and methodologies.

Supporting stakeholders with intelligence

The QFES Predictive Services Unit (PSU) provides a range of products and services to support stakeholders within the department and partner agencies. On a daily basis, the PSU automatically generate preparedness products that look six days ahead, which are available through SABRE. These products include daily and hourly guidance on key fire weather and fire behaviour parameters including Fire Danger Index, Wildfire Potential, and Drought Factor.

PSU provide briefings through a number of forums. Fire behaviour briefings are provided with participation by the BOM, through bi-weekly statewide preparedness videoconferences during bushfire season. If heightened fire weather conditions are forecast and/or experienced, the briefings are conducted more frequently as required.

During periods of heightened risk, PSU actively monitor locations and incidents to identify areas of potential concern prior to their escalation. At this time, the PSU are in daily discussion with Bureau of Meteorology staff members based in the State Disaster Coordination Centre. PSU also provide fire behaviour briefings to daily statewide videoconferences, as well as Regional Operations Centres and Incident Management Teams, during significant events and incidents.

In December 2018, QFES signed a Memorandum of Understanding with a key critical infrastructure owner for exchange of information. This will improve joint understanding of bushfire risk relating to this infrastructure. In turn, PSU will assist the infrastructure owner to plan for seasonal mitigation.

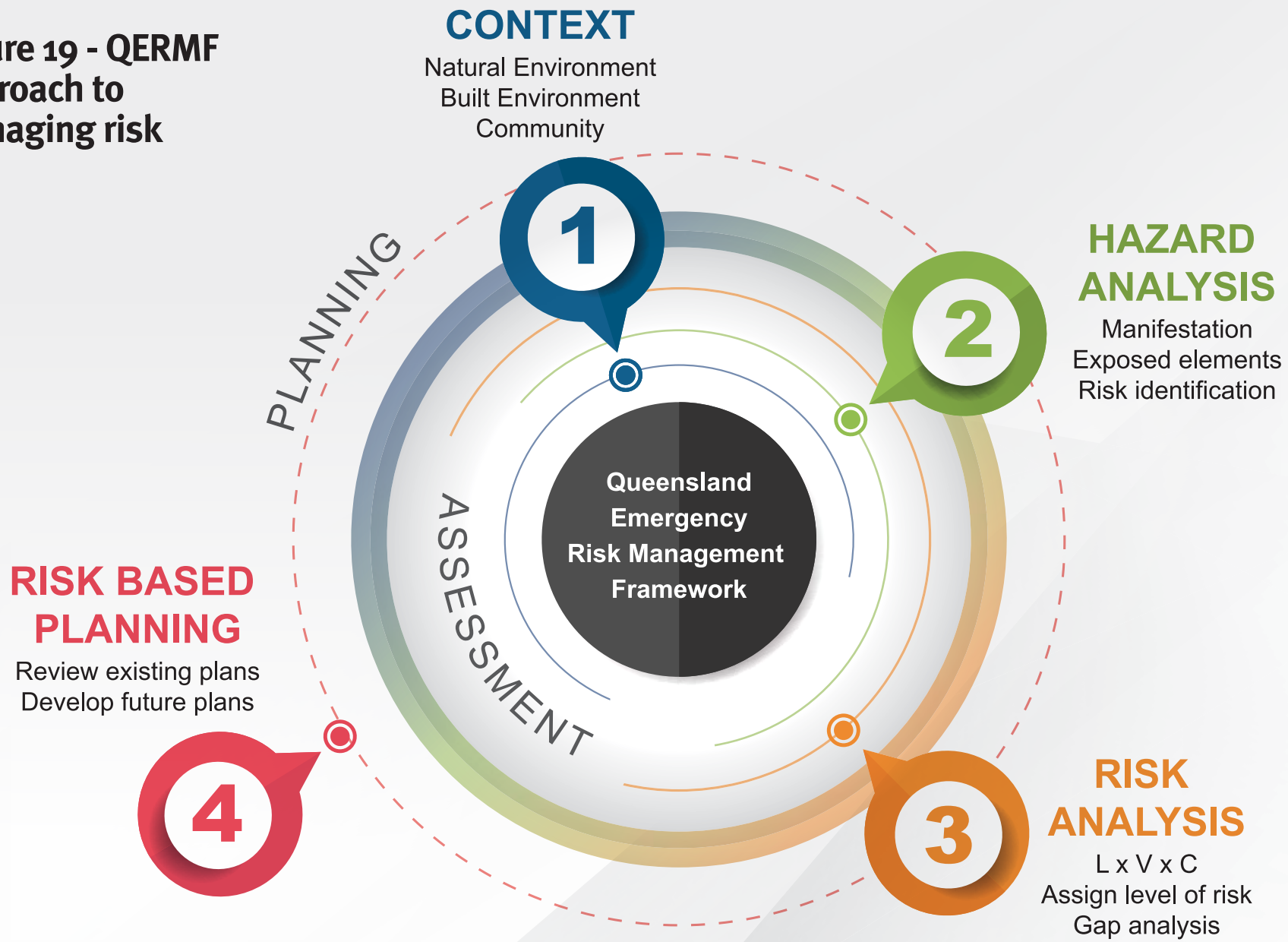
Supporting stakeholders in understanding risk and in the conduct of risk-based planning

Since 2015, a more comprehensive approach to understanding disaster risk was developed via the Queensland Emergency Risk Management Framework (QERMF).

QFES Hazard and Risk Unit facilitate QERMF risk assessments using an all hazards approach. QFES facilitate risk assessment workshops with Local and District Disaster Management Groups (DMG). In encouraging effective planning for bushfire risk, the DMGs are directed to liaise with their AFMGs, and vice-versa, to ensure collaboration on bushfire risk management. This includes, but is not limited to, seasonal mitigation priorities, residual risk post Operation Cool Burn, potential future planning concerns, and support to the AFMGs during the response phase.

Planning through the QERMF for any hazard undoubtedly derives cross-hazard preparedness benefits. These benefits are achieved through enhanced understanding of potential exposures and vulnerabilities, how risk in relation to each hazard manifests, and through collaboration on risk treatment and mitigation options. This point will be further strengthened as the disaster management and bushfire management arrangements are integrated.

Figure 19 - QERMF approach to managing risk



Bushfire: Large Scale Wild or Grass Fire. This assessment is a consideration of the unmanaged risk left over after annual mitigation activities (Operation Cool Burn) have taken place and should be undertaken in consultation with your Area Fire Management Group (AFMG).

As part of your ongoing bushfire planning, we advise you to consider discussing with your stakeholders who undertake mitigation activities (Ergon, DTMR etc), the value of communicating their activities to Rural Fire Service (the AFMG) and the LDMG.

This will enable incorporation of these activities within the annual bushfire risk management plan, enhancing the risk assessment of QFES and further informing your annual bushfire planning considerations.

Additionally, and in discussion with QFES, if a bushfire was to manifest in the identified 'at risk' areas, what vulnerabilities exist in relation to bushfire exposure. This will help inform your planning as to what the function of the LDMG would be during an event of this magnitude such as:

- Evacuation to and provision of a safe place of refuge;
- Consolidating messaging; and
- Community recovery.

Figure 20 - Excerpt of QERMF post-workshop correspondence

Bushfire Prone Area Mapping

REDI-Portal is used to inform land use planning using BPA mapping, but not for a natural disaster risk register as originally envisaged. The underlying BPA mapping takes a long-term (2050) approach to identifying hazard, which is well suited to land use planning and triggers the application of the Australia Standard for Construction of Buildings in Bushfire Prone Areas (AS3959). BPA methodology is, by design and purpose, engineered to assess the long-term outlook based on a maximal fuel load (80th per centile of the 'long unburnt condition' for the Vegetation Hazard Class) and does not take in to account fire scars or mitigation activities.[58]

REDI-portal is also currently used as a reporting tool, and the BPA mapping is used to aid risk identification for Operation Cool Burn activities across Queensland. At the time of implementation, BPA mapping was the best-available option. Now that Phoenix/SABRE has been sufficiently developed, a planned roll-out to replace BPA mapping for Operation Cool Burn can commence.

Coordinating and collaborating with land managers

In addition to the coordinated activities of the Area Fire Management Groups, individual land managers may apply for a Permit to Light Fire. QFES may coordinate or collaborate with land managers on permit and hazard reduction burns, regardless of AFMG membership. An example of collaborative efforts to undertake hazard reduction burns is the Stanwell Corporation Exercise (**see Figure 21**). Area Fire Management Groups (AFMG) are one of many mechanisms to manage fuel loads for a location.

58 Leonard et al, 'A new methodology for State-wide mapping of bushfire prone areas in Queensland', *CSIRO* [website], 2014, ‹https://publications.csiro.au/rpr/pub?pid=csiro:EP1310983›, accessed 21 December 2018.

Stanwell Corporation Exercise in Rocky

On Friday 17 November 2017, a collaborative hazard mitigation burn was conducted at the Stanwell Power Station.

The exercise was coordinated between the Kalapa Rural Fire Brigade (RFB), Stanwell Corporation and the Rural Fire Service (RFS) Rockhampton Area Office. During the development of the burn plan, risk management plans were established, infrastructure risk was conducted with Queensland Fire and Emergency Services (QFES) Predictive Services Unit providing relevant information. This gave us an effective and efficient plan this was to help implement the required outcomes for asset protection and escaping wildfires into the future.

During the planning phase Stanwell Corporation and the RFS brigades created a networking environment with open discussions for the planning and safety of all involved.

On the day Gogango, Gracemere and the Kalapa RFBs worked alongside the staff from the Stanwell Power Station. The day was a success with the crew achieving a cool burn to help lower the fuel load and protect infrastructures. Even through the grass looked green the underneath vegetation was abundant as this area had not been burnt for a number of years, nor had it been grazed on to help lower the fuel loads.

The day as provided an opportunity to trial the Rockhampton RFS Operational Support Unit (OSU) vehicle and to test radio communication networks under different affects including smoke and distance. Media opportunities were also included to keep surrounding communities informed on what was happening in their area.

Overall the day was a huge success; rebuilding strong relationships, testing equipment, and providing training opportunities. The Stanwell Corporation was pleased with the outcome and the way the event proceeded.

Tracey Charles
Brigade Training and Support Officer
Rockhampton Area
Rural Fire Service

Figure 21 – Stanwell Corporation Exercise in Rockhampton

Fire Warden network

A network of Fire Wardens across Queensland is a well-established mechanism QFES uses to support community preparedness. Fire Wardens issue Permits to Light Fire.

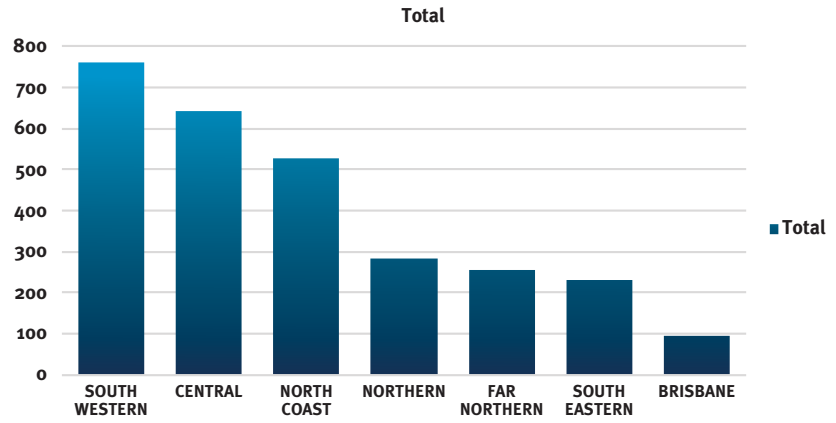


Figure 22 – Fire Wardens (all designations) by QFES Region as at 7 December 2018

Figure 23 - Jigija Fire Training program
Source: QFES

Permits to Light Fire

From 1 January to 6 December 2018, more than 20,000 permits issued by QFES Fire Wardens had been activated across the state. The following graph demonstrates that the number of permitted burns in 2018 (1 Jan to 6 Dec) is higher than the total for the preceding year, and relatively consistent across five years (**see Figure 24 below**).

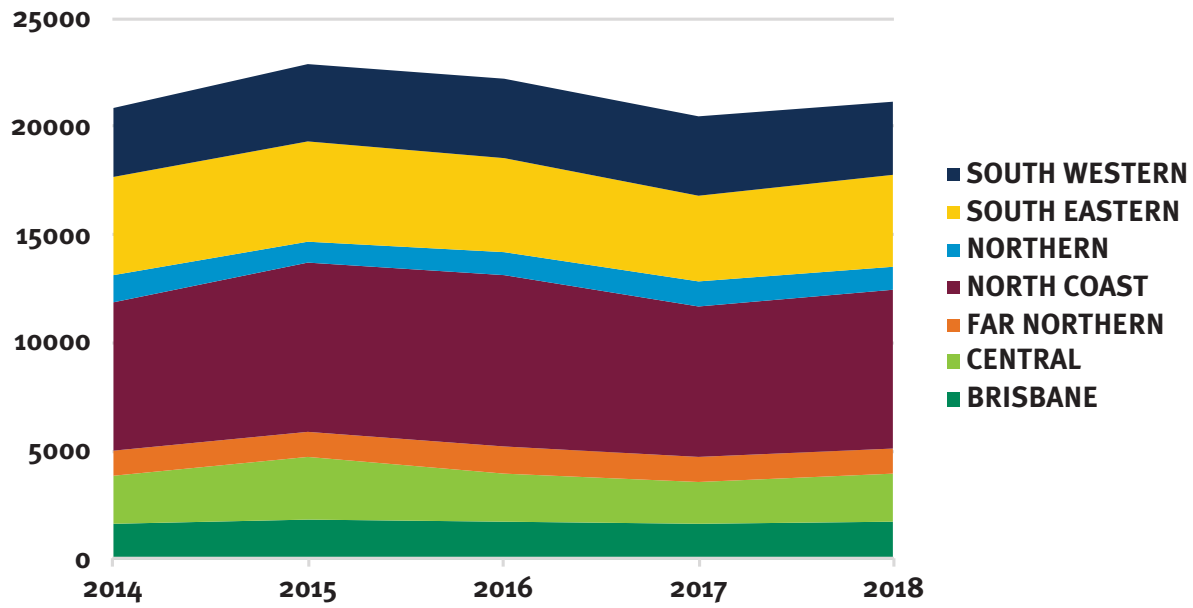


Figure 24 –Activated permit burns 1 December 2013 to 6 December 2018

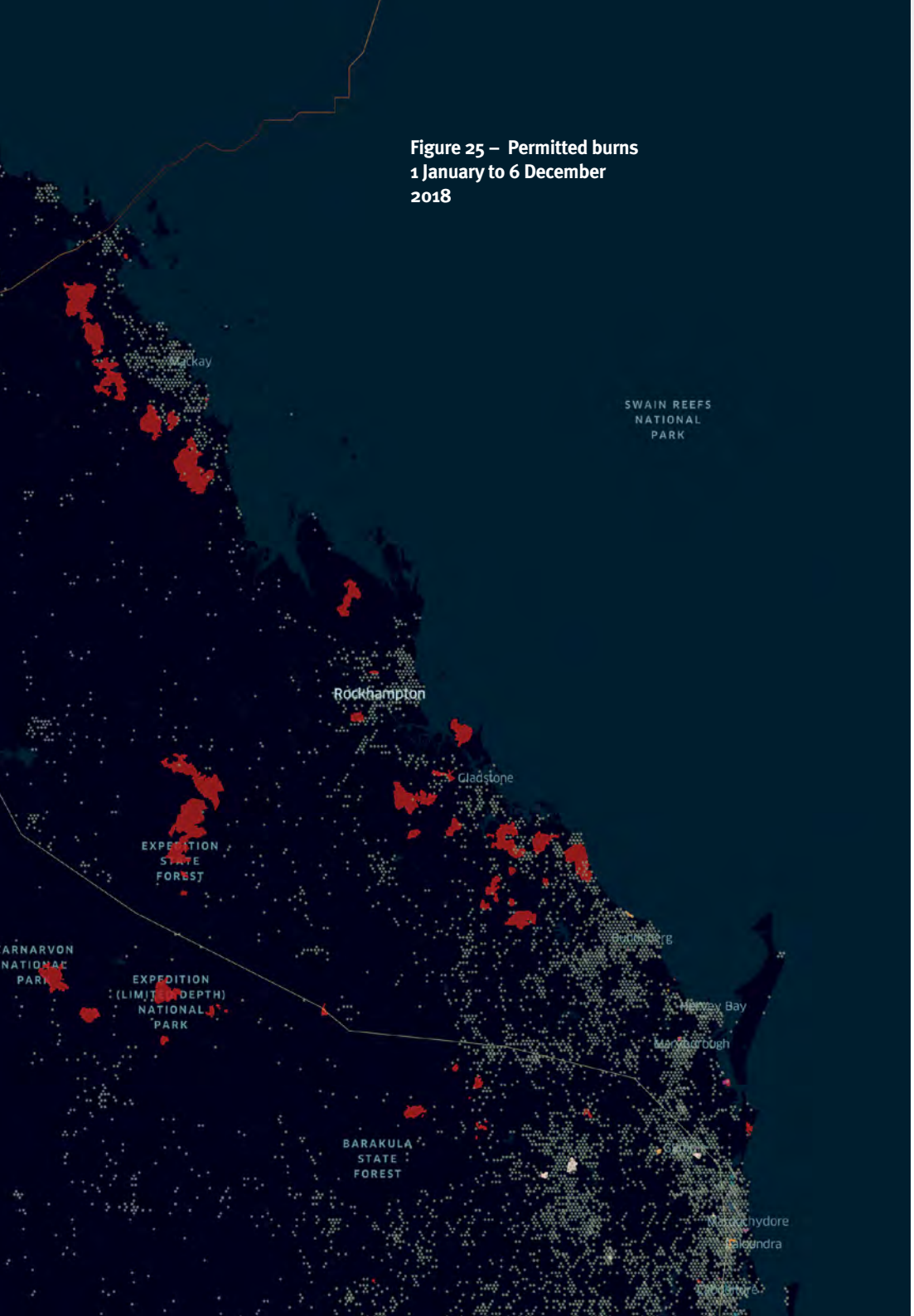


Figure 25 – Permitted burns 1 January to 6 December 2018

The areas in red in Figure 10 are the fire scars from the November/December 2018 events. Permitted burns are indicated by yellow hexagons. These burns include hazard reduction burns, which are undertaken throughout the year, but tracked particularly during 'Operation Cool Burn' (more detail in the next section).

The current permit system is localised. While the lot number and registered plan (RP) reference is included in the permit, the extent of the area burnt is not recorded. Further, there is believed to be some underreporting of permits issued through the quarterly reporting process. QFES is exploring technical and procedural options to improve the recording of permit burns.

The line represents the path of Tropical Cyclone Debbie track, suggesting a correlation between the fires and earlier cyclonic impact. (See recommendation 1.3 commentary for more information on QFES' bushfire preparedness efforts post Tropical Cyclone Marcia).

Hazard reduction burns and Operation Cool Burn

Since 2016, priority activities in Operation Cool Burn have been based on AFMG consensus of bushfire risk to the community. Therefore, AFMGs have been prioritising activities in some of the most difficult areas nearest to the interface between bushland and the community. Here, land parcel sizes are smaller and the tenure situation is the most complex, so mitigation activities require the greatest coordination to achieve.

Prioritising mitigation activities in these areas is consistent with the findings of the Integrated Economic Assessment of Fire Risk Management Strategies study.[59] The paper outlined case studies in both South Australia and New Zealand where fire risk management was determined likely to be most beneficial when applied closely to the valuable assets.

59 FL, Gibson, & DJ, Pannell, 'Integrated Economic Assessment of Fire Risks Management Strategies: Case Studies in Central Otago, New Zealand, and Mount Lofty Region, South Australia', *Bushfire and Natural Hazards Cooperative Research Centre* [website], 2004, ‹http://www.bnhcrc.com.au/publications/biblio/14›, accessed 21 December 2018.

Through identification of priorities by AFMGs, education activities have been targeted to a finer scale. Prioritisation also assists land managers to plan fire trail and firebreak activities, which also helps to facilitate future prescribed burning.

An extremely dry winter precluded the expected number of hazard reduction burns during Operation Cool Burn in 2018. Unfavourable conditions also reduced the hectares burnt during Operation Cool Burn in 2017 and 2018. However, it is important to note that the AFMG prioritisation activity means that the hazard reduction burns that were completed were the most impactful; risk reduction is not necessarily correlated with number of hectares burnt.[60] Of the hot spots rated as having a high or very high hazard exposure level, 68 per cent had a mitigation activity completed in 2018, up from 52 per cent in 2017 and 41 per cent in 2016.

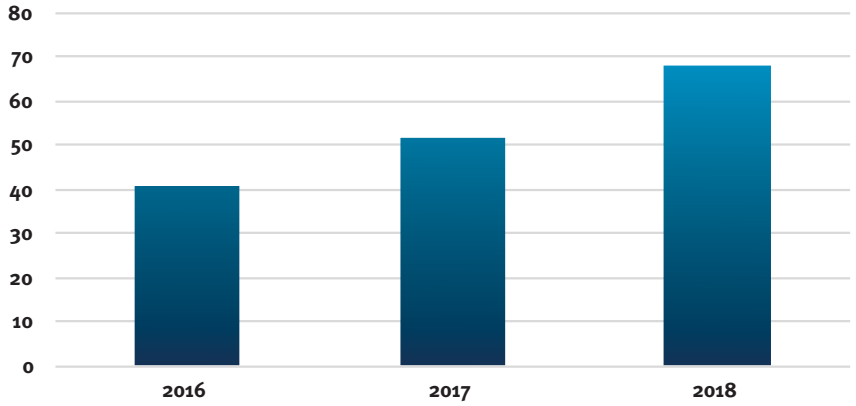


Figure 26 - Percentage of high or very high hazard exposure with a mitigation activity completed

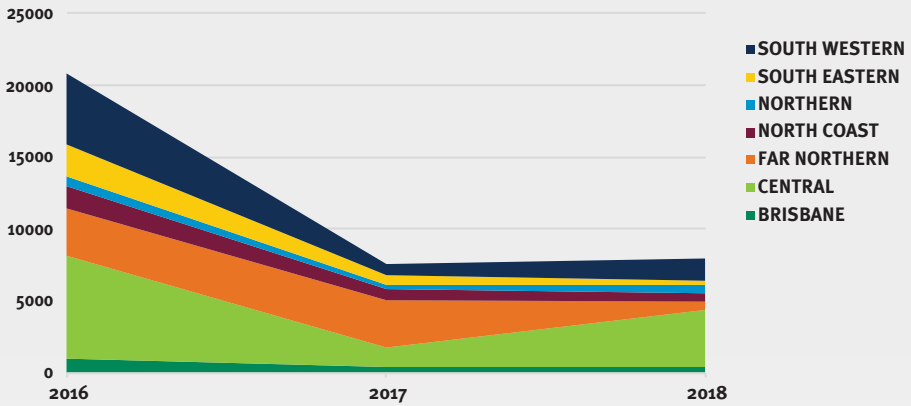


Figure 27 – Hectares burnt during Operation Cool Burn

NB. 4 x hazard reduction burn activities completed in 2016 were excluded due to being extreme outliers, totalling 800,000 ha burnt.

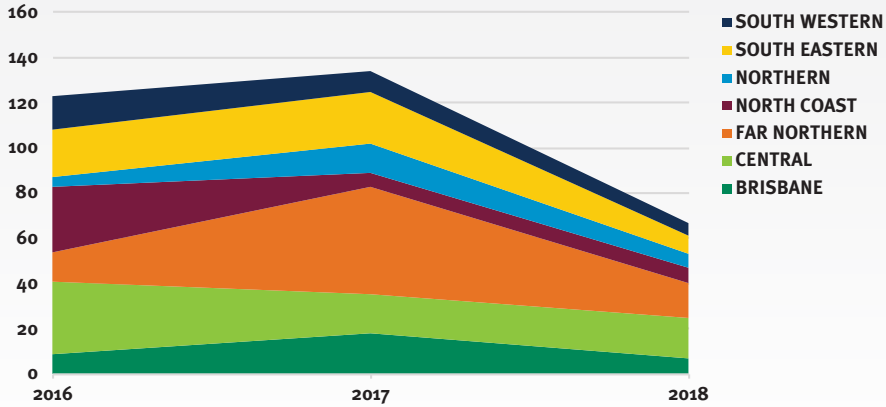


Figure 28 – Number of hazard reduction burns during Operation Cool Burn

60 Emergency Management Victoria, 'Safer Together: a new approach to reducing the risk of bushfire in Victoria', *Victorian Government* [website] 2017, ‹https://www.emv.vic.gov.au/news/safer-together-a-new-approach-to-reducing-bushfire-risks› accessed 16 December 2018.

Assessing residual hazard exposure

Since 2016, Operation Cool Burn reporting has required assessment of hazard exposure before and after mitigation activity. For example, in 2018, 187 activities were completed in areas with 'high' hazard exposure. Of these, 50 per cent were recorded as having a lower hazard exposure (moderate or low) after the mitigation activity. Not all entries recorded a hazard exposure before and/or after the mitigation activity, however.

Mitigating bushfire risk through education

QAO noted that QFES had recorded 71 per cent less community engagement activities from 844 in 2014 to 248 in 2017. While it is possible that the reduction is due to better targeting of activities to high-risk areas, it is also feasible that the decline could be attributed to an increasing number of activities going unreported, or even a decline in volunteer numbers / hours allocated to engagement.

QFES has drafted a Digital Transformation Strategy that will inform a series of technology initiatives over the next five years. One aim of the strategy is to significantly improve the ability of staff, volunteers and partner agencies to share information seamlessly.

Impact of the *Vegetation Management Act 1999* on hazard reduction burns

The Vegetation Management Act 1999 (administered by the Department of Natural Resources, Mines and Energy) does not limit QFES in performing its advisory role to land managers regarding the reduction of dangerous vegetation fuel loads.[61]

'*Exempt clearing work*' provisions continue to allow clearing for the purposes of creation or maintenance of fire management lines or fire breaks, hazardous fuel load reduction, maintenance of existing infrastructure, or the risk to people or infrastructure. The provisions apply on freehold land, Aboriginal and Torres Strait Islander land and leasehold land for agriculture and grazing purposes. Consistent with the *Fire and Emergency Services Act 1990*, land managers will still be able to undertake hazard reduction burning by obtaining a Permit to Light Fire from a QFES Fire Warden.

61 Department of Natural Resources, Mines and Energy, 'Vegetation management laws', *Department of Natural Resources, Mines and Energy*, January 2019, ‹https://www.dnrme.qld.gov.au/land-water/initiatives/vegetation-management-laws›, accessed 13 January 2019.

2018 Recommended Next Steps 1.2.1 & 1.2.2

1.2.1 Regularly use bushfire simulation tools to evaluate and provide more accurate and timely assessments of hazard reduction burns across all regions.

1.2.2 Continue working with stakeholders to ensure key planned mitigation activities such as hazard reduction burns are completed in a timely manner to reduce identified bushfire risks.

QFES 2019 Plans

Improving REDI-Portal

QAO noted that, "*REDI-Portal also assists land managers in coordinating bushfire risk mitigation activities. It does not, however, provide current and accurate information such as recent land management practices and recent fire history*".[62]

REDI-Portal is the interface for underlying data sets and applications. This includes the BPA mapping, which is not designed to provide current fuel load information, recent land management practices or recent fire history. To resolve this QFES has been working on adapting Phoenix-SABRE outputs for bushfire risk mitigation planning.

62 Queensland Audit Office, 'Follow-up of Bushfire prevention and preparedness. Report 5: 2018-19', *Queensland Audit Office* [website], 2018, ‹https://www.qao.qld.gov.au/reports-parliament/follow-bushfire-prevention-and-preparedness›.

Phoenix-SABRE was trialled as a replacement for BPA mapping (for mitigation planning) in the North Coast region during Cool Burn 2018, providing a basis for future expansion. Being an advanced analytics tool, there is a need to upskill users for optimal interpretation and application of the outputs. Increased capacity to support end-users with more Fire Behaviour Analysts will also be important for achieving the best outcomes from replacing BPA with Phoenix-SABRE for seasonal mitigation planning at a local scale.

During 2019, AFMGs will have access to Phoenix-SABRE derived products to support mitigation planning. The new tools reflect advances in bushfire research and analytic capability since the original audit.

Improved use of Overall Fuel Hazard Assessment Guide

In the follow-up audit, QAO noted that, although QFES had implemented fuel hazard assessment training and the use of Survey 123 program to collect fuel data on the ground, more awareness and training was needed to increase its effective usage. It is important to note that Survey 123, is an interface for users to input data as a result of completing an Overall Fuel Hazard Assessment using the Guide.

QFES is committed to improving fuel hazard assessment and awareness and so will continue to train staff, volunteers and land managers on the use of the Guide and the tool. A Training Needs Analysis is currently being completed by each QFES region to inform the number and location of courses required for 2019.

However, it would be impractical to conduct local, on-the-ground fuel hazard assessments across all of Queensland. Therefore, broader modelling and remotely-sensed fuel load assessment processes will continue to be an important input to the overall picture of fuel loads.

QAO noted that QFES does not enforce mitigation efforts by land managers using its legislative powers (section *69 Fire and Emergency Services Act 1990* – Requisition by Commissioner to reduce fire risk). Individual land managers remain responsible for fuel loads on their property, however QFES recognises that sustainable improvement to land management practices can be achieved through education and building rapport.

Simplifying reporting and promoting importance

QFES, as secretariat and chair of the AFMGs, documents their activities using REDI-Portal, but completeness and timeliness of record keeping is currently inconsistent. To improve this, QFES is simplifying reporting, promoting the importance of timely reporting and continuing to build relationships with AFMG members.

2014 Recommendation 1.3

QFES strengthens its oversight role as a lead agency by mitigating Queensland's bushfire risk to acceptable levels by:
Amending its bushfire mitigation planning to address prevention, preparedness, response and recovery and to manage Queensland's residual bushfire risk

QFES Action 2014-2018

Planning for prevention, preparedness, response and recovery

QFES produces wildfire mitigation and readiness plans that focus on the department's response, while the AFMGs prepare Bushfire Mitigation Plans. The two plans complement one another to cover prevention, preparedness and response.

QFES bushfire mitigation plans do not currently cover the recovery element to make the cycle complete. Additionally, QAO noted that not all regions are preparing Wildfire Mitigation and Readiness Plans, and those that do are inconsistent. Planning is an area for continued improvement, with opportunities for greater integration with the disaster management arrangements.

Recovery activity

The role QFES plays in recovery is one of support. Over the preceding four years, QFES has increased activity in the recovery phase, albeit in an ad hoc manner.

As part of the post-Tropical Cyclone Marcia recovery activities, QFES commissioned research from the BNHCRC on the effect of the cyclone on bushfire risk. The study found a correlation between defoliation as a result of cyclone impact and subsequent increase in "*fire spread and fire line intensity by 1.5 and 2.5 fold respectively*".[63] The study also found that it can impede fire line access. A supplementary field guide was produced for use with existing fuel hazard guides.

As a result of the improved knowledge, QFES established 'Taskforce Marcia' to focus mitigation efforts for the areas impacted by Tropical Cyclone Marcia (**see** Response Magazine June 2017). The mitigation efforts included deploying additional Volunteer Community Educators to enhance the local capacity to reach affected communities and empower them to prepare for the upcoming bushfire season.[64]

QFES has progressed in developing partnerships to enhance bushfire recovery. Folllowing the Deepwater and Eurimbula Fires, QPWS requested QFES assistance to engage the Victorian Bushfire Rapid Response Assessment Teams (BRRATs). The BRRAT collaborated with QFES, the Victorian Department of Environment, Water and Planning, representatives from NSW, ACT and QPWS to conduct a detailed assessment in the field. The assessments resulted in reports that directly assisted the transition from response, to emergency stabilisation and then to initial recovery.

Figure 29 – Aerial reconnaissance to support Bushfire Rapid Risk Assessment Teams

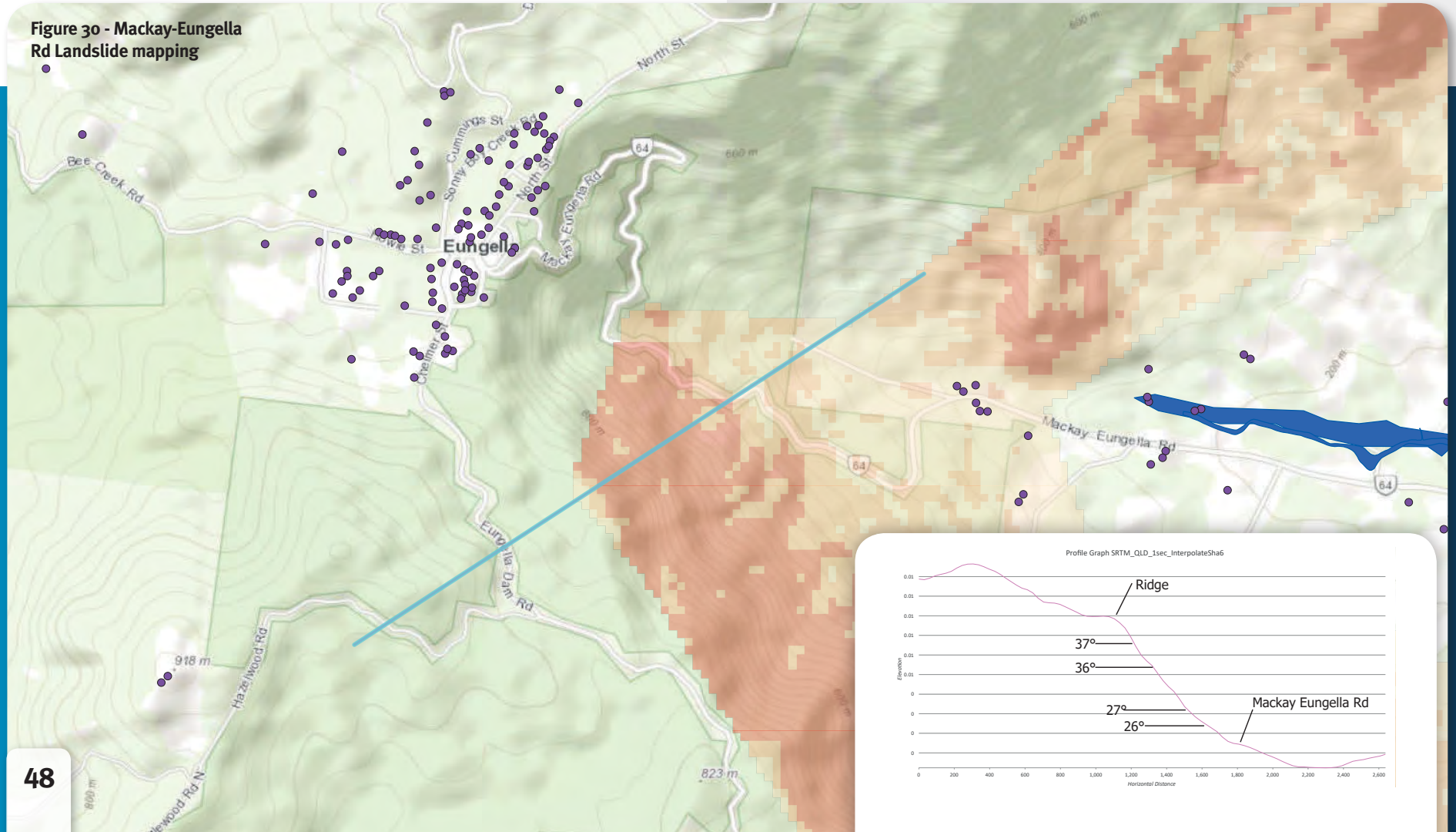
63 JS. Gould, 'Post-tropical cyclone fuel assessment and bushfire risk', *Bushfire and Natural Hazards CRC* [website], July 2015, ‹https://www.bnhcrc.com.au/publications/biblio/bnh-1962›, accessed 5 January 2019.

64 Sealy, D, 'Mitigation Report: Taskforce Marcia', *Queensland Fire and Emergency Services*, 2015 (not publicly available).

Within a matter of days, BRRATs seek to deliver a report to a land manager with a snapshot of the priority risks identified following a fire event. The reports also provide practical treatment solutions and approximate costs for risk mitigation. They focus on assessments of potential risk to life and property, critical infrastructure and the environment on public land, including impacts on immediate neighbours. The reports provide timely advice on the impact of the bushfire to: flooding and erosion, built assets, biodiversity, as well as social and cultural damage and recovery.

During the fire events, QFES separately led an assessment on the enhanced potential for landslide risk in burnt areas if followed by rain. QFES conducted the analysis in all burnt areas. The assessment indicated that the Mackay Eungella Road was at elevated risk of landslide. QFES advised all stakeholders on 12 December through the disaster management arrangements accordingly, also providing a fact sheet (see Appendix D). Consistent with the assessment, rockfall did occur on the Mackay Eungella Rd on 16 December. The landslide blocked the Mackay Eungella Road in both directions.

Figure 30 - Mackay-Eungella Rd Landslide mapping



2018 Recommended Next Steps 1.3.1 & 1.3.2

1.3.1 Ensure bushfire planning documents cover all phases of disaster management (including recovery)

1.3.2 Continue to support area fire management groups in developing their bushfire risk mitigation plans

QFES 2019 Plans

Bushfire Rapid Risk Assessment Team

Following the delivery of BRRAT reports, QFES will work with its partners to investigate the potential to develop and formalise a Queensland, multiagency and multidisciplinary BRRAT capability.

Integrated planning

In 2019, QFES will investigate ways to streamline and integrate planning across prevention, preparedness, response and recovery, as well as with an all hazards approach to disaster management planning at the local, district and state level. QFES will continue to support the effectiveness of the State Interdepartmental Committee on Bushfires.

Recovery activity

In partnership with the Queensland Reconstruction Authority, QFES will deliver a community information and education package as a result of the November and December fire events. Rural Fire Services will develop locally-led engagement activities to enhance bushfire preparedness across the impacted areas.

2014 Recommendation 1.4

QFES strengthens its oversight role as a lead agency by mitigating Queensland's bushfire risk to acceptable levels by:
Developing and implementing a coordinated strategy to address arson, deterring would-be offenders and rehabilitating convicted offenders

QFES Action 2014-2018

Support for Queensland Police Service

Queensland Police Service (QPS) is the primary agency responsible for addressing arson, however QFES is a key partner in protecting Queensland communities from this crime. QFES supports QPS with fire investigation expertise. The Fire Investigation Unit, and a network of Fire Investigation Officers across Queensland, provide expertise to determine the cause and origin of fires or explosions involving bushfire as well as structures, transportation, marine or hazardous materials. QFES provides QPS with information on fires detected.

QFES also delivers the Fight Fire Fascination (FFF) education program aimed at deterring young people from engaging in arson.

The FFF program was reinstated in 2016. It is a carefully designed education program for children (3-17 years) whose parents or carers are concerned about their unsafe fire behaviour. FFF is delivered through a series of visits to the home by specially trained firefighters.

QFES also provides the program as an option for young people involved in Restorative Justice Conferencing. Where a young person has committed an offence involving fire, the program can contribute to a fuller appreciation of the consequences of the offending behaviour. Demonstrating motivation and responsibility-taking can improve the conduct and outcomes of the conference.

Information sharing working group

QFES has established a working group to better understand and investigate opportunities for sharing bushfire arson information with partner agencies, QPS, Department of Environmental Science (DES) and private industry. The Bushfire Arson Prevention working group is currently considering a draft Memorandum of Understanding on cooperation and data sharing.

2018 Recommended Next Steps 1.4.1

Continue working with Queensland Police Service to develop and implement processes and systems to effectively share bushfire arson data. The data systems should also allow fire investigators to access the information they require more effectively and efficiently.

QFES 2019 Plans

QFES is also developing a digital means of sharing arson information to facilitate tracking and analysis of arson-related events. The initiative is called the 'Unlawful Fires Tracking and Analysis System'. Business requirements were endorsed in November 2018. In collaboration with the Public Safety Business Agency Geospatial Information System (GIS) unit, the initiative is currently in the proof of concept phase. Once operational, it will be available to stakeholders including QPS.

QAO noted that no agency in Queensland has oversight of arson across the state. QFES continues to support collaborative efforts to address arson, including through the progressing of a Memorandum of Understanding and a working group to support its intended outcomes.

QFES is also currently updating and redesigning its bushfire investigation training packages to increase its investigative capacity.

2018 Recommended Next Steps 1.4.2

Partner with agencies who have the appropriate expertise to ensure arson offenders in Queensland are provided with the education and rehabilitation required to deter them from reoffending.

QFES 2019 Plans

QFES is currently assessing options for ongoing evaluation of the FFF program and is exploring opportunities to support Queensland Corrective Services in the rehabilitation of adult offenders. Monitoring the effects of education programs is addressed under recommendation 2.1.

2014 Recommendation 1.5

QFES strengthens its oversight role as a lead agency by mitigating Queensland's bushfire risk to acceptable levels by:
Working with local councils to develop and communicate local bushfire plans for communities located in high risk bushfire-prone areas

QFES Action 2014-2018

Councils within Area Fire Management Groups

Local governments are key members of AFMGs and as such, are involved in the preparation of Bushfire Risk Mitigation Plans. QFES recognises that understanding of the bushfire planning process is variable between AFMGs and local government areas and will continue to support enhanced understanding among members.

Bushfire Survival Plans

In 2016, a statewide advertising campaign commenced to promote bushfire awareness and household 'Bushfire Survival Plans'. The campaign runs for 10-12 weeks somewhere between July and October each year, depending on seasonal conditions. The campaign educates Queenslanders about bushfire safety and encourages those living close to bushland to prepare their properties and complete a Bushfire Survival Plan.

Advertising directs people to the Bushfire Safety website to explore options suitable to their circumstances. The user-friendly website was developed to support individuals to identify risk factors and step them through their preparations.

The individually tailored plan can be created and printed from the interactive website. Advertising for the Bushfire Survival Plans included radio, online search, Facebook, Yahoo display and roadside billboards.

The 2018 campaign budget was $370,000 with $99,000 spent on development of the creative strategy and content, $242,000 on media placement and $30,000 on post campaign audience research. The evaulation of the campaign is addressed in the response to 2014 Recommendation 2.2.

2018 Recommended Next Steps 1.5.1

Continue working with local councils to ensure communities in high-risk bushfire-prone areas are provided with tailored local bushfire safety information and support. This will assist residents in preparing against the threat of bushfires by understanding their risk levels and in developing their own bushfire survival plans.

QFES 2019 Plans

Integrating planning for better local preparation

QFES will continue to improve planning for communities in high-risk bushfire prone areas by integrating planning across all hazards and with the disaster management arrangements as previously discussed.

QFES agrees with QAO that maintaining information on vulnerable persons, a dynamic and sensitive data set, is a challenging undertaking. QFES will explore ways to integrate AFMGs with the disaster management arrangements for improved local government collaboration and communication with communities.

Local bushfire plans

QFES has not developed local bushfire plans. QFES is currently liaising through its AFAC partners to identify best practice options for providing local content to assist communities and inform their personal or household plans.

Personal planning

Research following the Black Saturday bushfires, and more recently after 2017 fires in New South Wales, showed that personal planning was not sufficient alone to activate the triggers to evacuate.[65,66] Subsequent research suggests 'psychological preparedness'[67] is a critical factor in enacting a plan. QFES partnered with research institutions to determine the factors that improve psychological preparedness. QFES is incorporating the learnings from this project, Operation Synergy, and other research, to continually refine the messaging and products to best support effective bushfire planning.

Other tailored education materials

QFES has tailored education materials for travellers and those in bushfire prone areas and will release updates to two products in 2019: Bushfire Traveller's Guide (due February 2019) and the Practical Tips for a Safer Home (due June 2019).

65 *"Research by the OESC and CFA found that during the 2008/09 bushfire season around two-thirds of those in high bushfire risk areas intended to leave their homes, while around 30 per cent intended to stay. However, the Bushfire CRC's survey of those directly affected by the Black Saturday fires found that half had intended to stay, with 19 per cent reporting their intention to leave and 26 per cent intending to 'wait-and-see".*
-J. Whittaker, & J. Handmer, 'Community bushfire safety: A review of post-Black Saturday research'. *Australian Journal of Emergency Management* [online journal], 2010, 25(4), p. 11.‹https://search.informit.com.au/documentSummary;dn=542462673853997;res=IELHSS;type=pdf›, accessed 12 December 2018.

66 J. Whittaker, & M. Taylor, 'Community Preparedness and response to the 2017 New South Wales Bushfires', *Bushfire and National Hazards CRC* [website], 2018, ‹https://www.bnhcrc.com.au/sites/default/files/managed/downloads/community_preparedness_and_responses_to_2017_nsw_bushfires_final_v1.1.pdf›, accessed 6 January 2019.

67 'Psychological preparedness' is currently the most widely used term to describe *a person's capacity to anticipate and manage stress during stages of disaster warning and time of impact, particularly in research. However, other terms used in research and community education include psychological preparedness, emotional preparedness and mental fitness.*
- D. Every et al, 'That psychological bulls**t': Surprising findings from community research are improving preparedness communication', Australian Journal of Emergency Management [online journal], October 2018, ‹https://knowledge.aidr.org.au/resources/ajem-oct-2018-that-psychological-bullsstarstart-surprising-findings-from-community-research-are-improving-preparedness-communication/›, accessed 12 December 2018.

2014 Recommendation 2.1

QFES improves engagement with communities to prepare for and respond to bushfires by:
Increasing focus on monitoring the effects of educational materials it develops

QFES Action 2014-2018

Modernising community engagement

QFES has commenced a project to redesign its bushfire education material to ensure it is contemporary and reflecting a holistic, non-service specific, coordinated, all hazards approach to community engagement. QFES is increasingly targeting its education activities to identified high-risk areas, particularly face-to-face activities using Volunteer Community Educators.

QFES has significantly enhanced its education efforts through various channels such as mainstream and social media, and coordination of engagement activities through the establishment of Regional Community Engagement Networks in each QFES region.

In 2018, the Community Capability and Volunteerism Directorate created a new preparedness campaign called Operation Knock Knock. The statewide door-knock and engagement activities were conducted on Saturday 15 September 2018, by more than 1000 multi-agency staff and volunteers (QFES, Red Cross, Surf Lifesaving Queensland, Volunteer Marine Rescue and local community groups). Together, they reached over 7788 people (**see figure 31**).

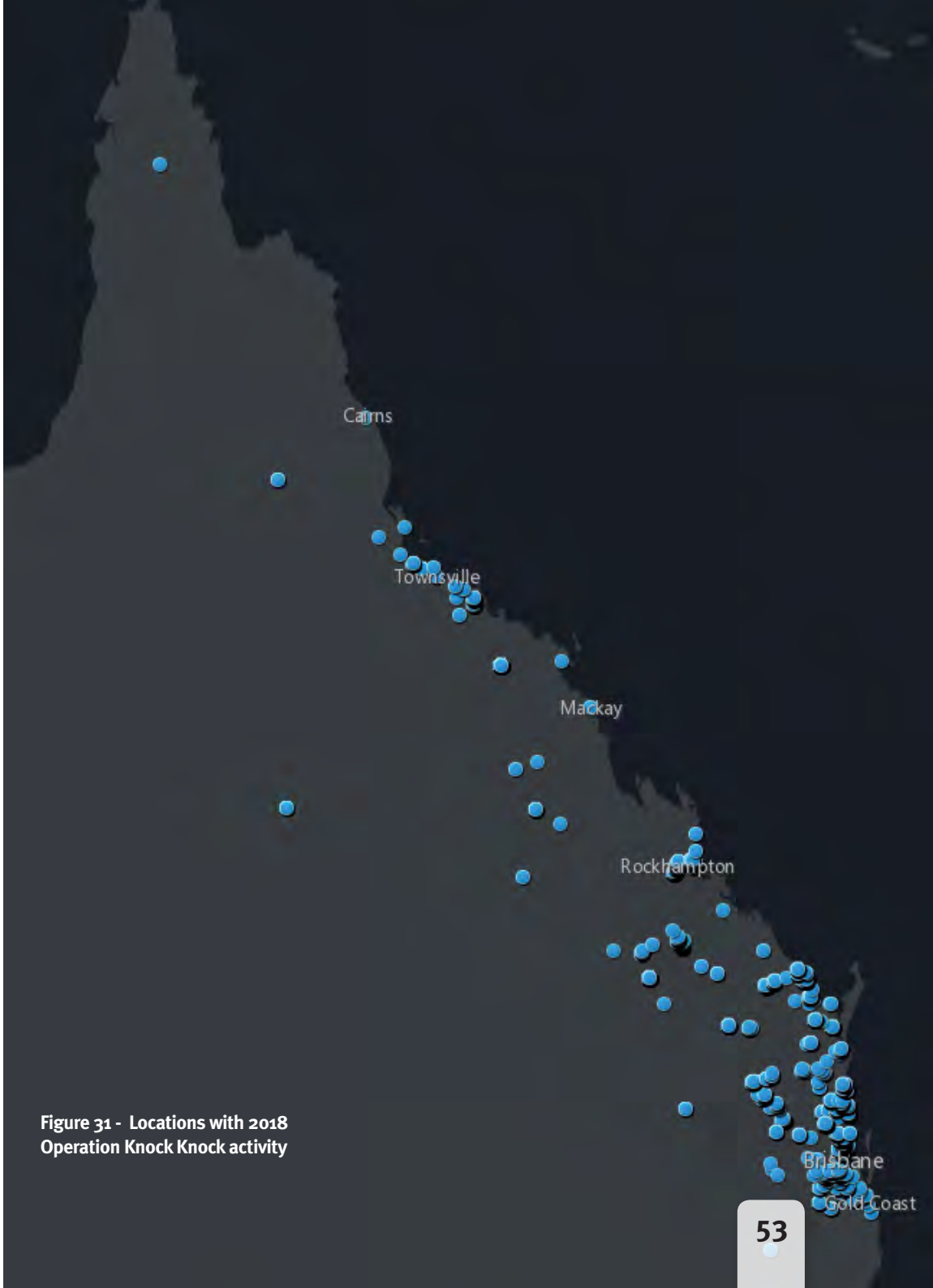


Figure 31 - Locations with 2018 Operation Knock Knock activity

In 2018, QFES launched the 'Community Insights Survey' to explore a broader range of hazards and preparedness activities than its predecessor, the 'Household Survey' (from 2004). Conducted annually, the Community Insights Survey will benefit QFES and other emergency sector organisations with its aim to:

- measure the risk perception of, and preparedness for, a broad range of hazard types
- provide greater understanding of the community's service expectations of QFES
- measure the satisfaction of those who have received a service
- continue to measure indicators related to smoke alarm installation.

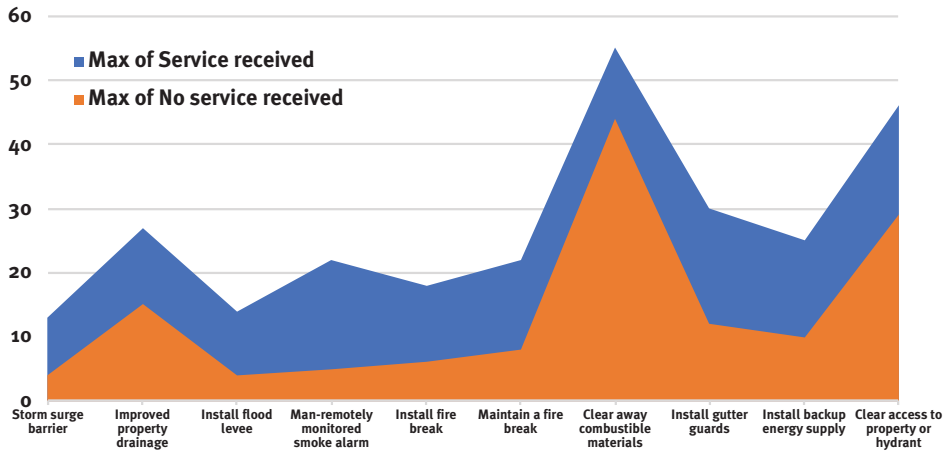


Figure 32 – Correlation between households receiving QFES service and rates of preparedness

QFES service linked to higher rates of preparedness activity

Results from the 2018 survey demonstrated a correlation between households receiving a QFES service and higher rates of preparedness activity, including adding storm surge barriers or flood levees and installing fire alarms and fire breaks. This is supported by research undertaken by the University of Western Australia and Murdoch University for the BNHCRC.[68] The research was informed by a number of studies and community surveys to identify community level influences on individual behaviours.

68 D. Morrison, C. Lawrence, & R. Oehmen, 'Community Level Influence on Individual Behaviours', *Bushfire and Natural Hazards Cooperative Research Centre* [website], 2014, <http://www.bushfirecrc.com/sites/default/files/managed/resource/community_level_influence_on_individual_behaviours_final_report.pdf>, access 12 January 2019.

Education via school curricula

> **"If appropriately educated and motivated on disaster risk reduction, [children and youth] will lead and become the drivers of change."**[69]

The National Strategy for Disaster Resilience recognised the role of children's disaster education in managing risk as a major priority. However, the mechanisms that enable children to understand and take action to reduce disaster risk remains largely unexplored and the evidence-base for best practice is limited.[70] QFES has ongoing involvement with the BNHCRC project on child-centred risk reduction in an effort to improve the evidence-base.[71]

Since 2013, bushfire education teacher resource materials have been made available via the QFES website (teacher resource materials).

QFES staff and volunteers often have close connections with the communities they are part of. Engagement with local schools, childcare facilities, and community groups is a long-standing tradition.

As part of the Australian Curriculum, Department of Education and Training (DET) include a range of relevant programs including on bushfires, community action and personal resilience. DET have undertaken to provide opportunities for QFES to present directly to students via the science, technology, engineering and maths (STEM) program.

69 Ronan et al, 'Promoting child resilience to disasters: Policy, practice, research', *Bushfire and Natural Hazards Cooperative Research Centre* [website], 2014, ‹https://www.bnhcrc.com.au/file/4976/download?token=O2N_QU_G›, accessed 4 January 2019.

70 Towers, B., 'Child-Centred Disaster Risk Reduction', *Bushfire and Natural Hazards Cooperative Research Centre*, n.d., ‹https://www.bnhcrc.com.au/research/hazard-resilience/236›, accessed 3 January 2019.

71 ibid.

2018 Recommended Next Steps 2.1.1

Develop and implement evaluation systems to review the effectiveness of its bushfire education programs.

QFES 2019 Plans

Bushfire education program evaluation

QFES plans to evaluate the effectiveness of education materials once the current products and programs have been rationalised and updated.

2018 Recommended Next Steps 2.1.2

Continue to collaborate with the Department of Education to ensure that school children in high-risk bushfire areas are taught knowledge and skills to prepare for and respond effectively to bushfires.

QFES 2019 Plans

Bushfire education for school children

QFES and the Department of Education will continue to strengthen their partnership and in 2019, will evaluate current bushfire education in schools. Both departments recognise the importance of ensuring children in bushfire prone areas learn how to prepare and respond effectively.

2018 Recommended Next Steps 2.1.3

Develop and implement a project plan to address the recommendations for its review of its community engagement materials in a timely and effective manner.

QFES 2019 Plans

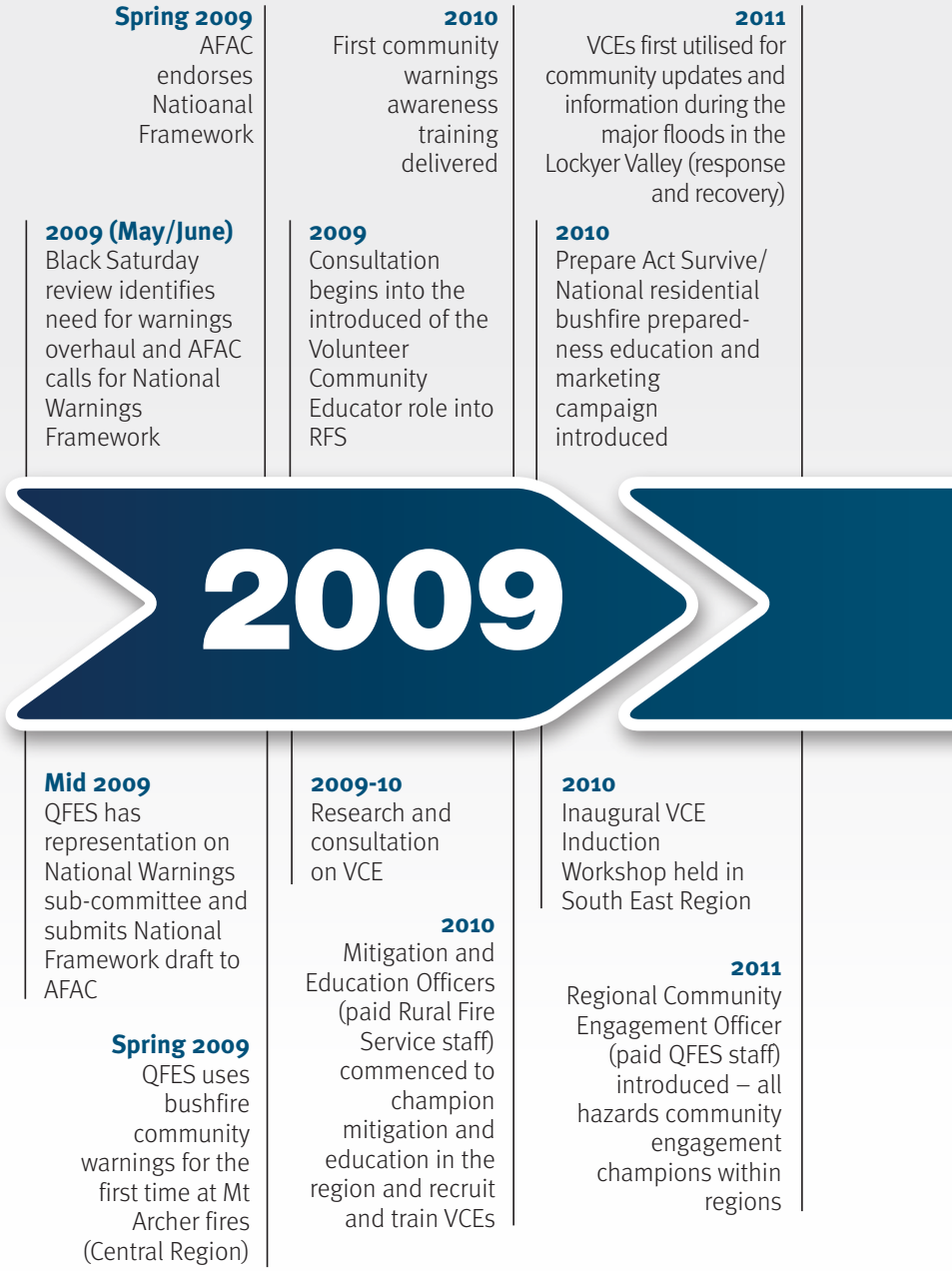
Community engagement material evaluation

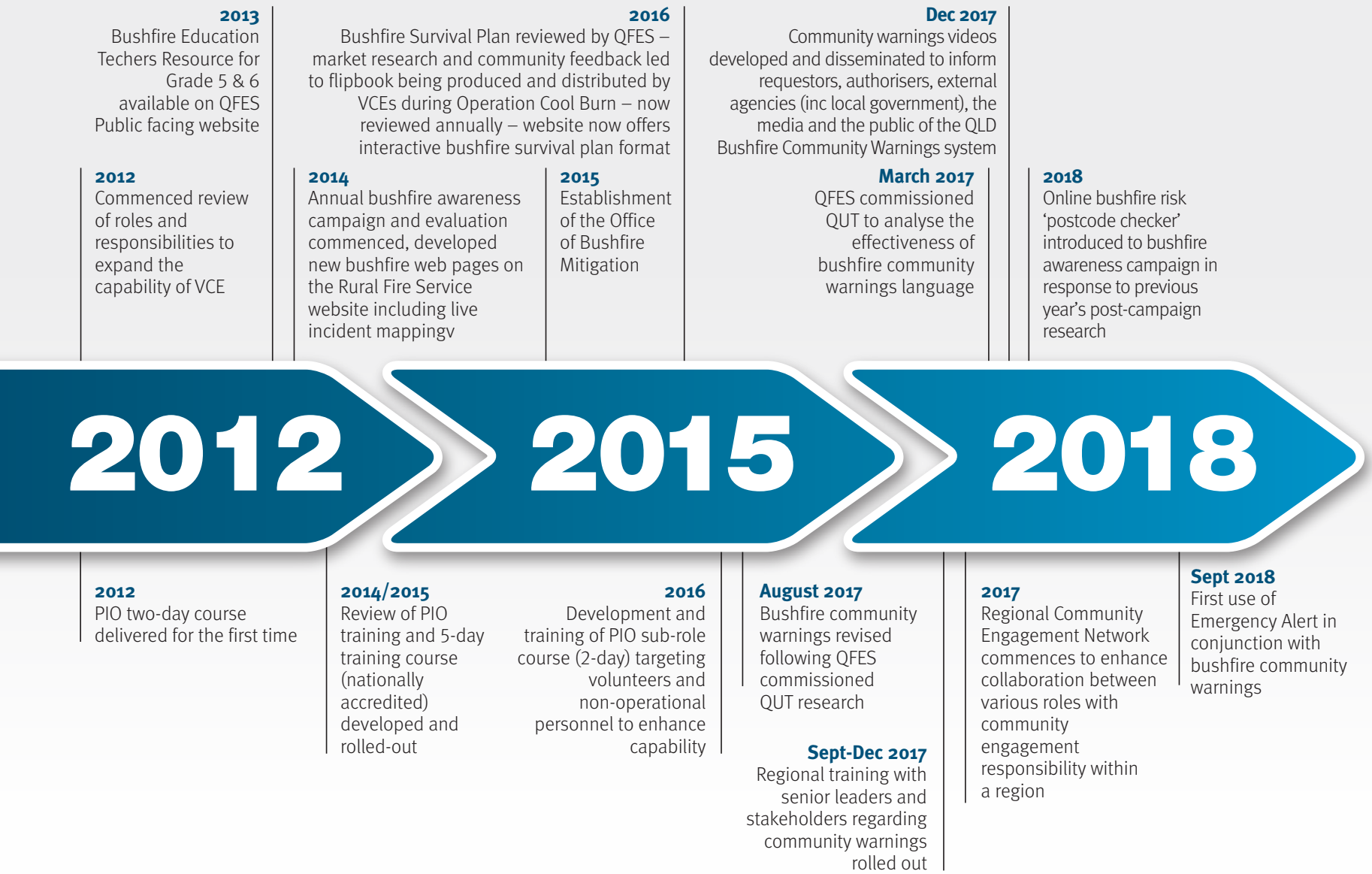
The QFES Engagement Strategy is currently under development and is expected to be published in early 2019. The strategy outlines QFES' commitment to engaging with stakeholders. The implementation activities include engagement training, toolkits, roles review, policy, procedure and documentation updates (encompassing an engagement evaluation template), all of which will be made available on the QFES intranet for shared learning.

The strategy recognises the diversity of Queensland communities, and appreciates that bespoke engagement activities are required to ensure communities are engaged appropriately on the matters relevant to them. It also recognises that QFES personnel are highly trusted within their local communities and therefore well placed to tailor engagement.

Evaluation of engagement activity is designed as a bottom-up approach. Local Communication and Engagement Plans will prompt for engagement evaluation as part of the process, which will inform an Annual Regional Engagement Plan and in turn, an evaluation at the organisational level.

Figure 33 - Timeline of QFES activity to improve engagement with communities to prepare for and respond to bushfires




2012
2012
PIO two-day course delivered for the first time
2013
Bushfire Education Techers Resource for Grade 5 & 6 available on QFES Public facing website
2014/2015
Review of PIO training and 5-day training course (nationally accredited) developed and rolled-out
2014
Annual bushfire awareness campaign and evaluation commenced, developed new bushfire web pages on the Rural Fire Service website including live incident mappingv
2015
Establishment of the Office of Bushfire Mitigation
2015
2016
Development and training of PIO sub-role course (2-day) targeting volunteers and non-operational personnel to enhance capability
2016
Bushfire Survival Plan reviewed by QFES – market research and community feedback led to flipbook being produced and distributed by VCEs during Operation Cool Burn – now reviewed annually – website now offers interactive bushfire survival plan format
August 2017
Bushfire community warnings revised following QFES commissioned QUT research
Sept-Dec 2017
Regional training with senior leaders and stakeholders regarding community warnings rolled out
March 2017
QFES commissioned QUT to analyse the effectiveness of bushfire community warnings language
Dec 2017
Community warnings videos developed and disseminated to inform requestors, authorisers, external agencies (inc local government), the media and the public of the QLD Bushfire Community Warnings system
2017
Regional Community Engagement Network commences to enhance collaboration between various roles with community engagement responsibility within a region
2018
2018
Online bushfire risk 'postcode checker' introduced to bushfire awareness campaign in response to previous year's post-campaign research
Sept 2018
First use of Emergency Alert in conjunction with bushfire community warnings

2014 Recommendation 2.2

QFES improves engagement with communities to prepare for and respond to bushfires by: *Reviewing and amending its bushfire warnings and alert protocols to provide clear and consistent messages to residents about the action to be taken before and during a bushfire*

QFES Action 2014-2018

QFES has made significant efforts to improve its emergency warnings and information on bushfire threats. QFES is a very involved member of the National Public Information and Warnings Working Group established under the leadership of the Australia-New Zealand Emergency Management Committee (ANZEMC), administered by AFAC.

QFES participates in continuous improvement activities, including working with QUT to enhance warnings and alerts. QFES has also reviewed its emergency alert protocols. QFES is a contributor to the current National Review of the Fire Danger Rating System.

Fire Danger Rating

The Fire Danger Rating system was adopted in 1967 as a result of more than 800 experimental fires and wildfire observations.[72] The need for a 'catastrophic' rating was identified following the extraordinary fire weather seen during the Black Saturday fires in Victoria.[73] The catastrophic rating was added in 2009, and is reached when the Forest Fire Danger Index (FFDI) exceeds 100 or the Grassland Fire Danger Index (GFDI) exceeds 150 in non-forested areas. The catastrophic rating was experienced in Queensland during November 2018.

QFES has made a significant investment in the development of a revised FDR system being led by AFAC, the NSW RFS and the Bureau of Meteorology.[74] An interstate contingent collated information and data from QFES on the recent fire activity in Queensland to inform future development of the Fire Danger Rating system. QFES will continue to be a key stakeholder in this project.

Catastrophic	A fire with a rating of 'catastrophic' may be uncontrollable, unpredictable and fast moving. The flames will be higher than roof tops. Many people may be injured and many homes and businesses may be destroyed. During a 'catastrophic' fire, well-prepared and well-constructed homes will not be safe. Leaving is the only option for your survival.
Extreme	A fire with an 'extreme' rating may be uncontrollable, unpredictable and fast moving. The flames will be higher than roof tops. During an 'extreme' fire, people may be injured and homes and businesses may be destroyed. During an 'extreme' fire, well-prepared and well-constructed homes may not be safe. Leaving is the only option for your survival.
Severe	A fire with a 'severe' rating may be uncontrollable and move quickly, with flames that may be higher than roof tops. A 'severe' fire may cause injuries and some homes or businesses may be destroyed. During a fire with a 'severe' rating, leaving is the safest option for your survival. Use your home as a place of safety only if it is well-prepared and well-constructed.
Very High	A fire with a 'very high' danger rating is a fire that can be difficult to control, with flames that may burn into the tree tops. During a fire of this type, some homes and businesses may be damaged or destroyed. During a fire with a 'very high' danger rating, you should use your home as a place of safety only if it is well-prepared and well-constructed.
High	A fire with a 'high' danger rating is a fire that can be controlled, where loss of life is unlikely and damage to property will be limited. During a fire with a 'high' danger rating, you should know where to get more information and monitor the situation for any changes.
Low-moderate	A fire with a 'low to moderate' rating can be easily controlled and pose little or no risk to life or property. During a fire with a 'low to moderate' rating, you should know where to get more information and monitor the situation for any changes.

72 CSIRO., 'McArthur Mk5 Forest Fire Danger Meter', *CSIRO* [website], December 2018, ‹https://www.csiro.au/en/Research/Environment/Extreme-Events/Bushfire/Fire-danger-meters/Mk5-forest-fire-danger-meter›, accessed 3 January 2019.

73 Yeo, et al, 'Fire Danger Indices: Current Limitations and a Pathway to Better Indices', *Bushfire and Natural Hazards Cooperative Research Centre* [website], 2014, p.11, ‹https://www.bnhcrc.com.au/file/5894/download?token=wWyrUm20›, accessed 23 December 2018.

74 L. Short, 'A New National Fire Danger Rating System (Abstract)', *Australian & New Zealand Disaster & Emergency Management Conference* [website], April 2018, ‹https://anzdmc.com.au/2018/04/20/2940/›, accessed 3 January 2019.

Fire Danger Rating signs across Queensland are largely maintained by local Rural Fire Brigades based on daily bushfire weather updates. These signs are just one channel for advising the community of current threat levels.

The Standard for Disaster Management in Queensland requires the use of multiple channels to empower communities to take action.[75] QFES uses many communication methods to create awareness amongst communities of bushfire threat levels. These channels include social media messaging that can be focussed to specific areas of risk, provide information on what action to take, and links to other sources for message verification.

Local Fire Bans

Local fire bans are one way of restricting people lighting fires when fire weather is unfavourable. There are a number of other options, which are applied locally depending on conditions, including strengthening permit conditions, ceasing to issue permits, or cancelling existing permits. Both local fire bans and permit restrictions help to prevent bushfires during high risk periods by reducing the likelihood of accidental ignitions and escaped burns. However, only local fire bans can prevent the lighting of fires that are exempt from requiring a permit (eg. less than 2m x 2m in size). Local fire bans can also contribute to greater awareness of Fire Danger Ratings in a local government area.

75 Inspector-General Emergency Management, 'Standard for Disaster Management in Queensland: Public Engagement, Inspector-General Emergency Management', *Inspector-General Emergency Management* [website] 2014, p. 23, ‹https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf› accessed 9 January 2019.

Bushfire safety campaign

As discussed earlier, QFES runs an annual bushfire safety campaign. The campaign was most recently reviewed in December 2018 for the campaign period August to October 2018.[76] The post-campaign report was informed by data on media placement and performance, audience research and web metrics from third party providers.

Overall, the campaign was said to have performed well with community attitudes towards bushfire safety and preparedness having remained steady since the previous research conducted in December 2017. The campaign is likely to have contributed to maintenance of individual bushfire preparedness levels.

Just over half of Queenslanders indicated they had noticed advertising for bushfire warnings and preparedness in the last six months (53 per cent), which is significantly higher than in 2017 (32 per cent). Respondents who checked fire danger ratings for their area once or more rose from 39 per cent in 2017 to 47 per cent in 2018.

The formal campaign is supported through a 'grass roots' media and social media campaign where bushfire season preparation messages are promoted to communities. Local QFES representatives appeared in local news publications to highlight specific fire considerations for the area, giving residents more targeted mitigation information.

76 *2018 Bushfire Safety Post-Campaign Report*, Queensland Fire and Emergency Services, December 2018. – not publicly available

Those living in Central Queensland, and those living within 500m of bushland are significantly more likely to have seen or heard at least one of the ad components.

Those living within 500m of bushland are also significantly more likely to have visited the microsite (22% cf. 15% total), used the Bushfire Postcode Checker (17% cf. 13% total) and seen an ad on Facebook (12% cf. 8% total).

Key Campaign Evaluation Metrics	Total	Region			Bushfire Risk		Bushland Proximity	
		Central QLD	South QLD	North QLD	Bushfire Hotspot	Other Area	Within 500m	Outside 500m
Sample size (n=)	*1,052*	*350*	*350*	*352*	*757*	*295*	*442*	*578*
Saw/heard at least one Ad	**28%**	35% ^	25%	25%	28%	30%	37% ^	22% v
Visited the Microsite	**15%**	18%	14%	13%	14%	17%	22% ^	10% v
Used Bushfire Postcode Checker	**13%**	14%	11%	13%	12%	13%	17% ^	9% v
Heard the Radio Ad	**10%**	14%	9%	8%	9%	12%	12%	9%
Saw Facebook Ad	**8%**	10%	6%	7%	7%	9%	12% ^	4% v
Saw the Digital Ad	**7%**	9%	6%	7%	7%	8%	10%	5% v

^ Significantly higher than other campaign (statistically significant result)

v Significantly lower than other campaign (statistically significant result)

Figure 34 - excerpt from third party audience research report.

While there were pleasing results with end-user approval and engagement with various channels, the campaign did not result in significant behaviour change. Community perceptions regarding the threat and personal risk of bushfires has remained stable. Queenslanders living in bushfire hotspots are only slightly more prepared than those not living in a hotspot (53 per cent versus 51 per cent).

These findings are consistent with recent research by the Bushfire and Natural Hazards CRC on community preparedness and responses to the 2017 New South Wales bushfires.[77] Even after survey respondents were provided with more information about catastrophic fire danger, a quarter said they would not leave their property. Though respondents sought information from a variety of media channels, the desired change in behaviour (evacuation) required confirmation of the threat by talking to friends, family or neighbours and/or through direct observation.

Bushfire information materials

QFES regularly reviews products that provide bushfire information to the community. A review is triggered when a product becomes out of stock in the QFES warehouse, which generally happens every 12 to 18 months. Products are first reviewed from a design perspective and then undergo an expert content review. The following Rural Fire Service products were last reviewed as detailed below:

- **Going Bush Booklet** – 17 April 2018
- **Permit to light fire pad** – 10 September 2018
- **Brochure** – Applying to light fires – 19 September 2018 (including the application to light fire form)
- **Brochure** – Lighting fires in Queensland – 5 June 2018
- **Brochure** – Obligations and Responsibilities of Permit Holders – 19 September 2018
- **Information and Warnings Corflute** – 19 September 2018
- **Stop Bushfire Arson Corflute** – 13 September 2018
- **Information and warnings postcard** – 18 September 2018

Bushfire Warnings

Public information and warnings about disasters and emergencies is a field that has been consistently reviewed and researched.[78] As improved understanding of what works is supported by evidence, it is incorporated into practice.

Bushfire warnings are standardised nationally through the work of the National Public Information and Warnings Working Group and the National Review of Warnings and Information 2014. QFES commissioned research through the Queensland University of Technology (QUT) in early 2017 to further inform state-specific changes to its warnings while ensuring their continued alignment with national review guidelines and standards.[79] QFES adopted all of the research recommendations for better practice.

77 J. Whittaker, & M. Taylor, 'Community Preparedness and response to the 2017 New South Wales Bushfires', *Bushfire and National Hazards Cooperative Research Centre* [website], 2018, ‹https://www.bnhcrc.com.au/sites/default/files/managed/downloads/community_preparedness_and_responses_to_2017_nsw_bushfires_final_v1.1.pdf›, accessed 6 January 2019.

78 L. Anderson-Berry et.al, 'Sending a message: How significant events have influenced the warnings landscape in Australia', *International Journal of Disaster Risk Reduction* [online journal[, Sept 2018, pp. 5-17, ‹https://www-sciencedirect-com.ezproxy.library.uq.edu.au/science/article/pii/S2212420918302760›, accessed 4 January 2019.

79 D. Greer, et.al, 'Enhancing Bushfire Community Warning Messages for Queensland Fire & Emergency Services (QFES)', *Queensland University of Technology*, 2017 (not publicly available).

A significant body of research on warnings has recently been examined by QUT researchers for the BNHCRC.[80] The research reaffirmed QFES's adoption of earlier QUT research advice, which is consistent with these principles for maximising comprehension of warning messages:

- be in an easy to understand layout - use dot points or subheads where possible
- personalise risk
- cover the hazard type, severity, likelihood, possible consequences, location and timeframe
- be in plain English
- group related information together
- be issued by a credible source
- link to other credible sources of information.

Emergency Alert

QFES first used Emergency Alert as a method of warning the public about an impeding bushfire threat in September 2018, using only once more before the extreme events of November and December 2018.

QFES recognised the communication method could be applied to the bushfire context, however templates required review in 2018. The review allowed for better alignment between bushfire community warnings and Emergency Alert messages.

Public Information Officers

QFES has provided extensive training to Public Information Officers (PIOs) who play a key role both in warnings request and in broader communication at incidents. PIO training is undertaken to a national competency (PUAOPE021A Manage Information Function at an Incident). QFES has trained 84 PIOs since 2015. QFES PIOs are operational positions (available to both staff and volunteers) and can perform the role of leader for the Public Information Unit / Section in an Australasian Inter-Service Incident Management System structure.

80 V. Tippet, et.al, 'Communicating for maximum comprehension', *Bushfire and Natural Hazards Cooperative Research Centre* [website], December 2018, ‹http://www.bnhcrc.com.au/hazardnotes/57›, accessed 12 January 2019.

QFES has also implemented a sub-role training program that incorporates all hazards and covers three sub-role areas within the unit: Information and Warnings, Media Liaison and Community Liaison (eg public meetings). Sub-role training is available to all QFES personnel (ie including both operational and non-operational persons) and 93 have received this training.

This training is reflective of QFES' ongoing investment in preparedness, which has helped with delivering timely, accurate information and warnings to agreed templates.

Multiple Channels

QFES has increasingly relied on a broad range of messaging channels including social media. The QAO report notes that over 500,000 people engaged with QFES bushfire related content between April and December 2017.

QFES continues to build on this coverage and for 2018, vastly increased its reach. During Operation Synergy, traditional media coverage increased by 170 per cent as compared to previous years. Facebook hits increased by 194 per cent to 22 million people worldwide, while Twitter reach rose 274 per cent from the previous year. Multimedia posts, including videos of aerial footage, created the largest increase in engagement for 2018.

During Operation Cool Burn, QFES reached 9.2 million people through Facebook. QFES also worked with its media partners to promote bushfire season preparation and mitigation, which resulted in 950 individual traditional media mentions.

Bushfire sirens

The use of sirens as warnings is decreasing in criticality due to growing use of other communications channels. Importantly, other options have the advantage of communicating what actions need to be taken, which is particularly relevant for visitors and new residents who may not be familiar with what to do when a siren is activated.

QFES has not maintained the same testing standards that were originally applied to the Mt Nebo and Mt Glorious warning sirens. Local residents have expressed concern over the frequency of testing within the regime. QFES, through the local rural fire brigade volunteers, still test the sirens periodically.

2018 Recommended Next Steps 2.2.1

Work with key stakeholders to review the effectiveness of various tools, such as Early Warning Systems, that QFES uses to inform communities of bushfire threats.

QFES 2019 Plans

Evaluating bushfire risk communication tools

QFES is currently reviewing its Emergency Alert templates considering the logistical limitations of the Emergency Alert system. For example, a bushfire warning will include specific details about the type of fire, expected time of impact and who is likely to be affected (down to street level, where possible). The Emergency Alert process does not enable the 'who' to be as specific. Therefore, tailoring the message to a particular location when it may be received in a broader area means very specific actions can cause confusion and possibly send people into dangerous situations. This situation can be exacerbated by any delays in message receipt.

QFES is separately evaluating bushfire community warnings (including Emergency Alert) during the November and December fire events of Operation Synergy.

The evaluation of bushfire risk communication tools is covered in the response to 2018 Recommended Next Step 2.1.3 (*Develop and implement a project plan to address the recommendations for its review of its community engagement materials in a timely and effective manner*).

Evaluation of engagement materials also includes distribution channels, as demonstrated by the 2018 Bushfire Safety Post-campaign Report.

Following the recent bushfire events, QFES is conducting a range of internal assurance activities to identify lessons learnt. Identified lessons will be prioritised for implementation and contribute to the continuous improvement of emergency warnings and information.

2018 Recommended Next Steps 2.2.2

Keep sufficient detail of its testing of the Early Warning Systems at Mt Nebo and Mt Glorious so it is clear how well the sirens can be heard.

QFES 2019 Plans

Through local volunteers, QFES will continue to provide a range of preparedness activities to meet the needs and expectations of the Mt Nebo and Mt Glorious communities. Bushfire warnings for this community will be considered in the context of the work on warnings across Queensland and the other communication technologies available.

2018 Recommended Next Steps

2.2.3 Ensure the outcomes and recommendations from the national review of the Fire Danger Rating system are addressed effectively and in a timely manner.

QFES 2019 Plans

QFES will continue to support National Fire Danger Rating System Program as it develops a robust approach based on contemporary science.[81]

81 L. Short, 'A New National Fire Danger Rating System (Abstract)', *Australian & New Zealand Disaster & Emergency Management Conference* [website], April 2018, ‹https://anzdmc.com.au/2018/04/20/2940/›, accessed 3 January 2019.

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Appendix A: Climate Change Position Paper

Future thinking

Strategy 2030

Climate Change

Position Paper 2018

Our Position

Queensland Fire and Emergency Services (QFES) is a committed supporter of the Queensland Government's Climate Change Response. QFES has developed this position paper to guide an integrated and holistic approach to our department's actions on Climate Change.

For many years, the impact of a changing climate has been recognised as a strategic risk for QFES. This paper provides greater visibility and clarity of our commitment and actions. We believe better decisions on climate change now, will improve our ability to deliver the right services in the right locations for Queenslanders, well in to the future.

The Case for Action

The anticipated physical, transitional and legal risks of climate change requires QFES to examine all aspects of its value chain, including its key role in Queensland's Disaster Management Arrangements.

With long-range investment in our people, buildings, fleet and equipment, we must be vigilant in looking ahead and anticipating change.

Our operating environment is complex, with many partner organisations and diverse communities working with us to improve the safety and resilience of all Queenslanders.

With agile systems and thinking, we can embed climate change considerations in our decision-making frameworks to reduce the impact of climate change and associated risks to our strategic objectives.

Queensland Climate Adaptation Strategy 2017-2030

As a leader in the emergency management sector, QFES is leading sector contributions to implement the strategy, including the Emergency Management Sector Adaption Plan. The QFES Position is aligned to the Sector Adaptation Plan and we will continue to promote commitment to the plan across the sector.

We recognise the interdependencies across Sector Adaptation Plans. We will continue to contribute to the Government Adaptation Action Plan and influence discussions at Local, State and Federal forums on policy development and implementation.

Future thinking

Strategy 2030

Integrating Our Climate Change Commitment

Principle 1: Integrated Approach

Climate change affects QFES decisions across our strategy, policy and operational environment. We must ensure our efforts are aligned, transparent and accountable. We will integrate our approach through governance arrangements. We will mainstream climate change in our strategy and planning by embedding best available climate change projections in our strategic and operational decision-making, including our emergency management capabilities and capacity.

Principle 2: Risk-based decision-making

We will remain at the forefront of climate science to underpin a contemporary understanding of associated risk. We will engage appropriate expertise to examine a range of climate scenarios to test our strategy and planning and to help us better prioritise our adaptation and transition efforts.

Principle 3: Sustainability

We will work toward quantifying and improving our energy efficiency across our supply chain, buildings, fleet and equipment. Transition criteria will inform design, acquisition and maintenance decisions to reduce our emissions, while maintaining high reliability and continuity of services during periods of high-demand.

Principle 4: Systems thinking

We recognise that QFES must be part of a whole of government and community effort to transition and adapt to climate change impacts. Land-use planning, infrastructure resilience and community resilience have a significant influence on Queensland's ability to manage the effects of climate change. We will continue to collaborate with the community and across levels of government and non-government sectors on these important topics.

Principle 5: Knowledge sharing

Community knowledge and understanding of climate change is a cornerstone in the effectiveness of mitigation and adaptation strategies. QFES has a role in supporting Queenslanders to have access to the right information to make decisions on how best to prepare for, respond to, and recover from climate-related disasters. Through our leadership and participation on cross-agency and cross-sector forums, we will work toward a common understanding of the risks associated with climate change.

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Appendix B: Excerpt from Operation Synergy Standing Order

Standing Order

Operation Synergy 2018

SO-Q-OM-3.72
Effective Date: 01/08/18

Purpose

The purpose of this Standing Order is to communicate the strategies and objectives for the 2018 bushfire[1] season which will enable the delivery of a coordinated departmental approach.

Synergy was chosen to reflect the outcome produced when all areas of QFES and its partners collaborate effectively during operations.

Application

This Standing Order applies to all Queensland Fire and Emergency Services (QFES) staff and volunteers.

Policy

Situation

The 2018 bushfire season known as **Operation Synergy 2018** will officially commence on 01 August 2018, through to a completion date dependent on seasonal conditions.

In preparation for the bushfire season, Operation Cool Burn 2018 focussed on mitigation activities to reduce bushfire risks and their potential impact; enhance engagement with various key stakeholders across the state; and strengthen situational awareness for preparedness and response operations.

To contribute to the creation of safe and resilient communities, Operation Synergy 2018 is based on the Prevention, Preparedness, Response, Recovery (PPRR) model and is a designated operational period to:

- Prevention: continue the reduction of residual risks across the state, through a variety of actions including assessment of permit conditions and restrictions in line with local risk, targeted education messaging to reduce accidental ignitions and consideration of fire bans;
- Preparation: continue to plan and exercise as well as proactively engage with communities, landowners/occupiers, local government and land management agencies. Actively assess Wildfire Alert Levels against local and regional risks and make use of predictive tools such as fire behaviour simulations;
- Response: ensure local, regional and specialist resources can mobilise and respond to bushfires (or an emergency bushfire situation) appropriate to the level of risk; and
- Recovery: provide post-incident support, as necessary, including supporting orderly transition to recovery coordinators, provision of localised support for communities and a timely return to full QFES operational capability.

When a fire is burning on land (public and private), the occupier of the land must be engaged to inform and/or work closely with the Incident Controller (IC) and their Management Team to bring the fire under control according to the risk and to reduce impacts on the community, property and the environment (refer to Section 67 of the *Fire and Emergency Services Act 1990*).

[1] The term 'bushfire' in this Standing Order is used to refer to fire involving all vegetation types.

Mission

A unified QFES approach, jointly with our various partners from state and local government agencies, related industry associations, and landowners/occupiers will be applied to enable the **mission objectives** of:

1. Protection of life – emergency responders and community;
2. Provision of public information and warnings;
3. Protection of critical assets;
4. Protection of community and agricultural assets; and
5. Conservation of environment.

Execution

All QFES full-time, part-time and volunteer members will operate together in an environment of mutual trust and respect through a single unified chain of command as one emergency department to the IC.

Operations are to be conducted in line with Australasian Inter-Service Incident Management System (AIIMS). Incident Management Teams (IMTs) should contain a suitable mix of staff and volunteers representative of the crews and agencies involved who ideally understand and *know the patch* they are working in. Local knowledge continues to be a valued asset and is to be used as much as possible.

Sharing of information with operational staff and volunteers and the timely communication of any change is important to the success of Operation Synergy 2018. The following activities must be conducted to ensure the mission objectives are achieved:

- incorporating Lessons Learned from Operation Thum nhoom 2017 and Operation Cool Burn 2018;
- reducing the likelihood of unwanted bushfires through the use of permits to burn and local fire bans;
- gathering of data for forecasting and informed decision-making purposes including monitoring the Wildfire Alert Levels (WALs) to align with fire weather information and residual fire risks;
- ensuring the full engagement, where appropriate, with area and locality specific Fire Management Groups (FMGs), Local Disaster Management Groups (LDMGs) and where the situation demands, District Disaster Management Groups (DDMGs);
- continuing to proactively engage and involve relevant landholders/occupiers and partners in the control of bushfires;
- mobilising and appropriately responding our people and best available resources in a safe, efficient and effective way to control bushfires; jointly with other agencies where appropriate;
- liaising with QFES Media to ensure the delivery of timely, suitable and informative media announcements and community warnings (advice, watch and act or emergency warning messages) to the public;
- investigating bushfires in a coordinated and timely manner where causes are unknown and are identified as a priority.
- providing support post-incident to impacted communities, as required;
- watching patterns and trends throughout the season and including these in the Operation Synergy 2018 After Action Review to examine performance and inform actions for future operational periods.
- considering the use of all available means of communication mediums (including community warnings, Emergency Alert, etc.) for any Emergency Warning Level messaging in collaboration with the LDMGs and local councils;
- undertaking early and ongoing engagement with local councils, partner agencies and other stakeholders in areas of risk, as well as the QFES Media, for community warnings and the State Disaster Coordination Centre (SDCC) Watchdesk for emergency alerts; and
- minimising the impact of firefighting resources (e.g. using approved firefighting foams only) which may cause environmental harm.

Appendix C: Seasonal Bushfire Outlook 2018-19

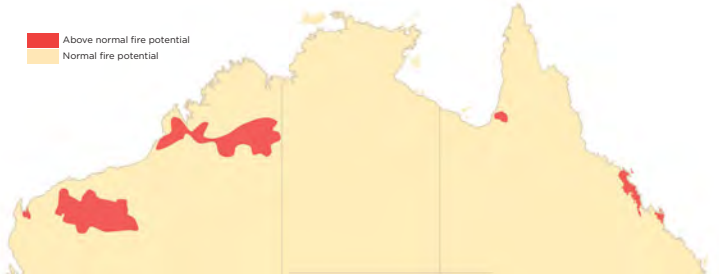
HAZARD **NOTE**

bushfire&natural HAZARDSCRC

ISSUE 49 JULY 2018

TOPICS IN THIS EDITION | FIRE IMPACTS | FIRE SEVERITY | FIRE WEATHER

NORTHERN AUSTRALIA SEASONAL BUSHFIRE OUTLOOK 2018



▲ Areas are based Interim Biogeographic Regionalisation for Australia and other geographical features.

BUSHFIRE POTENTIAL

This *Northern Australia Seasonal Bushfire Outlook* provides information to assist fire authorities in making strategic decisions such as resource planning and prescribed fire management to reduce the negative impacts of bushfire.

A *Seasonal Bushfire Outlook* for southern Australia will be published in early September, and will include an update on the northern fire season.

Bushfire potential depends on many factors. In northern Australia, conditions are determined by the nature of the previous wet season. The volume, location and timing of rainfall are critically important when estimating vegetation (fuel) volumes and growth. They also affect the timing of the drying of the vegetation.

The climate outlook for the next few months is also critical for the [illegible]

The annual Northern Australian Fire Managers' Forum, chaired by the Bushfire and Natural Hazards CRC, met in Townsville, Queensland, in June. This year marked the 20th anniversary of the forum, which gathers fire managers over three days from a range of public and private organisations from across northern Australia. The forum discussed the seasonal outlook for the imminent fire season, enabling the production of this *Hazard Note*. All other presentations from the Forum are online at www.bnhcrc.com.au/events/2018-nafm.

Forum attendees included representatives of the Queensland Fire and Emergency Services, Queensland Parks and Wildlife Service, Bushfires NT, WA Department of Fire and Emergency Services, WA Department of Biodiversity, Conservation and Attractions, NSW Rural Fire Service, the Department of Defence, the Bureau of Meteorology, the [illegible]

dominated by record warm daytime (maximum) temperatures, with highly variable rainfall. The months of October, November, January and March delivered widespread above average rainfall to tropical Australia, while September, December, April and May saw most areas experience average to below average rainfall.

The second half of 2017 saw the development of a weak La Niña in the Pacific Ocean, which peaked early in 2018 before rapidly declining. The overall impact of the La Niña on Australia's climate was modest, with intra-seasonal (month-to-month) variability tending to dominate rainfall patterns. This intra-seasonal variability led to near average northern wet season rainfall overall (October 2017 to April 2018), tending towards above average in the far north west, Top End and Gulf of Carpentaria, and below average in [illegible]

HAZARD **NOTE**

bushfire&natural HAZARDSCRC

ISSUE 55 NOVEMBER 2018

TOPICS IN THIS EDITION | FIRE IMPACTS | FIRE SEVERITY | FIRE WEATHER

SOUTHERN AUSTRALIA SEASONAL BUSHFIRE OUTLOOK 2018-19: NOVEMBER

▲ Above: AREAS BASED ON INTERIM BIOGEOGRAPHIC REGIONALISATION FOR AUSTRALIA AND OTHER GEOGRAPHICAL FEATURES.

OVERVIEW

Above normal fire potential remains across large parts of southern Australia, as first identified in September's *Southern Australia Seasonal Bushfire Outlook 2018 (Hazard Note 51)*. Rain in areas of eastern Australia during spring, while welcome, was not enough to recover from the long-term dry conditions. Wet conditions currently being experienced across coastal New South Wales will help, but it will not take long once heat and dry conditions return for vegetation to dry out. For example, the April-to-November period has seen Queensland record the ninth driest and fourth hottest period on record, New South Wales the eighth driest and fourth hottest period on record, and Victoria the 15th driest and hottest [illegible]

ANTECEDENT CONDITIONS

The year-to-date has been unusually warm and dry for large parts of southern and eastern Australia (Figure 1, page 2). The focus of the dry conditions has been New South Wales, where almost the entire state has experienced rainfall in the lowest decile (driest 10% of recordings). This represents serious to severe rainfall deficiencies. Rainfall deficiencies also affect most of northern and eastern Victoria, parts of southern and central Queensland, eastern South Australia and southern Western Australia. Across southern Australia above average rainfall is limited to the arid regions of northern South Australia and extreme [illegible]

remove the large negative rainfall anomalies which accumulated earlier in the year; it will take a number of months of above average rainfall to remove the deficiencies, meaning that general landscape dryness is likely to persist for many areas for some months.

The warming trend means that above average temperatures now tend to occur in most years, and 2018 has followed this pattern. Temperatures in Australia for the year-to-date have been very much warmer than average, with 2018 likely to finish amongst Australia's 10 warmest years on record. The overall mean temperature for January to November is currently [illegible]

Appendix D: Landslide Fact Sheet

Flood and Erosion Risk in Post-Bushfire Affected Areas

Queensland Fire and Emergency Services advises caution if you live, work or are travelling through hilly or mountainous areas (indicative but not restricted to gradients of 25 degrees or higher) recently burnt by bushfire which are also affected by significant rain.
These areas may have increased hazard exposure to landslide, flash flooding and debris flows.

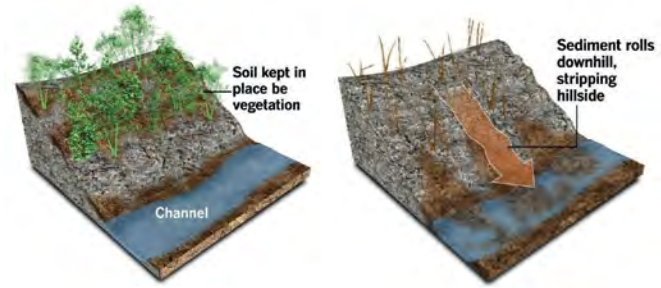
Large-scale bushfires can dramatically alter the terrain and ground conditions. Normally, vegetation absorbs a degree of rainfall, reducing runoff. However, bushfire can leave the ground charred, barren, and unable to ab-sorb water, creating conditions more prone to landslide, flash flooding and debris flow. This hazard can remain elevated until vegetation is restored—up to 5 years after a significant bushfire.

Flooding after fire can be more severe, as debris and ash left from the fire can form debris flows and also create small dams due to debris in places where you may not have previously encountered. These dams could also give way under load creating a small wave or surge affect adding to flash flooding. As rainwater moves across charred and denuded ground, it can also pick up soil and sediment and carry it in a stream of floodwaters. These debris flows can cause significant issues for drainage, water supplies and also safety.

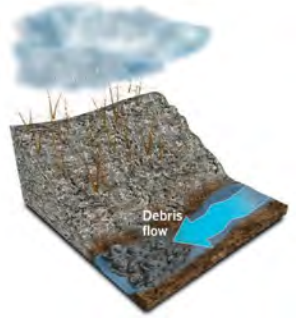
Risk Type	Trigger	Risk Description
Water quality/erosion processes	1 in 1 year rainfall (15mm in 1 hr)	Erosion processes and water quality issues in and downstream of a burnt area may result in a threat to water quality and aquatic biodiversity.
Flash Flood	1 in 5 year rainfall (25mm in 1 hr)	Rainfall maybe sufficient enough to result in flash flooding and create an immediate risk to roads and walking tracks in fire affected areas.
Significant debris flow/mass movement	1 in 20 year fall (35mm in 1 hr)	Rainfall maybe sufficient enough to trigger a landslide (mass movement debris flow) in fire affected areas.

Source: State Government of Victoria, 2014, *'Grampians Northern Complex Fire', Grampian Region 2014 Rapid Risk Assessment.*

Pre-Bushfire **Post-Bushfire**



Rain and runoff potential



Source: *National Weather Service (US), 2015, Post Wildfire Flash Flood and Debris Flow Guide.*

Recommendations
If there are concerns about the potential of any of the risks identified occurring, QFES recommends:

- Consider protection of life and safety as paramount by contacting Triple-Zero (Police or Fire).
- Liaise immediately with stakeholders and communities who are accessing or reside in those areas of concern
- Depending on the specific concern consider contacting your Local Government or Council.

This advice note is not intended to be a comprehensive risk assessment and is for information only. It has been prepared for the purposes of highlighting the potential flash flooding and erosion risks in the post bushfire landscape. Any specific concerns should be raised with emergency services and land owners/managers for further investigation and assessment. Users rely on this advice at this own risk and should obtain their own advice.