THE 2018 QUEENSLAND BUSHFIRES REVIEW

REPORT 2: 2018-2019

A climate for good neighbours

Inspector-General Emergency Management

Queensland Government

THE 2018 QUEENSLAND BUSHFIRES REVIEW

A climate for good neighbours

Front cover image:
Firebreaks on both sides of a fence in the Carpentaria area – evidence of a good neighbour.
Photo credit: Inspector-General Emergency Management

Office of the Inspector-General Emergency Management
Phone (07) 3029 8813
Email info@igem.qld.gov.au
Web www.igem.qld.gov.au
Postal address GPO Box 1425, Mail Cluster 15.7
Brisbane, Queensland 4001

BACKBURNING
IN CALLIOPE

Photo courtesy of Mt Alma Rural Fire Brigade

Document Details

Security Classification	PUBLIC
Date of Review of Security Classification	3 June 2019
Authority	Inspector-General Emergency Management
Author	Office of the Inspector-General Emergency Management
Document status	Final
Version control	V1.0
ISSN	2204-969X

Content

Intellectual Property Coordinator
C/O QPS Legal Unit, Legal Division
Queensland Police Service
GPO Box 1440, Brisbane 4001
Phone: 07 3364 3958
Email: PSBA.Copyright@PSBA.qld.gov.au

31 May 2019

Queensland Government

Inspector-General Emergency Management

The Honourable Craig Crawford MP
Minister for Fire and Emergency Services
PO Box 15457
CITY EAST QLD 4001

Dear Minister

In accordance with your instruction of 6 December 2018, I present a report into the effectiveness of Queensland's disaster management system in preparing for and responding to the major bushfires and heatwave that occurred in November to December 2018.

As requested, in conducting this review, my Office worked closely with the Queensland Police Service, Queensland Fire and Emergency Services and other key agencies to differentiate between:

- those lessons that are agency specific
- those that overlap with the disaster management system
- those that are specific to the disaster management system.

The review concentrated on the latter two, informed by the first.

Many different views were shared during the review process. Robust scrutiny of evidence and insights collected through public consultation, submissions, interviews and surveys informed the final recommendations.

The recommendations in this report build on good practice, and aim to enable the system to continuously improve to deliver greater public value for hazard-specific events.

Yours sincerely

Iain S Mackenzie AFSM
Inspector-General Emergency Management

Level 26, 111 George St
GPO Box 1425, Cluster 15.7
Brisbane Qld 4001
Telephone +61 7 3029 8813

THE 2018 QUEENSLAND BUSHFIRES REVIEW

ACKNOWLEDGEMENT

The Office of the Inspector-General Emergency Management acknowledges the Aboriginal peoples and Torres Strait Islander peoples as the Traditional Owners and Custodians of this Country. We recognise and honour their ancient cultures, and their connection to land, sea and community. We pay our respect to them, their cultures, and to their Elders, past, present and emerging.

Cattle Creek valley from Eungella.
Photo credit: Inspector-General Emergency Management

TABLE OF CONTENTS

Contents

MITIGATION IN PROGRESS.

Photo courtesy of B Wagner

FOREWORD

The 2018 bushfires stand out in Queensland's recent emergency management history. Record-breaking temperatures occurred in many places for days in late November and early December. Matching the scale of the fires, Queensland received help from other jurisdictions in equal measure. The disaster management system faced a hazard very different from the state's more common floods and cyclones. Its pace and rate of change challenged the arrangements, making a review an essential part of the improvement process.

This review was instigated by the Minister for Fire and Emergency Services on 6 December. In presenting the review's report, I am aware that the bushfires and the response resulted in minimal loss of life and property - certainly compared with fires in the southern states. I am also aware that for those who lost a loved one, and for those that lost their property, nothing can make up for that loss. Here I would like to pay tribute to Mr George Bird who lost his life in the Rolleston area on 30 November whilst working to protect the family property.

During this review, my Office came across many who were passionate about this subject and its individual issues. Many took the time to write to us. It has been pleasing to hear from the community in this way. I acknowledge their effort and thank them sincerely. Their views and commentary have helped steer the course of this review.

It became clear during the course of this review that some of the issues we were presented with pre-date the events of 2018, sometimes by decades. Some issues raised need solutions that find the balance between apparently differing values in our society. How, for example, do we balance the economic value from our agricultural sector with the value of our state's biodiversity? During the review we detected a willingness to find the balance. Indeed, our perspective is that parties, perceived as single interest are, in fact, interested in achieving similar outcomes. We should capitalise on this willingness to find solutions.

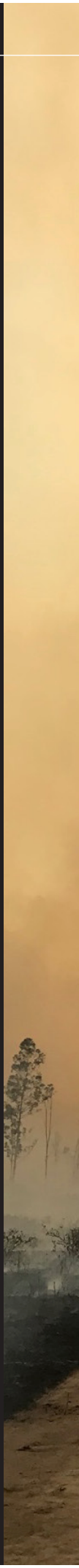
Framed by the **Standard for Disaster Management in Queensland**, we make a series of findings and recommendations that relate to all these matters. As is typical of most system reviews, many of these matters are inter-related, and some go beyond bushfires to other specific hazards. We also find ourselves, not for the first time, making some findings or recommendations that are similar to those of previous reviews by this Office. Continuous improvement can only be successful when we have created an organisational and sector-wide culture of learning where practitioners can feel safe to put forward their observations, insights and suggestions for change. Adopting a focus on lessons management will enable good practice to be identified and embedded. This approach should extend not only to disaster management practitioners across the sector, but also community members. Greater resilience and stronger shared responsibility for future disasters will be an outcome of better prevention and preparedness.

We heard about history during this review, and the importance of local knowledge based on it, in fighting local fires. This is undoubtedly an important factor. But recent commentary has also focused on the future. In a public statement in April, 23 former fire and emergency chiefs warned that Australia is unprepared for an escalating climate threat. Earlier in March, ASPI's Dr Robert Glasser made a similar compelling case for the need to begin preparing now for this future.

A first step should be to create a compelling narrative about climate and disaster risk reduction that explicitly recognises the changing scale of the threat and the new aspects we're beginning to understand, such as the compounding, cascading effects that we - along with our South Pacific and Southeast Asian neighbours - are likely to experience.

This State already recognises the science. The Queensland Climate Adaptation Strategy acknowledges that climate change is likely to exacerbate the frequency and/or severity of our weather extremes. This review has gone into some detail of two of these. I trust that it can contribute to the broader compelling narrative.

Iain S Mackenzie
Inspector-General Emergency Management



A FIREBALL IN THE SKY AT CALLIOPE

Photo courtesy of Mt Alma Rural Fire Brigade

TIMELINE QUEENSLAND NOVEMBER-DECEMBER 2018

This timeline shows indicative milestones for the heatwave and bushfire events of November-December 2018. It shows major meteorological events, changes in the state and regional activation levels of Government agencies, and the status of designated major fires. Due to their number, it does not include the status of local or district groups.

16/11/2018

FIRE

Eungella fire commencement (Finch Hatton, Eungella and Dalrymple Heights, including Kowari Gorge, Cathu State Forest, Broken River, Bloomsbury and Crediton State Forest)

19/11/2019

FIRE

QFES: Central Regional Operations Centre (Rockhampton) moved to Alert

20/11/2018

HEATWAVE

Bureau of Meteorology briefs the Queensland Disaster Management Committee about expected heatwave conditions

22/11/2018

HEATWAVE

Queensland Ambulance Service: State Incident Management Room moved to Alert

FIRE

QFES: State Operations Centre staffing levels elevated

Deepwater fire commenced (Agnes Water, Deepwater, Round Hill, Baffle Creek, Rules Beach, Oyster Creek, Winfield, Captain Creek, Eurimbula and Boyne Valley)

DISASTER MANAGEMENT

Australian Government Disaster Response Plan (COMDISPLAN) activated by Emergency Management Australia

23/11/2018

FIRE

51 bushfires active across the state

24/11/2018

HEATWAVE

Heatwave conditions developing: Central and Northeast weather districts

FIRE

52 bushfires active across the state

QFES: South Eastern Regional Operations Centre (Beenleigh) moved to Stand Up

QFES: Central Regional Operations Centre moved to Stand Up

25/11/2018

FIRE

Carnarvon National Park fire commenced

Evacuation of Deepwater and Round Hill (Deepwater fire)

Wind gusts: Emerald 91km/h, Roma 78km/h

Highest Fire Danger:

- 95 (Extreme) Rockhampton
- 93 (Extreme) Moranbah

Fire Weather Warning:

- Central Highlands
- Coalfields
- Central Coast
- Whitsundays
- Northern Goldfields
- Upper Flinders

HEATWAVE

Maximum temperatures were more than 6°C above average for a large area from near Cooktown on the north tropical coast, and south to around Gladstone, extending into Northern and Southern Inland weather districts

Mareeba Airport 39.5°C: hottest November day since 2000

Gladstone Airport 37.3°C: hottest November day since 1993

26/11/2018

FIRE

70 bushfires active across the state

New South Wales Rural Fire Service asks QFES if assistance is required; first interstate crews arrive

Gracemere fire commencement (Stanwell, Gracemere and Kabra)

Deepwater fire: door-knocking commenced and QPS began directing people to leave (Deepwater and Wartburg)

HEATWAVE

Queensland Ambulance Service: State Incident Management Room moved to Lean Forward

Extremely hot days exceeding 40°C occurred around Cooktown, Cairns, Innisfail, Townsville (Mt Stuart), Proserpine and Mackay (Racecourse)

Townsville (Mt Stuart) recorded the highest daily maximum temperature in this event, reaching 45.2°C

DISASTER MANAGEMENT

State Disaster Coordination Centre moved to Alert

Disaster Declaration for Gladstone disaster district

27/11/2018

FIRE

80 bushfires active across the state

Deepwater fire: evacuation of Rules Beach

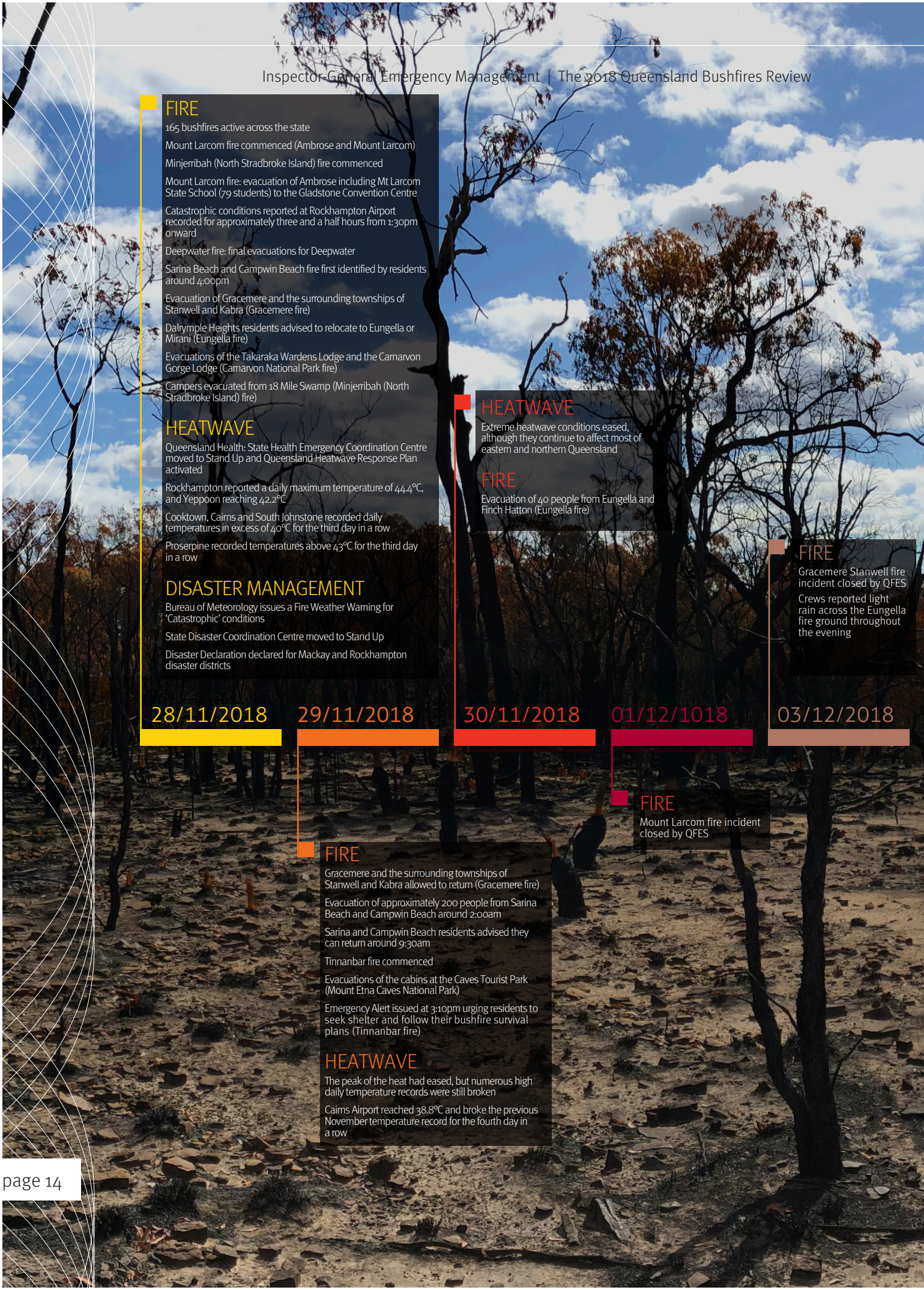
4 days straight Extreme fire danger ratings recorded in Queensland

HEATWAVE

Queensland Ambulance Service - State Incident Management Room - Stood Up

Queensland Health issued a Health Alert to warn residents not to handle fallen or injured flying foxes

Cairns Airport and Cooktown recorded two consecutive days above 42°C



28/11/2018

FIRE

165 bushfires active across the state

Mount Larcom fire commenced (Ambrose and Mount Larcom)

Minjerribah (North Stradbroke Island) fire commenced

Mount Larcom fire: evacuation of Ambrose including Mt Larcom State School (79 students) to the Gladstone Convention Centre

Catastrophic conditions reported at Rockhampton Airport recorded for approximately three and a half hours from 1:30pm onward

Deepwater fire: final evacuations for Deepwater

Sarina Beach and Campwin Beach fire first identified by residents around 4:00pm

Evacuation of Gracemere and the surrounding townships of Stanwell and Kabra (Gracemere fire)

Dalrymple Heights residents advised to relocate to Eungella or Mirani (Eungella fire)

Evacuations of the Takaraka Wardens Lodge and the Carnarvon Gorge Lodge (Carnarvon National Park fire)

Campers evacuated from 18 Mile Swamp (Minjerribah (North Stradbroke Island) fire)

HEATWAVE

Queensland Health: State Health Emergency Coordination Centre moved to Stand Up and Queensland Heatwave Response Plan activated

Rockhampton reported a daily maximum temperature of 44.4°C, and Yeppoon reaching 42.2°C

Cooktown, Cairns and South Johnstone recorded daily temperatures in excess of 40°C for the third day in a row

Proserpine recorded temperatures above 43°C for the third day in a row

DISASTER MANAGEMENT

Bureau of Meteorology issues a Fire Weather Warning for 'Catastrophic' conditions

State Disaster Coordination Centre moved to Stand Up

Disaster Declaration declared for Mackay and Rockhampton disaster districts

29/11/2018

FIRE

Gracemere and the surrounding townships of Stanwell and Kabra allowed to return (Gracemere fire)

Evacuation of approximately 200 people from Sarina Beach and Campwin Beach around 2:00am

Sarina and Campwin Beach residents advised they can return around 9:30am

Tinnanbar fire commenced

Evacuations of the cabins at the Caves Tourist Park (Mount Etna Caves National Park)

Emergency Alert issued at 3:10pm urging residents to seek shelter and follow their bushfire survival plans (Tinnanbar fire)

HEATWAVE

The peak of the heat had eased, but numerous high daily temperature records were still broken

Cairns Airport reached 38.8°C and broke the previous November temperature record for the fourth day in a row

30/11/2018

HEATWAVE

Extreme heatwave conditions eased, although they continue to affect most of eastern and northern Queensland

FIRE

Evacuation of 40 people from Eungella and Finch Hatton (Eungella fire)

01/12/1018

FIRE

Mount Larcom fire incident closed by QFES

03/12/2018

FIRE

Gracemere Stanwell fire incident closed by QFES

Crews reported light rain across the Eungella fire ground throughout the evening


04/12/2018
FIRE
88 bushfires active across the state
Deepwater residents allowed to return (Deepwater fire)
05/12/2018
DISASTER MANAGEMENT
Disaster Declarations in Rockhampton and Mackay disaster districts revoked
Disaster declaration for Gladstone disaster district revoked
FIRE
Eungella fire incident closed by QFES
06/12/2018
HEATWAVE
Queensland Health: State Health Emergency Coordination Centre moved to Stand Down
Queensland Ambulance Service: State Incident Management Room moved to Stand Down
FIRE
Carnarvon National Park fire incident closed by QFES
DISASTER MANAGEMENT
Minister for Fire and Emergency Services tasked the Inspector-General Emergency Management with reviewing key preparedness and response elements to the fires and hot weather events across the state
07/12/2018
DISASTER MANAGEMENT
State Disaster Coordination Centre moved to Stand Down
09/12/2018
DISASTER MANAGEMENT
State Recovery Coordinator appointed
15/12/2018
FIRE
Minjerribah (North Stradbroke Island) fire incident closed by QFES

THE 2018 QUEENSLAND BUSHFIRES REVIEW

EXECUTIVE SUMMARY

Tinnanbar.
Photo courtesy of Queensland Fire and Emergency Services

EXECUTIVE SUMMARY

On Saturday 24 November 2018, Queensland encountered rarely experienced hot weather conditions that continued into the following week. Severe heatwave conditions were forecast from Cooktown to Rockhampton.

While fires had been burning in many locations, sometimes for weeks beforehand, the forecast weather conditions were concerning, and the number of fires began to increase rapidly. The fire danger rating reached extreme in some locations on Monday 25 and Tuesday 26 November. On Wednesday 28 November, catastrophic fire conditions were observed at Emerald and for several hours at Rockhampton. The Bureau of Meteorology reported that parts of Queensland experienced the highest Forest Fire Danger Index on record for Queensland.

On multiple occasions temperature records were broken, by several degrees in some areas. At the event's peak, more than 200 fires were burning across the state. By Tuesday 4 December, conditions had begun to ease, with rain providing relief in some places. The bushfire and heatwave events resulted in the activation of all levels of the disaster management system in Queensland.

This review report considers the effectiveness of the Queensland disaster management system in its preparation and response to the bushfires and heatwave. The review covers the major fires, is based on the *Standard for Disaster Management in Queensland* and followed nine lines of enquiry. These covered the science and lessons from other events, the heatwave, risk, mitigation, intelligence, technology, warnings, coordination, evacuation and interstate support. Methodology included document analysis, attendance at community meetings and debriefs, interviews, a practitioner survey, two independent research reports and a community survey. The Office of the Inspector-General Emergency Management (the Office) invited public submissions which helped shape the direction of the review and identify major themes.

Extreme heat is a common occurrence across Queensland; historically more common inland than near the coast. Heatwaves often result in significant health stress on vulnerable people. It is rated third highest priority risk for Queensland. Heatwaves are considered a hazard-specific event, with one primary agency, Queensland Health, responsible for developing and communicating plans. If the event is significant, local governments should have an interest in managing the consequences, too. The community should also be able to take appropriate action based on information and warnings received.

The current *Queensland Heatwave Response Plan* outlines the arrangements for heatwaves. The Office found it an effective operational plan for a coordinated health response. Experience in other states shows that heatwave impacts can reach beyond human health. The current plan does not recommend actions that other agencies might take, while those of other jurisdictions do.

The Office found the heatwaves were well managed across the state. Several Hospital and Health Services reviewed operational preparedness. Although the Queensland Ambulance Service attended more incidents, hospital emergency department presentations across Queensland did not increase significantly. Power demand did not get close to generation capacity. Rockhampton – a significantly affected local government – extended library opening hours. Others passed on advice to residents. Cairns and their community responded to the death of many flying foxes; an incident that emphasised the importance of integrating environmental, physical and mental health planning. In the bushfire response, Queensland Fire and Emergency Services adjusted rosters in line with the increased heat. The heatwave, while mild in its effects on people, shows an opportunity for stronger leadership in heatwave-related projects.

The exceptional firefighting response to the unprecedented fires in Central Queensland highlighted the effectiveness of interagency cooperation, with more than 3000 Queensland Fire and Emergency Services staff and volunteers, 500 Queensland Parks and Wildlife Service staff and 1200 interstate personnel involved. Large aerial tankers were used for the first time in Queensland and sophisticated intelligence and technology played vital roles. The three evacuation case studies demonstrate how the responding agencies cooperated effectively under challenging conditions.

Fire management is complex, and a sophisticated understanding of how vegetation, topography and weather conditions affect fire behaviour is needed. The science behind the extreme fire weather conditions improves the understanding of bushfire risk. The Office commissioned the Bushfire and Natural Hazards Cooperative Research Centre to report about the science and separately about lessons from similar events. The first the Bushfire and Natural Hazards Cooperative Research Centre report shows that interrelated factors, compounded by climate change, resulted in the extreme conditions. Monitoring of relevant indicators is a priority, particularly when the research indicates extreme conditions will be more common in the future. The analysis of 13 comparable national and international events in the second the Bushfire and Natural Hazards Cooperative Research Centre report confirms preparation for future events requires a stronger focus on mitigation, particularly at the rural-urban interface. Bushfire risk is currently Queensland's fourth priority. The risk should be reassessed, as climate impacts intensify and the bushfire season becomes more prolonged. A longer bushfire season also requires authorities across Australia to reconsider how best to plan to share resources and assets.

The Office found that fuel, and management of fuel loads, should be the key focus of bushfire mitigation. Targeted reduction burns are instrumental in reducing the intensity of fires and should continue. All landholders should prioritise reducing hazardous fuel loads on their land. Queensland Parks and Wildlife Service and Queensland Fire and Emergency Services rate cool or planned burning as an effective mitigation tool. The Office heard that adequate firebreaks and selective land clearing can also be effective. Effective mitigation requires adjoining landholders to plan and prepare. The Queensland Parks and Wildlife Service *National Parks and Wildlife Good Neighbour Policy* is a good example of a collaborative approach to cross-boundary management. More can be done at the community and local level to better support the efforts of Area Fire Management Groups.

Queensland has the necessary framework for mitigation activities. Landholder understanding of the framework and knowledge of their bushfire risk needs to improve. A growing population in the peri-urban area, a lack of knowledge, and confusion about what is permitted is increasing the vulnerability of these communities. Nobody wants the damage of an intense bushfire. A concerted effort is needed to build on the willingness of stakeholders and the community to solve a common problem. Integrated approaches to the complexity of bushfire mitigation are needed, if its challenges are to be dealt with from an informed and united front. Reliable, secure and trustworthy information is essential to building partnerships and informing community decision-making.

Current intelligence and technology capabilities need to be utilised to their full potential and shared with those who need them the most across all phases of disaster management. The Office found the effectiveness of Queensland Fire and Emergency Services fire modelling and Fire Behaviour Analysts to be highly dependent on the quality of the data. Line scanning technology was a great success due to its timeliness and ability to accurately identify a bushfire's location. There is further opportunity to do more to convert information into intelligence and reduce the multiplicity of systems. Intelligence products should be shared, understood and used to inform all entities in the disaster management sector.

More than 570 warnings were issued for bushfire events between 24 November and 7 December 2018. Most of the residents surveyed considered that they had received the right amount of information, and that it was understandable and timely. The Office found that planning between local and district stakeholders needs to improve where a warning requires action. Timely communication with evacuated communities also requires attention. The Deepwater case study highlights the challenges of communicating in a fast-moving and dangerous situation.

At the early stages of the bushfire event, those at state level foresaw the need for a significant coordinated response. The Office found that there is no Queensland hazard-specific plan for bushfires. It is noted a Queensland hazard-specific plan for bushfires is being prepared by Queensland Fire and Emergency Services. Bushfire plans need to show how they link to disaster management arrangements and what triggers escalation to enable swift support for Queensland Fire and Emergency Services as the hazard-specific primary agency. In November 2018, as the bushfires escalated to meet the definition of a disaster, which agency should have been in charge, and of what, was unclear. The sheer scale of the event complicated the early flow of information about the fires. Queensland Fire and Emergency Services is leading work to address these issues.

There was notable good interagency collaboration and information sharing when local disaster management groups and district disaster management groups were activated, and when liaison officers were collocated in both hazard-specific and disaster management centres. The importance of liaison officers in hazard-specific events needs greater emphasis. Evacuations tested the effectiveness of coordination structures and interagency cooperation. Links between hazard-specific incident management and disaster management systems, together with communication and collaborative planning would avoid misunderstanding of roles. The arrangements for interstate assistance worked effectively and it is noted that Queensland Fire and Emergency Services is reviewing interstate deployment practices. The use of aerial tankers was appropriate, efficient and highly praised. The Office notes concerns over their use of suppressants and advice that they should not be relied upon as the primary means of suppressing a fire. The sharing of knowledge about their use, and integration of resources should expand significantly and include joint exercises.

The review ends with three conclusions: the need to work together to manage the risk of intense fires; the need to convey the risk and the best information about it, to the community; and the need for the disaster management system to adapt when the hazard needs the technical capability of a large hazard-specific agency to respond to a disaster that occurs because of it.

RECOMMENDATIONS

Heatwave

Recommendation 1

Queensland's plans and arrangements for heatwave should be reviewed to provide for an integrated multi-agency approach to their management. A single agency should lead and oversee this process. (pp. 43)

(Findings 1, 2, 3)

Science and risk

Recommendation 2

Wherever possible, the antecedents that will lead to catastrophic fire weather conditions existing for a particular area should be identified and documented within fire management plan relevant to the area. (pp. 62)

(Finding 5)

Recommendation 3

The future risk of bushfires to Queensland communities should be re-evaluated as part of the 2020 State Risk Assessment in light of recent and emerging science, events and lessons. (pp. 65)

(Finding 5)

Mitigation - engagement

Recommendation 4

A good neighbour policy such as that of the Queensland Parks and Wildlife Service, setting out clear expectations, be developed to guide all landholders. (pp. 70)

(Findings 6,7,12,13,14)

Recommendation 5

All Area Fire Management Groups should adopt and be guided by a good neighbour policy. (pp.80)

(Findings 6,7,12,13,14)

Recommendation 6

Area Fire Management Groups should share seasonal risk information with local groups and actively and appropriately contribute to disaster management planning. (pp. 80)

(Findings 6,7,12,13,14)

Mitigation – compliance

Recommendation 7

Legislation at state and local level requiring landholders to reduce fire risk on their property should be actively applied. (pp. 81)

(Finding 15)

Mitigation – authorisation processes

Recommendation 8

To make planned burning and land clearing easier to understand and implement for landholders, a single point of contact for all bushfire mitigation inquiries and permits should be established. (pp. 87)

(Finding 8, 19, 20, 21)

Mitigation – risk and effectiveness

Recommendation 9

Given an increasing risk of intense fires, the framework of legislation relating to vegetation management, bushfire mitigation and hazard reduction, together with mitigation and preparation priorities should be re-assessed. The re-assessment should aim to enable more appropriate and flexible means at the local level for the reduction of intense fires. (pp. 87)

(Finding 9, 16 17, 18)

Intelligence and technology

Recommendation 10

Building capacity in fire simulation and predictive capabilities, including the capability of people to read and interpret these products through training, should be investigated and considered. (pp. 99)

(Finding 22,23,24,25)

Recommendation 11

The outputs of these capabilities should be shared and actively inform the disaster management sector, including response operations and the creation of warnings and public messaging. (pp. 99)

(Finding 22,23,24,25)

Recommendation 12

The ability to share, analyse, interrogate and display information from disparate entities should be progressed as a matter of some urgency. (pp. 99)

(Finding 26, 27, 28, 38, 40, 44)

Public information and warnings – warnings about catastrophic conditions

Recommendation 13

The national messages for catastrophic fire danger ratings should be integrated with all existing and new community bushfire safety information. (pp. 108)

(Finding 31, 34)

Public information and warnings - education

Recommendation 14

Education on bushfires should include information about:

- the change in climate and resulting higher level of bushfire risk
- local bushfire risk, possible consequences, and preventative and preparedness actions for the community
- the purpose of bushfire mitigation activities (to reduce, not stop, bushfire)
- the need, types and purposes for planned burning
- intersects between different legislation and their regulations and exemptions
- the importance of a shared approach to bushfire mitigation.

All agencies with education material should share it freely. Material should be appropriately authorised for use in Queensland. (pp. 109)

(Finding 10, 11, 32, 33)

Public information and warnings – roles and responsibilities

Recommendation 15

Communications protocols about hazard-specific events should be developed to clarify responsibilities and the principles for the release of information and warnings. They should be included in all related hazard-specific plans and published on relevant websites, and used during events. (pp. 112)

(Finding 29, 30, 35, 36)

Public information and warnings – effectiveness of warnings

No Recommendation

(Finding 37)

Coordination structures and interagency cooperation – hazard specific planning

Recommendation 16

Hazard-specific and disaster management guidelines and plans should explain the circumstances and process for hazard-specific activation of the disaster management arrangements in support of an incident. They should be relevant to local authorities and local and district groups, and used during events. (pp. 125)

(Finding 39,41, 42)

Recommendation 17

Hazard-specific plans and guidelines should be published on external websites for access by relevant stakeholders. (pp. 125)

(Finding 39, 41, 42)

Coordination structures and interagency cooperation – coordination

Recommendation 18

Planning for response to bushfire risk should identify all stakeholders to be engaged in the response phase and their roles and responsibilities should be clearly documented. (pp. 126)

(Finding 4, 43)

Recommendation 19

All disaster management groups should run an exercise that has full involvement of a hazard-specific primary agency in the next 12 months and regularly thereafter. (pp. 127)

(Finding 39, 41, 42)

Coordination structures and interagency cooperation – liaison officers

Recommendation 20

All agencies should identify the capacity and appropriate positions for the role of liaison officers, and ensure sufficient numbers are trained. (pp. 128)

(Findings 45, 46, 47)

Recommendation 21

Coordinated arrangements for liaison officer deployment should be considered and documented by disaster management groups across the full spectrum of risk identified for their area of responsibility, and not rely on a singular inflexible approach. (pp. 128)

(Findings 45, 46, 47)

Coordination structures and interagency cooperation – evacuation

No Recommendation

(Findings 48, 49, 50, 51)

Coordination structures and interagency cooperation – interstate and commonwealth support

Recommendation 22

Clear public messaging regarding risks (if any) from the use of suppressants, including to 'organic' producers, should be developed and socialised before the next fire season and be readily available for dissemination when needed. (pp. 140)

(Findings 52, 53, 54, 55)

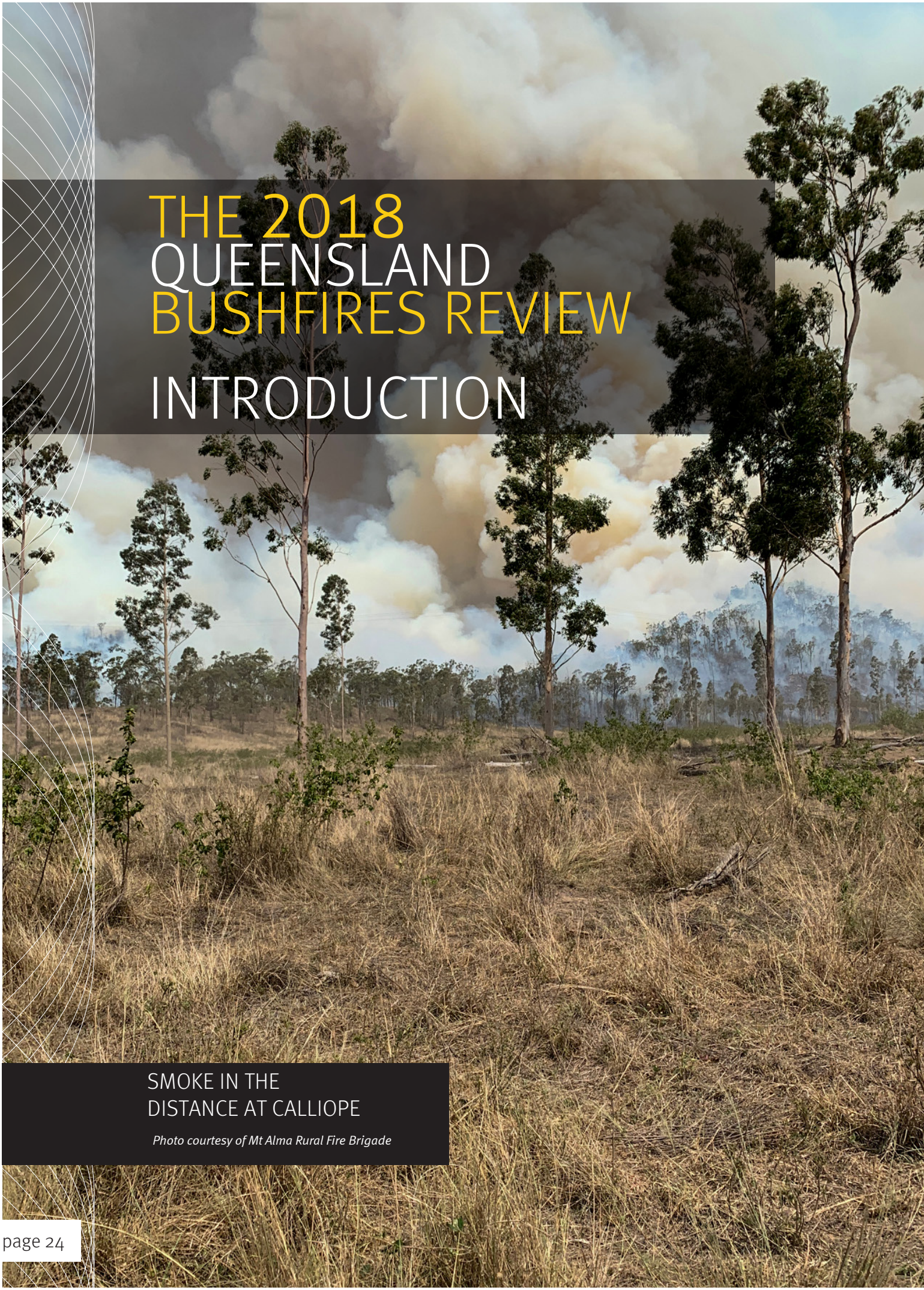
Recommendation 23

Targeted education about the short- and long-term effects of chemical suppressants should reach those likely to be exposed to them before aerial chemical suppressants are used in Queensland again. (pp. 140)

(Findings 52, 53, 54, 55)

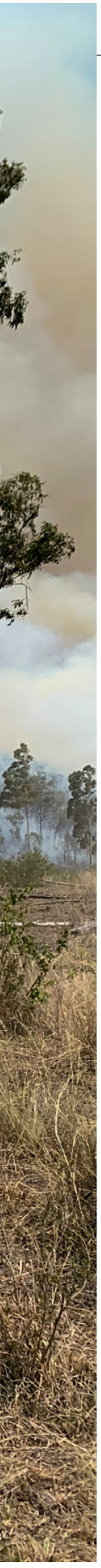
THE 2018 QUEENSLAND BUSHFIRES REVIEW

INTRODUCTION



SMOKE IN THE DISTANCE AT CALLIOPE

Photo courtesy of Mt Alma Rural Fire Brigade



Introduction

On Saturday 24 November 2018, Queensland experienced hot weather conditions that continued into the following week. Severe heatwave conditions were forecast from Cooktown to Rockhampton. While fires were already burning in multiple locations, sometimes for weeks beforehand, the forecast weather conditions were concerning, and the number of fires began to increase rapidly. The fire danger rating reached extreme in some locations on Monday 26 and Tuesday 27 November. On Wednesday 28 November, catastrophic fire conditions were observed at Emerald and for several hours at Rockhampton, the first time this had been documented in Queensland.

On multiple occasions temperature records were broken, by several degrees in some areas. At the event's peak, more than 200 fires were burning across the state. By Tuesday 4 December, conditions had begun to ease, with rain providing relief in some places. The bushfire and heatwave events resulted in the activation of all levels of the disaster management system in Queensland.

On Thursday 6 December 2018, the Honourable Craig Crawford MP, Minister for Fire and Emergency Services tasked the Inspector-General Emergency Management with reviewing key preparedness and response elements to the fires and hot weather events across the State. The terms of reference for the review can be found in Appendix A.

Purpose

The purpose of the review is to assess the effectiveness of Queensland's disaster management system in preparing for and responding to the major bushfires that occurred from late November to early December, and to the associated heatwave.

Scope

The review terms of reference were designed to ensure a robust approach to continuous improvement across all aspects of Queensland's disaster management system.

This review assesses entity and community preparedness and response to the major bushfires occurring in Queensland between 25 November and 7 December 2018, and to the associated heatwave that commenced on 24 November.

The review team, working closely with Queensland Fire and Emergency Services (QFES), established major fires criteria to further direct the review scope. These criteria included:

- loss of houses, sheds or machinery
- impact on community
- impact on critical infrastructure
- impact on the environment
- community and political interest
- impost on emergency service resources.

Major fires during the time period in scope were identified and the following fires (and the related communities) selected to provide focus to, while not limiting, the lines of inquiry:

- Agnes Water / Deepwater Fire (near Gladstone)
- Eungella / Finch Hatton / Dalrymple Heights Fires (near Mackay)
- Gracemere Fire (near Rockhampton)
- Mt Larcom Fire (near Rockhampton)
- Karara Fire (near Warwick)
- Minjerribah (North Stradbroke Island) Fire (near Brisbane)
- Undullah / Washpool Fire (near Ipswich)
- Carnarvon Gorge Fire
- Herberton Fire.

The review team worked closely with Queensland Police Service (QPS), QFES, local, state and Commonwealth agencies, and other relevant entities to differentiate between:

- those lessons that were agency-specific
- those that overlapped with the disaster management system
- those that were specific to the disaster management system.

The review concentrated on the latter two, informed by the first.

Out of scope

A review of recovery from the event, and the internal operations of specific agencies, were out of scope.

Methodology

The review assessed performance of the disaster management system based on Shared Responsibilities and Components of the Standard for Disaster Management in Queensland (the Standard), in particular:

- Hazard Identification and Risk Assessment
- Hazard Mitigation and Risk Reduction
- Preparedness and Planning
- Emergency Communications
- Response
- Component 13: Relief.

From initial observations about the event, analysed against the Emergency Management Assurance Framework and the relevant components of the Standard, the following lines of inquiry were developed:

- the effectiveness of the preparation and response to the heatwave
- the science behind the fire weather and bushfires, including lessons from other recent bushfire events that are relevant to Queensland
- the extent to which bushfire risk is understood
- the effectiveness of bushfire mitigation planning and implementation
- the effectiveness of the intelligence function in supporting decision-making, and the contribution of technology
- the effectiveness of public information and warnings in preparing the community and advising it about the event
- the effectiveness of coordination structures and interagency cooperation of entities involved in the event
- the effectiveness of evacuation arrangements
- the effectiveness of Commonwealth and interstate support arrangements, including technology.

Data collection

The Office considered a range of information and collected evidence to inform this report and its findings. The sources of evidence for this review have included:

- engaging with 43 entities across the sector, including 12 local governments, 12 state government agencies, one Commonwealth agency and 18 non-government organisations
- legislation, policy, plans, guidelines, doctrine and other associated data
- insights collected through public consultation
- a survey of the disaster management sector (29 responses)
- document analysis and stakeholder interviews to analyse barriers, enablers and good practice
- previous reviews undertaken by the Office and other entities
- community and scientific research commissioned by the Office.

Research

The Office sought leading and independent research from the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC). The BNHCRC was commissioned to produce two reports:

The science behind the events – to provide a scientific/meteorological explanation for the drought and heatwave conditions that gave rise to the bushfires that occurred in Queensland during November–December 2018. The report provides evidence to support the unprecedented nature of the event in Queensland, enabling understanding of its precursors - useful in anticipating future similar events.

Lessons from Australia and overseas – to review and synthesise the available literature from similar events in the last 10 years to identify lessons to be learnt from similar recent bushfires worldwide. The report analyses 12 national and international case studies and highlights both lessons learned and the lessons yet to be learned.

Research was carried out by the Office to complement these two reports. This concentrated on investigating links between climate change and bushfire risk in Queensland. Publications from a range of authoritative sources such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Climate Council, Bureau of Meteorology (the Bureau), Australian Strategic Policy Institute, Queensland Audit Office (the QAO), and numerous articles accessed through the BNHCRC were considered.

Community insights

As with all emergent reviews conducted by the Office, it was vital to understand the impact of events on the community. The approach to public consultation was four-fold:

- telephone survey of three of the most impacted areas (balancing those in rural and urban areas)
- attendance at seven community meetings
- visits to individuals and groups affected by the major bushfires
- inviting submissions from the public and representative groups.

Report structure

The report starts with a **timeline** of events as a backdrop for the sections that follow.

The Office has a history of gauging public perceptions, and has done so in all its emergent reviews. Such community views often prompt more in-depth questions. A summary of **submissions** reflecting the views that the Office heard immediately follows this introduction.

The effects of the **heatwave** on the community were eclipsed by the scale of the bushfires. As a separate hazard-specific event, it is important that its lessons are not diminished by the fires' greater coverage. The heatwave event began slightly before the fires, therefore the heatwave section of this report is set before the broader analysis of the fires.

The **bushfire response** received wide acclaim from many quarters. Before dealing with issues that are inevitable learnings from such an unprecedented event, the report gives early and rightful tribute to those involved in fighting the fires.

As the event was described at the time as unprecedented, the first issue to examine is what is known, or could have been known, about such events. The section on the **science and the risk** covers the extent to which the events could have been predicted, lessons from similar events, and compares them to the State's current prioritisation of bushfire risk.

As the risk exists and should be mitigated, the section on **bushfire mitigation** follows the section on the science and risk.

If mitigation activities are to be prioritised appropriately, then they should be based on intelligence about the hazard. A section on how **intelligence** about bushfires is developed follows bushfire mitigation.

Intelligence about a hazard has wider uses than just mitigation priorities. Chief among these is informing the community. The report therefore next examines **public information and warnings** and how they are influenced by the technical knowledge of a hazard-specific primary agency.

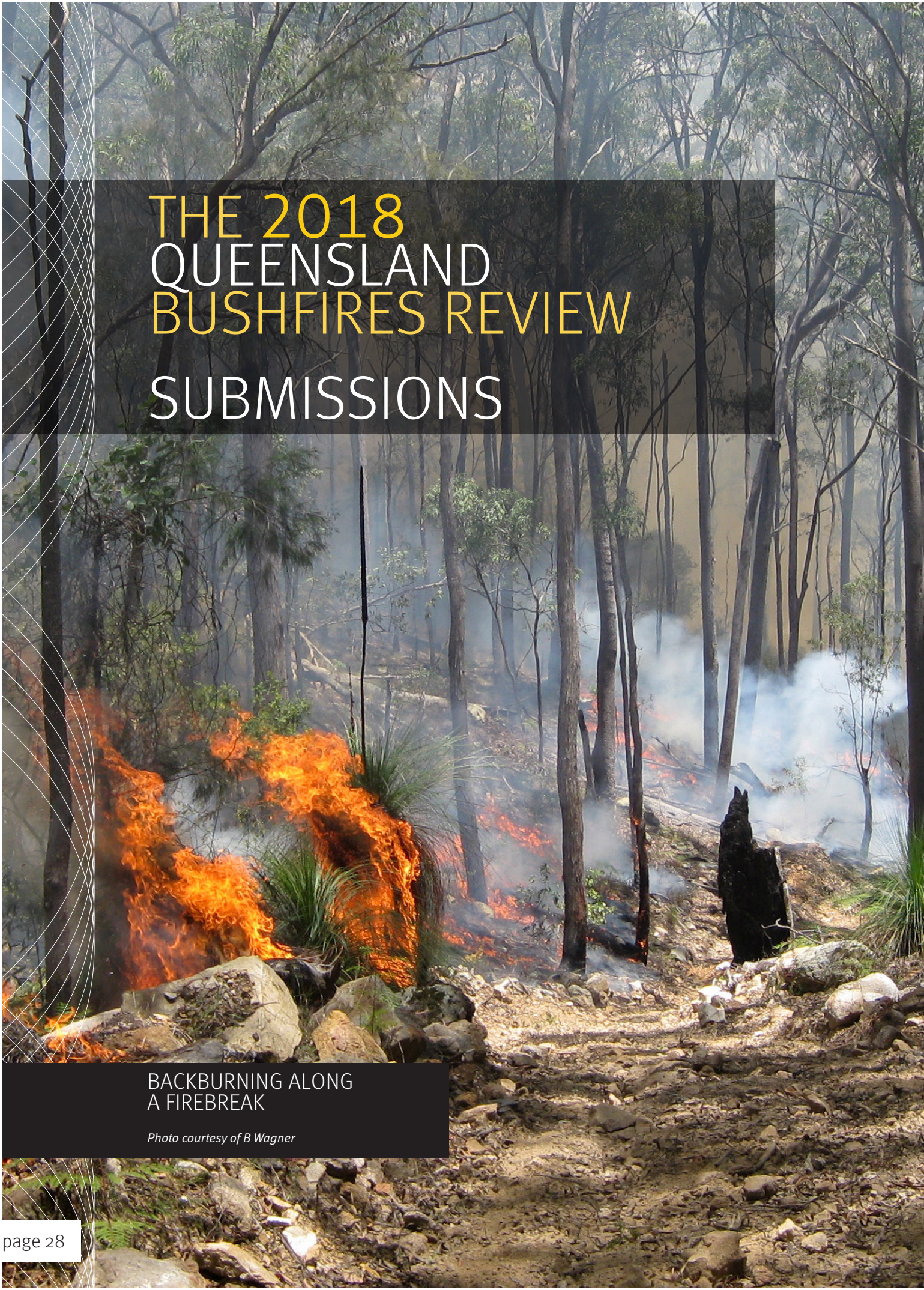
A community response to information and warnings, and the support they receive, depends on Queensland's disaster **coordination structures and interagency cooperation**. This section addresses how these work in relation to a hazard-specific event.

The duration and scale of this event required a response outside the State's capacity. The report's final section looks at how the **Commonwealth and other interstate support arrangements** worked in support of Queensland.

Case studies of **evacuations** are used in three places throughout the report to help illustrate response actions, warnings, and coordination and cooperation.

THE 2018 QUEENSLAND BUSHFIRES REVIEW

SUBMISSIONS



BACKBURNING ALONG A FIREBREAK

Photo courtesy of B Wagner

Submissions

The Office invited public submissions in recognition that it was not feasible to survey all affected persons in Queensland. Forty-eight written submissions were received from members of the public, and a further 10 from organisations. 50 agencies and representative groups were also invited to make a submission. Twenty-one written submissions were received in response to this request.

The Office would like to thank those who prepared and provided submissions and acknowledge the considerable effort and care taken. The insights from these submissions guided the direction of the review and led to inquiries which enabled the identification of recurring issues and themes. A summary of their diverse themes and arguments is provided below. Their appearance does not necessarily constitute endorsement by the Office.

The Office heard from associations representing bushfire managers who conveyed 'indisputable facts' about vegetated areas and their management. Their points were that fires will always start, and that fire management relies on, and must be led by, managing and reducing fuel. Climate change, they said, had not influenced the past build-up of fuel; some fires are best left to burn, and response will only be effective if preparation and mitigation have been effective beforehand. Other themes included: the need for state resourcing to manage fuel loads on state land instead of volunteer brigades, the need to tie state landholders more closely to the 'permit to light' arrangements, greater insistence on landowner responsibilities, more active use of 'requisition' legislation to assist in controlling fuel loads, and the amendment of the *Vegetation Management Act 1999* (the VM Act) to allow different defendable spaces around properties to reflect the variety of landscape and vegetation types present in Queensland.

Submissions were received from conservationists hesitant, due to their biodiversity conservation commitment, to engage with fire agencies about proactive burning, yet knowledgeable in the advantages of fire in promoting healthy ecosystems. Others were frustrated with what they see as the 'old mentality' of land management which leads local volunteers to be 'out of their depth' in considering future fire scenarios, and that a more integrated disaster management approach would place high conservation-value ecological communities on an equal footing with people and property. Some thought the answer lies in approaches like the 2017 Queensland Climate Adaptation and Climate Transitions strategies and Queensland's move to a zero-net emissions economy. Others did not see a risk from natural fire and argued that humans cause most fires, and nature is capable of managing the fuel through natural decay, instead of mitigation burning.

The Office heard from small primary producers and rural residents who are concerned by the amount of fuel in adjoining State-owned land, saw the need for greater communication between landowners and government agencies, were frustrated with the policy of mandatory evacuation to which they were subjected, and who wanted the right to stay and defend.

The Office received submissions from rural fire brigades disgruntled with 'newcomers' to rural areas who did not prepare their land for potential fire and stressed the importance of local knowledge in firefighters. Others praised the communal support and interaction across all agencies and services and from the wider community, while also highlighting opportunities for better planning and integration of interstate deployments.

The Office heard from individual – sometimes senior – rural firefighters, who regretted the loss of historical knowledge, the shift of QFES's Rural Fire Service (RFS) from a proactive service to a reactive service, and the over-reliance on volunteers and concurrent disregard for their years of experience. Others wanted greater QFES support in communications, training, readiness and command centres, modernisation and high-level support of the fire warden and 'permit to light' system, and the collection of more data. They emphasised the importance of the local dimension of rural firefighting, of fuel management, and of monitoring and evaluating through better technology investment. Some saw risks in the Land for Wildlife program, the expansion of land under Queensland Parks and Wildlife Service (QPWS) management, and in human-caused outbreaks from permitted fires. Yet others recognised the need for more permanent staff in support of rural brigades and in the QPWS, for expansion of rural fire brigades to cover the interface zone (where bushland and residential areas meet), saw opportunities for volunteers to participate in, and be paid for, mitigation burns on State land, saw potential support coming from the Australian Army, and regretted the inability to task local government assets directly. Some were critical of what they saw as the QPWS's inflexible planning, lack of budget, mitigation burning delivery and slow decision making.

The Office heard from graziers, primary producers and others who cited the history of fire as a land management tool, pointed out the risk of transport corridors, decried the bureaucracy, the responsibility-shifting, inflexibility and restrictions of the permit system, argued that property owners' livelihoods were dependent on the land, warned of the destruction from high fuel-load intense fires, and mourned the loss of wildlife when they occurred. Other primary producers argued for *all* to manage the sometimes-heavy fuel loads, especially in State-owned land. Methods of land management submitted varied; some argued for fire or harvesting, others for the reintroduction of cattle into national parks, while still others sought recognition and use of the fire management practices of traditional owners. They pointed out Australia's pre-European land was more open woodland, and the degradation of areas originally gazetted as national parks was due to 'woodland-thickening' and the lack of fire management. They also highlighted the 'inextricable' link between fire management and the VM Act, the limitations of that Act in allowing adequate firebreaks (particularly in forests) and on boundaries when neighbours do not act. Most generally sought the VM Act's bipartisan review in response to climate change. Others commented on the growth of weeds such as lantana which resulted from restrictions on mitigation activities.

Submissions were received from rural and suburban residents who railed against the 'timidity' which resulted in legislation to enable the effectiveness of preparedness activity (through requisitions for hazard reduction measures) remaining unused, and who recognised the need for more practical laws for mitigation burning. Others recognised the importance of managing land that was 'banked' by absentee landlords and praised the QPWS for their work in managing parks.

Some submissions reflected dissatisfaction about landholders who did not manage their properties and praised the volunteer rural fire brigades. Other submissions indicated tensions between key groups and general suspicion regarding the capabilities of others. In this regard, the Office notes that relationships are often cited as the reason why the Queensland disaster management system works. However, there are clear opportunities to do more in some areas of the system.

Some submissions contained information that, although useful, fell outside the scope of the terms of reference for the review, as it related to the functions of a single agency. The points raised in these submissions will be referred to the relevant agency while maintaining confidentiality of the submitters.

Some landowners were concerned about the regulation width of firebreaks alongside their fences.
Photo credit: Inspector-General Emergency Management

THE 2018 QUEENSLAND BUSHFIRES REVIEW

THE HEATWAVE

In November 2018 two hazard-specific events were occurring at the same time: a heatwave, which started on 24 November 2018, and the bushfires, which went into December. These events were interrelated, and this is shown in the report, where appropriate.

Source: Bureau of Meteorology, Special Climate Statement 67 – an extreme heatwave on the tropical Queensland coast.
Image by Mark Wilgar

The heatwave

In November 2018 two hazard-specific events were occurring at the same time: a heatwave, which started on 24 November 2018, and the bushfires, which went into December. These events were interrelated, and this is shown in the report, where appropriate.

Heatwaves have been described as a silent killer.[1] It is therefore important that the lessons from this event are identified and learned prior to the next event. Equally important are common lessons about hazard-specific agencies operating in alignment with the disaster management arrangements. Similar themes emerged during the bushfires.

This review covers how the heatwave conditions impacted the bushfire response, its distinct impacts to the community, and the activities that occurred in response to those impacts.

On 20 November 2018, the Bureau provided early advice regarding the heatwave conditions to Queensland Health and the Queensland Ambulance Service (QAS), as well as briefing the Queensland Disaster Management Committee (chaired by the Premier) on the forthcoming heatwave event and a prolonged fire season.

From 24 November to 1 December 2018, much of Queensland's east coast experienced extreme heat with a number of locations exceeding their highest recorded maximum and minimum temperatures.[2] Figure 1 shows the daily maximum temperature for Queensland for this period.[3] The Capricornia coast, from Lockhart River on the Cape York Peninsula to Shoalwater Bay in central Queensland, experienced extreme and prolonged heatwave conditions with temperatures exceeding 40 degrees.[4] For example, Cairns' annual temperature records were broken with temperatures reaching 43.6 degrees, being six degrees higher than the previous November record of 37.2 degrees.[5]

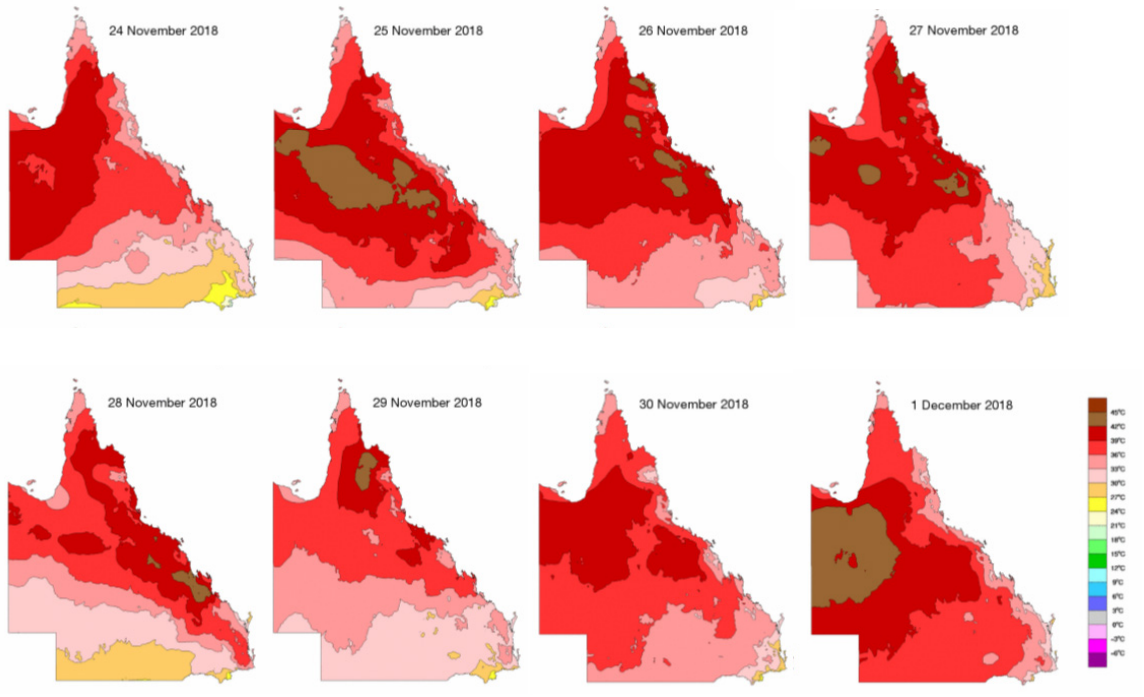


Figure 1: Daily maximum temperature for Queensland, for the days from 24 November to 1 December 2018.

Source: Bureau of Meteorology[6]

Extreme heat is a common occurrence across Queensland with higher temperatures historically more common inland than near the coast.[7] However, Queensland has experienced a significant rise in severe heatwaves since the 1980s, with significant heat in December 1972, February 2004, New Year 2014, and November 2014.[8] The Bureau provided the first national heatwave definition in 2014: three or more days of high maximum and minimum temperatures that are unusual for a location.[9]

Heatwaves often result in significant health stress on vulnerable people and have been responsible for more deaths than any other natural disaster in the last 200 years in Australia.[10] They also have economic impacts across the energy, infrastructure and transport sectors, agriculture and emergency services.[11]

Following creation of the definition in 2014, the Bureau launched the Heatwave Service for Australia which shows the heatwave severity for the previous two three-day periods and the next five three-day periods.[12] The service operates over the summer season from November to March each year.[13] Table 1 outlines the recognised levels of heatwave intensity and the links to potential community impacts.

Heatwave intensity	Colour code	Potential community impact
Low intensity heatwave	Yellow	Most people expected to have adequate capacity to cope with this level of heat but begin to see health effects. Increased risk to vulnerable groups.
Severe heatwave	Orange	Increased morbidity and mortality for vulnerable groups, such as those over 65, pregnant women, babies and young children, and those with chronic illness (e.g. renal disease, ischaemic heart disease).
Extreme heatwave	Red	May impact normally reliable infrastructure, such as power and transport. Health risk for anyone who does not take precautions to keep cool, even those who are healthy.

Table 1: Recognised level of heatwave intensity used in the of provision the Bureau Heatwave Service.
Source: Queensland Heatwave Response Plan.[14]

THE NATIONAL HEATWAVE FORECASTING AND ASSESSMENT SERVICE

The Bureau's National Heatwave Forecasting and Assessment Service provides the information and intelligence to guide decision making for Queensland's heatwave arrangements. It provides advance notice of predicted heatwaves to allow responders and the community time to adopt impact reduction measures.

The Heatwave Assessment is a panel of two maps of Australia showing actual heatwave conditions for the previous two three-day periods. The Heatwave Forecast is five maps showing predicted conditions across the next five three-day periods. Consecutive maps help to indicate heatwave conditions persisting for multiple days.

THE IMPACT OF CLIMATE CHANGE ON HEATWAVES IN QUEENSLAND

The science and wide-ranging impacts of climate change have recently been addressed in the *Emergency Management Sector Adaptation Plan* which is part of the *Queensland Climate Adaptation Strategy*.

A significant increase in trends has been observed and is predicted for Queensland to the end of the current century.[15] South West and Central Queensland have experienced a greater rate of increase in heatwave characteristics over the past 70 years than the rest of the state.

While this refers to all heatwave intensities, long-term increases in the occurrence of heatwaves classified as severe and extreme have also been observed across large parts of Queensland since the 1940s. Notably, the pace and scale of change has and is escalating over time.[16]

When compared with previous studies, new insights into regionally specific patterns of heatwave changes are now possible, since the Department of Environment and Science (DES) has undertaken extensive analysis of high-resolution temperature data.

In terms of the general Queensland context, this shows the frequency, duration and intensity of heatwaves will continue to increase over the current century, with sharper increases especially after 2050. In the absence of strong mitigation measures and significant transformation of the way Queenslanders live, the heatwaves are projected to reach unprecedented levels by the end of the century.

Under the current projected future climate, Queensland may experience:

- 15 per cent of the year in heatwave conditions, up from three per cent in 2018
- an increase in duration of individual heatwaves from four days to close to 30 days
- an increase in average temperature of all heatwaves from 32.5°C to 36°C
- an increase in the average temperature of all the hottest heatwave days from 34°C to 43°C.

Importantly, some region-specific analysis shows a trend of a decreasing number of heatwave events because the duration of individual heatwave events will exceed 120 days. This indicates that parts of Queensland will experience a significant rise in mean average temperature, leading to the heatwave conditions of today becoming the norm in the future.[1]

Adapted from emerging work.

1Relative to the reference period for the assessment of 1986 to 2008

What was expected

As with bushfire, heatwave is considered a hazard-specific event. For specific hazards in Queensland, there is one primary agency responsible for developing plans and communicating with national counterparts. Hazard-specific plans should be integrated with disaster management planning at all levels, and may include the need for multi-agency support. Queensland Health is the primary agency for heatwave, and responsible for maintenance of an effective hazard-specific plan in the *Queensland State Disaster Management Pla*n (the State Plan).[17]

The arrangements for disaster management are articulated in the *Disaster Management Act 2003* (the DM Act). The DM Act establishes the legislated requirements for disaster management and disaster operations. 'Local governments should primarily be responsible for managing events in their local government area,' according to the DM Act's section 4A, Guiding principles. They do so 'under policies and procedures decided by the State…' From this, local government is expected to have an interest in providing respite and managing the consequences of heatwaves when they occur in their area.

The *Queensland State Natural Hazard Risk Assessment 2017* identifies severe and extreme heatwaves as the third highest priority risk for Queensland.[18] It outlines that the operational risks and specific treatment plans are addressed within the local- and district-level risk registers and disaster management plans.[19] On this basis, the Office would expect to find heatwave identified at the local and district levels, and treatment actions outlined within local and district disaster management plans. It was also expected that State agencies would assess the applicability of heatwave risk to their core business and use their findings when developing disaster management plans.

The State Plan recommends an all-hazards approach to planning on the basis that the functions and activities used to manage one event could be applied to a range of events. It also outlines that a hazard-specific plan may be necessary when hazards require distinct operational or coordination requirements.[20] A key component of hazard-specific plans is that they address the hazard action across all phases, and show how the Queensland disaster management arrangements link to the specific hazard arrangement and support the primary agency.[21]

Under the State Plan, Queensland Health is the primary agency responsible for heatwaves and management of the hazard-specific *Queensland Heatwave Response Plan* across Queensland. The State Plan outlines the opportunity for hazard-specific plans to be developed as sub-plans at the local and district levels when the applicable hazard is identified. The Office would expect a hazard-specific plan for heatwave to be developed at the local and district levels in localities where heatwave is an identified risk.

From the Standard, the Office would expect heatwaves to be considered by local and district disaster management groups. Where considered a hazard, the Office would expect to see activities to reduce the likelihood of a heatwave impacting a community in mitigation and risk reduction plans. The Office also expects to see key stakeholders being involved in planning, priorities being identified, and responsibilities for certain functions being allocated.

Local groups ensure that communities are aware of ways to mitigate, prepare for, respond to and recover from disasters or hazard situations. The Office would expect timely public information and education initiatives to empower communities, and their outcomes having a positive effect on the actions taken by a community.

The ability of the community to take appropriate action in the event of a heatwave is vitally important to reducing the risk of loss of life. Warnings include any communication to the broader community which requires the community to act. The Office would expect to find warnings are effective in reaching the targeted audience, are easily understood and provide the community with tools to reduce the effect of heatwave conditions.

Disaster response operations are focused on stabilising the community impact of a disaster. This includes a range of life-, property- and environment-saving activities. The Office would expect response operations to a heatwave to help to minimise impacts on the community.

What was found

The *Queensland Heatwave Response Plan* was initially developed in 2004 under the authority of the Queensland Emergency Medical Systems Advisory Committee, with the DM Act as the legislative basis.[22] Authority now sits with the State Plan, which identifies Queensland Health as the primary agency with responsibility for heatwaves and maintenance of an effective hazard-specific plan.[23]

The current *Queensland Heatwave Response Plan* outlines the arrangements for heatwaves in Queensland. More specifically, it identifies the activation triggers, notification process, and the roles and responsibilities of the health sector when a heatwave is predicted. While the plan makes note of the non-clinical effects of a heatwave (transport, emergency services, energy, agriculture), its focus is on minimising the direct clinical effects.

This diverges from the 2004 *Queensland Heatwave Response Plan*. While limited in detail, the 2004 version outlined and linked the action plans for other relevant agencies in response to a heatwave.[24] The current version (2015) states that 'local, district and individual agency heatwave plans may be developed to support the operationalisation of this plan – relevant to local needs and risk.'[25] It further explains:

> *Agencies are encouraged to consider specific issues and ensure arrangements are in place to perform these, including consideration of business continuity planning to consider the impact of heatwaves on infrastructure and staffing.*[26]

The plan does not recommend actions a local government, local group, district group, or state agency should take to prepare for, or respond to, a heatwave. A review of plans from other jurisdictions reveals it is common practice to integrate the clinical and non-clinical responses of a heatwave.[27]

The Queensland Heatwave Response Plan was activated on 28 November 2018 in response to the extreme heatwave conditions being experienced throughout the State. This event was the first time that the *Queensland Heatwave Response Plan* has been activated since its development in December 2015. Queensland Health received positive feedback from Hospital and Health Services (HHSs) and areas of the department, which stated that the current plan is effective in providing clear guidance to disaster management stakeholders on roles and responsibilities in heatwave events. The Office considers that it is an effective operational plan for promoting a coordinated health response to heatwaves, focused on minimising the direct clinical effects of heatwave on the community.

Queensland Health also maintain the *Heatwave Response Communications Protocol*. This outlines the multi-agency responsibilities and activities to communicate information and risks to both the Queensland community, and disaster management stakeholders, when a heatwave is imminent in any part of the state.[28] This is discussed further in the Public information and warnings section of this review.

It is known from heatwaves experienced in other states across Australia that the impacts can reach beyond human health. During the 2009 southern Australia heatwave, as many as 500 people died in Adelaide and Melbourne. Financial losses due to power outages, transport disruptions and response costs were estimated at $800 million.[29] There were also moderate to moderately-high impacts on roads and the train system, minimal impacts to telecommunications, water and airports, and relatively minor impacts on trams and sea ports.[30] A report into the 2009 heatwave found that state and local governments, hospitals, emergency response organisations and the community were largely under-prepared for a heatwave of that magnitude, and a need for interagency support and coordination was identified.[31]
Table 2 identifies the potential impacts of severe and extreme heatwaves.

As identified in the State Plan, it is expected that local and district groups assess the applicability of different hazards and use these findings when developing disaster management plans.[33] This recognises their role in working with local communities to prepare and plan for, respond to and recover from disasters. Given that heatwaves are Queensland's third highest priority risk, the Office would expect to find heatwave identified at the local and district levels, and treatment actions outlined within their plans.[34] While the Office heard evidence of local-level activities to minimise the risk of health-related heatwave impacts on the community, heatwave is not consistently identified as a hazard in local disaster management plans (local plans). Only around one third of local plans currently identify it as a hazard. Scientific research, provided later in this review, shows that such events might become more frequent. An opportunity therefore exists for more integrated plans for a heatwave response.

Response to the 2018 heatwave

The Office's analysis has shown the 2018 heatwave conditions were well managed across Queensland. Impacts have been identified across human health, key infrastructure and the environment. These impacts and the response to these impacts are explored below.

Personnel and staffing	Fire danger days often occur at the same time as heatwaves – leading to lower staff levels Higher levels of stress Poor rest and sleeping patterns
Infrastructure	Buildings designed for lower heat stress levels Bitumen and road-seals may lose integrity at high temperature Railways shift and buckle at high temperature Higher levels of use of public places like pools and shopping centres
Utilities	Planned power outages Potential for disruption from other emergencies – e.g. fire
Economic development	Less active consumption patterns in extreme heat Less mobility in extreme heat Less interest in visiting places in high fire-danger periods
Emergency Services	Multiple demands and stressors on these services in extreme heat periods

Table 2: Impacts of extreme heat. Source: Northern Victorian Cluster – Municipal Heatwave Plan.[32]

Human health

In preparation for the extreme heat conditions in November, several HHSs reviewed operational preparedness in accordance with the *Queensland Heatwave Response Plan*. Activities included contacting vulnerable persons and facilities regarding the forecasts and possible interruptions which prolonged heat may cause, checking critical infrastructure to ensure readiness, and confirmation of threat levels.

Emergency department presentations across Queensland did not increase significantly during the heatwave, and no significant trends were identified. The QAS attended an additional 2453 incidents between 25 November and 30 November 2018, which was a 13.9 per cent increase compared to the same period in 2017. Of these incidents, 97 were for heat-related illnesses, compared to 24 during the same time in 2017. Wednesday 28 November was the busiest day during this period, with 24 requests for service received for heatwave-related illnesses. Emergent work in Victoria suggests that there may be a link between community education campaigns and a decrease in presentations to emergency departments because people were listening to the advice and warnings. The Queensland data is yet to be analysed for any similar correlation.

In Rockhampton, the Office heard that the local government extended the opening hours of the library to provide the community with somewhere to keep cool. They also pushed out messaging, particularly around the impact of heatwave on the elderly and other more vulnerable communities.

Other activities undertaken by local governments included distributing community advice and information in relation to heatwave risks via social media and local government websites. Most HHSs reported engaging with local and district groups and providing specialist health advice on heat-related illnesses. HHSs reported relying on local groups as the primary source of information for situational awareness of activities occurring in the local area. In one area, the Office heard that the consequences of the heatwave were minimal.

Extreme heat was also identified as an issue that required particular safety attention for front line operations during the associated bushfires. A deployment roster limiting time on the front line for firefighters was established by QFES in consideration of the hot working conditions that would be experienced. Deployments of one travel day, three operation days, and one travel day were implemented instead of the usual 1-5-1 roster for crews on ground. Although this affected logistics and created confusion in some areas, the adjusted roster appears to have been a key contributor to lower occurrences of heatwave injury.

Key infrastructure

Throughout the heatwave, the Department of Natural Resources, Mines and Energy (DNRME) maintained high levels of situational awareness of market participants with assets vulnerable to the impact of heatwave conditions or located near the fire event. DNRME also monitored the performance of the power system in collaboration with the Australian Energy Market Operator to ensure that any risk of supply/demand imbalance or possible system stability and security issues were detected early. Situational reports addressed the specific risks related to heatwave conditions and the fire and included wider market capacity to manage the impact of adverse outcomes if the risks were realised.

While heatwaves can cause damage to infrastructure and utilities, including power outages from an increased demand in electricity, Queensland's network performed during this event and DNRME was not required to intervene. Queensland has a total generation capacity of approximately 13,520 megawatts.[35] The highest total demand in November 2018 was 8829 megawatts on 28 November 2018.[36] The power supply system performed as designed, with no forecast or significant disruption to supply during the heatwave, apart from a few local power outages reported in Cairns.

Extreme temperatures also exert excessive force on the rail infrastructure and greatly increase the chance of failure. The heatwave caused varying levels of impact across the rail network:

- Speed restrictions were commonly imposed in various rail corridors due to the extreme heat.[37]
- Extreme heat conditions affected signalling and the speed of trains between Rockhampton and Townsville.[38]
- The Toowoomba–Rosewood line was closed due to the heat and the misalignment of tracks.[39]
- One track in the Oorindi section was closed due to track misalignment.[40]
- Speed restrictions imposed on the western coal corridor impacted the Aurizon coal freight trains.[41]
- Long distance passenger services were affected with some services terminating at Emerald and replaced with road coaches to Longreach.[42]

Environmental

Heatwaves can also have a very negative impact on animals.[43] The extreme heat was associated with the death of more than 23,000 spectacled flying foxes which equates to almost one third of Australia's population of the species.[44] Flying foxes are vital for the health of forests, acting as pollinators and dispersing seeds. In February 2019, the species was upgraded from vulnerable to endangered on the national threatened species list in recognition of heightened concerns for the future of the species.[45]

Heat-stressed flying foxes also present a health hazard to the community. On 27 November 2018, Queensland Health warned residents not to handle fallen or injured flying foxes, and for vaccinated people trained in their care to handle them regardless of their condition.[46] Flying foxes are part of the bat species. About 15 per cent of the bat population carry the potentially deadly Australian bat lyssavirus which can be transmitted to humans through a bat bite or scratch, or possibly through exposure of the eyes, nose or mouth to bat saliva.[47]

Following this event, Cairns Regional Council has been working with the University of New South Wales to collect and freeze the deceased animals to study the impact of heat stress on flying foxes. This study has the potential to inform improved management of flying fox colonies in extreme conditions.[48] Since October 2015, Cairns Regional Council has maintained the Flying Fox Advisory Committee, implemented sprinklers at the library in an attempt to reduce the impact of heat on flying foxes and most recently drafted a *Flying-fox Heat Stress Emergency Plan* which will become part of Cairns Regional Council's overarching *Heat Stress Emergency Plan*.[49]

Within the Ipswich City Council *Flying Fox Roost Management Plan*, preparation and mitigation activities are identified to minimise heat-related mortality events on flying fox populations. This plan acknowledges the elevated threat to public health that may occur because of multiple flying fox deaths. Internal arrangements are in place that trigger contact with West Moreton Hospital and Health Service (WMHHS) when high temperatures that may impact on flying fox populations are forecast. Mirroring this, WMHHS includes advice from Ipswich City Council on the status of flying fox mortality management activities whenever the HHS escalates their operations in response to a heat event. This symbiotic relationship benefits both parties and decreases the potential risk to public health.

While impacts on flying foxes are highly visible as they often roost near urban areas, concerns exist for other wildlife that have more solitary and cryptic lifestyles. This means consequences from heatwaves are not as obvious or documented.[50]

Finding 1: Initial analysis has shown the heatwave conditions were well managed across the State.

Finding 2: Heatwaves can affect a range of sectors important to the wellbeing of communities, including power generation, water supply and transport. Although the *Queensland Heatwave Response Plan* does not provide for a coordinated multi-agency approach to the state's management of heatwaves, all agencies with interests had planned and reacted well to heat-related effects.

Hotter than ever – the Cairns extreme heatwave

For four consecutive days in late November temperatures soared to above 42°C in the centre of Cairns, the highest temperatures recorded in the region. Hot, sticky conditions continued into ensuing days, as the Bureau had advised at the local group meeting a fortnight earlier.

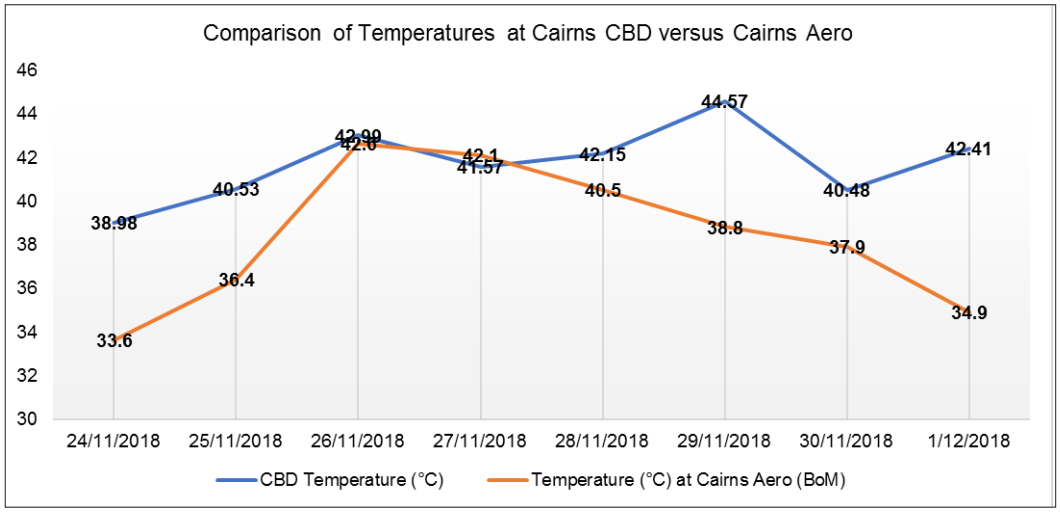


Figure 2: Comparison of the highest recorded temperatures within the CBD by Cairns Regional Council with those recorded at Cairns Airport by the Bureau of Meteorology.
Source: Queensland Fire and Emergency Services (emerging work)

Although the area was familiar with hot conditions, this was a much different challenge. At least five dogs perished due to heatstroke and hundreds of spectacled flying foxes fell from their roosts, unable to withstand the temperatures and dry conditions. Groups of deeply concerned citizens and wildlife carers converged at the roost sites to provide distressed animals with life-giving water, arrange for recommended water sprinkling systems to be established, care for survivors and collect the rapidly decomposing dead. Fears at a community level were divided between humans contracting disease and the long-term survival of the flying fox colonies.

Who leads the response in this scenario, given the human physical and mental health impacts, destruction of the Cairns flying fox population and the associated adverse effects of very hot weather on the wider population?

In the absence of an answer, the Cairns Local Disaster Management Group established a new Special Weather Forecast Working Group, associated with the Bureau services, aiming to provide an effective management bridge between more traditional disasters and 'other' weather events.

Adapted from emerging work.

Integration of hazard-specific planning

A shared understanding of hazards improves the ability for agencies to identify opportunities to align their plans and recognise their capability limits and escalation points. The following significant work is being performed to better understand heatwaves and reduce the associated risks to the community:

- QFES is leading the development of the State Heatwave Risk Assessment with the Queensland Health and the Department of Environment and Science (DES).
- The Child and Youth Mental Health Service in Queensland Health is developing an online resource specific to heatwave. The resource will complement others in a suite of resources aimed at helping the 0–4 years age group to cope with disasters. These have already been distributed across local and district groups and HHSs.
- DES is funding a project, jointly with QFES, to manage the health effects of heatwaves and the urban heat island effect in Queensland.
- DES has conducted extensive analysis of high-resolution temperature data which provides new insights into regionally specific patterns of heatwave changes.
- The Queensland Future Climate Dashboard accessible via the Queensland Government's Long Paddock website summarises information from 11 global climate models with regional scale simulations until the end of the current century.
- At a national level, Emergency Management Australia (EMA) is establishing a working group (overseen by the Bureau Hazard Services Forum) to develop a national framework for consistent heatwave information and warnings.

Finding 3: Although there is an increased appreciation of the need to better understand heatwaves and prepare for and mitigate their impacts, efforts by State Government departments are presently fragmented. Queensland Health, the primary agency with the responsibility for heatwaves, has the opportunity to provide coordination in heatwave-related plans and projects across government.

URBAN HEAT ISLAND EFFECT

Urban areas generate higher temperatures than nearby rural areas in a phenomenon called the urban heat island effect. Dark, heat-absorbing and impermeable materials used to construct urban buildings and infrastructure radiate heat into their immediate surroundings and cool slowly at night. This, combined with the canyon-like form of cities, high density of vehicles and lack of green space, makes urban areas very hot.

Good practice in other states

In Victoria, the Public Health Branch developed the *Heatwave Planning Guide 2009* to assist local government to address heatwaves at a community level by developing heatwave plans and supporting the local community during heatwaves.[51] Prior to the development of the guide, 13 pilot projects involving 22 local governments were conducted in 2008 to develop and implement heatwave plans for incorporation into existing local plans. The remaining 57 local governments were subsequently funded to develop and implement a heatwave plan.[52]

Examples of initiatives developed through the heatwave pilot projects include:

- developing partnerships with pool operators to extend pool hours
- developing partnerships to assist vulnerable population groups during a heatwave to borrow or hire equipment such as mobile air-conditioners
- implementing Memorandums of Understanding with the Australian Red Cross to make daily contact with people registered on a vulnerability list once a heat alert was issued
- developing a range of material, merchandise and give-aways suitable for a resident's heatwave pack, including information, a water bottle, a neck cloth and a recyclable bag.[53]

The 2014 report *Heatwave Management: Reducing the Risk to Public Health* by the Victorian Auditor-General concluded that some agencies, local governments and public hospitals were not sufficiently prepared for the demands they would face during the 2014 heatwave which resulted

in 167 excess deaths in Victoria.[54] The Victorian Auditor-General found that:

- governance arrangements were unclear
- the quality of planning for heatwaves was variable
- public health messages were not always well targeted
- heatwave plans activation was not well understood.[55]

The Victorian Auditor-General's findings reiterate the Office's recommendation in the 2014 *Review of state agency integration at a local and district level*:

> *That Queensland's disaster management arrangements are reviewed to enhance integration. Specifically:*
>
> - *to address the disparity between functions and structure of local government and disaster groups*
> - *to integrate hazard-specific agency planning at all levels of the arrangements*
>
> *(This may include legislative, policy and procedural considerations).*[56]

The findings and recommendation outlined above highlight that these lessons are not new and are yet to be learned.

The Office notes good practice activities occurring in other jurisdictions. In South Australia, the Department for Communities and Social Inclusion can activate the Telecross REDi service when an extreme weather event is declared. The service is provided by the Australian Red Cross and supports vulnerable and isolated people by calling them daily during declared heatwaves.[57]

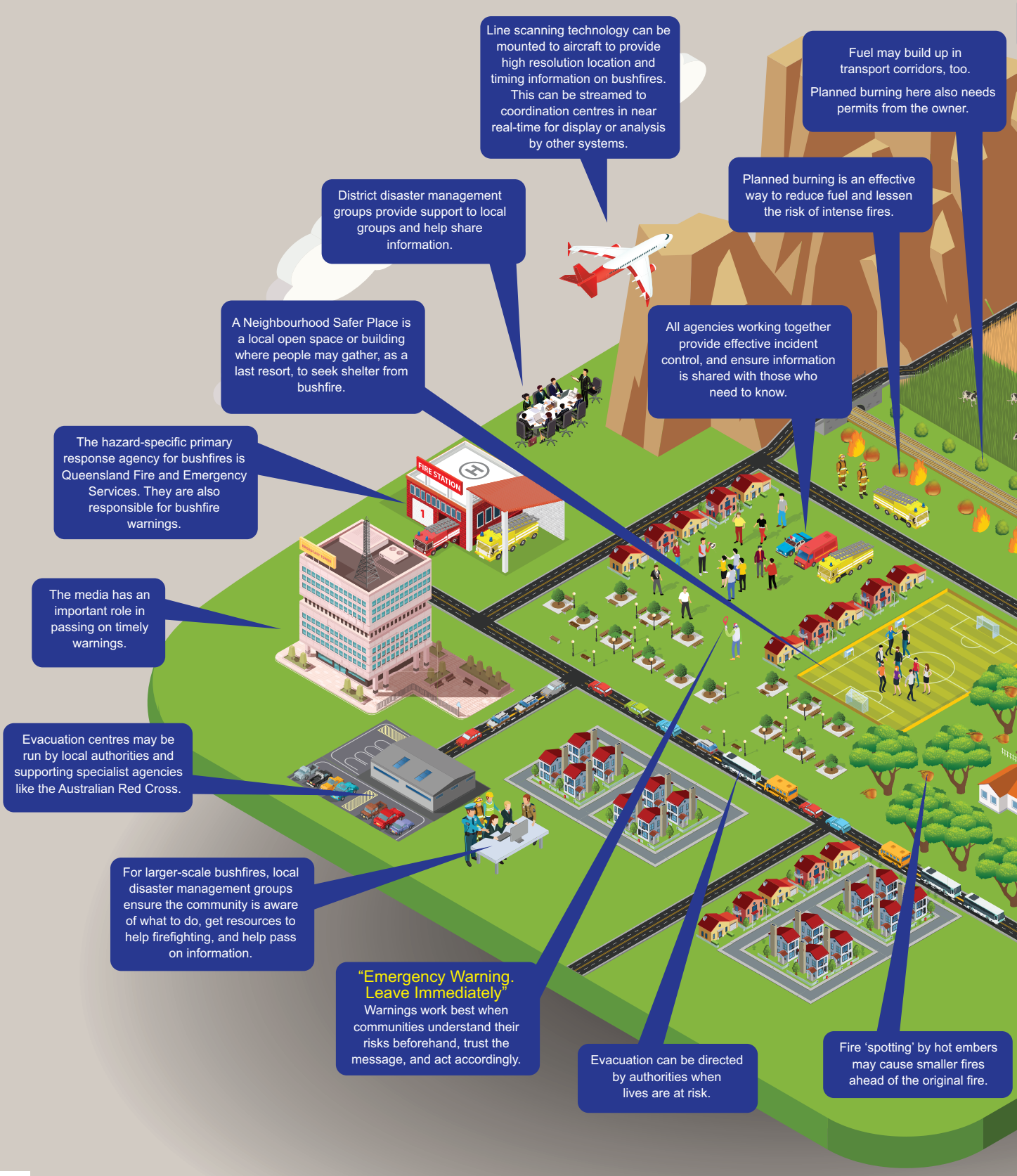
A similar service operates overseas (in Luxembourg) where people over the age of 75 who live alone can register for home visits from Red Cross volunteers who will ensure they have enough to drink and are protected from the heat.[58]

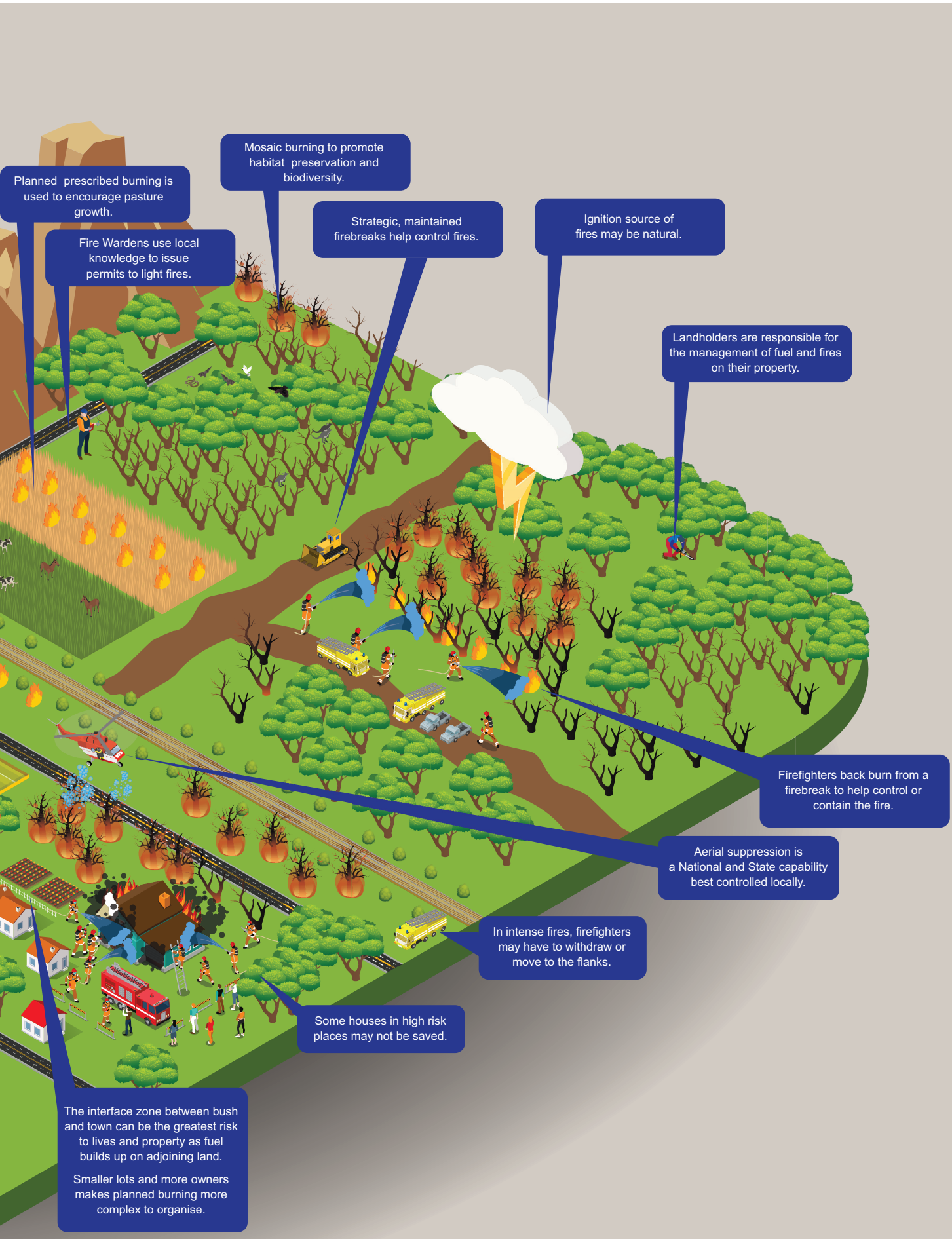
There is significant analysis of heatwave hazard and good practice occurring, both in Queensland and across other jurisdictions. Analysis and good practice can be further developed and integrated into the Queensland arrangements. The Office looks forward to the implementation of current QFES and DES initiatives to progress this work, and to Queensland benefitting from the lessons of others.

Recommendation 1:

Queensland's plans and arrangements for heatwave should be reviewed to provide for an integrated multi-agency approach to their management. A single agency should lead and oversee this process.

PREPARATION AND RESPONSE TO BUSHFIRES




Planned prescribed burning is used to encourage pasture growth.
Mosaic burning to promote habitat preservation and biodiversity.
Fire Wardens use local knowledge to issue permits to light fires.
Strategic, maintained firebreaks help control fires.
Ignition source of fires may be natural.
Landholders are responsible for the management of fuel and fires on their property.
Firefighters back burn from a firebreak to help control or contain the fire.
Aerial suppression is a National and State capability best controlled locally.
In intense fires, firefighters may have to withdraw or move to the flanks.
Some houses in high risk places may not be saved.
The interface zone between bush and town can be the greatest risk to lives and property as fuel builds up on adjoining land.
Smaller lots and more owners makes planned burning more complex to organise.

THE 2018 QUEENSLAND BUSHFIRES REVIEW

THE BUSHFIRE RESPONSE

The speed of bushfire, and the pace of planning, decision making, communications, and actions were a surprise to many accustomed to responding to a flood or cyclone. In this context the Office wishes to acknowledge the exceptional response of QFES, QPS, QAS and DES (QPWS) to the heatwave and bushfire emergency of November–December 2018

Minjerribah (North Stradbroke Island), 30 November 2018.
Photo courtesy of Queensland Fire and Emergency Services

The bushfire response

The speed of bushfire, and the pace of planning, decision making, communications, and actions were a surprise to many accustomed to responding to a flood or cyclone. In this context the Office wishes to acknowledge the exceptional response of QFES, QPS, QAS and DES (QPWS) to the heatwave and bushfire emergency of November–December 2018. During this review the Office met outstanding individuals, well-embedded in their local communities and wholly committed to the people they lived with and served. The submissions received, meetings attended, and interviews conducted by the Office also recognised the quality of individual and agency responses. The weather conditions were oppressive, and the terrain was often challenging. The evacuation case study included in this section highlights the cooperation and coordination between agencies which is a key feature of Queensland's disaster management arrangements.

The firefighting

Queensland Fire and Emergency Services and Department of Environment and Science

The combined efforts of more than 3000 QFES staff and volunteers, 500 QPWS and 1200 interstate personnel, with the associated ground and aerial equipment, played a vital role in reducing the impacts of the bushfires. Interstate deployment included forest firefighters to support QPWS firefighters, and QPWS staff were embedded in QFES's command system of Incident Control Centres, Regional Operation Centres and State Operations Centre. Large aerial tankers not previously seen in Queensland were used, as were vital fire line scanning technologies.

Informed decision-making, supported by intelligence, was instrumental in preventing loss of life. Aircraft, satellite imagery and ground crews collected vital fire information, and location-specific weather forecast intelligence was provided by the Bureau. This information combined with the predictive bushfire modelling capability of Fire Behaviour Analysts, to provide quick and accurate fire predictions to assist decision makers. The effort to fight the fires was well regarded and widely recognised by landholders and agencies alike, even by those who had more critical views of other aspects of the event.

Firefighting support

Queensland Police Service

QPS officers attending the fire operation centres played a significant role in facilitating information flow and improving responsiveness. The co-location of QPS and QFES forward command posts in the Mackay district worked well. QPS officers provided traffic control, acted as liaison staff in Incident Control Centres and Local Disaster Coordination Centres (LDCCs), managed evacuations and staffed evacuation centres. The quick establishment of the evacuation centre for Gracemere (near Rockhampton), under considerable time pressure, is noteworthy.

The size and flexibility of the QPS enables officers to be deployed from other parts of the state to manage fatigue and free up local officers for response. The event was at times a challenge for all agencies. QPS officers' training and experience in decision-making under stressful conditions paid dividends here.

Local government

As information came to hand, local governments and their local disaster management groups reacted appropriately to support their communities in the event, providing equipment, logistics, and support for evacuations where necessary. Local governments not directly impacted by the event, and with the capacity to do so, played a critical role in supporting those who were.

The Council to Council (C2C) program, formally recognised during the 2012 Queensland Flood Commission of Inquiry, was utilised by Gladstone Regional Council. Disaster Management Officers (DMOs) from Ipswich City Council and Moreton Bay Regional Council were deployed to assist during the bushfire event. This enabled Gladstone Regional Council staff to more effectively manage fatigue in the LDCC, adding capacity to the local government's ability to respond to community needs. It is also an effective way for other local governments to gain experience in a hazard of a type and scale not normally seen in Queensland, better equipping them to manage these conditions as they become more frequent and widespread in the future due to climate change.

Queensland Ambulance Service

The QAS State Local Ambulance Service Network (LASN) operations deployed a total of 53 staff (paramedics, supervisors, emergency medical dispatchers) for counter-disaster operations relating to the bushfires. Deployed officers were primarily used to support firefighters and volunteers on the ground as well as supporting Service Network core business continuity. Staff were provided from all over Queensland. Like QPS, QAS officers supported evacuations, staffed evacuation centres and provided liaison officers to LDCCs. They supported the evacuation of an aged care facility as part of the Gracemere evacuation. The Office is pleased to note the proactivity of the QAS's Central Queensland Service Network in orienting deployed staff and then routinely obtaining feedback from them about how the orientation could be improved.

Finding 4: Overall, the effectiveness of firefighting and support agencies' response to the bushfires was successful and received acknowledgement and praise from many areas.

Evacuation

Evacuation arrangements are complex. In disasters, they are a measure of the extent to which responding agencies work together effectively to deliver community outcomes. There are several bodies of work that describe the stages of evacuation and guide how they should be carried out, which the Office has recently reviewed in the Queensland context. Across the five phases of evacuation (Decision, Warning, Withdrawal, Shelter, and Return[59]) the Office expects to see entities actively engaged in creating a common situational awareness, so that decisions can be made based on the most accurate, current intelligence available.

In this review the Office looked in detail at the evacuation of three places: Sarina Beach, Gracemere and Deepwater. Case following studies of these areas are placed throughout this report to elaborate on certain points. The case study below illustrates responding agencies working together effectively in challenging circumstances.

CASE STUDY: A COORDINATED RESPONSE TO THE EVACUATION OF SARINA BEACH

The fire which threatened houses at Sarina Beach and Campwin Beach was not classified by the Office as a major fire during the events of late November and early December 2018. Although a relatively small fire, one officer described it as the most challenging incident faced during the entire event within the Mackay region due to frequent situation changes. Another officer involved in coordinating the incident told the Office that they did not know who was in charge at any point. However, in that officer's view, this created flexibility which allowed all agencies to do what was needed to manage the event holistically.

Residents first identified a vegetation fire around 4pm on 28 November. Reports indicate that the first Triple Zero call was made at 8:46pm, with QFES crews arriving at 9:05pm, at which time QFES records state that there was no fire in evidence. A second Triple Zero call was made at 10:15pm, and QFES was on the scene by 10:38pm and remained to respond to the fire. Around the same time, the LDCC in Mackay closed overnight as they were unaware of a risk of current events escalating. The online QFES Newsroom posted at 1:30am on 29 November that crews were working to contain the fire with no immediate threat to property.

It had been determined that the conditions forecast for that evening would be suitable for backburning to create containment lines. QFES's firefighting services controlled the fire. The support of State Emergency Service (SES) and the QPS was integral. However, at approximately 1:45am, the wind changed. This caused the situation to rapidly escalate, placing homes and property at risk of an uncontained fire.

Decision

The Office expects evacuations to be initiated by an agency with the authority to do so. The control structure is expected to adapt from incident management to a coordinated, interagency response to the larger event. Due to the rapidly changing conditions and the imminent risk to life and property, the primary agency on the scene (QFES) decided that Sarina Beach and Campwin Beach townships needed to be evacuated. QPS issued a declaration under the *Public Safety Preservation Act 1986* (the PSP Act) to direct the immediate evacuation of all at-risk residents. Mackay Regional Council was advised of the escalating event and subsequent evacuations.

Warning

During the warning phase of an evacuation, the Office expects to see timely warnings being issued which are responsive to community needs and reflect an integrated approach between relevant agencies. At 1:50am QFES sent an Emergency Alert to Sarina Beach residents with an associated emergency warning. At the same time, the QFES Newsroom issued Leave Immediately advice with Standard Emergency Warning Signal. At 2:00am, Mackay Regional Council stood the LDCC back up to provide support to this event. While QFES worked to regain control of the fire and protect properties, the SES and QPS door-knocked the approximately 90 households in the direct line of the fire, to ensure that all residents were aware of the danger. Mackay Regional Council mobilised heavy machinery and water tankers to assist with the response at the request of QFES staff on the ground. While this was happening, the fire approached the only access road for the community which limited the potential for the community to withdraw.

Withdrawal

When conducting the withdrawal of a community during an evacuation, the Office expects to see coordinated operations conducted in a planned manner by the agencies involved. During this event, the Office heard that existing withdrawal plans for this community were not used, as they had been developed for use in a slow-moving wet event such as a cyclone and were inappropriate for a severe and rapid bushfire event.

Rapid, coordinated decision-making was employed by all agencies. A suitable withdrawal plan was quickly developed between QFES, QPS and Mackay Regional Council, which determined that the waterfront was the nearest safe place to which to withdraw. The community of approximately 200 people was directed to evacuate to the beach as the road out of the Sarina Beach township became impassable. From the initial emergency warning to the completion of the evacuation of all people at risk, 45 minutes elapsed.

Shelter

Initially, the sheltering phase of this evacuation used a place of refuge – the beach – rather than an evacuation centre. However, while the community waited for the immediate threat to pass, the disaster management system was coordinating plans for their relocation.

From the LDCC, Mackay Regional Council organised two buses to wait at a staging area outside of the impact zone. These were to be available for later use in transporting community members to an evacuation centre that was being established in Sarina, once conditions allowed them to access the beach. SES flood boats equipped with medical kits were deployed, to be stationed at the beach in case urgent medical attention and transport were required.

Most community members from Sarina Beach and Campwin Beach chose to seek alternate accommodation when the road re-opened rather than attend an evacuation centre. This is what the Office would expect to see in an effective sheltering phase of evacuation. The Office also expected to see the evacuation centre set up and managed by appropriately trained people from the responsible agency. Mackay Regional Council set up and operated the evacuation centre in accordance with their plans.

Return

When making plans to return an evacuated community to their homes, it is expected that the appropriate agencies agree with the initial decision to return. The return of the community to Sarina Beach and Campwin Beach was initiated once the PSP Act declaration was lifted by QPS at 9:24am the same morning.

The Office expected to see information about return being disseminated to the community in a timely manner. At 6:45am, the warning for this incident was downgraded to Advice: Stay Informed. The Office heard that some community members had returned to their homes directly from the beach once the immediate danger had passed. Others began returning home prior to the PSP Act declaration being lifted. People who had taken shelter in the evacuation centre were officially advised that it was safe to return at 11:30am and were able to do so with minimal assistance from the local group, which again provided a bus to assist those who needed it.

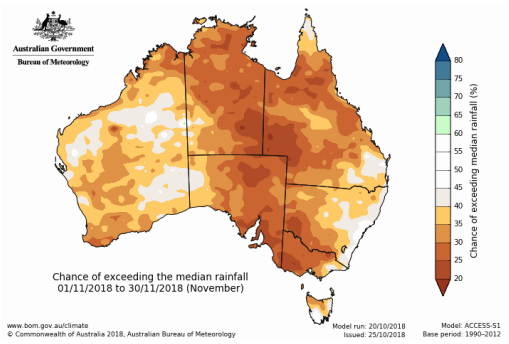
A final message was posted by the QFES Newsroom at 6:30am on 30 November advising QFES were no longer required on scene. The only damage recorded to property in this incident was the loss of two sheds and some scorched fencing. All lives and property were effectively protected by a well-coordinated, multi-agency response.

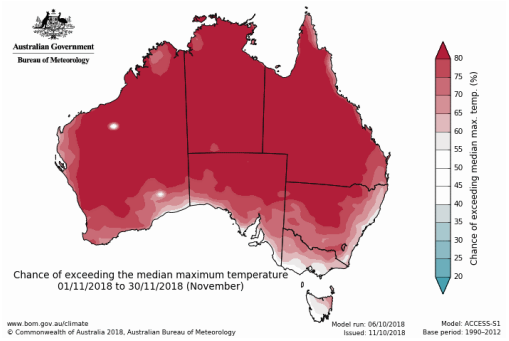
THE 2018 QUEENSLAND BUSHFIRES REVIEW

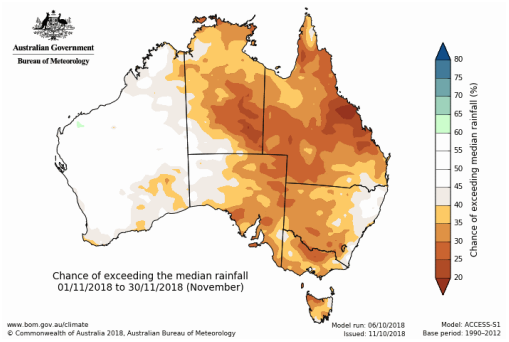
UNDERSTANDING THE SCIENCE AND THE RISK

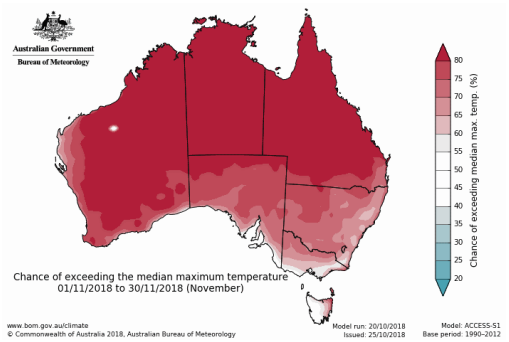
Having reviewed the heatwave that preceded the fires, and acknowledged the bushfire response, the Office considered it important to understand the scientific background to these events, to answer the questions: 'should Queensland have been surprised?', 'what should Queensland look for in future?' and 'how does this fit with Queensland's current understanding of bushfire risk?

Burn scars in the sub-tropical rainforest, Dalrymple Heights.
Photo credit: Inspector-General Emergency Management









Seasonal outlooks for rainfall and temperature for November 2018. Source: Bureau of Meteorology

Understanding the science and the risk

Having reviewed the heatwave that preceded the fires, and acknowledged the bushfire response, the Office considered it important to understand the scientific background to these events, to answer the questions: 'should Queensland have been surprised?', 'what should Queensland look for in future?' and 'how does this fit with Queensland's current understanding of bushfire risk?' Alongside the Office's research, the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC) provided two reports that address the science behind the event and outline lessons identified from relevant case studies.

BNHCRC evidence and commentary

The science behind the Queensland bushfire and heatwave event

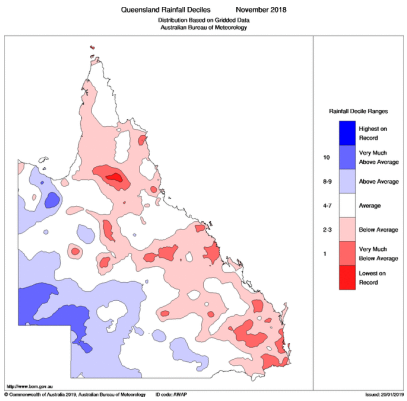
The first report describes the science and meteorology of the drought and heatwave conditions which led to the November–December 2018 bushfires. It confirms that the conditions of greatest impact occurred between 24 November 2018 and 4 December 2018 – the 'critical period.' The report contrasts the indicators leading up to the critical period against seasonal climatology and the predicted outlooks, to give insights into why the catastrophic fire weather occurred. The insets below paraphrase the first report.

> The Northern Australia Seasonal Bushfire Assessment (NASBA) is prepared annually by the BNHCRC from contributions from QFES and other fire management agencies. It informs fire authorities and assists them to make strategic decisions to reduce the negative impacts of bushfire events.[60] Even before the NASBA was published in July 2018, climate anomalies were observed in Queensland. The state had experienced sustained drought conditions. Below average rainfall and above average temperatures led to far below normal soil moisture values. Using data from the Bureau's seasonal outlooks and fuel assessments, the NASBA highlighted the Central Coast and Capricornia regions as at risk from 'above normal bushfire potential' in forested areas.

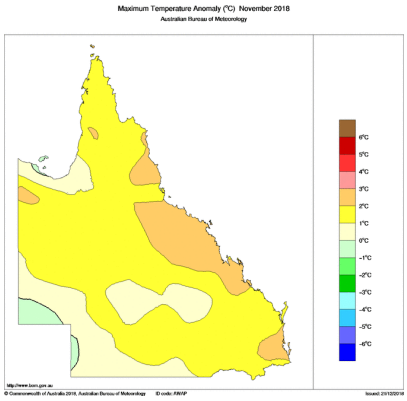
Conditions did not improve up to, and during the critical period. Rainfall and atmospheric humidity were well below the annual average, and temperature anomalies were observed. Over the southwestern regions of Queensland, the temperature anomalies were dramatic. The regions most affected by fires had also experiencing a sustained period of below-average humidity over several months. The strongest effect was in November during the critical period. Only the southeast of Queensland experienced fairly substantial rainfall in October. However, the soil moisture modelling indicates that it was eliminated from the system quite rapidly, and would not have had a large effect by late November.

The resultant lack of moisture caused vapour pressure, a variable unaffected by temperature, to reach figures which were well below the normal threshold. Alongside this, soil moisture – a statement of the combined interaction of these variables – indicated that, on average, soils within the Capricornia region were much drier than previous years. The Keetch-Byram Drought Index (KBDI) is a tool which estimates soil moisture depletion in the upper soil levels. The value is a direct representation of the amount of rainfall in millimetres required to return the soil to saturation.[61] Data for Mackay, Rockhampton, Cairns, Amberley and Townsville was calculated with sustained values well above the climatological mean for the season. While the highest KBDI values were not unprecedented, at Mackay, Cairns and Rockhampton the accumulated sustained deficit was the third highest in 75 years (upper 5–10%) and was far greater than the predicted seasonal climatology. Overall, the high consistency of the Bureau's seasonal outlooks between June and October 2018 give confidence in the NASBA assessments.

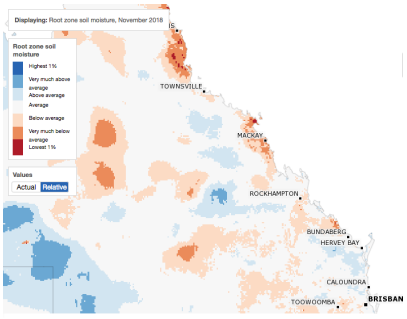
Prior to November 2018, a large pool of hot air formed in the southwest of Queensland. During the critical period it was carried through to the central coast. In this time, a number of maximum temperature records were broken across Queensland (some by large amounts) and at several locations, with previous records exceeded on multiple days. Temperatures in Cairns reached very high levels, rising above the historic record by 5.4 degrees Celsius, far exceeding the previous record gap of 0.3 degrees Celsius. It is not unique to break temperature records many times during an event. However, the sheer number of records set in November over multiple days and areas *was* unprecedented.



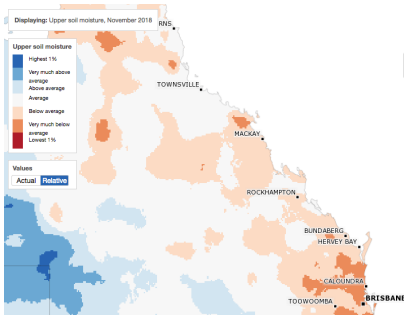
Queensland rainfall deciles, November 2018.
Source: Bureau of Meteorology



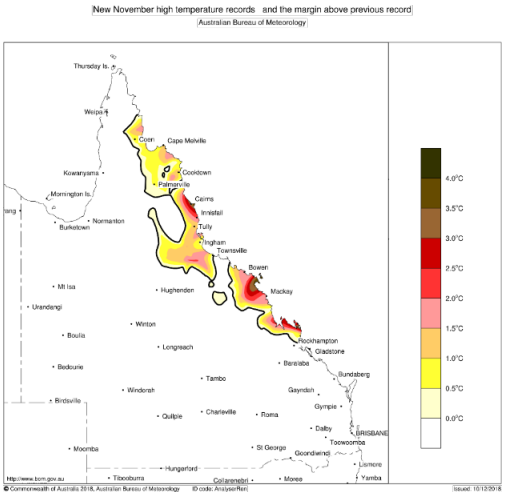
Maximum temperature anomaly (°C), November 2018.
Source: Bureau of Meteorology



Root zone soil moisture, November 2018.
Source: Bureau of Meteorology



Upper soil moisture, November 2018.
Source: Bureau of Meteorology



New November high temperature records and the margin above previous record. Source: Bureau of Meteorology

While heatwave conditions do not in themselves define extreme fire weather, they do provide several of the ingredients that contribute to it. Further studies of the relationship between fire weather and heatwave conditions in Queensland coastal environments may prove instructive.

Analysis of heatwave intensity measures indicates that severe or extreme heatwaves along the Queensland coast are not unprecedented. There is some indication that their frequency has increased in recent decades. Large-scale circulation anomalies that contribute to heatwave formation were observed in the months leading up to the critical period. The anomalies comprised of a mid-tropospheric anticyclone, slow moving near-surface systems and a significant lack of soil moisture. Climatologically rare westerly winds of a strength not observed until now moved the pool of hot air through to the central Queensland coast. Further investigations also found relative, episodic low levels of humidity were maintained over the month of November, resulting in widespread atmospheric dryness. Elevated Forest Fire Danger Index (FFDI) values were observed across the central Queensland coast and reached catastrophic levels on 28 November 2018 at Rockhampton and Emerald. While these values rely on temperature, humidity and drought factor, the sustained 40-kilometre per hour westerly winds caused the FFDI spike.

The Continuous-Haines (C-Haines) Index is used to measure the potential for dry, unstable air to contribute to the development of large or erratic bushfires. It has been adapted for Australian conditions. Although this measure is indicative of erratic fire behaviour, there is no direct correlation. The index combines measures of the vertical rate of change in air temperature and the change in moisture content of the lower atmosphere to provide a score out of 13 (theoretical maximum). A value is considered high if it exceeds the 95th percentile value for the location.[62] During the critical period, the C-Haines Index in Rockhampton recorded several spikes above this threshold and the values were close to the theoretical maximum.

Predicting the worst fire weather conditions is more difficult than predicting 'typical' conditions, as it involves predicting the highly unusual. The predictability is very dependent on context: what is being predicted, the degree of accuracy required in the forecast, and the duration of an outlook. The Bureau is developing a system, based on ensembles of forecasts, to increase the warning time for forecasts of the most extreme

conditions. This system, used in medium range (0–10 day) models to generate seasonal outlooks, can also provide authorities with a range of outcomes – including best and worst cases – rather than just the scenario most likely to occur.

The first report shows that Queensland received fair warning of an above-normal bushfire potential in the areas subsequently most affected, but that conditions, often locally focused, worsened to a surprising extent.

The indicators of a severe fire weather season were present in the months before November, but the coinciding weather conditions in the last week made the event unprecedented. The first report also provides indicators of what Queensland might look for in the future. These are covered, together with lessons from the second report, in later paragraphs.

Lessons and insights from significant bushfires in Australia and overseas

The BNHCRC's second report analyses literature from comparable events within Australia and internationally. The report highlights lessons identified from 13 separate bushfire case studies written in recent years. Climate change is a key driver for an increased frequency of significant or disastrous bushfire events.

With one or two exceptions, most of these recent wildfire events were preceded by drought and occurred during heatwaves. In many cases the drought and heatwaves were unprecedented but were not unexpected.

Without exception, the fires featured in the case studies overpowered, overwhelmed and outpaced the suppression and other response efforts of emergency services personnel. The events were only controlled when they ran out of fuel or when the weather conditions changed substantially. As a result, authorities involved in all case study fires accept that climate variability is now a reality. Out-of-scale events are more commonly being classed as normal, and authorities and communities are struggling to adequately prepare for them. The case studies reviewed are shown in the table below.

A high price has been paid for the lessons collected from the case study fires. The bushfire events reviewed came at a combined cost of almost 500 lives and an economic cost of approximately $40 billion. They provided more than 200 lessons and insights. Of these, the BNHCRC report highlighted lessons which, due to their importance and prevalence, are worthy of detailed explanation. The lessons are categorised according to their relevance to each disaster management phase. The following paragraphs paraphrase BNHCRC's work on the second report.

National Case Studies	International Case Studies
'Black Saturday' fires, Vic. 2009	Canada fires 2011
Wambelong fire, NSW 2013	Canada fires 2016
Dunalley fire, Tas. 2013	California fires 2017
Sampson Flat fire, SA 2015	Chile fires 2017
Pinery fire, SA 2015	Greece fires 2007
Waroona fire, WA 2016	Greece fires 2018
	Portugal fires 2017

Table 3: List of national and international case studies

Prevention and mitigation

The first lesson is about **the need for fuel hazard reduction on three different levels.** The first level is the broad landscape, comprised mostly of forest fuels resulting from a lack of prescribed burning, negligent land use practices, a lack of forest management infrastructure maintenance and alteration of a forest's purpose (i.e. production forest converted to national park). The second level deals with the build-up of fuels in the rural/urban interface. Recent expansion of the population has been ill-managed and uncontrolled resulting in many communities living amongst forest and natural vegetation, which considerably increases their risk. The final level is the build-up of fuels in backyards, accumulated over time and consisting of natural and human-made materials. The abundance of fuel at all three levels made it extremely hard to manage the fires. Wind changes made them uncontrollable. Reducing fuel build-up at all levels is considered better than preparing narrow, cleared buffers around communities. Experience shows that bushfires that develop in the broader landscape under severe fire weather conditions will breach those buffers. In all cases, fires were started by long- and short-range spotting and ember attacks. The case studies and research suggest that **prescribed burning needs to reach a yearly threshold of eight to ten per cent of the landscape to reduce risk.**

In many case studies, the **fires were started by the electricity distribution network and infrastructure**. During hot and windy conditions, powerlines sag and are thrown around. When lines break and fall, they can ignite vegetation. Maintenance of the distribution network is vital to reduce bushfire risk. Authorities need to work with utility providers to accomplish this.

While tools can be used to infer patterns and monitor indicators, authorities cannot accurately predict the time or place of future droughts and heatwaves. Alongside this, many Australian vegetation types with no previous history of burning are drying out and posing a greater risk. **Authorities can no longer rely on past events as a guide to the future.**

Adopting a focus on **lessons management enables good practice to be identified and embedded through action and change.** This approach encourages communities and authorities to embrace shared responsibility for future disasters by being better educated and prepared.

A number of case studies found that the authorities did not monitor growth in population on the edge of the bush. Authorities were unaware of the increasing risks due to land use changes and the resulting build-up of natural and human-made fuel. Much of Australia now adheres to stringent building codes to optimise mitigation efforts. However, as the codes do not apply retrospectively, there are many legacy buildings at risk. The lesson is that authorities need to be vigilant and continually assess and understand the cumulative risk, while also **maintaining up-to-date bushfire law and enforcement capability** for prevention and mitigation.

Preparedness

There is a strong need for responsible agencies to continually reassess or evaluate the arrangements, preparedness, resources, training, capability and capacity of emergency services in the light of climate change. **Historic skills and methods are not necessarily a good basis for the capabilities required of future disaster events**. Emergency services need to adapt to the changing climate and continually assess their capacity and capability. Decision makers must regularly assess whether emergency services and land managers are appropriately resourced to prepare for future fire events.

The case studies highlight the importance of timely public warnings, and the need for authorities to clarify what action the community needs to take.

Another important lesson accepted in Australian jurisdictions is the need for **ongoing updates to the statewide status of the bushfire hazard**. Authorities must understand where the fuels are in relation to people and assets. There needs to be evidence-based prioritisation of fuel load mitigation, and how communities and emergency services can prepare for significant bushfires.

Internationally, case studies indicate a large number of lives and houses were lost due to an absence of regulation for people building in fire-prone areas. Authorities need to continually manage and assess urban development and planning regulations. By-laws or regulations need to ensure any urban or community development occurring in or around bushland needs to account for the elevated bushfire threat. This needs to be coupled with appropriate fire-based building codes, all of which can help to educate and inform communities.

Response

The case studies highlight the importance of **rapidly detecting and responding to a bushfire outbreak with the adequate resources and capacity.** In many of the case studies, the outbreak of the fire was not detected for some time, and there was a significant delay in organising the response. Authorities need detection systems in place to forecast periods of high fire danger, to prepare the community to be ready for a bushfire. In Australia, jurisdictions increase their capability and capacity to respond to events by sourcing resources from other jurisdictions (nationally and internationally). There is however, an emerging world-wide overlap of fire seasons due to climate change, which will limit the future availability of resources. If they are to be planned for effectively, there is **a need for a statewide risk-based framework to address regional emergency response arrangements.**

The case studies also found that the authorities experienced confusion **about their incident management structures due to uncertainty about their roles, functions, leadership and decision-making.** Bushfires are dynamic, fast-moving phenomena that are extremely time sensitive. As such, incident management teams must be assembled quickly and work effectively to supress the fire. This issue has been prevalent within historic disasters and was highlighted in the 1939 Royal Commission into the Victoria Bushfires. A possible solution is to provide regular training and scenarios for emergency services with the involvement of multiple agencies. A further solution is to have pre-incident agreements in place which clearly identify who will be in charge and clarify the roles of relevant agencies and individuals. Many Australian jurisdictions have incident management teams which are set up and placed on standby prior to the bushfire season. These teams may span multiple agencies and are able to work seamlessly, as they train together, know each other, and know how to operate within a disaster event.

Most case studies also showed that pre-planning by authorities did not adequately prepare them to respond to the fire events. Many of the events were large and utilised hundreds of personnel and assets. **Resource tracking systems can enable more effective logistical support and reduce the exposure to risk for the deployed personnel.** The systems would enable authorities to make sensible, strategic decisions about the allocation of limited resources and the location of their personnel and assets.

Effective suppression requires early fire detection. **Augmented intelligence systems can assist to manage information flows within a dynamic environment.** Planning units or intelligence teams are often overwhelmed with information which can ultimately reduce overall efficiency. While Australia uses bushfire spread simulators to perform similar tasks, these tools are basic and only provide a fraction of what is possible.

Recovery

Although most case studies did not address the recovery aspects of the disasters, those which did considered them to be critical to community resilience. A strong emphasis was placed on **prior implementation of recovery plans, the importance of rapidly restoring essential infrastructure and services**, as well as the **dispatch of rapid damage assessment teams**. The way in which authorities respond or implement recovery actions depends largely on the assessments including the welfare and wellbeing of communities. These assessments need to be done rapidly and efficiently. The restoration of infrastructure and crucial services accelerates the overall recovery process and allows for those injured to be treated and evacuated.

The case studies also indicate a need for a **seamless transition from response to recovery, meaning that incident controllers at various levels need to start thinking about recovery while the incident is unfolding**. This will provide the community with support and resourcing in the difficult period immediately following the event. Recovery involves multiple agencies including state and local government. The case studies suggest **local governments perform a pivotal role and need adequate resources, training and capability.**

Summary of key insights:

Queensland can take comfort that it is addressing a number of these lessons. The programs of climate adaptation, lessons management, revision of warnings, and the State's recovery experience are ongoing. Although outside the scope of this review, the importance placed on recovery here is worth noting. During this review the Queensland Reconstruction Authority (QRA) has raised the need to consider the cumulative effects of disasters on communities.

There appear further opportunities to build on other lessons. The two reports together contain

common themes, that the Office found are relevant to Queensland. They are extracted as a summary below.

> The future has an increased potential for catastrophic bushfires as a consequence of climate variability, increased fuel availability, population growth at the rural-urban interface and land use changes. This means that communities need to be better educated, prepared and embrace the concept of 'shared responsibility.'
>
> Fire managers and emergency services will also need to be better prepared, trained and resourced to undertake diverse activities. These include risk assessment, hazard mitigation, fire prevention and suppression, community engagement, and disaster recovery.
>
> Urban development will need to include a more thorough appraisal of bushfire risk and building standards to account for the worsening projected bushfire potential.
>
> Emergency services and the broader community will need to adjust to the changing fire-proneness of regions and regional vegetation types that historically were not prone to fire.
>
> In almost all case studies, the fire disasters were preceded by drought and heat wave – in some cases, of unprecedented severity.
>
> Having adequate early warning systems in place is the key to implementing adequate mitigation and preparedness measures. It is not yet possible to reliably and accurately predict the time, place, and severity of drought.
>
> Landscape prescribed burning is not a 'panacea', but it is the cornerstone to managing the bushfire threat. The case studies also demonstrate that suppression, community protection barriers and other measures of preparedness fail when challenged by large, fast spreading, high intensity landscape fires.
>
> A reliance on suppression alone, including the deployment of aircraft, will likely fail under severe weather and heavy fuel conditions, especially when there are multiple synchronous outbreaks. Therefore, it is critical to get the right balance between expenditure on hazard mitigation and suppression capability.
>
> It is essential to understand the geo-spatial bushfire risk to communities and other critical assets. This should inform communities, inform planning and prioritising of risk mitigation measures, and help update incident response plans.
>
> All new buildings in bushfire-prone areas should comply with modern building codes to ensure they incorporate measures to reduce the risk of ignition from ember attack.
>
> Timely (early) assessment, dissemination and communication of public warnings is critical for informing and preparing communities. Linked with this is the need to provide, or identify community refuges, have in place sound and well communicated evacuation plans, and the need for better community bushfire safety education programs.
>
> From the case studies, there are numerous insights and lessons for fire and emergency services and the broader community on preparedness and incident response. These include the need to ensure;
>
> - clarity of authority, roles and functions within and between emergency services agencies, state-level emergency structures, local government and relevant Ministers
> - clarity around the roles of state and regional operations centres and how they interact with each other, with IMTs and with local government
> - the need to improve the flow of information within Incident Management Teams and, and between [these teams] and the various state and regional operations centres
> - better integration of local rural knowledge and of volunteer brigades
> - integrated communications technology and interoperability
> - better augmented intelligence systems to assist decision makers manage the barrage of data associated with major fire incidents.

In the context of '*what should Queensland look for in future*?', it may be difficult to forecast severe fire conditions. However, there are several factors that act as red flags or indicators to alert authorities to future events. The Office carried out some additional work with an expert meteorologist to draft a table of measures.

The Office is aware that QFES already monitors these measures through presentations from the Bureau, which are a standing agenda item at bi-weekly statewide video conferences. They are shown below to inform a wider audience. Queensland needs to continue to monitor climatic and fuel conditions, including the parameters in the tables below, and to apply any new science and technologies as they emerge.

Red Flags (trigger further investigation)	Measures
Rainfall	» Look for sustained periods of lower than average rainfall
Temperature	» Look for heatwave conditions » Look for monthly maximum temperature anomalies 2–3 degrees above average
Relative humidity	» Look for sustained periods of below average relative humidity » Consider overnight humidity recovery – any time where overnight relative humidity is substantially lower than normal expect an increased risk the next day
Atmospheric humidity	» A sustained period of below normal humidity may have an effect on fuel dryness » For climatological monitoring a conservative (independent of temperature) measure of humidity (vapour pressure, mixing ratio, dewpoint) should be used » Need to examine the diurnal (daily) variation
KBD Index	» A simple model of the amount of rainfall in millimetres required to return the soil to saturation » Values above the 90th percentile/or what is considered unusually high and above the long-term average are a trigger
C-Haines Index	» Combines atmospheric moisture and stability to flag the potential for higher than expected fire activity if ignition occurs » Does not currently have a directly quantified nor qualified relationship to fire behaviour » Thresholds yet to be established, but relative to some higher percentile of local climatological distribution is a potential red flag » Climatologies should be based on the forecast or observed data that are being used operationally

Table 4: Indicators for future events and their measures

Indicators	Details
Forest Fire Danger Index (ties in with multiple other indicators)	» Look for forecasts of FFDI in the Very High and above ranges » Dependent on » Drought Factor (based on rainfall and evaporation) » Temperature » Relative humidity » Wind speed and direction
Soil moisture (Scientifically so much better than the KBDI)	» Look for pronounced deficit/below average root zone and surface layer soil moisture » Should be compared and calibrated with KBDI » Look at root zone for live fuel dryness » Look at surface layer for litter dryness » Quantitative relationships between current and accumulated soil moisture deficits and fuel state should be established to optimally use these data (a research project).
Fuel assessments	» Need to be done at all levels (in the bush, on its edge and in yards) » Look at soil moisture, vapour pressure and relative humidity
Wind Strength	» Critical for enhanced fire danger, with FFDI increasing exponentially with increasing wind speed
Vector wind patterns and direction*	» Look for wind coming from the centre (westerly winds) rather than the coast (easterly winds) » Look for changes in the flow pattern over QLD which can create a pathway for hot air to travel to the coast
Anticyclones and heatwaves	» High pressure system – 'generally associated with lighter winds and fine and settled conditions' » Look for the presence of a slow moving, mid-tropospheric systems » Cross reference with monitoring screen level temperature anomalies and soil moisture anomalies

**This indicator is specific to the Queensland coast.*
Table 5: Current indicators already monitored by Queensland Fire and Emergency Services

The two BNHCRC reports provide clear insights about this event, and similar events in recent years. Other observations suggest that the unprecedented conditions of this event may become more common in the future. Emerging research suggests that the rate of climate change is increasing. The *Queensland Climate Adaptation Strategy* states that climate change is likely to result in harsher fire weather, reflecting hot, dry, windy conditions in the future. Queensland's preparation for, and mitigation of, the impact of future events will be enabled if the precursors are understood, and the lessons of other events really learned.

Finding 5: Scientific analysis confirms that conditions during these events were unprecedented. Importantly, there are broader authoritative indications that similar conditions may become more prevalent in the future. The research shows that lessons from previous events around the world support this.

Recommendation 2:

Wherever possible, the antecedents that will lead to catastrophic fire weather conditions existing for a particular area should be identified and documented within fire management plan relevant to the area.

The extent to which bushfire risk is understood

To understand how the research fits with the current understanding of bushfire risk, the Office looked for State and local government perspectives.

The *Queensland State Natural Hazard Risk Assessment 2017* sets out Queensland's current approach to both heatwave and bushfire risk.[63]

> Heatwaves, arguably due to their less violent, slower onset and less publicised nature, have only more recently begun to be recognised at a true level of risk. Climate projections indicate generally hotter conditions, with the Bureau of Meteorology and Queensland Health working collaboratively on the Heatwave Service to align service response with weather forecasts.
>
> Heatwaves have a broad range of potential health effects impacting mortality rates for vulnerable persons as well as potential impacts on essential services. Heatwaves are also one contributing factor, from a multi-hazard perspective, in the increased hazard of bushfire. Managing the risk associated with heatwaves is Queensland's equal third priority.
>
> Bushfire is a frequently occurring event in Queensland however is generally very well managed and often occurs in areas less densely populated. While this can reduce the risk to life there is still the potential for a range of significant economic impacts to Queensland agriculture, industry and tourism. Bushfire Prone Area mapping is used within land use planning and mitigation operations along with predictive analytics and fire weather forecasts to proactively manage this hazard before risks manifest. Bushfire risk is Queensland's fourth priority.

To provide context for this rating, there are seven risks identified in the *Queensland State Natural Hazard Risk Assessment 2017*. At fourth priority, bushfire is rated behind five of the other risks, some of which are given equal priority.

At the local level, the three local governments which were heavily impacted by the 2018 bushfires were Rockhampton Regional Council, Gladstone Regional Council and Mackay Regional Council. These local governments, like most, adopt a disaster risk approach which reflects their varied geographic regions and climate. Although they all mainly lie on coastal land, each has specific variables that they must consider.

Mackay Regional Council, the most northern of the three, is classified as part of the 'wet tropics' and is comprised of large quantities of tropical rainforest and wetlands.[64] The majority of the region is low-lying with the city of Mackay sitting on the coast. Much of the land around the city is used for agricultural purposes and is comprised mostly of sugar cane fields. Overall, the region receives, on average, high levels of rainfall and, as such, is surrounded by rainforest that does not have a history of burning.

Gladstone Regional Council is the southernmost of the three local governments and falls under the 'east coast cluster' which encompasses areas from Rockhampton to Sydney.[65] Located further south along the coast than Mackay, the region receives significantly less rainfall and as such is persistently drier. Situated directly on coastal land, the city of Gladstone is bounded on the west, south and east by various coastal ranges and falls under a sub-tropical, sub-humid climate.

Rockhampton Regional Council lies in between the other local governments, slightly north of Gladstone, and is similarly part of the 'east coast cluster.' Rockhampton city is situated approximately 40 kilometres inland from the ocean and experiences a humid, sub-tropical climate. The city is bordered by Berserker Range on the east, the Athelstane Range to the west and is located at the base of the Mount Archer National Park. The park is comprised of 'mostly open eucalypt woodland with patches of vine scrub' and has a distinct history of fire incidents.[66]

The conditions alter how each local government perceives the risk of bushfire events in their local disaster management plans. Of the three local governments, Mackay Regional Council tends to prioritise bushfires lowest due to a lack of historical burning in the surrounding rainforests and the 'wet tropics' climate. Their local plan states that:

> *Mackay City and other communities throughout the region have not had a history of being subjected to or threatened by major bushfires and there is no evidence that this situation should change in the future if monitored diligently.*[67]

While they defer to the lead agency (QFES) during an event, they do not have a bushfire specific arrangement in place and instead treat the risk under a more generalised approach. Overall, their plan does account for some level of bushfire risk. However, it is mostly directed towards addressing the pattern of historic coastal threats.

Owing to a generally drier climate, Gladstone Regional Council places a moderate emphasis on identifying and addressing bushfire risk, stating in their local plan that 'the whole of the Gladstone region, including the outer areas of the City of Gladstone are at risk from bushfires.'[68]

Bushfires are subsequently classified as 'almost certain' to occur, however the associated consequences are identified as 'minor' (i.e. causing a minor disruption to the community) giving it a 'high' overall risk level. Gladstone Regional Council uses a threat-specific arrangement for bushfire events which assumes that the control of response activities will be undertaken by QFES, with Gladstone Regional Council providing assistance through its disaster management group.

Like Gladstone, the Rockhampton region experiences a drier, sub-tropical climate. Unlike the other local governments, Rockhampton Regional Council places a more substantial emphasis on identifying and addressing bushfire risk. They indicate that 'following repeated fires from 2007 leading to the extensive and catastrophic fires of 2009, the Mount Archer area has been the focus of recent fire management activities,' and; 'a coordinated approach to bushfire management is vital.'[69]

Subsequently, this local government has developed and implemented a hazard-specific sub-plan for bushfires which outlines the general arrangements for giving assistance during a substantial bushfire event. This involves the local government assuming that control will be held by QFES. Rockhampton Regional Council's sub-plan covers all aspects of a bushfire event by addressing: bushfire preparedness, proactive strategies, coordinated response at all levels and the implementation of a *Wildfire Readiness Plan* (noting that the terms 'wildfire' and 'bushfire' are often used interchangeably).[70] As a result, the Rockhampton Regional Council prioritises bushfires to the same degree as coastal weather events, classifying them as a 'likely' occurrence. Despite this, the associated consequences are only perceived as 'minor-to-moderate' giving bushfires an overall risk level of 'medium to high.'

Each local government provides varying bushfire risk resources on their websites. All use a public disaster dashboard which displays the location and description of all fire incidents within the region as they occur. They also provide public safety warnings and links to additional information provided by external sources. Rockhampton Regional Council and Mackay Regional Council both provide detailed maps identifying bushfire-prone areas for residents, however Gladstone Regional Council does not. Gladstone Regional Council provides a fire-related factsheet which primarily deals with health effects caused by fires and smoke and includes post-event recovery. Gladstone Regional Council also provides an all-hazards 'Ready' guide designed to prepare the community for a disaster event.[71] Mackay Regional Council provides a 'Types of Disasters' guide which briefly outlines some of the risks associated with bushfires and how to mitigate them.[72] However, most local government resources take an all-hazards approach or focus on coastal weather events. Rockhampton Regional Council provides detailed information as they prioritise bushfire risk to the same degree as coastal disasters. Their information covers many aspects of bushfires and is accompanied by the local government's 'Bushfire Management Strategy' guide which looks to 'provide a regional and strategic assessment of bushfire risk, identify priority areas of risk and outline coordinated, proactive and cost-effective processes in the management and prevention of this risk.'[73] It can be concluded that all three local governments provide their communities with risk-based information which is appropriate to their geography and their understanding of the bushfire risk.

To set these three local perspectives in context, it is important also to consider how future risk might look. The *Queensland Climate Adaptation Strategy 2017–2030* and recent publications supported by scientific research from reputable sources such as the Reserve Bank of Australia, the Climate Council and the Queensland Conservation Council, identify climate change is occurring within Australia.[74] This points to the unprecedented weather conditions observed in the months leading up to the catastrophic fire conditions of 2018 becoming more common.

The *Queensland Climate Adaptation Strategy* (the Strategy) outlines the changes which are occurring within the environment and the effects this will have on natural disasters. The Strategy predicts future bushfire events will be altered by:

- higher temperatures
- hotter and more frequent hot days
- fewer frosts
- harsher fire weather
- higher levels of drought.

The Strategy makes the point again that elevated temperatures and drier conditions will result in prolonged bushfire seasons across Queensland affecting regions which have historically had low fire risks. The impacts will be felt most in communities at the rural-urban interface due to excessively dry fuel build-ups combined with hot, dry and windy conditions. As a result, it is predicted that future bushfire events will occur more frequently and will be consistently more severe.

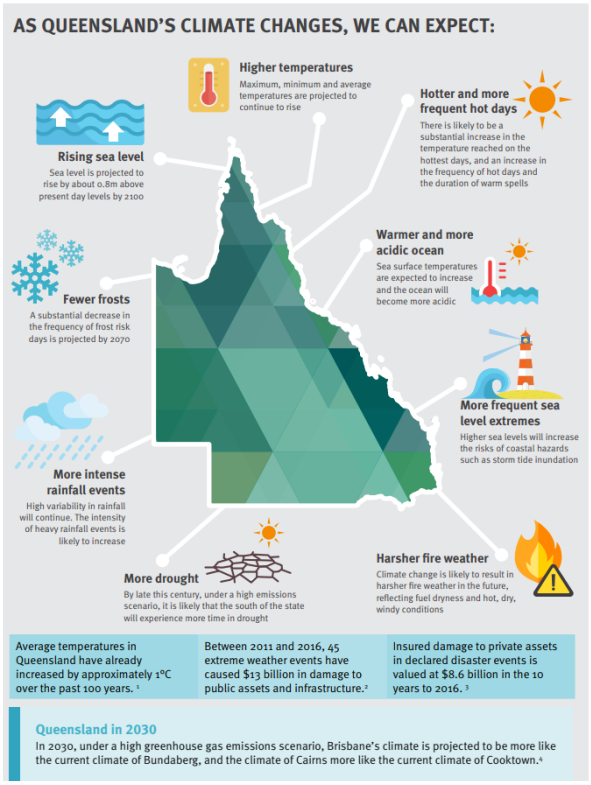
The science also identifies that Queensland will experience:

- a continued rise in sea levels
- more frequent sea-level extremes
- warmer and more acidic oceans
- more intense rainfall events.

While these factors will increase the intensity of traditionally 'wet' disasters like cyclones, models indicate the northern parts of Queensland will experience an overall drop in their frequency.[75]

The *Emergency Management Sector Adaptation Plan* identifies the climate adaption priorities to support the sector in managing climate change risks, engaging with the opportunities of a changing climate and building resilience.[76] The plan builds on existing disaster management arrangements and informs disaster management planning at all levels.

The State Plan emphasises the importance of risk and its management. It is important to note that risk is more than just the hazard. The Queensland State Natural Hazard Risk Assessment 2017 states that, in addition to likelihood and consequence, 'in order to identify and evaluate the best measures for reducing risk, an assessment should also analyse hazard, exposure, vulnerabilities and capacities, as well as the direct and indirect impacts.'



Source: Queensland Climate Adaptation Strategy 2017-2030

The prioritisation of bushfire risk relies, quite reasonably, on previous events and experience. In the light of this most recent event, with rainforests burning, and the science pointing to an increasing rate of climate change, it would appear reasonable to reassess the prioritisation of this risk and what is done about it.

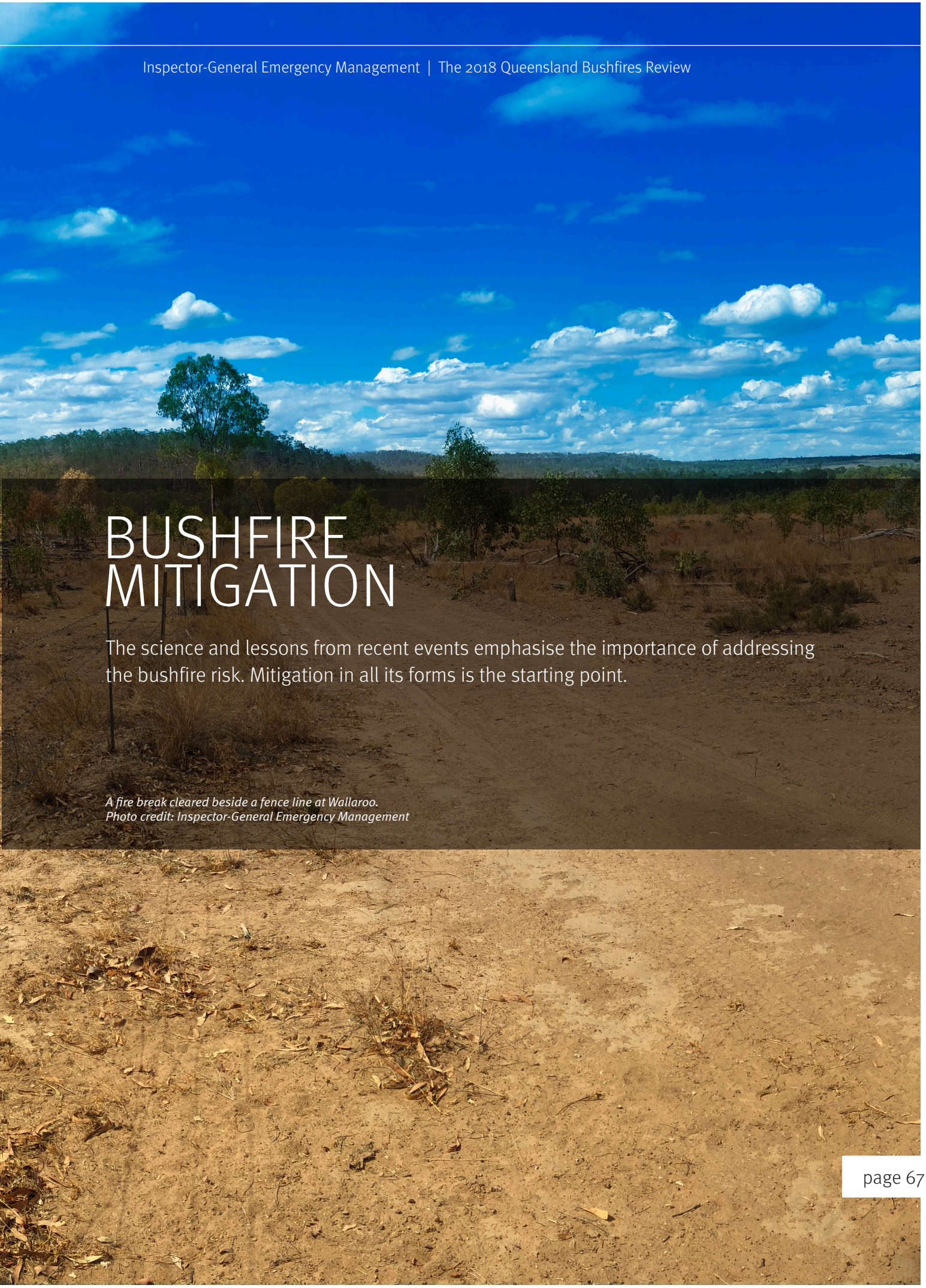
Recommendation 3:

The future risk of bushfires to Queensland communities should be re-evaluated as part of the 2020 State Risk Assessment in light of recent and emerging science, events and lessons.

THE 2018 QUEENSLAND BUSHFIRES REVIEW

BUSHFIRE MITIGATION

The science and lessons from recent events emphasise the importance of addressing the bushfire risk. Mitigation in all its forms is the starting point.

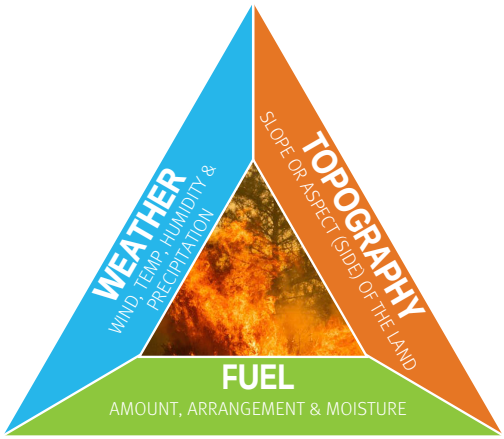


A fire break cleared beside a fence line at Wallaroo.
Photo credit: Inspector-General Emergency Management

Bushfire mitigation

The science and lessons from recent events emphasise the importance of addressing the bushfire risk. Mitigation in all its forms is the starting point.

Mitigation refers to the activities intended to reduce or eliminate risk, or lessen the actual or potential effects or consequence of an event.[77] Fire behaviour is critical to understanding bushfire mitigation. Topography, fuel and weather are the three key factors which influence how a bushfire behaves. If all three factors are strong, in that they 'favour' the conditions for a bushfire, the challenge of trying to manage the fire becomes immense. A fire is more manageable if any of these factors can be influenced.[78] Of these factors, only fuel can be influenced by people. There is little that can be done about slopes or the arrival of a hot, dry, windy day. Understanding the available fuel, including the size, moisture content and amount, are pivotal to understanding the speed and intensity of a bushfire.[79]



FIRE BEHAVIOUR TRIANGLE

Fuel and the management of fuel loads is a key focus of mitigation and hazard reduction strategies. Reducing the amount of fuel will directly contribute to reducing the intensity (heat) of a bushfire by reducing combustible material before a fire starts. High fuel loads create high intensity fires, which create significant convection heat (hot air rising) which, in turn, enables hot embers from the ground to be lifted into the atmosphere. Prevailing winds then carry the hot embers ahead of the fire, which starts more fires. This process is referred to as spotting. Reducing the combustible material can also contribute to reducing the likelihood of a fire starting.

Bushfire mitigation activities cover a wide range of methods which may be used to reduce the risk associated with bushfires. Bushfire mitigation should include both activities to reduce the likelihood of fire developing and damaging property, as well as mitigation activities to reduce the consequences should a fire occur. They include hazard mitigation measures such as prescribed burning, grazing, chemical treatment and more expensive mechanical techniques, as well as community resilience-building measures, such as property preparation and education. Hazard mitigation measures are important in enhancing the protection of people, property and the environment, and making communities more resilient to fire. Hazard mitigation activities prior to the outbreak of a fire relate to the actions which can be taken by landholders and land management agencies, assisted by fire agencies and at-risk communities, to prevent the loss of life and destruction of assets from catastrophic bushfires. Hazard mitigation activities include reducing the build-up of fuel over time to prevent a bushfire or reduce their impact.

Prescribed burning is defined as the planned application of fire, under prescribed environmental conditions and within defined boundaries, to achieve defined management objectives.[80] It is one of the most common hazard mitigation activities to reduce fuel, and is also considered one of the most cost-effective approaches. Many landholders and agencies regularly use prescribed burning to achieve land management objectives. These burns are done to protect life, property and other assets. Planned burns also manage ecosystems and help to protect and maintain biodiversity, habitat manipulation, weed control and forestry (silviculture) production. Planned burns have long been a part of the Australian landscape and have historically been performed by traditional owners or custodians to manage the landscape. Hazard mitigation burns are instrumental in helping to reduce a fire's speed, severity and potential effects.

Hazard mitigation that focuses on reducing fire intensity should consider the broader consequences of a fire occurring and the unintended damage and additional vulnerabilities it could cause. For example, reduction of fuel loads around a dam water catchment should also consider whether these activities might have a flow-on effect on water quality and availability.

The authorising environment for bushfire mitigation

There are several statutes which inform and cover bushfire mitigation responsibilities and activities in Queensland. The key legislation which creates the bushfire mitigation framework is the *Fire and Emergency Services Act 1990* (the FES Act). The FES Act establishes QFES and provides for the prevention of, and response to, fires and certain other incidents which may endanger persons, property or the environment. The functions of QFES under the FES Act, include to 'provide an advisory service, and undertake other measures, to promote fire prevention and fire control…'[81] Section 69 provides the QFES Commissioner with the authority to require any occupier to reduce the risk of a fire.

Responsibility of landholders

Public land managers and private property owners, both referred to as landholders in this document, have a responsibility to minimise fire hazards on their land, as identified in five key Queensland statutes:

- *Fire and Emergency Services Act 1990*
- *Nature Conservation Act 1992* (Nature Conservation (Wildlife Management) Regulation 2005)
- *Forestry Act 1959*
- *Vegetation Management Act 1999*
- *Planning Act 2016* (i.e. Planning Regulation 2017).

These Acts also outline the granting and use of permits for bushfire mitigation, as well as any exemptions. For example, the VM Act and the Planning Regulation 2017 (collectively referred to as the vegetation management laws for the purposes of this report) provide for exemptions to clearing land to establish and maintain firebreaks, to establish a fire management line and for the reduction of hazardous fuel loads in accordance with the FES Act. The Acts and their respective regulations, together with associated policies and codes, guidelines and procedures are collectively referred to as the bushfire mitigation legislative framework in this report.

The *Nature Conservation Act 1992* (the NC Act) protects native wildlife and native plants. Essential habitat areas for protected wildlife are protected under the VM Act. The NC Act provides that all native plants are protected plants, and the clearing of protected plants in the wild is regulated by the Nature Conservation (Wildlife Management) Regulation 2005. DES's policies determine if a plant is considered to be 'in the wild.'

The responsibility for mitigation and hazard reduction is also clearly outlined in the *Disaster Management Act 2003* (the DM Act). The DM Act identifies that managing disasters is a shared responsibility involving government agencies, individual landholders, non-government and private organisations.[82] The Standard expands on this in regard to hazard mitigation and risk reduction. It states that governments, entities and practitioners need to acknowledge the interconnectedness of risk mitigation and treatment activities and ensure their shared management to meet community needs.[83]

The DM Act also states that disaster management should be planned across prevention, preparedness, response and recovery, including;

> *the taking of preventative measures to reduce the likelihood of an event occurring or, if an event occurs, to reduce the severity of the event.*

The DM Act further indicates that disaster management means:

> *arrangements about managing the potential adverse effects of an event, including, for example, arrangements for mitigating, preventing, preparing for … a disaster.*

Appendix B provides an overview of the legislation which may influence a landholder's decision to prepare and respond to bushfires.

Responsibilities of entities managing public land

In addition to protecting land and property, a range of state entities have statutory responsibilities for land management. The NC Act provides that land must be managed to conserve nature, while also recognising the involvement of Aboriginal peoples and Torres Strait Islander peoples in the management of protected sites.[84] It identifies several key management principles for national parks; these include:

- ensuring the processes of nature continue unaffected
- protecting the areas of biological diversity
- ensuring the permanent preservation of the area's natural condition and protection of the area's cultural resources and value.[85]

The role of QPWS as a significant landowner is detailed in the Queensland Parks and Wildlife Service's *Good Neighbour Policy* (the *Good Neighbour Policy)*. The *Good Neighbour Policy* outlines the position of QPWS on several cross-boundary management issues, including fire hazard mitigation activities. The *Good Neighbour Policy* states that QPWS gives the highest priority to protecting life and property within its fire management activities, while considering the protection of biodiversity, cultural and natural values. The *Good Neighbour Policy* states that fire management includes:

> *... co-ordination, co-operation and active participation with fire authorities and other land managers in matters such as the location, construction and maintenance of fire control lines, notification of intention to burn (required under the Fire and Rescue Services Act 1990), access to property, training in fire management, undertaking fuel reduction burns, developing wildfire contingency plans and wildfire responses.*

The policy also emphasises the importance of a collaborative approach to land management, enabled through open and positive relationships.

> *Land management practices are more effective if they are developed in consultation with neighbours and local communities, made available to neighbours and implemented co-operatively across the landscape.*

The Office supports collaborative land management and its role in encouraging cooperation and creating efficiencies. It is suggested that a good neighbour policy, developed for all landholders and emphasising the importance of a collaborative approach, could benefit bushfire management planning and implementation activities across the state.

Finding 6: Queensland Parks and Wildlife Service staff were generally regarded favourably during the review. The *Queensland Parks and Wildlife Service Good Neighbour Policy* appears generally to drive good relationships with their neighbours.

Finding 7: The *Queensland Parks and Wildlife Service Good Neighbour Policy* emphasises the importance of a collaborative approach. It has the potential for broader application and could benefit bushfire management planning and implementation activities across the state by encouraging cooperation and creating efficiencies.

Recommendation 4:

A good neighbour policy such as that of the Queensland Parks and Wildlife Service, setting out clear expectations, be developed to guide all landholders.

Authority to light fire

The FES Act provides for the granting of permits, conditions and exemptions to light fires, including for fire mitigation. A Notification issued by the Commissioner in 2010 under the FES Act, does allow certain fires to be lit without a permit, if adequate precautions are taken to prevent the spread of the fire:

- fires less than two metres in all directions (these fires are not exempt during notification periods and you must obtain a permit from a fire warden)
- BBQs and campfires (for cooking) enclosed in a fireplace, constructed as to prevent the escape of fire or any burning materials
- a fire lit for the purpose of burning the carcass of a beast
- a fire lit at a sawmill for the purpose of burning sawdust or other residue resulting from the operation of a sawmill
- a cane fire (this may be lit under certain conditions and notification to the fire warden may be required).[86]

This is contingent on local laws and other legislation. Where a local law prohibits the lighting of fires, the written permission of the relevant local government is to be obtained before a permit will be issued.[87]

It is important to note the FES Act exempts QPWS from requiring permits while performing duties under the NC Act. Persons performing duties under the *Forestry Act 1959* (other than plantation operators and officers) also do not require permits. Other fires may only be lit if a permit is obtained from a fire warden.

Fire wardens represent the QFES Commissioner and can grant (or refuse to grant) a permit in their area. Fire wardens cannot issue a permit outside of their area. All prescribed burns, including those for mitigation, should be performed by skilled personnel with proper authorisation. The need for authorisation is stipulated in the FES Act. Section 65(3) states:

> *The Commissioner must refuse to grant a permit to light fire on any land unless satisfied that reasonable steps have been taken to notify every occupier of adjoining land (within the meaning of section 64) of the making of the application; and that a reasonable opportunity has been given to every occupier so notified to object (orally or in writing) to the granting of the permit.*

The QFES Commissioner can impose either a local fire ban or declare a state of fire emergency during a period of extreme fire danger, where predicted conditions and weather forecasts indicate that fires may be difficult to control and pose a danger to communities, or where there is a growing fire emergency. A local fire ban or state of fire emergency can be declared to all or parts of the state and remains in force until cancelled.

Authority to clear land

Clearing vegetation to create firebreaks and trails is another form of bushfire mitigation and works in conjunction with planned burns. It reduces fuel loads and creates access for vehicles and firefighters.

The clearing of native vegetation in Queensland is regulated by Commonwealth, state and local governments.[88] DNRME administers the VM Act, which operates together with the Planning Regulation 2017. This is done by assessing and monitoring land clearing through audits and information provided by members of the community.[89]

There are exemptions to land clearing regulations for the following purposes:

- establishing or maintaining a necessary firebreak to protect infrastructure, other than a fence, road or vehicular track, if the maximum width of firebreak is 1.5 times the height of the tallest vegetation next to the infrastructure, or 20 metres, whichever is the wider
- establishing a necessary fire management line up to 10 metres wide
- when it is necessary to remove or reduce the imminent risk that the vegetation poses of serious personal injury or damage to infrastructure
- reducing hazardous fuel loads using fire under the FES Act
- when it is necessary for maintaining infrastructure including core airport infrastructure, buildings, fences, helipads, roads, stockyards, vehicular tracks, water facilities and constructed drains other than contour banks, unless the clearing is for sourcing construction material
- maintaining a garden or orchard, provided the predominant canopy trees are retained.[90]

Clearing under these exemptions does not require application or notification. To clear more vegetation than is stated in the standard exemptions, a landholder can complete an online request and receive a near-instant response, or submit a development application.

Changes made to the vegetation management laws in 2018 do not affect these exemptions.[91] These exemptions have been in place since 2004.

Disaster management preparedness

The State Plan identifies QFES as the primary response agency for bushfire. As stated in the Heatwave section of this report, a key principle of the DM Act is that local government is primarily responsible for managing emergencies or disasters in their local government area, with district and state groups providing support.

The State Plan sets the expectation that local and district groups assess the risk of different hazards and apply their findings when developing their disaster management plans.[92] The State Plan also identifies hazard-specific plans should be developed for hazards, such as bushfire, that have distinct operational or coordination requirements. Disaster management planning is expected to be informed by robust risk assessment and analysis. A key component of hazard-specific plans is that they describe actions, across all phases, specific to the hazard and they include information on how the disaster management arrangements integrate with hazard-specific arrangements to support the primary agency.[93]

What was expected

There are several entities that have legislative responsibility for bushfire hazard identification, mitigation and risk reduction. In the context of the Standard, the Office expected to find effective mitigation approaches informed by legislation and strategic policy and frameworks. The mitigation practices and activities of these entities are guided by operational policies and guidelines. The approaches would be informed by good practice drawing on emerging evidence. They would be supported by operational plans which enable interoperability and are scalable, fit for purpose and adaptable to changing conditions.

At strategic and operational levels, the Office expected to find bushfire mitigation plans and activities that are informed by risk assessments which follow industry-recognised methodologies and are agreed by stakeholders. These mitigation plans would aim to reduce the likelihood and consequence of a hazard affecting communities. They would consider the impact on people, property and the environment.

At a local and district disaster management level the Office expected to see disaster management plans or hazard-specific bushfire risk and mitigation plans. These plans would identify the hazards, risks and mitigation strategies for bushfire that would potentially impact on community or critical infrastructure within the local government area. In line with the State Plan, these bushfire plans would also reflect the state-level *Wildfire Mitigation and Readiness Plans* developed by QFES as the primary agency responsible for bushfire, and QPWS bioregional planned burn guidelines where appropriate.[94] In line with the Standard, the Office would also expect to see evidence of the plans being regularly reviewed and updated.

These plans would be informed by risk assessment approaches which use robust and replicable risk management processes and frameworks. The Office expected to see information about bushfire-prone areas drawing on available evidence of landscape slope, potential fuel loads and potential fire severity. [95] A range of mitigation strategies appropriate to the context of their local or regional area were expected, which include considering all relevant stakeholders and activities for each phase of disaster management. In addition, the Office looked for approaches which enabled seamless integration between agencies with a role in bushfire mitigation. These assessments are expected to inform mitigation planning and implementation. Evidence of risk management being informed by previous bushfire events and exercises was also expected.

The Office expected to see plans developed by practitioners with fire knowledge and planning expertise, aligned to legislation and doctrine. It was anticipated that the process to develop mitigation plans would involve a range of stakeholders. The Office expected that plans would identify shared priorities and critical partnerships. It was also expected that high levels of interoperability across the plans and strategies of other agencies engaged with bushfire. The Office expected to see roles, responsibilities and accountabilities outlined in plans, in addition to capability limits and escalation points.

The Office also expected to see evidence that the plans had been developed, communicated, shared and reviewed with relevant local stakeholders to ensure all are aware of the bushfire risks. Active involvement with key agencies and entities such as Area Fire Management Groups was expected. It was also expected that the community would be considered as important stakeholders in risk management.

The Office also expected to see evidence of the planned and executed mitigation strategies for the 2018–2019 fire season. Additionally, documented evidence of why mitigation may not have been completed was expected, as well as how residual risks were identified, prioritised, managed and shared.

What was found

Research, and years of lessons from the field, indicate that mitigation has an impact on fires. Activities targeting the reduction of available fuel loads can have a direct effect on the intensity of a fire. Based on this premise, any mitigation activities completed to prepare for the 2018–2019 fire season would have, and in some cases did have, an impact on reducing the severity of the major fires.

The key entities involved in conducting mitigation practices are QPWS and QFES's RFS, local governments and individual landholders. The Office found that DNRME also plays a significant part, performing planned burns and mechanical mitigation on unallocated state land. Additionally, the Department of Transport and Main Roads conducts road corridor fuel reduction activities. These planned burns were reported through QFES for Operation Cool Burn.

The Office also heard from landowners who took their responsibilities seriously and were passionate about the importance of mitigation burns. As the accompanying pictures show, some were keen to emphasise the differences that fires of varying intensities can have on the landscape.

Mitigation activities 2018

The responsibility for bushfire risk mitigation rests with the owner of the hazard – the landholder. QFES has a significant interest in assisting landholders and occupiers in reducing the risk of bushfires. Operation Cool Burn is an annual effort to achieve this between April and August unless operational or weather conditions make this unviable. It is a period where QFES assists and coordinates reporting on the efforts of government and private landholders to mitigate risk for the upcoming season. To achieve this QFES has established a network of Area Fire Management Groups. These consist of land management agencies so that key risk areas can be identified and priority mitigation activities coordinated across tenures.

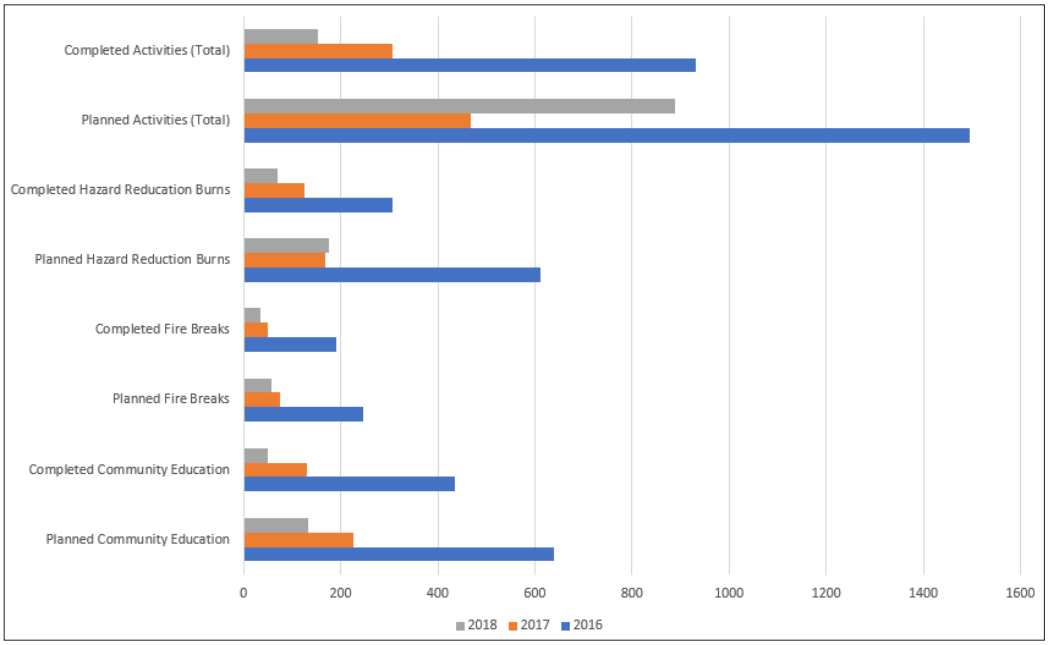
Operation Cool Burn 2018 officially commenced on 1 April 2018 and was intended to continue to 31 August 2018. Due to the weather conditions, Operation Cool Burn ended a month early on 31 July 2018. Operation Synergy, the 2018 bushfire season, officially commenced on 1 August 2018.

Cool burn effect.
Photo credit: Inspector-General Emergency Management

Hot mitigation burns out of control, resulting in too much damage to vegetation.
Photo credit: Inspector-General Emergency Management

The results of a hot, intense bushfire.
Photo credit: Inspector-General Emergency Management

Unaffected vegetation in the vicinity of an intense fire.
Photo credit: Inspector-General Emergency Management



Operation Cool Burn: Planned versus Completed activities by type, 2016-2018
Data courtesy of Queensland Fire and Emergency Services

The purpose of Operation Cool Burn is to:

> *assist landowners/occupiers and other stakeholders in reducing the risk of bushfire and/or reducing the potential danger to persons, property or the environment in the event of a bushfire.*

The Office also notes that;

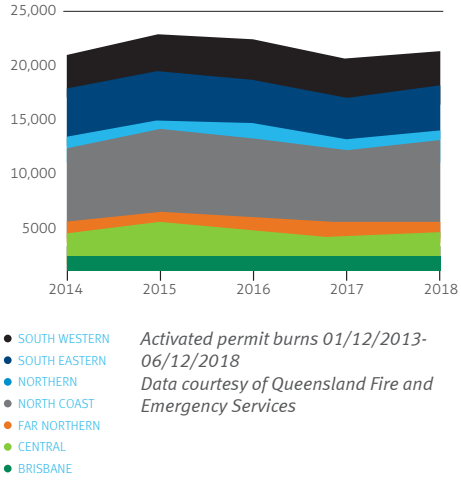
> *Operation Cool Burn is a period of heightened mitigation activity, but hazard reduction burns, fireline/break maintenance and community education occur year-round.*

At the end of Operation Cool Burn, QFES reported on mitigation activities performed in priority areas across the state. Of the 177 planned hazard reduction burns in 2018, 69 (almost 39 per cent) were completed. QFES also advised the Office that the number and prioritisation of planned burns varies annually based on many factors. These include the burns completed in the previous Cool Burn period, and whether new priorities have developed due to other mitigation activities and climate variability.

Although Operation Cool Burn is the prescribed operational period for conducting hazard mitigation burns, mitigation activities may still be conducted outside of this period, including hazard reduction burns where conditions permit. These activities, as well as bushfires, drought, the impact of grazing on fuel loadings, and other variables all impact on the amount of fuel and the bushfire risk, and therefore on the way that planned burns are prioritised.

Landholders and planned burns

From 1 January to 6 December 2018, more than 20,000 permits issued by QFES fire wardens were activated across the state. The following graph demonstrates that the number of permitted burns in 2018 (1 January to 6 December) is higher than the total for the preceding year and has been relatively consistent across five years. However, in some cases, whether a permit is applied for depends on the applicant's view of risk, and these views, the Office heard, are not always aligned with actual bushfire risks. Consequently, not all permits are for mitigation burns, and not all mitigation burns by landholders are covered by permits. It can be concluded that there is no easy correlation between permits issued and mitigation burns. QFES intends to establish a system that records alignment of permits to the risk profile being burned.



Activated permit burns 01/12/2013-06/12/2018
Data courtesy of Queensland Fire and Emergency Services

While weather conditions may have affected the ability of landowners to use fire as a mitigation strategy, other strategies are available. The Standing Order released by QFES announcing the close of Operation Cool Burn listed other prevention activities that could still be undertaken after the commencement of the fire season. These included:

- assessment of permit conditions and restrictions in line with local risk
- targeted education messaging to reduce accidental ignition
- considerations of fire bans.

The early onset of the fire season is increasingly being identified as a possible 'new normal' in planning for bushfire.

> *Climate change forecasts are suggesting that spring isn't going to change for the southern part of Australia but autumn is generally going to be drier and hotter…The bushfire season is going to get longer, firefighters are going to get more tired, resources are going to get more stretched.*[96]

Current mitigation approaches are informed by legislation, policy and evidence. The management of bushfire risk within state parks was consistently raised during the review. QPWS within DES is responsible for the management of approximately 13 million hectares of parks and forests.[97]These include national parks, forest reserves and state forests. While it is recognised that fire is a natural and necessary part of Australia's landscape, it can have both beneficial and adverse effects on some environments. As part of the management of these areas, QPWS uses several methods to reduce fuel loads. These include:

- planned burns
- mechanical methods such as grazing, dozing, ploughing or slashing
- using herbicides along control lines
- selective harvesting.[98]

QPWS identifies the primary focus for mitigation is on people, property and the environment. They are required to manage and protect Queensland's biodiversity and that ensure species of conservation significance and in culturally significant locations are protected.

Protecting Queensland's biodiversity

In a report focused on bushfires, it is important to recognise those Government priorities, like biodiversity, that are affected by bushfire mitigation activities. Biodiversity refers to the variety of all living organisms on earth; the different plants, animals and micro-organisms. Healthy ecosystems provide natural resources such as foods, natural sources of drugs and the purification of water and air. Biodiversity is increased by genetic change and evolutionary processes and reduced by processes such as habitat degradation, population decline and extinction.[99]

The Queensland Government's draft *Biodiversity Conservation Strategy* identifies the importance of biological diversity in maintaining an ecosystem's health and functionality, and highlights the important values biodiversity has in Queensland. Importantly, it states that Queensland's biodiversity is:

- a global hotspot, recognised internationally for the unique and important species found here
- crucial to a range of economic activities, such as tourism, primary production, and the growing film industry
- essential to Queensland's cultural identity underpinning the state's global brand.[100]

The *Queensland Biodiversity and Ecosystems Climate Adaptation Plan p*oints to how the changing climate will increase existing stressors, such as invasive species and extreme fire behaviour, and their impact on the environment. Extreme fire weather, coupled with invasion by flammable weed species, can allow intense bushfires to change ecosystems; for example, closed forest ecosystems could convert to open forest ecosystems as a result of these threats.[101] The high value placed on Queensland's environment by many sectors emphasises the need for appropriate fire management to protect the state's unique ecosystems, especially as the climate changes and threats increase.

Finding 8: Those involved in land management have differing goals in their use and control of fire. Their levels of knowledge regarding vegetation and fire management, and therefore risk, varies; however, a view shared by many was that bushfire mitigation activities are a priority.

Extreme conditions in 2018

Changes to the climate mean that the management of bushfire risk is increasingly challenging. The

mitigation efforts for the 2018-19 fire season were curtailed by early fire weather, resulting in a compounding effect on future events. Entities highlighted that the extreme conditions in some cases exceeded the effectiveness of mitigation measures; for example, some areas that were damp still burned, as the hot, dry and windy weather had a 'hairdryer effect' on the landscape. While catastrophic conditions were recorded, the Office is aware that they occurred over a short timeframe and were limited to key locations across the state. The Office strongly supports that undertaking bushfire mitigation activities is important and effective in most conditions and should continue as a priority.

The hot and dry weather that occurred in late November and early December 2018 created the conditions for extreme bushfires. Some parts of Queensland experienced their highest Forest Fire Danger Index on record. Strong westerly winds, high temperatures and low humidity reflected the conditions more typical in southern bushfire-prone states. The hot, dry winds also created the potential not only for spotting but also for plume-driven fire activity. On 28 November, the Bureau issued a Fire Weather Warning that included the potential for catastrophic conditions, the first ever such warning issued in Queensland. Catastrophic conditions were observed in Emerald and Rockhampton.

In their submission, QFES highlighted the weather conditions and how they affected Operation Cool Burn in 2018:

> *Above average fire potential was identified in the July and September BNHCRC Northern and Southern Australia Seasonal Bushfire Outlooks in 2018.*
>
> *An extremely dry winter impacted on the expected number of hazard reduction burns during Operation Cool Burn in 2018, however of the locations rated as having a high or very high hazard exposure level, 68 percent had a mitigation activity completed in 2018, up from 52 percent in 2017 and 41 percent in 2016.*

The impact that extreme conditions could have on the effectiveness of mitigation measures to enable fire containment was also commented on by QPWS:

> *...the extent and early-season timing of these events were caused by extreme weather conditions and under such extreme conditions bushfires will burn across land with very low fuel loads. The probability of bushfire containment decreases as Forest Fire Danger increases so under extreme weather conditions the strategy of containment may not be possible.*

The intensity of the 2018 bushfires saw them penetrating rainforests in the Eungella National Park, identified as astounding by some fire scientists:

> *Rainforests are non-burnable. That's one of their distinguishing features. So, if a rainforest is burning, that's really significant... For them to be burning up is telling us just how extreme the fire weather conditions are, how stressed the vegetation.*[102]

Identification, communication and transfer of residual risk

As identified in the *Queensland Emergency Risk Management Framework*, risk mitigation strategies aim to 'determine and implement the most appropriate actions to treat (control or mitigate) the identified inherent risk.'[103] The Framework also highlights that once treatment of risk measures has been identified or implemented, the consideration of residual risk is important:

> *Residual risk is the risk that is beyond the capability and/or capacity of the Local or District community or communities and existing disaster management arrangements to treat or mitigate.*[104]
>
> *Residual risk – the risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained.*[105]

The management of this residual risk requires that either the:

- residual risk is accepted as tolerable, or
- transferred to and/or shared across the levels of the disaster management arrangements (upon consultation).[106]

Collaboration and communication are pivotal in this process. First, they ensure the complexity of the risk assessment is covered across hazard types and relevant agencies. Second, they ensure that where residual risk remains, there is a shared and planned approach to understanding the risk and measures to manage it.

Roles and responsibilities

The QAO conducted a performance audit of bushfire prevention and preparedness in 2014 and examined the implementation of the recommendations in a follow-up audit in 2018. The *Bushfire Prevention and Preparedness: Report 10: 2014–15 (*the 2014 QAO Report) identified that QFES is 'not focused on, nor effectively performing the full scope of its legislative mandate, particularly its role of preparing for the threat of bushfires.' The *Follow-up of Bushfire Prevention and preparedness: Report 5: 2018–19* (the QAO Follow-up Report) concluded that QFES had made efforts to address the underlying issues and had increased its focus on bushfire mitigation. The QAO recognised that in many cases QFES was reliant on the actions of others, like volunteers, other state agencies or the federal government, to fully implement the recommendations. It did note that:

> *It is critical that QFES's efforts to improve its collaboration with key stakeholders continue. In particular, it should continue to engage with land managers and local governments to better identify bushfire risks and prioritise mitigation activities.*

Notwithstanding the many agencies identified by the QAO with roles and responsibilities for bushfire mitigation, the Office's conclusions support the need for greater collaboration by QFES with stakeholders.

QFES included the role and work undertaken in bushfire mitigation by the department in their submission to the Office.

> *Hazard reduction burns, firebreak maintenance and community education occur year-round, but each year, QFES conducts Operation Cool Burn, a period of heightened mitigation activity where bushfire mitigation activities are coordinated across the state. 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.*

QFES also coordinates the operation of Area Fire Management Groups to support a shared approach to planning, implementation and reporting of bushfire mitigation activities. This is discussed in more detail below.

Some entities have asserted that not enough mitigation has been undertaken in National and State Parks. Some view the mitigation work undertaken as ineffective in reducing bushfire risk or only undertaken for the purposes of biodiversity conservation.

The Office heard from QPWS that the department manages parks, forests, and reserves, which equates to approximately eight per cent of Queensland's land. They do this in accordance with the NC Act, *Forestry Act 1959*, FES Act, and the DM Act, when responding to disasters. QPWS follows the recommendation of the 2009 Victorian Bushfires Royal Commission that a five per cent target for prescribed burning of the state should be established.

The choice of five per cent – a Victorian target – has been the subject of submissions. Some assert that nature is capable of looking after itself through natural decay and fires, and no target is necessary. Others spoken to thought that burning every three to five years (targets of 33–20 per cent per year) are necessary. The BNHCRC research has evidence from Western Australia that prescribed burning of between eight and ten per cent a year is necessary to make a difference. Queensland benefits from a range of vegetation types. QPWS planned burn guidelines cover 13 bioregions. With that variety, it is difficult to see how a standard target is suitable everywhere. The Office concludes that it may be better for fire management groups to agree on a collaboratively determined target, based on research, local risk, ecology and sustainability; this would represent the good practice of place-based decision-making, empowering local groups.

Finding 9: In the light of research suggesting the likelihood of increasing risk of intense fires, and the variation across Queensland's 13 bioregions, a prescriptive approach to issues such as firebreaks, land clearing and general fire mitigation activities across all 13 bioregions is not sustainable or logical.

The capacity of QPWS officers to implement mitigation activities has fluctuated over time. DES annual reports between 2013–2014 and 2017–2018 show a 23 per cent reduction in employee expenses while land managed rose from 'more than 12 million' to 'approximately 13 million' hectares.[107] The Office heard that across Queensland there are teams of QPWS officers, each responsible for mitigation and control of bushfires in national and state parks across land areas of approximately 20,000 hectares. As the climate changes, these teams are increasingly required to suspend mitigation work to respond to bushfires that occur more frequently during cooler months. Often, two team members will be deployed to another area for fire response duties, leaving two officers to continue mitigation at a reduced capacity. Despite these challenges and their implications, QPWS has successfully reached 90–100 per cent of their target of prescribed burns for several years.

QPWS emphasised the importance of a shared approach to managing bushfire risk, and the need for ensuring collaboration with all relevant entities, including individual landholders, communities, non-government organisations and private organisations. They noted that there is a high reliance on private property owners to also undertake resource-intensive, ongoing mitigation works as fuel loads re-accumulate, to reduce bushfire risk.

The Office found the collaborative approach applied by QPWS and RFS works well and is positively supported by both agencies. This, however, remains a bilateral approach by state government agencies. Broadening this and involving local stakeholders and their knowledge in the process of identifying priorities, planning, scheduling, and undertaking of and reporting on bushfire mitigation activities, is desirable. If achieved, it should not only support the emergence of a shared and better aligned standpoint, but a collaborative and more effective approach to bushfire mitigation in Queensland.

The Office heard from a number of entities responsible for bushfire mitigation that 'fire is tenure blind' – that it does not respect property boundaries. However, there are limited resources to undertake mitigation of fire-prone land in a state the size of Queensland. To achieve an effective reduction of risk to life and property, mitigation activities are prioritised based on an assessment of risk. Informed by the Area Fire Management Groups, many Operation Cool Burn activities have focused strongly on high-risk areas of bushland, close to residential areas with smaller land parcels. This approach is supported by research and shared between DNRME, QPWS and QFES.

The Office received public submissions with a different view. Some landowners living further away from the major town centres, in regional areas and on larger parcels of land, argued that state-managed land adjacent to their properties had not been mitigated enough to reduce the risk of significant fires. One perspective heard from landholders in several regions, was that the risk assessment to identify priorities was 'city-centric' and not applicable to the broader Queensland context.

> *You talk about protecting property being a priority. I lost 22,000 acres of grazing land in that last fire. That's my property and, to me, that's more valuable than a house [paraphrased]. - Grazier, Central Queensland.*

The Office heard from QPWS that changes to land use planning regulations for developments in locations with a higher fire risk profile is helping to mitigate risk for new properties in peri-urban areas. The State Planning Policy 2017, together with its overlay codes, identifies techniques that can be used to achieve an acceptable or tolerable level of risk for development. Unfortunately, properties and developed areas established before these changes continue to pose a challenge for hazard reduction efforts.

The Office also heard that insufficient knowledge of bushfire risk, and the actions required to reduce that risk, can also lead to inaction on the part of property owners. The Office heard from the South East Queensland Fire and Biodiversity Consortium that often when properties change owners, the awareness of hazard risk and mitigation activities for that property does not get passed to the new owners. With an increasing population moving into existing developments in peri-urban areas, this lack of bushfire knowledge may be creating an increased vulnerability to bushfire hazards.

Finding 10: Bushfire mitigation by removing fuel through planned burns and clearing may never be enough to remove the risk of bushfire hazards entirely for communities.

GOOD PRACTICE

The South East Queensland Fire and Biodiversity Consortium (SEQFBC) is a network of land managers, scientists and representatives from local, state and Commonwealth government. It is devoted to providing a coordinated response and advice for fire management, fire ecology and the conservation of biodiversity in Queensland. SEQFBC does this through a combination of approaches, which include applied research and the delivery of education, extension and engagement programs. These involve community information evenings, workshops and individual property risk assessments. All are aimed at assisting private landholders with guidance and evidence-based information on fire management and biodiversity conservation issues.

SEQFBC has worked in collaboration with, and is largely funded by, local governments in Brisbane, Gold Coast, Gympie, Ipswich, Lockyer Valley, Logan, Moreton Bay, Redlands, Scenic Rim, Somerset, South Burnett, Sunshine Coast and Toowoomba. QFES is a member of the SEQFBC and provides it with funding.

There are further forms of mitigation, beyond reducing fuel loads. There is potential for QFES, Area Fire Management Groups, SEQFBC and their local members to provide part of the solution to this issue; by for example:

- inviting interested landowners to be engaged with the activities of their local Area Fire Management Group to ensure fire risks adjacent to rural properties are considered
- using tools available from QFES for bushfire monitoring, prediction and analysis that are discussed in the intelligence and technology section of this review
- emphasising the role of land use planning in prevention and mitigation in peri-urban areas
- community education and outreach programs to continue building resilience, but also an informed understanding of the risks associated with living in peri-urban areas.

The scientific projections of increased bushfire risk highlight the limitations of physical mitigation activities. To make the most of these activities, a concerted effort is needed, which is dependent on people.

Finding 11: There is scope to emphasise the role of land use planning and to improve education and advice about bushfire risk as complementary mitigation strategies. This should be location specific and supported by Area Fire Management Groups. The South East Queensland Fire and Biodiversity Consortium represents good practice here.

Area Fire Management Groups

In 2013, recommendations of the Malone Review into the Rural Fire Service,[108] supported by the Police and Community Safety Review,[109] advocated a planning system for bushfire management that complemented the existing disaster management arrangements. The proposed structure included district fire management groups, aligned to disaster districts.

The 2014 QAO Report pointed to gaps in knowledge about hazard reduction burns and their effectiveness. It noted that QFES had established fire management groups to help manage Queensland's fuel loads. Membership was to include representatives from major landholders across all levels of government, the private sector and other relevant stakeholders. The groups were to encourage a coordinated approach to bushfire management, but the QAO noted that there was no process for fire management group members to collect each other's fire management plans or report back on the effectiveness of the burns.[110] It recommended that QFES formalise the role of fire management groups, including reporting planned and implemented hazard reduction burns, and their effectiveness.

The QAO Follow-Up Report, noted QFES efforts to formalise these groups at area [approximately local government] level. But it also found that QFES should work to provide better assessments of the effectiveness of hazard reduction burns through simulation tools, and work with stakeholders to ensure timely hazard reduction burns. Much, it would seem, depends on the effectiveness of fire management groups.

QFES has recently responded to the QAO Follow-Up Report in its *Bushfire Prevention & Preparedness – Current & future state analysis: January 2019.* QFES now reports that 51 Area Fire Management Groups cover 64 local government areas, with work underway to establish more groups, particularly in Indigenous council areas. QFES acknowledged Area Fire Management Groups are best practice, as they form a place-based approach. However, QFES cited

differences between local views and a whole-of-state perspective over the prioritisation of social, economic and environmental factors, contributing to tensions. This highlights the importance of the governance arrangements for these groups, and the effective functioning of the State's Bushfire Inter-Departmental Committee. Planning, the sharing of plans, and using appropriate products to inform decision-making from the QFES Predictive Services Unit, could better inform the success of mitigation across areas, and inform planning for future mitigation. There are, however, different perspectives about Area Fire Management Groups between those in Brisbane and those in rural areas. In talking to landholders, the Office heard that less bureaucracy was needed. Area Fire Management Groups were described as being too restricted by the rule book to actually mitigate and plan for what was needed.

> *We understand 'Own the fuel, own the risk.' But we don't understand 'Own the fuel, own the risk; but you can't cut down the trees.' – a local government*

The Office also heard that there are complications for landholders relating to back-burning and mitigation burning, and that people are not familiar with the messaging.

The Office concluded that what is needed is an integrated and consistent approach to the management of land for everybody. Having formalised fire management groups, further work is now needed to strengthen the connections between them and the local disaster management groups. If expanding and maturing Area Fire Management Groups occurs during 2019 as planned by QFES, this will go some way towards connecting the local-level planning, effects of mitigation and broader understanding of the residual risks.

This approach needs to be supported by other, less formal ones. In rural areas, engaging with people during events that are occurring locally has already paid dividends in one region. For example, the annual rodeo, the gymkhana, provides a chance to talk, and train people through conversations. A combination of the formal and informal methods of communication is needed. Area Fire Management Groups, enabled by a formal connection to disaster management groups, and operating locally through less formal engagement, would likely achieve this.

Local engagement with landholders helps communities better understand the risks they face and informs planning and prioritisation of risk mitigation measures. Disaster resilience is significantly increased by proactive planning and preparation. Sharing of seasonal risk information is likely to encourage landholders to act proactively and build self-reliance.

Finding 12: Progress has been made to establish and formalise fire management groups as recommended by the *Malone Review of the Rural Fire Service*, supported by the *Police and Community Safety Review* and identified as necessary by the Queensland Audit Office.

Finding 13: Having formalised the establishment of the groups, there is a further opportunity to formalise the link between fire management and broader local disaster management planning. A formal link between Area Fire Management Groups and local disaster management groups would inform bushfire risk and its management more comprehensively.

Finding 14: Successful fire management groups are inclusive, engage well with stakeholders and do not appear as an extra layer of bureaucracy.

Recommendation 5:

All Area Fire Management Groups should adopt and be guided by a good neighbour policy. (Refer to Recommendation 4)

Recommendation 6:

Area Fire Management Groups should share seasonal risk information with local groups and actively and appropriately contribute to disaster management planning.

Managing existing fuel loads

The level of fuel loads prior to the season was raised by many stakeholders. Debriefs in the Eungella/Finch Hatton area identified high fuel loads following Tropical Cyclone Debbie. It was also noted that the situation was exacerbated by the rainforest canopy being shredded in the cyclone, leading to the forest drying out. Extra fuel loads, drier forest, a drier year and the extreme weather conditions led to more than 3000 hectares (10 per cent) of the forest being burned.

Managing fuel loads was also the focus of some submissions. The issue of compelling landholders to undertake preventative measures such as mosaic burns was also raised. One submission identified that the FES Act (s.69) enables the requisition of hazard reduction measures, such as making and

maintaining firebreaks and managing vegetation, on private property, but claimed 'this is not enacted.' The 2014 QAO Report identified that, while QFES has the authority to issue notices to reduce fuel loads, in the three years prior to the 2014 QAO Report, this authority had been exercised 12 times. The report also stated that there was no information to identify whether follows-ups had occurred to ensure the fuel loads had been addressed. QFES has never issued a notice to a local or state landowner. The QAO Follow-Up Report states that, rather than using the authority provided through legislation, 'QFES informally asks private land occupiers with excessive fuel loads to reduce the risk on their properties, but does not record the risk level, number of requests it makes, or the outcome.' The Office found no evidence to suggest that this has changed, although QFES intends broader work in this area and recognises that it will require agencies across government and the community to acknowledge and action their responsibilities.

Finding 15: Queensland Fire and Emergency Services' informal approach to reducing fuel loads and limited use of requisition legislation (s.69) may have been appropriate in historical risk environments. As the risk increases, greater use of this legislation will become necessary to mandate appropriate mitigation.

Recommendation 7:

Legislation at state and local level requiring landholders to reduce fire risk on their property should be actively applied.

Complexity in bushfire mitigation

Bushfire mitigation is complex. The complexity starts with the number of stakeholders involved. They include several state departments, all local governments, not-for-profit organisations, non-government organisations, land parcel lessees and property owners. These stakeholders also have different land management objectives which affects how they view risk. A landholder must also navigate a complex regulatory environment and consult adjoining landholders before they can undertake bushfire mitigation activities.

The Office heard many conflicting views during the review. The roles and responsibilities of entities and the approach to mitigation were heavily debated. Views vary on who should be responsible for mitigation, preferred forms of mitigation and their effectiveness, the purpose of mitigation, its frequency, and locations for mitigation activities.

The Office found the climate change debate both polarises and unites views. Some entities state that the 2018 fires were the result of limited planned burns and mitigation by state government and limitations placed on land owners, regardless of changes in climate. Others argue that reducing carbon emissions is a critical first step to reducing severe fires, before discussions around mitigation methods should begin. However, many on both sides want to avoid the destruction caused by uncontrolled, intense, hot fires. Principle 5 of Queensland's *Biodiversity and Ecosystems Climate Adaptation Plan* is: 'collaborate across sectors and jurisdictions to maximise co-benefits and minimise maladaptive outcomes for biodiversity and ecosystems.'

With the prospect of more hot, intense fires, there is an immediate opportunity to build on this overt willingness to solve a common problem.

Finding 16: The review found common agreement about the detrimental effects of intense fires.

Some entities state that there has been a trend at the state level away from using planned burns as a mitigation approach. However, cool or planned burning is highly rated as a form of bushfire mitigation.[111] In 2013, QPWS rated carefully considered planned burning as 'the best way' to mitigate severe, extensive wildfire and its impacts.[112] The BNHCRC's research states that it is the cornerstone to wildfire mitigation.

The *2009 Victorian Bushfires Royal Commission Final Report (Summary)* states, 'Prescribed burning is one of the main tools for fire management on public land.' QPWS considers planned burns to be an important mitigation tool and prioritises planned burns to protect life, property and the environment from the adverse effects of fire. QPWS undertakes planned burns to maintain and enhance ecosystem health, biodiversity and the range of habitats to protect other park and forest values, such as places of cultural heritage significance and natural resource productivity.

Finding 17: Planned burning is considered a very effective form of bushfire hazard reduction by key entities responsible for land management. Overall hazard reduction should continue to be prioritised and efforts should be made to improve community preparedness and land use planning.

The Office heard from conservation NGOs about their views on planned burns. They also supported burning as a mitigation tool to prevent more severe bushfires which pose a greater risk to native flora and fauna. It was pleasing to find some consistent ideas between entities representing different sectors. For example, the benefits of thickets, mosaic burning and traditional burning practices, as well as the need for effective mitigation to prevent severe bushfires, were views held by agriculturalists, conservationists and government land managers alike.

Planned burns are useful tools for the purposes of weed control, pasture regeneration, silviculture (forestry management) and for ecological reasons. Mitigation activities such as mechanical clearing and slashing can also be useful tools for other purposes. From the evidence gathered, it seems that the multitude of intents and uses for these activities compounds the difficulties that entities experience in recognising who is doing what action, when, and what outcome they are seeking. Adding further complexity are the needs and justifications for *not* undertaking these activities at certain times, in certain areas, or due to capacity, resourcing or access issues. This lack of knowledge about the roles, responsibilities and plans of others adds to the debate about what effective bushfire mitigation should involve.

> *Fire ecology and management is not rocket science; it is much harder than that.*[113]

Adding to the complexities in understanding roles and responsibilities is the need to understand how vegetation, topography and weather conditions affect fire behaviour. The Office learned during this review that there are only a small number of qualified fire behaviour analysts in Queensland, and that they are a highly-regarded and valuable resource. Given that fire management is, and will continue to be, a complex and multifaceted science, responsible entities must find integrated approaches to the complexity, so that bushfire mitigation can be approached from an informed, united front.

Finding 18: Greater uptake of hazard reduction activities can only occur when conservationists, agriculturalists and fire management experts and other key stakeholders collaborate.

CASE STUDY: TRADITIONAL BUSHFIRE PRACTICES ON MINJERRIBAH

Minjerribah (North Stradbroke Island) is a priority offshore island which includes numerous freshwater wetlands, cultural heritage sites and unique ecosystems. In January 2014, fires impacted 16,800 hectares of Minjerribah including as many as 150 cultural heritage sites. The sites are of global archaeological significance, with some being approximately 30,000 years of age.

The Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC) is a non-profit prescribed body corporate responsible for protecting the native title rights of the Quandamooka People following a Native Title determination in 2011. QYAC works with key landholders to manage the ongoing protection of cultural heritage and landscapes across Minjerribah. Within Naree Budjong Djara (Our Mother Earth) National Park, QYAC and the Queensland Parks and Wildlife Service (QPWS) work together under an Indigenous Joint Management Agreement.

The 2014 fires prompted QYAC and the Queensland Reconstruction Authority to work together to develop the *Minjerribah Bushfire Management Strategies*. The strategies integrate modern disaster management techniques with the traditional burning practices of the Quandamooka People. It is an example of a cooperative, locally-led and state-facilitated approach to the development of township fire management strategies.

The strategies are designed to mitigate the impacts of bushfires on Minjerribah townships. They provide risk mitigation, planned burning, hazard reduction and wildfire suppression for lands adjoining Point Lookout, Dunwich and One Mile, and Amity. The plan also complements the fire management strategy for Naree Budjong Djara (Our Mother Earth) National Park, which aims to greatly reduce the risk of an island-wide bushfire.

The project initially focused on discussions with Elders and recording their knowledge of their country, which included accessing areas they had not previously been able to access for many years. Sharing old ways and old stories highlighted how their country was more prone to hot fires. Local Indigenous values and experience were incorporated into the township fire management strategies.

The Minjerribah community now has approximately 25 Quandamooka rangers working for QYAC, Minjerribah Camping, and the QPWS, and rural firefighters trained in wildfire response to assist local QFES crews, Redland City Council responders and staff employed by mining company Sibelco.

In October 2018, QYAC was recognised through the Get Ready Queensland – Resilient Australia Awards for the *Minjerribah Bushfire Management Strategies* to protect Minjerribah's townships.

On 28 November 2018, as bushfires once again threatened Minjerribah, QYAC were represented 24 hours a day at the Incident Control Centre (ICC), and were heavily involved in decisions about managing the bushfire response. The ICC's planning and response was heavily informed by QYAC's mapping and GIS capability. It informed agencies of the cultural and ecological values, unique landscape and access points. QYAC's involvement highlighted the Quandamooka People's knowledge of methods to contain the fire, and their cultural advice was sought on critical matters by all agencies. For example, QYAC worked with Sibelco and Seqwater to make decisions regarding water supplies, provide access and establish firebreaks.

The Quandamooka People led the front line on the ground and ensured cultural values were respected by all agencies. Their involvement through QYAC was a critical success factor in the response to the 2018 bushfire, and ensured that the response protected cultural and ecological values in line with the *Minjerribah Bushfire Management Strategies*. This illustrates the importance of strong partnerships, joint planning and a locally-led response. It is an example of effective interoperability between different agencies with different structures working towards a common outcome, informed by traditional Aboriginal practices.

Those involved with the QYAC initiative told us of three factors that would help improve mitigation efforts. First, building agility into the authorising of permits to light fires, to allow maximum use of often fleeting weather windows. Second, building resilience in communities by reducing fuel and risk on the edge of towns, thus reducing the need to protect property and allowing mitigation burns to concentrate on other areas. Third, spreading understanding of the 'big picture' - long term ecological and cultural aims so that all understand the reason for local action.

QYAC Rangers caring for Country, conducting planned burns on Minjerribah (North Stradbroke Island).
Photo courtesy of QYAC, by Lucinda Allanson

Purpose of mitigation

It is often not well understood that mitigation does not stop fires. Mitigation enhances the chance for those fighting the fire to attack the fire. Break lines may be jumped, but they provide a place from which a fire can be attacked. Lower fuel loads reduce fire intensity, meaning that those fighting a fire have a greater chance of being able to control it.

One submission summed up common views about the inevitability of fire in Australia, their damage when intense, and the challenges of controlling them. This suggested that the basis of bushfire management is to expect fires to start, as it is impossible to prevent fires from occurring in the Australian bush given the range of ignition sources. The submission also stated that:

> *… focusing on controlling fires after they start is doomed to failure. It only succeeds with fires burning under mild conditions and in relatively light fuels. Fires burning in heavy fuels driven by strong winds are mostly impossible for fire fighters to extinguish; their only option is to wait for weather to change or for the fire to burn into an area of low fuel. During the wait, serious damage will occur.*
>
> *On seven occasions since 1926, Australians have seen more than 500 homes destroyed by bushfire. These losses all occurred in extreme fires which, as we saw only too clearly on Black Saturday, can overwhelm even the most professional of fire services, irrespective of resources. In these situations, 'man' is not in control. Rather nature is in control. And the best fire services can do is pray that the weather will change for the better.*

Mechanical clearing for mitigation

The Office heard from several landholders that the legislation relating to land clearing was too prohibitive for individuals to meet its requirements, while also satisfying their own calculation of fire risk on their property. They highlighted the link between fire management and the vegetation management laws, and the limitations of the laws in allowing adequate firebreaks, particularly in forests, on boundaries when neighbours took no action, and for the workplace health and safety of farm staff fighting fires. Some raised what they saw as the short-sightedness of some aspects of land clearing and the state government's role in regulating tree clearing:

> *We own the freehold to the country, but they (State Government) own the trees. The rules are about saving the tree, rather than saving the forest. Let us at least put in buffers. – Grazier, Central Queensland.*

Submissions included suggestions for:

- education programs targeting landholders to encourage the benefits of well-planned firebreak construction in reducing the impacts of devastating fires
- landholders having the ability to perform a self-assessment to determine the appropriate size of a firebreak on their land rather than size being prescribed
- the vegetation management laws taking into consideration the need for an effective firebreak to be double the height of the tallest tree growing beside firebreaks.

Representatives from DNRME told the Office that there are many exemptions to the requirements of the vegetation management laws and the *Nature Conservation Act 1992* if clearing is being performed for fire management purposes. This is detailed in the DNRME submission to the Commonwealth Standing Committee on Agriculture and Water Resources for the *Inquiry into the impact on the agricultural sector of vegetation and land management policies, regulations and restrictions* discussion paper.

CLEARING FOR FIRE MANAGEMENT

No approval or notification is needed to clear necessary firebreaks or fire management lines. Specifically, a landholder may clear to establish or maintain:

- a firebreak to protect infrastructure (other than a fence, road or vehicular track) up to 1.5 times the height of the tallest adjacent vegetation or 20 metres (whichever is wider)
- a fire management line 10 metres in width
- clearing to establish or maintain a fence up to 10 metres wide – providing a fire management line on the boundary of all properties.

In an emergency, landholders can do any clearing required by an authorised fire officer.

These responsible measures have always been permitted, and these regulatory exemptions under the vegetation management laws have not changed in 20 years.

In non-coastal areas, landholders can also clear a firebreak up to 1.5 times the height of the tallest adjacent vegetation or 30 metres wide, whichever is greater, provided they make a notification to DNRME. The notification is free and can be done quickly and easily online. This measure is provided by the accepted development vegetation clearing code for managing clearing for necessary property infrastructure.

Should a landholder consider they need to clear a wider firebreak or fire management line than provided for by the above measures, they are able to make an application for a development approval. The application can also be submitted online, and strict statutory timelines apply to the assessment and approval process. Applications are assessed using the State Development Assessment Provisions under the Planning Regulation 2017. The exemptions provide sufficient width to cover most landholders' needs.[114]

The DNRME submission to the Commonwealth inquiry also states that over the past two years, only one application to clear a wider firebreak or fire management line has been received.[115] The Office was advised by DNRME that there is sufficient flexibility in the current exemption process as a single application may be made for the properties of multiple landholders. More education is needed about these exemptions.

Such education should include the importance of vegetation management laws for protecting biodiversity. As this report has stated earlier, biodiversity contributes to a healthy environment, is important to culture and to tourism and for pharmaceuticals.[116]Mechanical clearance can contribute to changes in vegetation. This in turn can change the fire properties of the land. Negative effects follow, such as increasing access for feral animals and weeds, and reducing the movement of fauna. Therefore, ensuring that landholders are informed about their eligibility for exemptions, and the processes for requesting additional clearing, is an important first step in understanding the operation of the current vegetation management laws.

Finding 19: Exemptions to vegetation management legislation, that allow for land clearing specific to bushfire mitigation, are not understood by all.

Perceived barriers to mitigation

The Office heard in interviews and through submissions that there are some issues that hinder the undertaking of bushfire mitigation activities. The submission precis earlier summarises these written points. Additionally, the Office heard from landholders in a variety of regions, who were committed to ensuring the land was fit for future generations, but who were confused about the various rules.

Many wanted wider firebreaks; some due to tree height, aware of their reach should one fall, or to stop crown fires from spreading. A particular irritation for others was the restriction on protecting fences. The Office heard quotes ranging between $5000 and $12,000 per kilometre to renew fences. Some wanted to ensure safer working conditions for themselves and their farm workers when fighting fires. Some wanted to be given allowances for neighbours who did not clear on their side of the fence. Some wanted recognition that different vegetation types needed different treatment.

Others commented on the permit to light rules, particularly where other landholders like road, rail, and water authorities, national parks, local and sometimes federal government, and reluctant neighbours were involved. Frustration and fear pervaded their conversations and commentary; frustration with, and fear of, breaking the laws as they saw them.

> *During Operation Cool Burn in my area, I was the only one. No one was burning. They were all frightened. - Grazier, SE Queensland*

Similar stories were heard elsewhere. One property owner in Central Highlands demonstrated his need to build a break larger than the legislated 10 metres along the fence line, because the breaks on adjacent state land were inadequate to provide appropriate protection. This approach, while highly practical and undoubtedly effective during these events, was technically in breach of legislation. The property owner raised concerns to the Office that they might be penalised for creating this break. This concern stemmed from the owner being questioned by a representative from the state agency that owns the adjacent land, about whether a protected species had been cleared while building the break. The property owner had taken this measure in order to protect that very type of protected species on the adjacent state land, where the breaks were inadequate to provide that protection. This property owner recalled being told of the success of 'state burns' but could not recall 'having seen any smoke' during the prescribed time.

The Queensland Government website sets out to clearly present information for landholders who wish to clear land on their property. It states that first, the landholder should request a free property report, which includes property information and three maps to help identify clearing requirements:

- **Regulated vegetation management maps** - show vegetation categories needed to determine clearing requirements. Maps are generally updated monthly to show new property maps of assessable vegetation.
- **Vegetation management supporting map -** provides information on regional ecosystems, wetlands, watercourses, and essential habitat and factors.
- **Protected plants flora survey trigger map -** is needed to determine if any part of the proposed clearing is within a high-risk area.[117]

The page also lists other legislation, government agencies and policies that may apply:

- Australian Government legislation - *Environment Protection and Biodiversity Conservation Act 1999*
- Queensland protected plants legislation - *Nature Conservation Act 1992*
- Queensland vegetation management legislation and exemptions – *Vegetation Management Act 2003*
- Local government requirements – some local governments have local laws or planning scheme requirements that also regulate clearing
- Department of Environment and Science – coastal development, contaminated land, heritage places, plants, animals, mining and other environmentally relevant activities
- Department of Aboriginal and Torres Strait Islander Partnerships – Indigenous cultural heritage
- Department of Agriculture and Fisheries – forestry on state land, fish passages, mangroves
- Department of Natural Resources, Mines and Energy – interference with overland flow, clearing in a watercourse
- Department of State Development, Manufacturing, Infrastructure and Planning – development, planning and state development
- State Policy for Vegetation Management.[118]

The Office found that the information regarding land clearing on the Queensland Government website, and the DNRME website, is set out simply. In practice, though, the amount of intersecting legislation, exemptions, regulations and sources of information linked to clearing vegetation for fire management contributes to a complex and confusing process.

Regarding planned mitigation burns, the Office heard from landholders that it is difficult to navigate the process of obtaining and executing permits to light fires. The *Applying to Light Fires in Queensland* brochure can be found on the Rural Fire Service website and provides step-by-step guidance for the process of obtaining permission to light a fire.

It encloses a permit form with clear instructions for completing it correctly. The brochure states that there must be 'no council bylaws prohibiting the use of fire' and that this should be checked with the local government. The *Lighting Fires in Queensland* brochure also provides landholders with their responsibilities for use of fire on their property.

The content on the web pages could be clearer and simpler by consolidating what a landholder needs to know. The detail and interpretation of regulations makes the process more confusing. An example is the Lighting Fires in Queensland web page which attempts to dispel myths about what landholders can and cannot do.

> ***Myth*** *- That all 'Permit to Light Fire' applications must be received by the Fire Warden in writing.*
>
> ***Fact*** *- Applications for a 'Permit to Light Fire' can be received either verbally or in writing. Fire Wardens have the discretionary authority to determine the method in which a permit application is received.*[119]
>
> ***Myth*** *- That all 'Permit to Light Fire' applicants must provide their adjoining neighbours with a minimum of 72 hours notification in relation to their intent to apply for a permit.*
>
> ***Fact*** *- Not all applicants for a 'Permit to Light Fire' are required to provide their adjoining neighbours with a minimum of 72 hours notification. Fire Wardens have the discretionary authority to determine what is required as a reasonable amount of notification time based on local knowledge and experience.*[120]

In summary the issues included:

- the process of applying for permits to light fires
- navigating intersecting legislation (VM Act, Planning Regulation 2017, *Forestry Act 1959,* NC Act, FES Act and *Local Government Act 1993*) to understand regulations and exemptions for land clearing and approvals for planned burning
- challenges in obtaining agreement from neighbours to conduct planned burns
- entities' capacity to undertake clearing and planned burns with the appropriate resources, fire knowledge, equipment and conditions required.

Reliable, secure and trustworthy information is essential to building partnerships. Government needs to provide Queenslanders in cities, and in regional, rural and remote communities, with personalised services that anticipate their needs.[121]

The Queensland Government's DIGITAL1ST Strategy encourages government to avoid developing isolated, standalone solutions, and instead deliver seamless, joined-up and personalised information. A solution such as a unified digital experience, paired with accessible alternatives for statewide reach, has the potential to resolve many of the 'knowledge' and 'permission' barriers. Part of the solution may lie in the 'Veg Hub' concept, established by DNRME in 2018. Here, landholders can make phone and email enquiries and receive expert advice about vegetation management. A team of staff dedicated to fielding enquiries is in Charleville and supported by staff from around the state. The 'Veg Hub' has already dealt with more than 5000 calls since its inception.[122]

Finding 20: Some landholders see legislation and 'permit to light' regulations that guide mitigation activities as complex, and a barrier to effective bushfire mitigation.

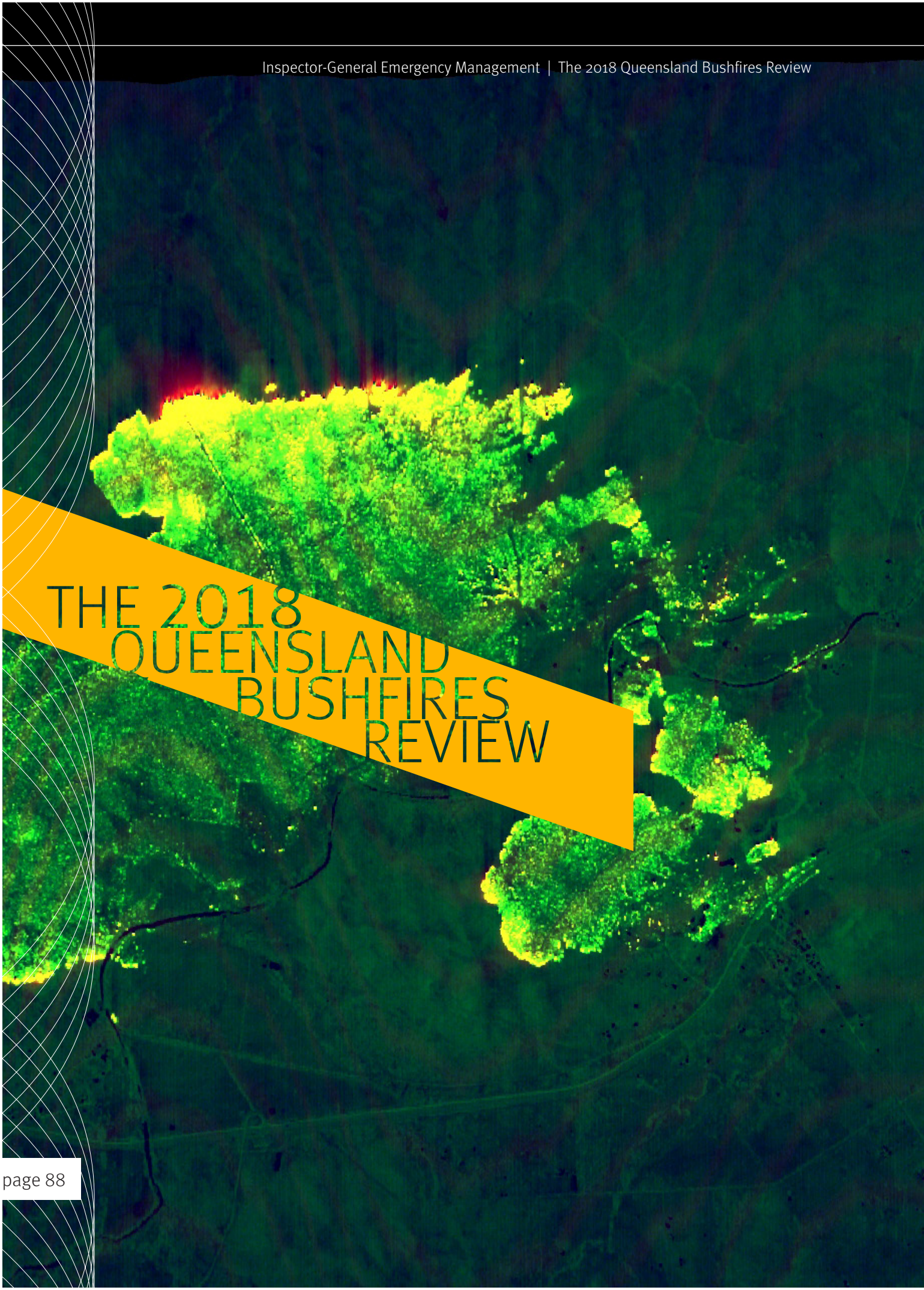
Finding 21: A single source of information, along the lines of the Department of Natural Resources, Mines and Energy's 'Veg Hub', about mitigation activities, regulations, exemptions and approval processes would make navigating the system more accessible and efficient for landholders.

Recommendation 8:

To make planned burning and land clearing easier to understand and implement for landholders, a single point of contact for all bushfire mitigation inquiries and permits should be established.

Recommendation 9:

Given an increasing risk of intense fires, the framework of legislation relating to vegetation management, bushfire mitigation and hazard reduction, together with mitigation and preparation priorities should be re-assessed. The re-assessment should aim to enable more appropriate and flexible means at the local level for the reduction of intense fires.



THE 2018 QUEENSLAND BUSHFIRES REVIEW

INTELLIGENCE AND TECHNOLOGY

The previous section of this review touched on the contribution that fire behaviour analysts can bring to bushfire planning and mitigation. This section looks at current capability and what might be possible in the future.

Line scan of a bushfire.
Image courtesy of Queensland Fire and Emergency Services

Intelligence and technology

The previous section of this review touched on the contribution that fire behaviour analysts can bring to bushfire planning and mitigation. This section looks at current capability and what might be possible in the future.

Intelligence is critical in the preparation and planning of resources for potential disaster events. It is used widely. It is noted later in this report that just prior to this event, Emergency Management Australia pre-emptively activated the *Australian Government Disaster Response Plan*, known as COMDISPLAN, based on intelligence sources, that included QFES. It is essential that intelligence capabilities are utilised to the full potential and shared with those who need them across all the phases of disaster management.

What was expected

Intelligence functions exist to support decision-makers and planners by generating products that give a clear understanding of what the current situation is, and what potentially could happen. These products inform activities such as prioritisation, resourcing, tasking, communications and messaging. All entities participating in Queensland's disaster management arrangements are expected to have intelligence functions. The Office expects agencies working within the disaster management arrangements to have policies, procedures and plans to establish intelligence functions.

When considering the Standard and previous reviews, the Office expects that an intelligence function would:

- have documented roles and responsibilities
- be established in places to support decisions makers
- be supported by trained and skilled staff
- have quality processes and products in place for incoming and outgoing information
- deliver products using common language and an agreed format that can be easily understood
- have anticipated what products are needed and who needs to receive them
- have established protocols to share products to those who need them in a timely way
- have engaged in exercises across all levels of Queensland's disaster management arrangements involving many stakeholders.

Although many agencies were involved in the bushfires, the focus of this section of the review is on the intelligence function of QFES as the primary agency for a bushfire hazard. During the 2018 fires, the Office expected that QFES would have an intelligence function which produces timely products to those who need them. It was also expected that these products would provide evidence, highlight risk, support decisions, and provide a common awareness for those who need to know.

What was found

The Office found that QFES had clear doctrine in place before the 2018 bushfires to establish an intelligence function and purpose. QFES uses an adaptation of the Australasian Inter-Service Incident Management System (AIIMS) to manage bushfire events. AIIMS provides a common incident management structure for agencies to manage events such as bushfires. Both AIIMS and QFES doctrine identifies the need to have an intelligence function to support the incident management structure.

The QFES doctrine outlines that the intelligence function purpose is to:

- collect information on the current and forecast situation
- process this information into relevant, timely, accurate and useful intelligence
- meet critical intelligence needs and share this to those who need it to support decision-making and planning.

The function is designed to address what is happening, why it is happening, what is likely to happen, and associated risks and opportunities.

QFES doctrine identifies a Modelling and Predictions Unit and a Fire Behaviour Analyst function to assist the intelligence function. Their purpose is to predict incident behaviour and provide intelligence products.

There were many systems and tools used during the 2018 bushfires to support situational awareness. In *The Cyclone Debbie Review*,[123] the Office highlighted the importance of modelling to enable better decision-making and improved community outcomes. The importance of systems that share information was also commented on. The examples below highlight some of the technologies used during the 2018 bushfires.

Finding 22: Queensland Fire and Emergency Services had clear doctrine in place for 2018 fires around establishing an internal intelligence function and its purpose.

Fire modelling

Phoenix RapidFire (Phoenix) is a tool used to simulate the spread of fire. It was developed through a research project involving BNHCRC, the University of Melbourne, and the Victorian Department of Environment, Land, Water and Planning. The tool is used by agencies such as the Tasmanian Fire Service, Country Fire Authority and the Department of Environment, Land, Water and Planning in Victoria, and the New South Wales Rural Fire Service.

Phoenix relies on accurate inputs including:

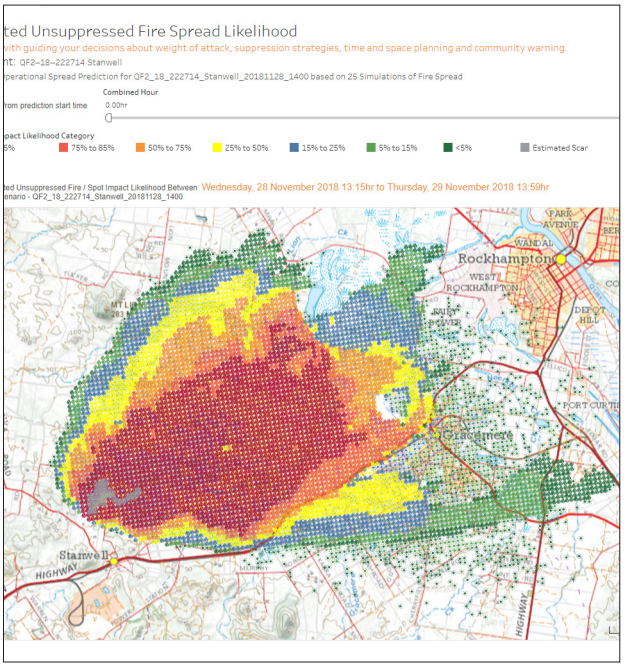
- the precise fire location at a known time
- forecast weather
- fuel load and structure.

The tool also uses information such as the terrain, fire history and disruptions such as roads and rail networks. Phoenix is used by trained operators who can quickly create a map showing where a bushfire could spread if there was no suppression.

Simulations from Phoenix can be used across each of the disaster management phases. Victoria, Tasmania and New South Wales use it as a planning tool to inform prescribed burning strategies. It can use forecast weather for the next several days to support preparedness decisions. During the response phase, it can be used to better inform incident management decisions, such as suppression strategies. It has the potential to be used for recovery to better inform land use planning after a bushfire event. The tool also has functionality to consider suppression activities such as water bombing. This functionality is not used by QFES, due to the uncertainty of this information and the need to provide a consistent product to decision makers.

Phoenix is a deterministic model, meaning the same inputs will always produce the same result. Models from Phoenix provide a realistic simulation based on the best available information. Phoenix has proven to be a very valuable tool for producing intelligence products for those managing fires. Unlike tools used for storm tide which are referenced in *The Cyclone Debbie Review,* Phoenix does not give a range of probabilities showing uncertainty. QFES has been actively working to improve on that capability through the development of Simulation Analysis-Based Risk Evaluation (SABRE) that provides this for bushfire.

SABRE uses an ensemble approach to deal with uncertainty. It reads in the best estimate of inputs, then runs these multiple times in Phoenix. At each run it adjusts the weather, fuel and ignition values based on how certain the Fire Behaviour Analyst believes it to be. These results are then combined and analysed in SABRE to give a probability of bushfire spread. This shows the levels of uncertainty about where the fire is likely to end up by a given time. The Office found this product easy to understand.



SABRE output showing probability of bushfire spread. Image courtesy of Queensland Fire and Emergency Services

SABRE was developed in-house by the Predictive Services Unit of QFES. It is a comprehensive decision-support framework containing a suite of bushfire monitoring, prediction and analytical tools. The various tools are tailored to support specific decision requirements and user need.

These tools cover:

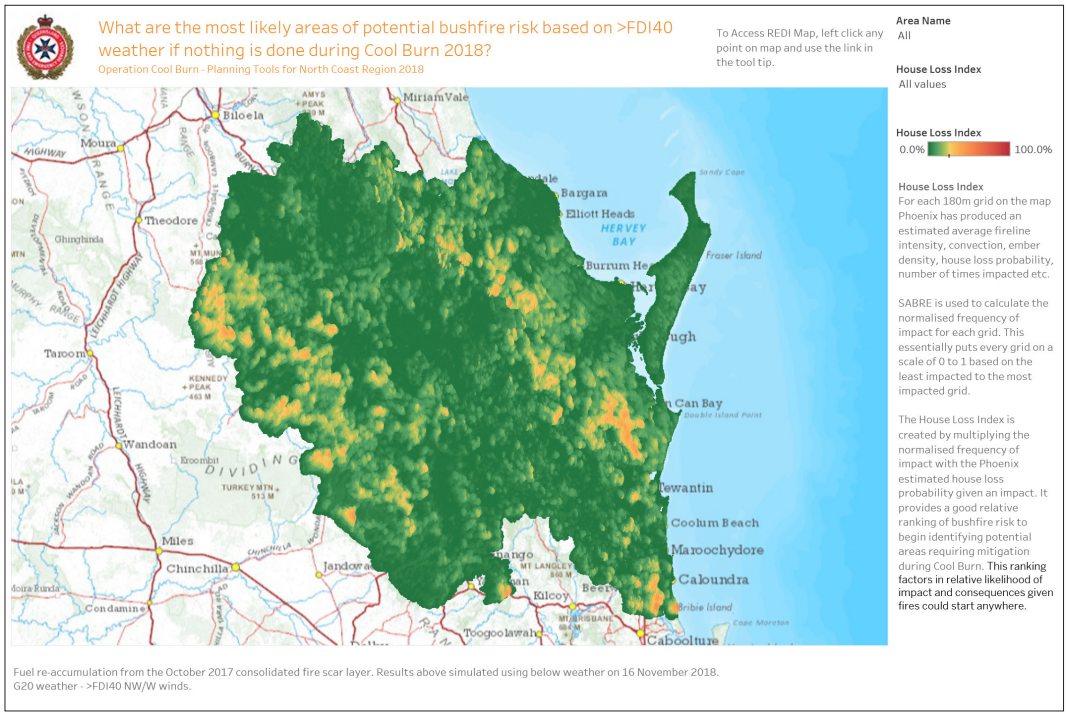
- Prevention – planning for the next two to 12 months
- Preparedness – planning for upcoming conditions in the next two to six days
- Response – aimed at first responders to assist decision-making.

SABRE is available to all QFES staff and volunteers. Some state government agencies and some local governments can access some of its functionality. SABRE's preparedness and response tools (fire spread prediction) have also been used in the Australian Capital Territory, South Australia, Tasmania and Victoria. SABRE integrates with other QFES operational systems and internal and external datasets, such as current incidents and the latest weather forecast information. It also has a prototype tool to guide community warnings. The Office was impressed with the functionality of SABRE.

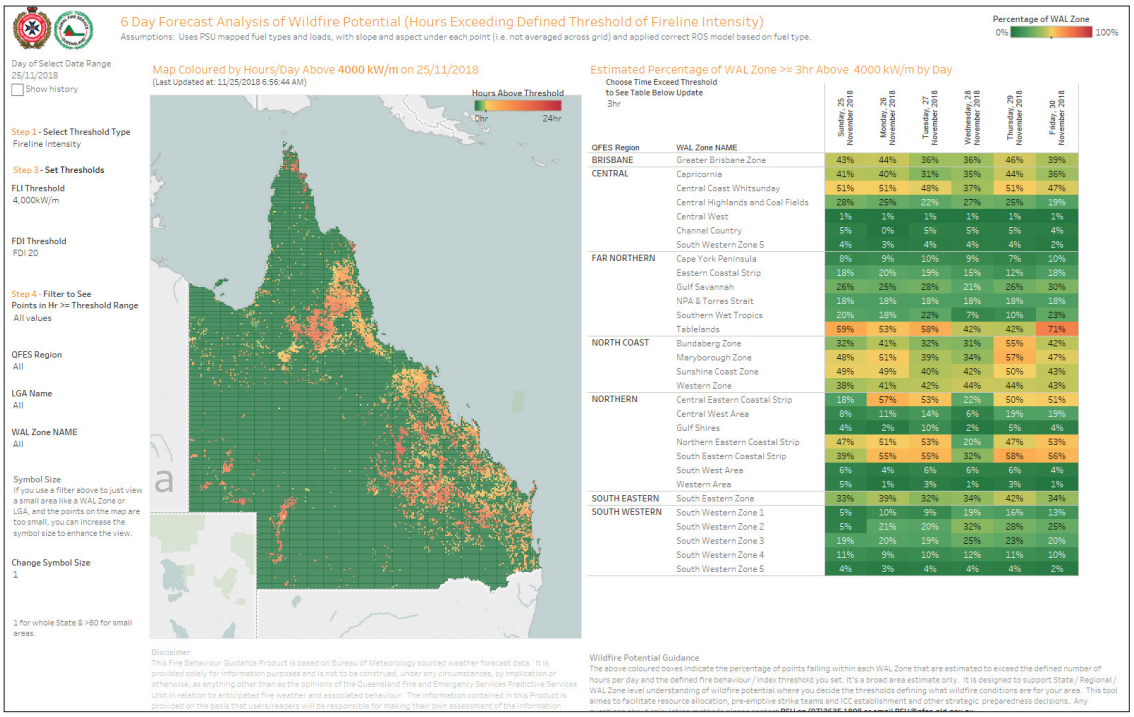
Skilled and trained Fire Behaviour Analysts are needed to operate Phoenix and to manage SABRE. However, the maintenance of SABRE was found to rely on a single Fire Behaviour Analyst which appears a significant risk. This capability sits in the Predictive Services and Advanced Capability Support Units within QFES. QFES formed the Advanced Capability Support Unit in 2018 to address the availability of system administrators and is trying to grow this capability.

Fire Behaviour Analysts told the Office that there is always uncertainty regarding the inputs required to run the simulator. Knowing the exact location of a bushfire at a given time is often a challenge. This is a critical input for an accurate prediction. Later in this report technologies are covered, such as line scanning, data from satellites, and other tools such as Air Operations Fire Mapping that assist here.

QFES has a small number of Fire Behaviour Analysts. Sixteen officers have undertaken training and six to eight are nationally qualified. Other states also have Fire Behaviour Analysts, who can be accessed through interstate and national arrangements. Using the available models, a Fire Behaviour Analyst produces the most reasoned bushfire spread prediction and associated fire behaviour advice. To ensure a quality bushfire spread prediction, the Fire Behaviour Analysts use their skills to fine-tune the inputs to accurately simulate what is happening on the ground. They also account for any potential elements that cannot be appropriately managed within the simulator. The prediction and advice information support decisions such as weight of attack options, suppression strategies and community warning message content.



SABRE output showing data to assist bushfire prevention planning.
Image courtesy of Queensland Fire and Emergency Services



SABRE output showing probable bushfire conditions to assist with preparedness.
Image courtesy of Queensland Fire and Emergency Services

During the 2018 bushfires Fire Behaviour Analysts were in very high demand. Most were located at the State Operations Centre in Brisbane, and some were subsequently deployed to the Rockhampton Regional Operations Centre. An additional eight Fire Behaviour Analysts were deployed from other states, to support operations and manage fatigue.

The senior Fire Behaviour Analyst was almost entirely committed to briefings, including the Queensland Disaster Management Committee. Other Fire Behaviour Analysts distributed predictive products to the Regional Operations Centres and Incident Management Teams, to planners and decision-makers in Brisbane, and ensured incoming counterparts were set up to use the tools.

The Office heard praise in places from QFES regional staff about the Predictive Services Unit, the Fire Behaviour Analysts and the products they disseminated. The Rockhampton Regional Operations Centre debrief identified that they would have liked to have a Fire Behaviour Analyst on-site earlier. Conversely, the Office also heard during interviews that some decision-makers during the 2018 bushfires did not have confidence in the fire simulations and thought they were not relevant to their local conditions. The Office heard from Fire Behaviour Analysts about some resistance by decision makers towards using these products. It was surprising to find that this tool was not being used extensively within QFES.

Finding 23: Fire prediction products were high quality and well-regarded in some areas, but their acceptance is not universal within Queensland Fire and Emergency Services.

Products from Phoenix and SABRE are known to have directly influenced key decisions during the event. This included the evacuations of Gracemere and Deepwater. It is also known that they were used in the decision not to evacuate the Rockhampton Hospital. The Office heard that some of these decisions were made in Brisbane because there was direct access to the Fire Behaviour Analysts.

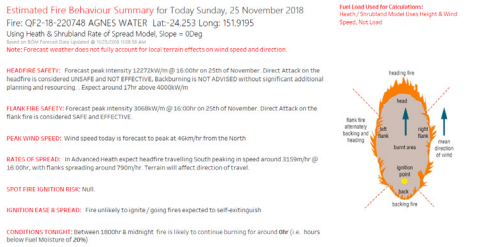
The Office sees advantages in the predictive services' capability being expanded. The focus should move away from vertical agency reporting to a broader information-sharing approach. This approach must include contextual information for the product to be understood by non-experts. More broadly, QFES efforts to encourage greater awareness of the interconnectedness of agencies and a cultural realignment to the disaster management system would all aid future information and intelligence flow.

SABRE PRODUCTS FOR RESPONSE

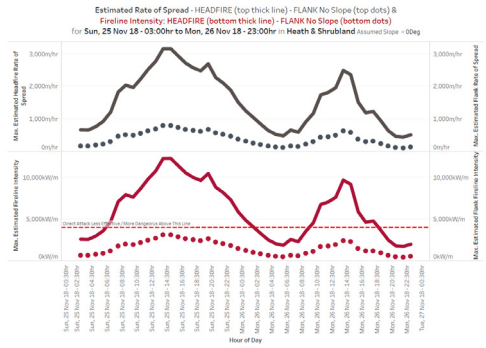
The SNAP report is designed to facilitate improved decision-making for first responders and fire managers engaged in planning and incident management.

The first section shows the selection of the incident in question, the rate of spread model and the parameters used to drive the selected rate of the model. The text section immediately beneath is designed to provide the peak daily fire behaviour values and their plain English meaning for decision makers. These explain the potential for the fire's effects on crew and community safety at the head fire and the flank fire, and some of the conditions throughout the day and into that night.

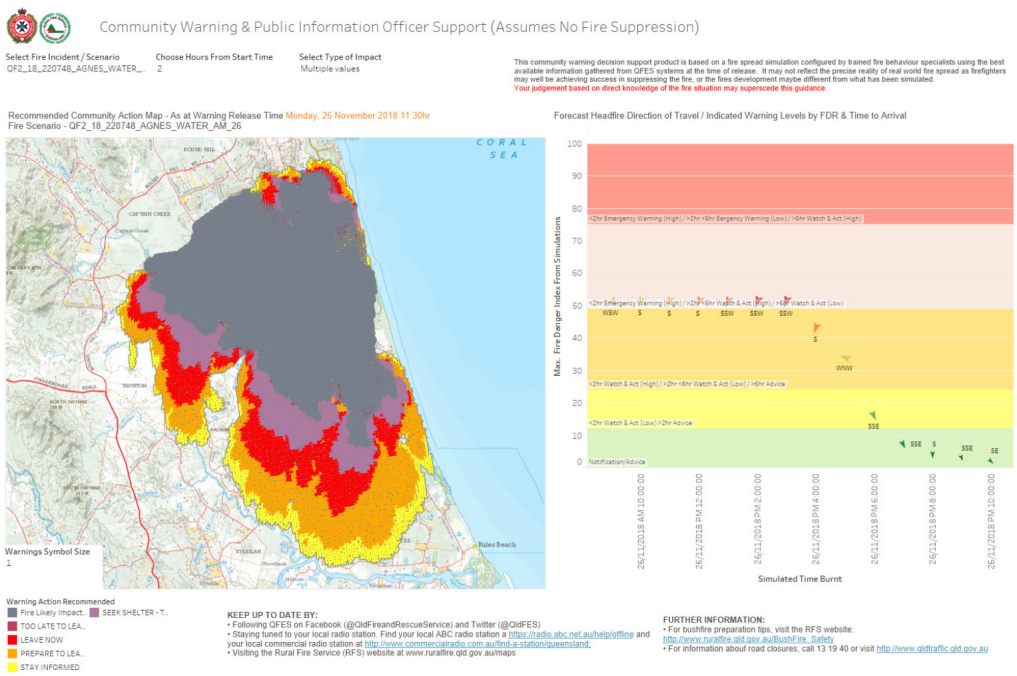
The bottom section is a chart through time of estimated hourly rates of spread (top) and fire line intensity (bottom) for the head fire (thick unbroken line) and flank fire (dotted line).



SNAP report: Estimated Fire Behaviour Summary
Image courtesy of Queensland Fire and Emergency Services



SNAP report: Estimated rate of spread and fire line intensity.
Image courtesy of Queensland Fire and Emergency Services



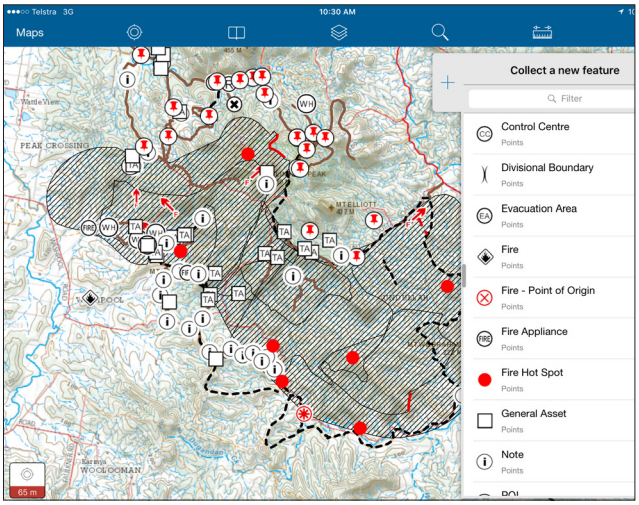
SABRE output showing Community Warning and Public Information Officer support.
Image courtesy of Queensland Fire and Emergency Services

The Office also heard how these products and the proactive actions of the Fire Behaviour Analysts played a critical role in some community warnings. The decision for the community of Tinnanbar to shelter in place is one example. Without this intelligence provided by the Fire Behaviour Analysts, the community was to receive a message to evacuate. This would have resulted in the people of Tinnanbar evacuating down the only access road which already had fire appliances and crews in action on it. Fire simulations predicted that this road would be impacted during the evacuation period, which it subsequently was. Had the warning to evacuate not been changed to shelter in place in response to the Fire Behaviour Analysts' guidance, this community may have been at greater risk.

> *What the Predictive Services Unit did in that week saved people's lives, no doubt about it. – QFES Manager.*

The Bureau played a crucial role in providing intelligence information and products during the event. Fire Behaviour Analysts routinely work closely with Bureau meteorologists. During the event a request was made for a fire researcher employed by the BNHCRC and the Bureau to deploy to the State Operations Centre. The researcher worked with QFES staff during the peak days of the event to provide expert advice on forecast weather. This included modifying the weather inputs to better represent the local conditions. This gave the Fire Behaviour Analysts a dedicated resource while the embedded meteorologist continued to provide high level briefings.

Fire modelling requires accurate information about the time and location of a fire. Fire Behaviour Analysts in Queensland traditionally use a combination of radio logs, satellite data and visual observations to determine a fire's location. Air Operations Fire Mapping is a tool used by trained Air Observers to manually collect information about a fire. It allows information such as a bushfire's current location, fire fronts, burned areas, spot fires, suppression activity and other items of interest to be collected. Air observers are deployed to bushfires in either fixed-wing aircraft or helicopters. They manually record visual representations of what they see into the Air Operations Fire Mapping tool. The accuracy of the information depends on the skills of the pilot, visibility, and the situational awareness of the air observer. The tool also allows observers to take true colour photographs of the fire with location information. This information is then uploaded through the 3/4G phone network or via satellite transmission for viewing and analysis in Total Operation Mapping (TOM). TOM is a web-based mapping application that allows users to view and interact with spatial information.



Example output from the Air Operations Fire Mapping tool. Image courtesy of Queensland Fire and Emergency Services

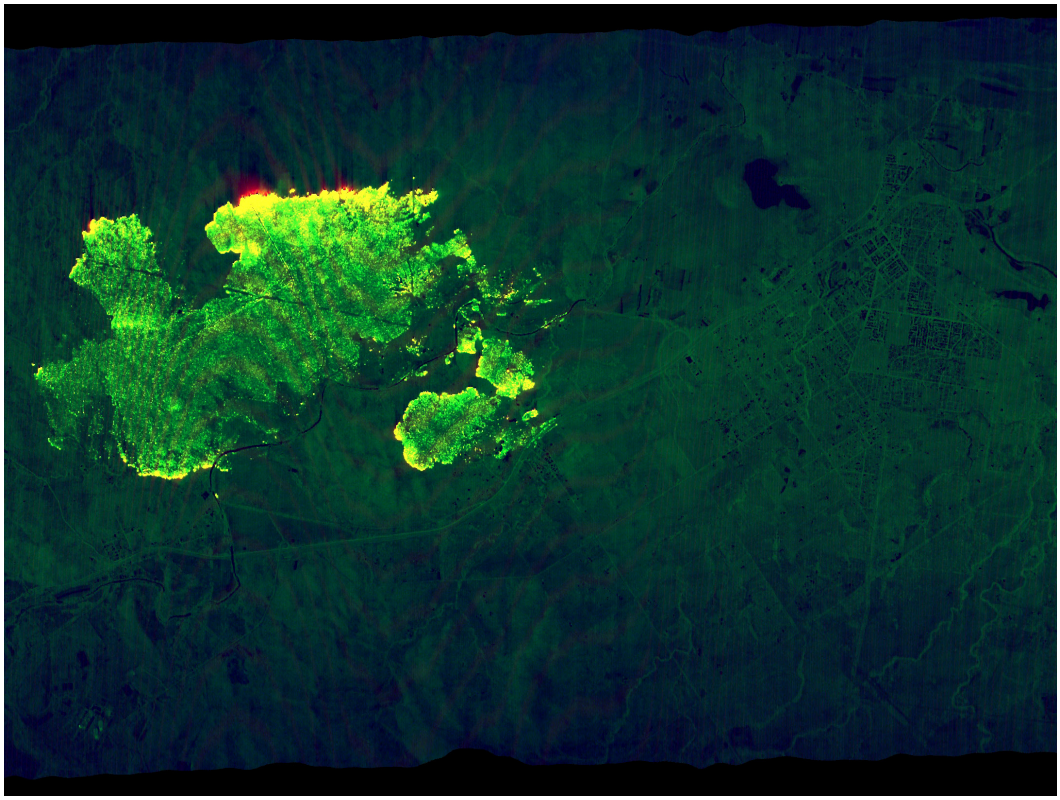
The Office was told that there were sometimes issues with the quality of the data produced through Air Operations Fire Mapping. For example, there was no way for the Fire Behaviour Analysts to know when the information collection was complete. The Office was told that air observers sometimes wait until the aircraft lands to adjust or record what they saw, as it is too hard to do in the air. If the time is not correct it may reduce the accuracy of the simulation. Other alternative sources of data are used to complement information gathered in this way.

What an air observer might see. Photo courtesy of the aircrew of Queensland Fire and Emergency Services Air Operations

The Fire Behaviour Analysts use several satellite services, both infrared and optical, to gain intelligence about bushfires. This information was reported to be very accurate and a valuable resource. However, the Office was also told that it was not always timely, as it depended on satellite passes. The resolution of the imagery also varied depending on the service.

Line scanning is currently considered the most useful, flexible and reliable method to provide high resolution location and timing information on bushfires. The technology is used by many of the southern states, and uses infrared camera technology to identify fire edges, spot fires and burned areas. Scanners are mounted to aircraft which are deployed over active fires to gain intelligence. Line scanning images can be streamed in near real-time for display or analysis by other systems. While offering significantly greater flexibility in terms of frequency and resolution, they remain constrained by weather, cloud and smoke.

Line scanning captured during this event was a great success. This was due to its timeliness and its ability to accurately identify a bushfire's location. This information was used repeatedly by Fire Behaviour Analysts to produce predictions based on highly accurate starting conditions (active edges and existing burn scars at a known time). Line scanning, when collected, provided a greater degree of certainty around the time and location details of the fire compared to that collected through Air Operations Fire Mapping.



Line scan of a bushfire.
Image courtesy of Queensland Fire and Emergency Services

Finding 24: The functionality of Phoenix RapidFire, and particularly the Simulation Analysis-Based Risk Evaluation (SABRE), combined with the skills of the Fire Behaviour Analysts is a valuable intelligence resource that could be used more widely across all phases of disaster management (Prevention, Preparedness, Response and Recovery). It is considered a capability that is cutting edge, used by others, and is worthy of building on.

Finding 25: Intelligence from fire modelling tools and advice from the Fire Behaviour Analyst community contributed positively and significantly to public messaging. Complementary systems, such as line scanning from aircraft to report accurately on fire fronts, were beneficial.

Systems to display intelligence

QFES has several mapping systems to visualise information.

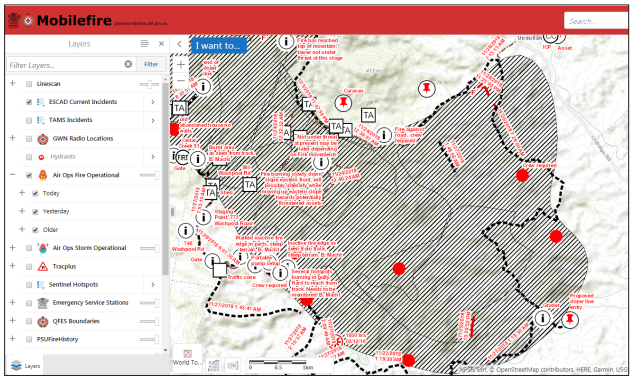
Mobilefire is designed for use in the field on phone or tablet devices. It displays foundation and operational spatial information including current incidents and information collected by the Air Operations Fire Mapping application. Mobilefire is used by RFS staff and volunteers.

QFES can share information through web services using a resource called QDMA Sharing. This allows information to be viewed or analysed in other systems. QDMA Sharing also includes web applications. The Office was told that 130 users external to QFES had access to QDMA Sharing.

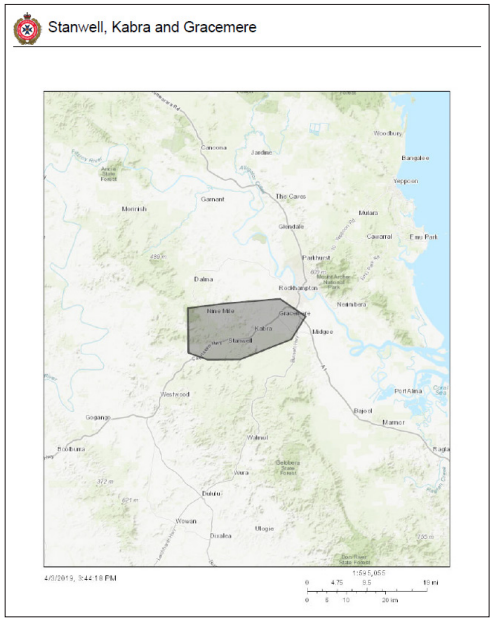
The State Disaster Coordination Centre (SDCC) Situational Awareness Platform, formerly known as the Weather Events Catalogue, is another mapping system aimed at providing situational awareness of current events. It displays foundation mapping datasets and has dashboards showing current incidents, damage assessments and State Emergency Services tasks. This platform is available to external agencies such as local governments and other state agencies through secure access.

The SDCC Situational Awareness Platform is capable of producing an exposure report for an area of interest. The report includes information such as the impacted disaster management groups, estimated population numbers from Census data, and key infrastructure such as hospitals, aged care facilities and schools. If these products were incorporated into the SABRE outputs they could enable useful intelligence products for a much wider audience. However, it was reported that the Fire Behaviour Analysts had little awareness of the exposure reports or the SDCC Situational Awareness Platform. The Office heard that QFES plan internal reorganisation to address this; putting operational planning and risk teams under common management.

The Office heard the same frustration among operational staff in coordination centres that was heard following Tropical Cyclone Debbie about the multiplicity of systems in the disaster management sector. The Office has raised this matter in previous reviews. One coordination centre operator spoke of five different mapping systems in use.



Example output from Mobilefire.
Image courtesy of Queensland Fire and Emergency Services



Example of content in an exposure report generated by the SDCC Situational Awareness Platform.
Image courtesy of Queensland Fire and Emergency Services

Another told us:

> *The terrifying thing is that we're still fighting these fires strategically with pieces of paper and excel spreadsheets. We seriously need to get systems in place to fix the problem. We need information on the ground feeding into a system; raw data that turns into intel, that feeds into the Regional Operations Centre; that feeds into local government; everywhere that decisions are made.*

There is a further opportunity to do more to convert information into intelligence. Some in QFES are well aware of this. One officer commented, 'Collectively we need to do more to develop intelligence products.' Although recovery is out of scope for this review, the Office heard from the QRA of several

products that they have developed to visually display spatial analysis to inform recovery. Their analysis of fire scars overlaid with other data and the Smart Mapping program both appear to have the potential to be used for response purposes across the disaster management system. Their experience with consolidating and streamlining data about damage assessments has shown both progress and challenges. Collaboration with QFES over the sharing of data and production of such intelligence has potential benefits for other agencies and levels of government. The QRA also highlighted the value of aligning reporting across all phases of an event (Prevention, Preparedness, Response and Recovery) to improve consistency of information and increase situational awareness.

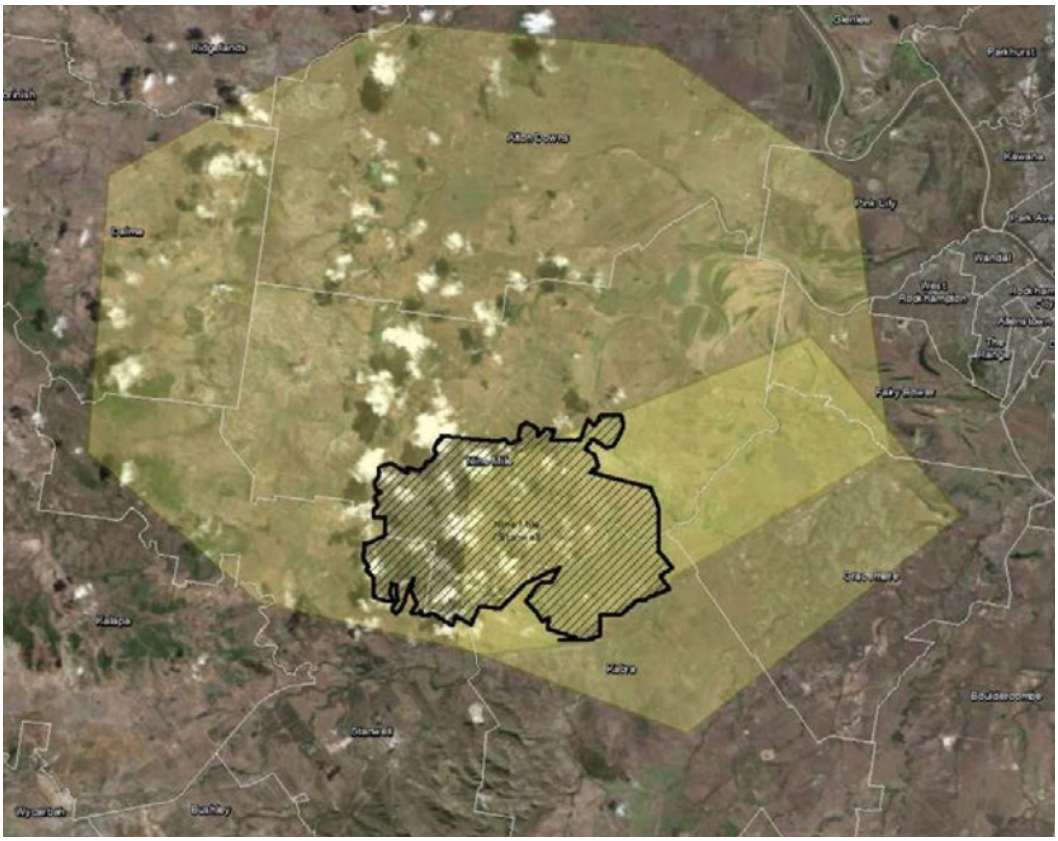
Intelligence products should be aimed at meeting the needs of the broader disaster management sector.

They should be shared, understood and used to inform all phases of disaster management, including:

- collaborative bushfire mitigation and preparedness planning
- predicting upcoming conditions
- informing the community including warnings for bushfires.

When this is coupled with the speed with which the situation changed during these bushfires, there is once again a compelling case for a single information management system. *The Cyclone Debbie Review* recommended:

> *Significant effort should be invested to provide disaster decision-makers at every level with a shared understanding of risks, the situation, and capability, so that they can agree on the best decisions for the communities they serve.*



Stanwell fire scar and the associated Emergency Alert polygons.
Source: Queensland Reconstruction Authority

Finding 26: Providing disaster decision-makers at every level with a shared understanding of risks, the situation, and capability, so that they can agree on the best decisions for the communities they serve, is critical to delivering effective community outcomes.

Finding 27: Queensland Fire and Emergency Services' systems used to disseminate situational awareness mostly display information, which requires further analysis to deduce intelligence.

Finding 28: Having heard from agencies about various technologies to enable data-sharing and visualisation and analysis, there is considerable opportunity for further collaboration to reduce duplication of effort and develop full interoperability.

Recommendation 10:

Building capacity in fire simulation and predictive capabilities, including the capability of people to read and interpret these products through training, should be investigated and considered.

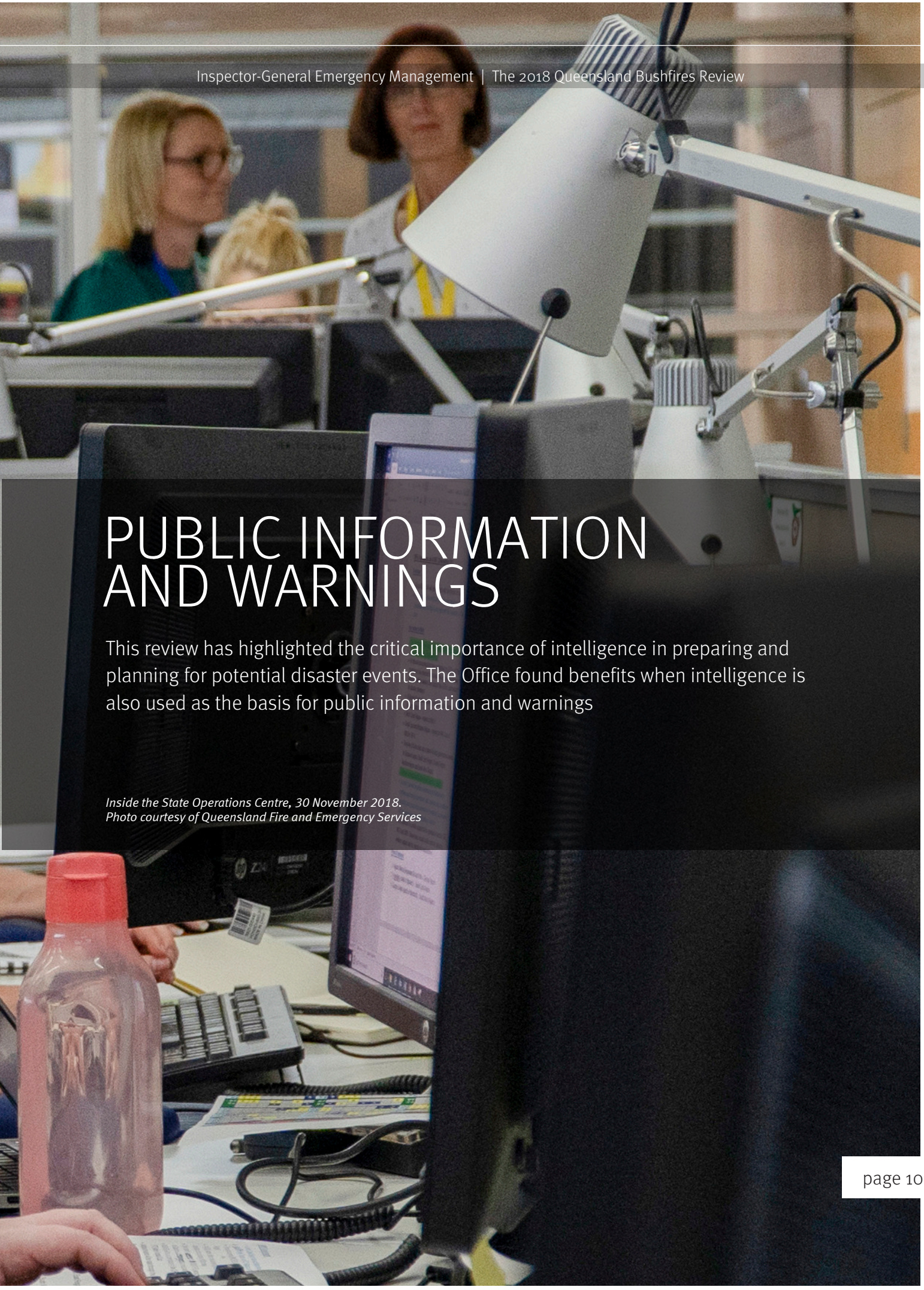
Recommendation 11:

The outputs of these capabilities should be shared and actively inform the disaster management sector, including response operations and the creation of warnings and public messaging.

Recommendation 12:

The ability to share, analyse, interrogate and display information from disparate entities should be progressed as a matter of some urgency.

THE 2018 QUEENSLAND BUSHFIRES REVIEW



PUBLIC INFORMATION AND WARNINGS

This review has highlighted the critical importance of intelligence in preparing and planning for potential disaster events. The Office found benefits when intelligence is also used as the basis for public information and warnings

Inside the State Operations Centre, 30 November 2018.
Photo courtesy of Queensland Fire and Emergency Services

Public information and warnings

This review has highlighted the critical importance of intelligence in preparing and planning for potential disaster events. The Office found benefits when intelligence is also used as the basis for public information and warnings. This section of the report explains how the public information and warnings system works, what was expected and what was found.

Timely and accurate information and warnings inform communities. They tell communities about risks and empower them to understand the consequences of decisions and actions they choose to take. Ineffective and untimely information and warnings can quickly erode public trust and confidence in disaster management arrangements and government.[124]The public value of all levels of government is determined by the extent to which people believe policy, and practice meets their needs and expectations.[125] Previous reviews published by the Office have acknowledged the difficulty in building and maintaining community confidence and participation in the disaster management system as public values change over time.[126]

Warning is defined as point-in-time information about a hazard that is expected to affect communities. Warnings give information about the likely impact and expected consequences, and include action-based advice.[127] Public information is less urgent and describes information given to the community immediately before, during and after an emergency or hazard. It is acknowledged that responsibility for timely and effective public engagement (including public information and public education) is shared between entities.[128] When entities work together effectively, this enables timely, targeted and tailored information and warnings.

How the public information system works

People are more likely to acknowledge and act on a warning if they have prior awareness of local risks and the confidence to take appropriate action.[129] A total warning system explains how warnings relate to public information; that is, general communication and education about risk.[130]Australia's total warning system defines its essential elements and lifecycle through all phases of an event.

Australia's Total Warning System
Source: Australian Institute for Disaster Resilience Handbook 16: Public Information and Warnings

The effectiveness of warnings depends on three essential factors; weather forecasting, risk planning, and scenario modelling. It may also be influenced by community factors:

- pre-existing community perceptions of risk and potential impacts[131]
- previous experience of disaster events[132]
- community-held knowledge of what to do to reduce impact, and capabilities to carry out those actions (self-efficacy)
- understanding what a warning means at an individual, household and neighbourhood level (drawing on the ability to contextualise the warning information provided).[133]

The authorising environment

Responsibility for public information and warnings is shared across all three levels of government, as prescribed in relevant legislation, policy and doctrine. For example:

1. The Commonwealth *Meteorology Act 1955* prescribes key functions of the Bureau including weather forecasting and the issue of warnings of gales, storms and other weather conditions likely to endanger life or property, including weather conditions likely to give rise to floods or bushfires (Section 7, 1b and c)
2. Section 8B of the FES Act prescribes the following 'warning-type' functions to QFES:
   - **(a)** *to protect persons, property and the environment from fire and hazardous materials emergencies; and*
   - **(b)** *to provide an advisory service, and undertake other measures, to promote*
     - **(i)** *fire prevention and fire control; and*
     - **(ii)** *safety and other procedures if a fire or hazardous materials emergency happens.*
3. The DM Act prescribes responsibilities to both local and district disaster management groups to ensure the community is aware of how to prepare for, and what to do during and after a disaster.

National guidance

National doctrine and policy on this topic has been developed by the Australasian Fire and Emergency Services Authorities Council (AFAC). AFAC is a national peak body for public sector fire, land management, and emergency services, and was established by its members to collaborate on matters of international, national and regional importance. QFES is a member and uses the doctrine and policy to inform Queensland's bushfire incident management, public information and warnings.

In response to the 2009 Royal Commission into the Victorian Bushfires, the then Australian Emergency Management Committee convened a National Bushfire Warnings Taskforce to develop an improved bushfire warning system. AFAC was a key member of the taskforce and hosts doctrine and guidance from this work, including:

- the discussion paper, *A national systems approach to community warnings*[134]
- the *National Framework for Scaled Advice and Warnings to the Community*[135] (known as the National Bushfire Warnings Framework), underpinned by specific messaging detailed in Australia's revised arrangements for bushfire advice and alerts[136]
- a position on bushfires and community safety for agencies to use when influencing relevant jurisdictional policy development and developing operational priorities and mitigation strategies[137]
- the *Community Safety Messaging for Catastrophic Bushfires: Lessons Learnt from Black Saturday Bushfires* guideline, an evidence-based advice about the key messages that could be conveyed to communities about bushfire survival.[138]

Further national guidance is provided by the Australian Institute for Disaster Resilience, the custodians of the Australian Disaster Resilience Handbook Collection. The recently published *Public Information and Warnings Handbook* draws on the expertise from across the disaster resilience, emergency management, police, health, broadcast media, research and social services sectors in Australia. It provides insight and guidance for people responsible for communication with the public in the event of an emergency.[139]

What was expected

In this review the Office set out to look at:

- how well the public information and warnings were integrated across the two hazard types, across the two hazard-specific lead agencies, and the broader disaster management system
- how well the broader elements of the total warning system were evident across the bushfire incident management and disaster management systems
- opportunities for improvement across the broader systems of incident management, disaster management, and the total warning system
- examples of good practice.

Previous reviews have highlighted opportunities to improve public information and warnings. These include recommendations relating to:

- issues of collaboration with local groups, addressing information sharing, messaging responsibilities, terminology and timing[140]
- ensuring entity plans reflect agreed warning and notification protocols, and roles and responsibilities[141]
- improving the timeliness, accuracy and targeting of Emergency Alert (EA) messaging[142]
- strategies to improve availability of information to decision makers and other audiences[143]
- providing disaster decision makers at every level of Queensland's disaster management arrangements with a shared understanding of risks, the situation and capability.[144]

The Standard provides the key community outcomes required from effective disaster management practice. For public information and warnings, the following key outcomes apply:

- communities are empowered through timely public information and through education initiatives to prepare for, respond to, and recover from disasters
- public engagement outcomes have a positive effect on the action taken by the community across all phases of disaster management
- communities at risk of impact from an event are defined and can be targeted with contextualised warnings
- communities at risk of impact from an event, receive fit-for-purpose, consistent, accurate warnings through all phases of events.[145]

The State Plan includes disaster management responsibilities for hazard-specific primary agencies which should address the hazard actions across all phases (Prevention, Preparedness, Response and Recovery). For bushfire and heatwave, this therefore makes the link between both preparedness activity and response, and Queensland's disaster management arrangements. The State Plan identifies QFES as responsible for managing and administering the EA system, distributing bushfire community warnings, and as the hazard-specific primary response agency for bushfire incidents. QFES is also to ensure that disaster management and disaster operations are consistent between plans, policies, standards and guidelines.

The State Plan also identifies a range of agency-specific responsibilities for Queensland Health which include primary agency responsibility for the *Queensland Heatwave Response Plan*, provision of health disaster and incident information to the public and disaster management stakeholders, and messaging on public health risks to affected communities.

Hazard-specific primary agencies have responsibilities outlined in hazard-specific plans, such as the *Wildfire Mitigation and Readiness Plans* and the *Queensland Heatwave Response Plan*. Their responsibilities include:

- addressing the hazard actions across all phases of disaster management, including information on how Queensland's disaster management arrangements link with the hazard-specific arrangements
- ensuring that hazard-specific plans support primary agencies to manage the hazard-specific events
- identifying hazard-specific risks and the communication of risks
- ensuring that hazard-specific plans are developed in consultation with affected stakeholders
- providing disaster decision-makers at every level with a shared understanding of risks, the situation and capability.[146]

In the context of the Standard and the State Plan, the Office expected to find effective approaches to

developing and implementing public information and warnings, informed by legislation, national frameworks, strategic policy, doctrine, and collaborative planning. It was expected that these approaches would be further informed by good practice, emerging evidence, and changing local community contexts and communication needs.[147] In the *Review of Seqwater and SunWater Warnings Communications* published by the Office in 2015, it was identified that the arrangements in place for warning the community of dam water releases would benefit from being collaboratively developed and aligned between those responsible.[148] The review resulted in the *Water Legislation (Dam Safety) Amendment Bill 2016* to improve the integration of dam safety and disaster management. Consequently, dam owners and operators, local government and local groups, supported by DNRME, undertook to recognise the different approaches and triggers required by each agency, and implemented a warning system which met the needs of the entities involved and, importantly, met the needs of the community.

It was expected that well established and exercised doctrine would be found. The Office also expected to find that:

- plain language community messages and education are action-orientated and inform the community of the risks
- warning messages use common language and are consistent with other public information and advice
- warning messages are tested with the community to determine community understanding
- public information is accurate, reliable, relevant, and timely
- roles and responsibilities for public information and public education are agreed to and documented before an event
- warning messages are delivered by entities with authority to do so, in line with agreed and documented roles and responsibilities
- the communication protocols for the effective delivery of public information and community warnings across all phases of disaster management are collaboratively developed
- these protocols include the roles and responsibilities of hazard-specific primary agencies and their supporting disaster management stakeholders.[149]

The Office would expect to see evidence of consistent messaging across the three activated systems of heatwave management and response, bushfire management, and disaster management. The Office would also expect the content to include community preparedness, including community contribution to mitigation and response to these events. The Office would also expect that the activities would result in the following community outcomes as defined by the Standard:

- Stakeholders have a shared understanding of, and ready access to, risk information for all types of events.[150]
- Communities are empowered through timely public information and through education initiatives to prepare for, respond to, and recover from disasters.[151]
- Public engagement outcomes have a positive effect on the action taken by the community across all phases of disaster management.[152]
- Communities at risk of impact from an event are defined and can be targeted with contextualised warnings.[153]
- Communities at risk of impact from an event, receive fit-for-purpose, consistent, accurate warnings through all phases of events.[154]

What was found

Disaster management doctrine

The Queensland Disaster Management website (www.disaster.qld.gov.au) is intended to be a repository of all publicly available doctrine, plans and publications relating to Queensland's disaster management arrangements. It should provide all entities with a common source of truth for current doctrine, including publicly available functional and hazard-specific plans. Neither the *Queensland Heatwave Response Plan* and its associated communications protocol nor any bushfire hazard-specific plans (such as the *Wildfire Mitigation Plans* and *Readiness Plans*) are currently available or referenced on the site. It would be helpful to include publicly available functional and hazard-specific plans to clarify the roles and responsibilities associated with issuing warnings to the community.

Disaster management doctrine for heatwave

As stated in the Heatwave section of this report, Queensland Health maintains the *Queensland Heatwave Response Plan* and the *Queensland Heatwave Response Communications Protocol*. Queensland Health has the following public information and warnings responsibilities for heatwaves:

- maintaining situational awareness of potential heatwave conditions via the Bureau website
- identifying vulnerable groups and considering them in arrangements
- developing messages while ensuring alignment with the Bureau as part of a broader communication strategy
- sharing of messaging with HHSs, QAS and partner agencies through usual networks and the SDCC.

The communication activities outlined in the *Queensland Heatwave Response Communications Protocol* align with heatwave intensity levels to ensure a scalable and consistent approach. Queensland Health provides relevant advice to key internal and external stakeholders when activated for a severe or extreme heatwave. At the local level, Queensland Health liaises with local government, utility providers, local event organisers, and other relevant stakeholders to address emerging public health risks. They also liaise with health-related stakeholders including QAS, aged care facilities, private hospitals, primary health care networks, community health care providers and pharmacies.

The Office found that the distribution of alerts and warnings is not clearly articulated in the *Queensland Heatwave Response Communications Protocol*. Reference is limited to noting that 'each disaster management stakeholder is responsible for further disseminating warnings and alerts through their own communications networks.' However, the *Queensland Heatwave Response Plan* provides greater detail. It identifies that 'Queensland Health, in consultation and collaboration with the Bureau and the SDCC, will establish briefings, provide consistent information for public messaging and advice for other agencies. This will be done through normal channels through the SDCC.' This means that Queensland Health provides the content for public messages to the SDCC and local governments, who then distribute the alerts and warnings to the community.

The Office heard that the communication processes outlined in the *Queensland Heatwave Response Communications Protocol* were not strictly followed during the heatwave. On some occasions, the SDCC issued health-related messages without prior consultation or engagement with Queensland Health. The Office also heard that existing communication channels were not fully utilised. In contrast, the usual communication processes were followed during the bushfire event. However, the fact that during November, two events caused by different hazards, and managed by different agencies were occurring at the same time, appears to have been overlooked. This could have resulted in inconsistent communication. Queensland Health felt that there needed to be greater engagement and found it challenging to ensure that health-related impacts from the bushfires were included in messages, both at the local level and state level.

Disaster management doctrine for bushfire

The Office found that QFES had clear internal-facing doctrine in place before the 2018 bushfires. It outlines the roles and responsibilities of key personnel for public information and warnings, and requires liaison with local and district disaster management stakeholders. However, it was also found that the doctrine is not consistent across all QFES regions.

The Office found that the internal-facing doctrine (*Central Region Wildfire Response Plan*, Incident Management System doctrine) details the requirement for key QFES staff to brief local and district groups on event and incident details and potential impacts, including the issuing of public information and warnings. The Office heard that these roles were further emphasised during QFES's 2018 bushfire event preparedness staff briefings.

The Office did not find any collaboratively developed external-facing doctrine, or hazard-specific plan for bushfire which outlines the links to the disaster management arrangements. The survey of QFES staff and disaster management stakeholders involved in these events conducted by the Office, found that respondents did not recall local- or district-level, cross-sector bushfire or heatwave exercises being conducted with disaster management stakeholders in the 12 months prior to the 2018 bushfire events.

QFES has advised that work is underway on the collaborative development of planning and doctrine with disaster management stakeholders.

Finding 29: Processes for issuing bushfire community warnings in Queensland are not fully understood by those with disaster management warning responsibilities, nor can these processes be fully integrated into the disaster management arrangements. An opportunity exists to recognise their differences and mirror arrangements similar to those for dam water releases.

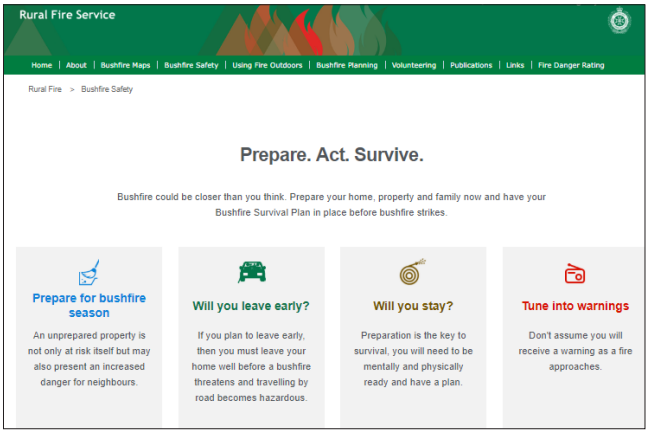
Finding 30: The Office found no heatwave nor bushfire hazard-specific doctrine available on the disaster management website nor is there any bushfire hazard-specific doctrine available in the public domain (for use by disaster management stakeholders and others).

Public bushfire and heatwave information

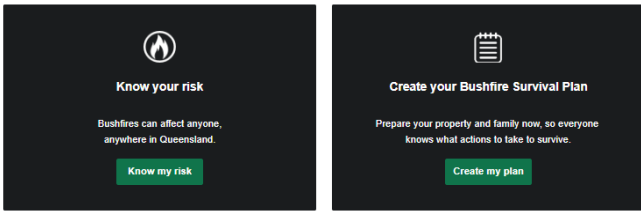
The Office was advised by QFES that Volunteer Community Educators (VCEs), Bushfire Safety Officers and Regional Community Engagement Officers deliver local-level community safety and bushfire preparedness information to the community. Regional Community Engagement Networks have been established in each QFES region to coordinate planning for the engagement activities. VCEs also attended community meetings, provided advice and publications, knocked on doors within impacted areas, and conducted 'welfare checks' during the 2018 bushfires. QFES advised the Office that a new preparedness campaign involving more than 1000 multi-agency staff and volunteers knocking on doors statewide on Saturday 15 September 2018 reached approximately 7800 people. QFES has also developed bushfire education materials for schools and teachers, and supports them through interactive sessions about bushfires, community action and personal resilience. QFES continues to work with the Department of Education to develop strategies for education that are appropriate for use in schools.

In January 2019, the Office conducted a desktop review of publicly available information to assess the consistency of bushfire and heatwave preparedness information provided by local and state entities. A varying degree of community preparedness information across local and state websites was found. Since January, the websites and social media campaigns of some state entities have been updated to include bushfire and heatwave preparedness content, and heatwave community safety information.[155]

The Office found that the RFS's Bushfire Safety website provides well-structured information and messages about the key elements of bushfire preparedness and community safety. It includes preparation advice, templates for households to develop a bushfire survival plan, and daily fire danger ratings and bushfire warnings fire danger ratings are an early indicator of the potential risk, should a bushfire start.[156] The ratings are based on the Bureau's forecast districts in Queensland and are jointly developed by QFES and the Bureau.[157] There are six levels of fire danger rating, ranging from low-moderate to catastrophic. Messaging about catastrophic fire conditions is currently limited to one instance within the materials available on the RFS website. There would be benefit in the messaging for catastrophic fire conditions to be integrated across existing information and public education materials, campaigns and community engagement activities.



The Rural Fire Service's 'Prepare. Act. Survive.' web page.
Source: Queensland Fire and Emergency Services



The Rural Fire Service's 'Know your risk' and 'Create your Bushfire Survival Plan' online tools.
Source: Queensland Fire and Emergency Services

CATASTROPHIC FIRE DANGER RATING

A catastrophic fire danger rating means any fires that occur are likely to 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 such fires, well-prepared and well-constructed homes will not be safe. Leaving is the only option for survival.
(National Warnings Taskforce, 2009)

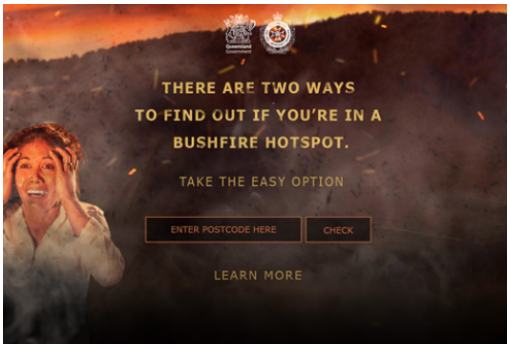
Finding 31: The Office found limited information relating to the national key messages for catastrophic fire danger ratings across material at a local and state level.

Recommendation 13:

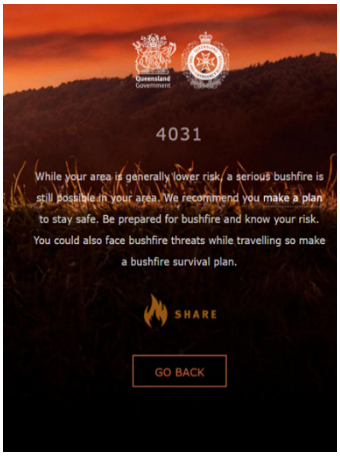
The national messages for catastrophic fire danger ratings should be integrated with all existing and new community bushfire safety information.

QFES provided the Office with information about their public education campaigns and resources. A statewide bushfire safety advertising campaign is run for up to three months between July and October each year. This is part of an extensive public information campaign which uses a variety of communication channels. The advertising campaign also aims to encourage those living close to bushland to prepare their properties and complete a bushfire survival plan, and directs people to the Bushfire Safety website to explore options suitable for their circumstances. The 2018 advertising campaign budget was $370,000 with $99,000 spent on developing the creative strategy and content, $242,000 on media placement and $30,000 on post campaign audience research. By comparison, the 2018 'if its flooded, forget it' campaign budget was $1,000,000. This may reflect the difference between equal-first and fourth place in Queensland's statewide natural hazards risk assessment, the higher level of flood fatalities and the frequency of flood events.

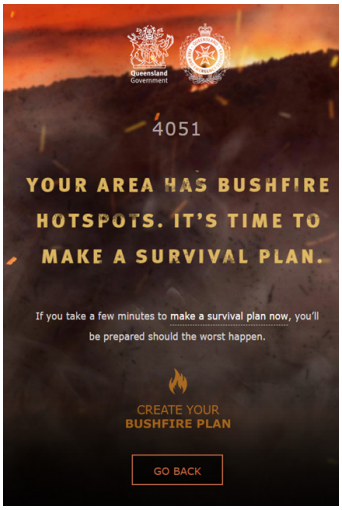
The advertising campaign is supported by print and online resources to help engage Queenslanders in bushfire safety conversations and preparedness actions. Recent improvements to these supporting materials include online interactive media such as the Bushfire Survival Plan (steps users through their risk and specific preparation and survival actions) and the Post Code Tracker (users enter their postcode to receive risk information and links to the Bushfire Survival Plan). Post-campaign research by QFES revealed that users found the resources interesting, informative and easy to use. These resources may be leveraged and promoted to the wider community by requesting local governments to include links on their websites.



Bushfire safety Post Code Tracker tool.
Source: Queensland Fire and Emergency Services



Bushfire safety Post Code Tracker output: low risk area.
Source: Queensland Fire and Emergency Services



Bushfire safety Post Code Tracker output: high risk area.
Source: Queensland Fire and Emergency Services

The Office notes that the *Central Queensland Bushfires Recovery Plan 2018 – 2021* commits funding to public information and education initiatives to support impacted communities to become more resilient against future disaster events.[158] This includes enhancing the centralised *Get Ready Queensland Program* with a campaign to help educate and prepare communities for future bushfires. The RFS is also being funded to develop locally-led engagement to improve bushfire preparedness between July and November 2019.

Finding 32: There are varying degrees of information for community preparedness for bushfire and heatwave on local government websites across the three areas surveyed.

Finding 33: There is an opportunity to enhance education about bushfires targeted to the various at-risk communities. It should be consistent in format and the factors it takes into account. It should use community outreach and participatory approaches and be local in its application.

Recommendation 14:

Education on bushfires should include information about:

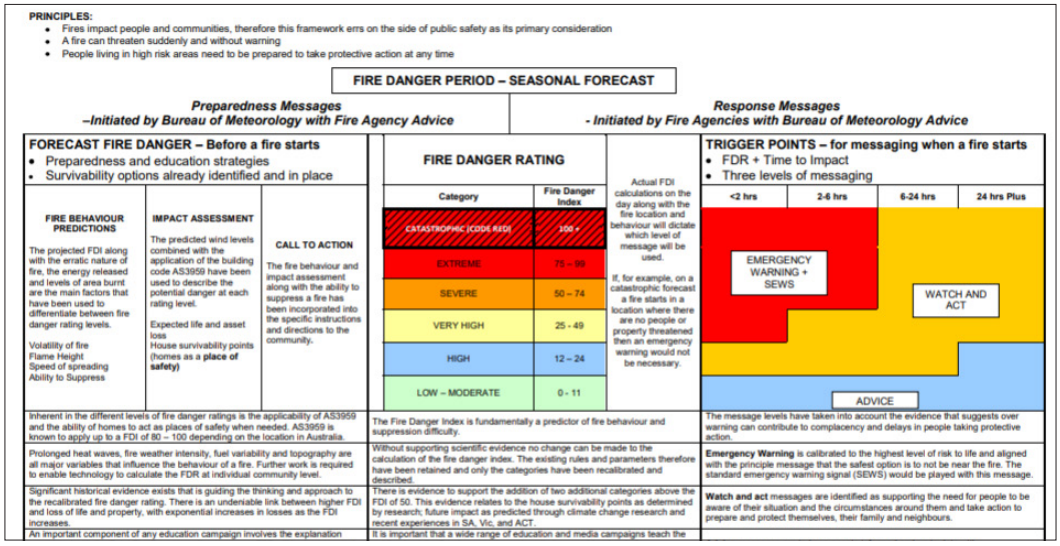
- the change in climate and resulting higher level of bushfire risk
- local bushfire risk, possible consequences, and preventative and preparedness actions for the community
- the purpose of bushfire mitigation activities (to reduce, not stop, bushfire)
- the need, types and purposes for planned burning
- intersects between different legislation and their regulations and exemptions
- the importance of a shared approach to bushfire mitigation.

All agencies with education material should share it freely. The material should be appropriately authorised for use in Queensland.

Queensland bushfire community warnings

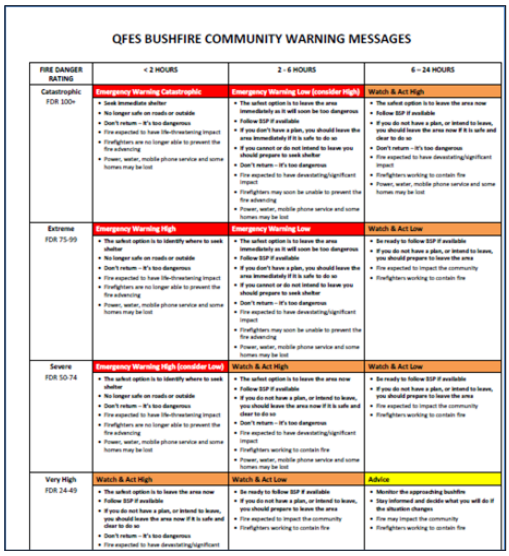
The Office found that the QFES bushfire community warnings are predominately based on the *National Framework for Scaled Advice and Warnings to the Community*, which was established in 2009 in response to recommendations from the Victorian Bushfires Royal Commission.[159]

The Office was advised that QFES conducted an extensive review of bushfire warning messaging in conjunction with the Queensland University of Technology (QUT) in 2017. QUT used research funded by the BNHCRC to develop evidence-based insights into risk and warning communication to improve the language of bushfire warnings and create templated messages. A suite of briefing resources with accompanying videos for QFES internal staff, media partners, key disaster management stakeholders and the public were disseminated. The Office also found that QFES



National Framework for Scaled Advice and Warnings to the Community.
Source: Australian Institute for Disaster Resilience

Bushfire warnings factsheet.
Source: Queensland Fire and Emergency Services



QFES bushfire community warning messages.
Source: Queensland Fire and Emergency Services

had delivered a specific training package to internal operational managers, highlighting language changes from the review and focused on the internal message authorisation process, responsibilities for warnings and consequence management. However, the Office also found that the revised bushfire community warning messages are yet to be fully integrated across QFES's internal-facing doctrine. It would be helpful if the suite of resources were available online to further inform the broader disaster management sector.

QFES maintains its role as a central 'point of truth' by requesting that stakeholders and partner agencies refer the community to the QFES social media channels and website instead of sharing bushfire warnings. The Office was told that this approach mitigates the risk of outdated information being promoted through social media, as bushfire warnings can quickly change. The Office understands the dynamic nature of fire events. Yet, it would be beneficial for warnings, and particularly critical warnings about evacuations, for example, to be actively communicated to stakeholders to ensure they are informed at all times. QFES has advised that it will continue to develop its stakeholder engagement practices to ensure they are better informed of bushfire warnings in the future.

The Office was also advised that Queensland Health contacted Victoria Health to access recently reviewed and updated bushfire fact sheets about topics such as smoke and returning to properties. The fact sheets were rapidly adapted to the Queensland context and widely distributed across local and district groups and HHSs. The Office understands that the fact sheets were well received.

Finding 34: Nationally developed bushfire community warnings are distinct from other disaster warnings used in Queensland.

The role of broadcast media

The Office was advised that QFES maintains governance arrangements with broadcast media agencies which underpin service delivery. Memorandums of understanding with the Australian Broadcasting Corporation (ABC) and Commercial Radio Australia are in place and outline commitments from broadcasters to deliver warnings and information to affected communities during disasters. Many ABC managers in regional Queensland are members of district and local groups and receive the SDCC's key whole-of-government communiques, like the State Update. This provides valuable situational awareness

to inform the ABC's operational and resourcing decisions in times of flood and cyclones. The Office found that this kind of intelligence is not as efficiently shared through Queensland's disaster management system for bushfires. It would be beneficial to adopt consistent communication systems to support the continuous flow of up-to-date critical information between key stakeholders, and particularly to the media.

Emergency Alert

Emergency Alert (EA) is the national telephone warning system used by emergency services to send voice messages to landlines and text messages to mobile phones within a defined area about likely or actual emergencies. EA is just one way of warning communities and will not be used in all circumstances. The system relies on telecommunications networks to send messages, and message delivery cannot be guaranteed.[160] Supporting doctrine for the use of EA in Queensland is available on the Disaster Management website and includes the *Queensland Emergency Alert Manual* and associated user templates and information sheets.

During the 2018 update of the *Queensland Emergency Alert Manual* by QFES, the templates for bushfire emergency alert messaging were found to be dated, and inconsistent with the updated bushfire community warnings. At that time, the Emergency Alert System had not yet been used in Queensland for a bushfire incident. Significant updates were made to the bushfire EA templates and a single generic EA message template was developed to refer to the information on the QFES Newsroom website. The QFES Newsroom provides media organisations with up-to-date information about bushfires, emergencies and disaster events. The Office was told that the rationale for referring communities to the QFES Newsroom takes account of the following:

- QFES provides specific directions in its bushfire community warnings to small geographical areas and the EA system cannot guarantee message dissemination will only occur within a polygon area. This could cause significant consequence management issues including the evacuation of residents who do not need to relocate and traffic management issues.
- Bushfire situations in Queensland can change very quickly and the message could change between the time the EA is issued and the time the recipient reads or hears it (SMS message to mobile phones and voice message to landline phones). This could cause a person to respond to a Leave Now message after QFES has changed the message for the community to Seek Shelter.

CURRENT QFES BUSHFIRE EMERGENCY ALERT TEMPLATE

Voice message

This is a bush fire warning from Queensland Fire and Emergency Services. There is a significant fire occurring in //SUBURBS//. You need to stay updated and see what action is required by looking at the latest warning for the //SUBURBS// fire at q f e s dot q l d dot gov dot a u

SMS Message

Bushfire warning from Qld Fire & Emergency - fire in //SUBURBS//. Check what action to take & stay updated at https://bit.ly/1JJidVF

Use of warnings during the bushfire events

The Office was told that more than 570 warnings were issued for bushfire events between 24 November and 7 December 2018. The QFES Commander of State Operations authorised the use of Watch and Act advices and above to be accompanied by an EA campaign for the first time. This resulted in 52 EA campaigns during the event, and more than one million bushfire-related warning messages to communities across 26 local government areas. Procedures were changed during the event to expedite their release, and the Office heard that it generally worked well. Most of the evidence collected for this review indicates that the community received the 'right amount' of information, and that broadly it was considered 'accurate.'[161] However, the Office also heard the language used in warnings could be clearer and specific locations should be mentioned earlier in the warning.

The community is not the only stakeholder that needs to receive warnings. If action is required as a result of a warning, it needs to be planned for. During the event, in many cases both local and district level stakeholders had not been briefed or informed prior to warnings being issued to their respective communities. The Office found that some QFES

officers in key regional and local leadership roles, perceived their role to brief and liaise with disaster management stakeholders as being fulfilled by updates to the QFES Newsroom website and QFES social media posts. This view conflicted with the expectations of disaster management stakeholders at both local and district levels. A significant number of these stakeholders expressed concern about a lack of visibility of the warnings, which then affected their ability to provide accurate public information to support their communities to respond to those warnings. This contributed to some unintended consequences, such as:

- one case where a non-trafficable road was included as a nominated evacuation route in a community warning. Although this message was corrected within two hours, the initial message caused consternation, and the local government to issue clarification.
- warnings to evacuate significant numbers of residents being released without notifying local and district groups. This disrupted the activation of local planning that is crucial to coordinate support for evacuated residents and to ensure the provision of consistent and complementary public information regarding such matters.
- one case where an 'Emergency Warning: Leave Immediately' was followed by a 'Watch and Act: Prepare to Leave' warning. This led to some local community members believing that they could return home when the safest option was to stay away. Partner agencies developed advice and messaging to assist staff to manage this situation.

Finding 35: There remains a significant level of confusion and differing expectations expressed across state agencies and local governments, about allocated roles and responsibilities in providing bushfire warnings to local communities when an incident escalates to an event causing major disruption across the community.

Finding 36: The local governments and local and district groups across the three areas surveyed, indicated they would have been better able to support if they were more aware of the intent and timing of warnings, Emergency Alert messages or evacuation messages being sent to their communities.

Recommendation 15:

Communications protocols about hazard-specific events should be developed to clarify responsibilities and the principles for the release of information and warnings. They should be included in all related hazard-specific plans and published on relevant websites, and used during events.

QFES NEWSROOM

QFES Newsroom[162] is a public facing website used to publish and distribute all bushfire notifications and official warnings, EAs, media releases, press conferences and other multimedia content. Bushfire warnings are displayed in chronological order and users can search for region-specific warnings.

The community's experience

Three key areas were selected to be surveyed, as they met the Office's major fires criteria and the residents had experienced a range of warning types, including evacuation messages. An independent market research company was engaged, which surveyed 545 residents via telephone interviews across the following areas:

- Eungella, Finch Hatton and Dalrymple Heights (n=69)
- The town of Gracemere (n=301)
- Agnes Water, Deepwater and Baffle Creek (n=175).

The survey was designed to understand:

- exposure to, and experience of, any preparation, planning and education activities before the bushfires
- use of, and reactions to, public information, warnings and alerts before and during the bushfires
- suggestions to improve public information and alerts
- experiences regarding the evacuation processes
- perspectives on the value of public information provided during the events (such as preparation advice, warnings and evacuation advice) and suggested improvements

» knowledge about risks associated with heatwave conditions and actions taken.

Appendix F has details on how to access the full survey report.

Results from the community survey provide a lens into the community's experience of the 2018 heatwave and bushfire events, across the rural and urban areas surveyed.

Residents used both official and unofficial information channels in the days before and during the 2018 bushfires. The sources used varied with age, with youth favouring social media or EA messages. Urban residents favoured EA messages, while those in rural areas tended to regard family and friends as equally useful. For information about the heatwave, television was regarded as most useful, followed by the Bureau, ABC radio and social media.

Most residents considered that they had received the right amount of information about how to prepare and respond, and that it was understandable and timely. Perceptions of accuracy varied. In one fire area, information was perceived to be wrong or outdated.

EAs were generally well regarded. Most residents thought them accurate, although one survey area regarded them as neither accurate nor important, and some thought they were inconsistent.

The impact of such warnings and messages needs to be built on an existing understanding developed over months beforehand. The survey results highlight an opportunity to develop greater understanding about bushfires. Those who received information or education felt it made them confident that they would be able to prepare for and respond to bushfires. Suggestions for improvement included more education on bushfires in general, more specific and accurate information and warnings, more advice on traffic control when evacuating, and less 'fear-mongering.'

Actual preparation for bushfires also varied. Under half of the survey respondents had a bushfire plan; although of those that did, most followed it. Most indicated that their plan included preparation for, or consideration of what they would do, if they were ever required to evacuate. However, fewer than one third had prepared an evacuation kit.

Outside the topic of public information and warnings, the survey results show more detail about responses to evacuation advice and the heatwave.

When asked what further information or education could be provided to better inform the community about the risks of heatwave, and what to do to reduce these risks, the most common response was to provide a greater amount of information or education.

Finding 37: During the events, information about the fires and bushfire community warnings was generally well received by 60 to 70 per cent residents who responded to the survey. The majority of residents felt the information arrived at the right time.

(No Recommendation)

Community expectations

The Office noted an opportunity to improve public perceptions and expectations about the location and accessibility of services such as evacuation centres. In some cases during the 2018 bushfires, the community expected that an evacuation centre would be opened in a specific place. The Office heard through individual submissions and agency debriefs that some community members were unhappy about the distance to an evacuation centre during the Deepwater evacuation. In Finch Hatton, an evacuation centre was relocated due to hazard proximity; however, not all community members were aware of the change. This pre-emptive expectation is at odds with the complex decision-making process that practitioners undertake when selecting a suitable location for an evacuation centre, based on hazard proximity, anticipated number of evacuees, and other parameters.

This gap in the provision of information to community members can also be seen in repatriation processes for the evacuated areas. Some community members reported frustration and distress due to a lack of information around their ability to return home, and the timeframes involved. Agencies such as the Department of Communities, Disability Services and Seniors and Australian Red Cross advised of cases where community members sustained panic attacks and emotional trauma while waiting for news of their ability to return.

While significant planning and damage assessment was undertaken by disaster management agencies to ensure a safe return for evacuated communities, there is an opportunity to improve how and when this is communicated to affected community members.

CASE STUDY: PUBLIC INFORMATION AND WARNINGS DURING THE EVACUATION OF DEEPWATER

The following case study is based on evidence drawn from a variety of sources including interviews, submissions, debrief reports, surveys, and publicly available information such as warnings issued on the QFES Newsroom website. It shows the challenges of keeping the public informed in a fast-moving and dangerous situation.

The incident that developed into the Deepwater bushfire (encompassing the areas of Wartburg, Baffle Creek, Rules Beach and Oyster Creek) was first reported on 22 November 2018. Between 23 and 24 November, RFS crews worked with landholders to contain the incident.

However, on 25 November conditions worsened. A request for assistance was received by QPS through QFES Communications from the Wartburg RFS at 11:30am, for assistance in implementing road closures due to safety concerns related to the potential for smoke and fire to affect motorists. Ten minutes later, QFES advised QPS of the imminent evacuation of the Deepwater and Round Hill areas. QPS, SES, Ergon Energy and Gladstone Regional Council were contacted for assistance, as community evacuations to the Wartburg Recreation Centre commenced.

At 12:50pm a Watch and Act: Leave Now warning and associated Emergency Alert were issued. The warning instructed residents of Deepwater to evacuate toward Miriam Vale, where an evacuation centre was being established.

Decision

When the decision is made to evacuate a community, it is expected to be made by, and in consultation with, agencies with the responsibility to do so. QFES was well-placed as the primary agency to decide that evacuation of the community was necessary. QFES contact with other member agencies of the local group allowed coordinated assistance and planning to support the emerging needs of the community.

The Office saw evidence of the control structure being adapted to cater to the potential needs of self-evacuating and directed evacuees, including the relocation of places of refuge and re-sizing of PSP Act declaration boundaries as the event unfolded. Messaging to the community was also adapted in response to these changes.

Warning

During the warning phase of evacuation, the Office expects to see timely warnings that reflect an integrated, interagency approach. At 1:45pm on 25 November, a PSP Act declaration was enacted by QPS for areas near Deepwater National Park. This enabled people within the declared area to be directed to evacuate for their own safety.

At 2:42pm, after further consultation between QPS and QFES, Wartburg was deemed to be unsafe. Members of the community who were attending the Wartburg Recreation Centre were instructed to relocate to Miriam Vale. This caused some confusion for members of the community who had already been directed to present at Wartburg.

This decision was reinforced by a further Watch and Act: Leave Now message for Deepwater, advising that the evacuation centre had been opened in Miriam Vale. Emergency Alerts and advice were used repeatedly throughout the days following, keeping the community updated on the status of the event.

Other methods of warning the community about the bushfire were used during this event. Extensive door-knocking was conducted from 26 November onwards by QPS, SES and RFS staff and volunteers. The Office heard reports that some residents initially refused to leave their homes when contacted. Their details were recorded so that further attempts could be made. Some residences were door-knocked up to five times over the days that followed. This put the agencies undertaking door-knocking at repeated unnecessary risk, and used valuable resources which could have been put to use elsewhere.

Withdrawal

In a coordinated withdrawal, the Office expects to see appropriate agencies taking the lead role in supporting the community to evacuate. QPS took the leading role in directing community members to leave on 26 and 27 November due to the expansion of the PSP Act declaration boundary.

Assistance was provided to residents who wished to leave but did not have transport available to them. Checks were conducted of known camping grounds and caravan parks in at-risk areas, and people were advised to evacuate. Welfare checks were conducted on individuals whose relatives were unable to contact them and had registered a concern for their safety to the LDCC or via the Register.Find.Reunite system.

Messaging and warnings continued to direct the community to evacuate toward Miriam Vale. This caused frustration in some communities such as Baffle Creek, as the distance to the evacuation centre was significant – sometimes up to a 40-minute drive. However due to the conditions experienced and the volatility of the fire, there were no viable locations for an evacuation centre or place of refuge east of Miriam Vale. The only safer place available in the Deepwater area in bushfire conditions is the beach.

A Watch and Act: Prepare to Leave warning received at 7:00pm on 27 November reportedly contributed to confusion in the community. Some individuals believed that this advice negated the four Emergency Warning: Leave Immediately messages that had been issued over the preceding four hours, and the thirteen Watch and Act: Leave Now messages issued prior to that over a period of more than 48 hours.

There are reports that due to this message some individuals attempted to return to their properties, despite the PSP Act declaration, disaster declaration, and emergency warnings which were in place at the time. This indicates that there was some perception by community members that a downgrading in the level of warning meant that the situation was no longer dangerous.

In response to this misunderstanding, QPS developed supporting messaging in collaboration with QFES. This provided the community with more information and reiterated the message that individuals were required to remain evacuated if they had already done so, as it was not yet safe to return. There is an opportunity to further develop this concept and provide greater clarity around downgraded messaging for future events.

The Office heard that emergency services continued to door-knock residents who had refused to leave. The Office's community survey indicated a significant portion of the Deepwater community members surveyed (79 per cent) did not evacuate when directed. The Office heard multiple reports in both individual submissions and during debriefs of individuals hiding in their homes and in bushland surrounding their properties to avoid being ordered to evacuate.

Several individuals were reportedly removed from their properties under police authority. Some individuals from the community reported feeling traumatised due to the perception that they had been unreasonably forced from their homes. The reports indicate a lack of understanding about directed evacuations, and what these mean for individuals. The point that is perhaps lost, is that such direction is for their own welfare, and that remaining puts others in danger. Responding firefighters have one less concern if people are not at properties that they are protecting. QPS have a duty to ensure the safety of the community. The direction to evacuate is given if it is deemed necessary for the preservation of human life. There is an opportunity for further public engagement on this topic.

The Office heard from some community members who had been required to leave despite having extensive plans to remain and defend their homes during a bushfire. According to public submissions, the dissonance between encouraging individuals to create and enact household bushfire survival plans, and enforcing mandatory evacuations regardless of whether these plans exist, caused significant tension between emergency services and some community members during this event.

The final evacuations were conducted at 4:00pm on 28 November. Road access to the entire area was cut. Individuals were evacuated from Rules Beach by flood boat.

CASE STUDY: CONT...

Shelter

When it is determined necessary to open evacuation centres, the Office expects that this will be done in a planned way, by the appropriate agency. An appropriate level of situational awareness should inform the location and management of the centre.

The Miriam Vale evacuation centre was opened by Gladstone Regional Council staff in accordance with their plan. This was initiated when the situation in Deepwater escalated, rendering the Wartburg Recreation Centre unsuitable.

The Office expects to see evacuation centres being managed by appropriately trained people, who are either from, or present at the request of, the responsible agency. Gladstone Regional Council staff managed the Miriam Vale evacuation centre, with assistance initially provided by SES and Lifeline. The Australian Red Cross assisted at the evacuation centre briefly, setting up the Register.Find. Reunite registration capability and providing psychological first aid and outreach to community members.

> The Australian Red Cross has identified that it can be difficult to communicate the value of the role they play in disasters to other agencies within the sector. They have since identified a need to promote a greater understanding of their role in disasters (a role that is an auxiliary to government) to other agencies.

Within an evacuation centre, the Office expects to see measures taken to provide evacuees with facilities and, importantly, information to meet their needs. According to agencies within this centre, the lack of information provided in the centre about what had happened to property and livestock during the fires was a major concern for evacuees. During this event, approximately 26,000 hectares were burned. Approximately 123 properties came under direct threat, with one house partially damaged, and two houses lost completely. The Office was told by multiple agencies within the evacuation centre that some evacuees were in the evacuation centre for more than seven days without any information about whether their home had been affected.

Community meetings were held daily within the evacuation centre to provide available information about the whereabouts and impact of the Deepwater bushfire. These were well-received by evacuees for the most part, however more detailed information was desired by some individuals. One individual described the evacuees as being 'starved of information.' There is an opportunity to significantly improve information sharing to community members who have evacuated during an event.

Return

The return of evacuees to the affected area once it has been deemed safe requires careful planning and agreement between the responsible agencies. It should also be done in a timely manner to minimise the negative impacts that being evacuated may have on the community. Ideally, planning for return should begin as soon as the evacuation is ordered.

Planning for the return of residents to Deepwater began on 1 December. The planning process was initiated by QFES and QPS and involved several members of the local group which included the local government. Gaining agreement and lifting declarations by those responsible was required before the return could begin, due to the multiple declarations which had been in place during the event.

QFES advised the local group that the fire was burning within containment lines on 2 December and it was safe for the community to return. Gladstone Regional Council and QPS then conducted assessments on roads and assets within the impacted area to ensure that it would be safe for community members to travel to their properties. Potential hazards such as abandoned machinery, fallen or unstable trees, fallen powerlines and wandering stock were identified.

Once all agencies on the ground were satisfied that return was suitable, a report was provided to the DDC. The plan for the proposed structured return of Deepwater residents was approved by the DDC on 3 December. The next morning, 4 December, residents were advised they were able to return.

The Miriam Vale evacuation centre was closed that day. On 5 December, the disaster declaration for the Gladstone disaster district was cancelled. QFES continued to patrol the now-contained fire until 14 December.

Deepwater – 29 November 2018.
Photo courtesy of Queensland Fire and Emergency Services

THE 2018 QUEENSLAND BUSHFIRES REVIEW

COORDINATION STRUCTURES AND INTERAGENCY COOPERATION

This section looks at the coordination structures and interagency cooperation necessary for successful management of hazard-specific events like bushfires.

Landholders and fire services working together to build fire breaks.
Photo courtesy of B Wagner

Coordination structures and interagency cooperation

This section looks at the coordination structures and interagency cooperation necessary for successful management of hazard-specific events like bushfires.

The disaster management system and specific hazards

The DM Act outlines Queensland's disaster management arrangements which operate as partnerships between the community, disaster management groups and agencies at the local, district, state and Commonwealth levels. The disaster management arrangements recognise that each level must not only work collaboratively, but in unison, to ensure effective coordination of planning, services, information and resources. Each level of Queensland's disaster management arrangements has its own role and functions to deliver coordinated, cooperative and integrated outcomes through responsive and scalable approaches. The disaster management arrangements also enable a progressive escalation of support and assistance through their four tiers as required.

The principal structures of government under Queensland's disaster management arrangements are:

- disaster management groups at the local, district and state levels
- local-, district- and state-level coordination centres to support their respective groups
- disaster management plans prepared by the relevant level's disaster management group
- functional lead agencies for specific functions and responsibilities
- hazard-specific primary agencies to combat specific threats (such as terrorism, pandemic, and ship-sourced pollution)
- purpose-specific committees created by disaster management groups.

Local governments, through their respective local groups, have primary responsibility to manage events at the local level. The local government chairs the local group and the chairperson appoints the Local Disaster Coordinator. The district group provides support to local groups on request in disaster operations where the local group's capacity to respond has been exceeded. Although the membership of each district group is unique, it usually includes representatives from state agencies responsible for hazard-specific arrangements and the functions of disaster management, and a representative from each local government within the district. Local and district groups must develop disaster management plans for their respective areas, which are informed by a range of key documents.

The Queensland Disaster Management Committee (QDMC) provides senior strategic leadership in relation to disaster management, and facilitates communication between the Premier, relevant Ministers and Directors-General, before, during and after disasters. The QDMC is responsible for preparing the State Plan which, together with the *Prevention, Preparedness, Response and Recovery Disaster Management Guideline* (the Guideline) prepared by QFES, outlines the primary responsibilities for agency responses. The QDMC also appoints the State Disaster Coordinator to coordinate disaster response operations where a state-level response is deemed necessary. QDMC is supported by the State Disaster Coordination Group.

The State Disaster Coordination Group comprises senior officers from all Queensland Government departments, the Queensland Reconstruction Authority, and the Public Safety Business Agency. Non-government organisations and commonwealth agencies are standing invitees. The State Disaster Coordination Centre (SDCC) supports the State Disaster Coordinator and the State Disaster Coordination Group and provides a single point of truth about an event. The SDCC also coordinates requests for assistance under Queensland's disaster management arrangements in support of district and local groups.

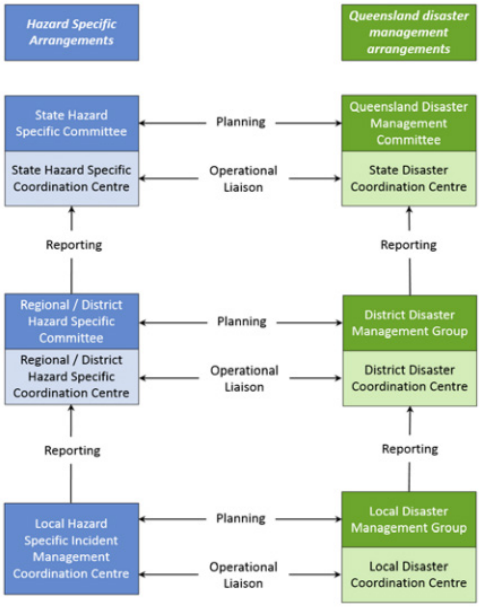
The DM Act provides the legislative basis for the system of control to facilitate coordination, cooperation and integration across agencies involved in disaster operations. Following a disaster declaration, authority and additional powers lies with the District Disaster Coordinator (DDC), and section 9 of the DM Act empowers the DDC to ensure that all responding agencies are properly coordinated to effectively deal with the disaster. The DDC has a clear overall coordination role.

At the same time, the authority for an agency to command is established in their enabling legislation or by agreement within an agency. Disaster management doctrine is developed to provide consistent structure and arrangements. AIIMS is used by QFES, Queensland Health and QPWS. It takes an all-agencies approach and helps all involved in disaster management to have a common understanding of command and control roles. This enables interoperability between individuals and agencies which may not have previously worked together. Like the disaster management arrangements, AIIMS also provides a management and team structure which is adaptable and scalable. The key terms 'command', 'control' and 'coordination' are defined by AIIMS:

> *Command – The internal direction of the members and resources of an agency in the performance of the organisation's roles and tasks. Command operates vertically within an organisation.*[163]
>
> *Control – The overall direction of emergency management activities in an emergency situation. Authority for control is established in legislation or in an emergency plan and carries with it the responsibility for tasking other organisations in accordance with the needs of the situation. Control relates to situations and operates horizontally across organisations.*[164]
>
> *Coordination – The bringing together of organisations and other resources to support an emergency management response. It involves the systematic acquisition and application of resources (organisational, human and equipment) in an emergency situation.*[165]

The direction of members and agency resources affects management and coordination. In some cases, command structures within an agency operate vertically, while the overall direction of emergency management activities in an emergency or disaster situation is operating horizontally across different agencies. Multi-agency coordination and collaboration aims to systematically harness resources and information to ensure an effective response to an emergency or disaster. Role clarity enables multi-agency coordination and collaborative work practices among organisations involved in disaster management. In a hazard-specific situation, the primary agency's legislation, technical expertise, capability, structure and resources empowers and equips them to make critical decisions in response to a hazard situation. Often these may occur as 'business-as-usual' events with no effect on the community. When an incident begins to affect the community, the broader disaster management arrangements may be activated to provide coordinated support to the hazard-specific arrangements.

Bushfire events like those experienced in late 2018 require the activation of hazard-specific arrangements. There needs to be adaptation in how Queensland's disaster management arrangements function when such hazards affect the community. Local governments involved in this event show this in their plans; both Gladstone Regional Council and Rockhampton Regional Council's bushfire subplans' purpose is for the 'provision of assistance in the event of bushfire.' The figure below from the *Queensland Disaster Management Arrangements Participant Guide*, shows the parallel decision and reporting chain that emerges in such events.



Hazard specific arrangements and Queensland's disaster management arrangements.
Source: Queensland Fire and Emergency Services, QueenslandDisaster Management Arrangements Participant Guide

Before the scale of an event causes a 'serious disruption to the community,'[166] hazard-specific primary agencies may establish decision and reporting chains as part of normal business. In these circumstances, decisions about the response, based on technical knowledge, are taken by the hazard-specific primary agency. When the scale of the event requires a 'significant coordinated response'[167] Queensland's disaster management arrangements may be activated. Decisions in

disaster management groups about support are based on strong planning and liaison links between the two chains.

Responsibility is shared whenever collective action occurs. The simultaneous involvement of multiple agencies and parties in a disaster situation can be complex, particularly when the relative emphasis of their activities varies. For example, emergency agencies emphasise command and control, whereas the activities of local groups are consultative, collaborative and participatory.

This Office cannot emphasise enough the importance of hazard-specific primary agencies and disaster management groups understanding the significance of this diagram and concept. One local government told the Office that the most important lesson from this event is that the roles of (in this event) firefighting agencies and of the local group should be distinctly defined, and understood by all stakeholders.

What was expected

Under the State Plan, QFES is the hazard-specific primary agency responsible for bushfires and management of bushfire mitigation and readiness plans across Queensland. QPWS leads firefighting on national parks, conservation parks and state forests where there is no threat to life or property.[168] The State Plan notes that a key component of hazard-specific plans is that they address the hazard action across all phases, and they show how the disaster management arrangements link to the hazard-specific arrangements and support the primary agency.[169] A generic structure for hazard-specific arrangements is illustrated in the *Queensland Disaster Management Arrangements Participant Guide*.[170] It specifies;

> *…hazard-specific detail on the nature of the support provided by the disaster management arrangements, the placement of liaison officers and notification processes is provided in hazard-specific plans.*[171]

The State Plan outlines the opportunity for hazard-specific plans to be developed as sub-plans at the local and district levels when the applicable hazard is identified. The Office expected the State Plan, and hazard-specific arrangements as outlined in the *Queensland Disaster Management Arrangements Participant Guide*, to be followed, and hazard-specific plans to be developed as appropriate.

When considering the Standard, the Office expected plans to clearly identify how Queensland's disaster management arrangements link with hazard-specific arrangements, and to provide clear direction to all responsible at all levels of activation. As with heatwave, it would be expected that bushfire would be considered by local and district groups. Where considered a hazard, the Office would expect to find a hazard-specific plan developed. It is also expected that state agencies would assess the applicability of bushfire risk to their core business and consider this when developing disaster management plans.

The Office expected to find accountabilities detailed in local, district and state sub-plans to ensure effective coordination and cooperation during events. This would support practitioners and decision-makers to manage the shared responsibility for an event and would underpin well-governed partnerships and critical relationships. Established communication and information-sharing protocols within hazard-specific agencies, and how they link with supporting disaster management entities, should be both agreed and documented through collaborative planning. All stakeholders, should use common language and mutually agreed doctrine to ensure common understanding.

It was expected that hazard-specific primary agencies would ensure that their disaster management group's members and representatives clearly understand the hazard-specific arrangements and plans. The Office expects local and district group members to have the appropriate level of authority and delegation. It was expected that experienced and trained staff from hazard-specific primary agencies and core disaster management groups would collaboratively plan with relevant stakeholders, including the community, for hazard-specific action across all phases of disaster management.

Hazard-specific primary agencies are expected to have an emergency response capability; with established, scalable and flexible structures and operational centres in place. The Office also expected local government to have a disaster response capability in line with being primarily responsible for managing events in their local government area. The Office expected that response operations to a bushfire would help to minimise impacts on the community.

It was expected that reliable, relevant and accurate information would be made available to the key

stakeholders involved. Communications should be both responsive to events and consistent across, and vertically through, entities and their systems. The Office expected decision makers to be supported with information and systems that provide an increasing situational awareness of events. Key decisions and relevant information should flow within internal control structures and feed into various external agencies operating within Queensland's disaster management arrangements.

It was expected that with the activation of hazard-specific arrangements, the broader disaster management arrangements would also be activated to provide coordinated support to the hazard-specific primary agency. The Office expected to see parallel decision-making and reporting structures linked through collaborative planning and liaison between groups.

Evacuations

Evacuations are often examples of significant coordinated responses. During evacuations, the Office expected to see arrangements in place that aligned to evacuation planning and management doctrine. It was expected that these arrangements would be activated and utilised as intended within the disaster management system where required during this event.

The Office also expected to see linkages and triggers in place for the different legislative mechanisms that could be used by agencies to enact an evacuation, with consideration given to the impact that this might have on the way that evacuees and the evacuation process was managed. Ultimately, the Office expected to see efficient, effective evacuation processes take place in line with the arrangements above.

To gain a full understanding of the operations during the bushfire and heatwave events, local and district group debriefs were observed in Gladstone, Mackay and Rockhampton, as was the Rockhampton Regional Operations Centre debrief. The Office received a briefing on the State Operations Centre debrief. Interviews with officials holding various roles and at a range of levels of Queensland's disaster management arrangements were also conducted.

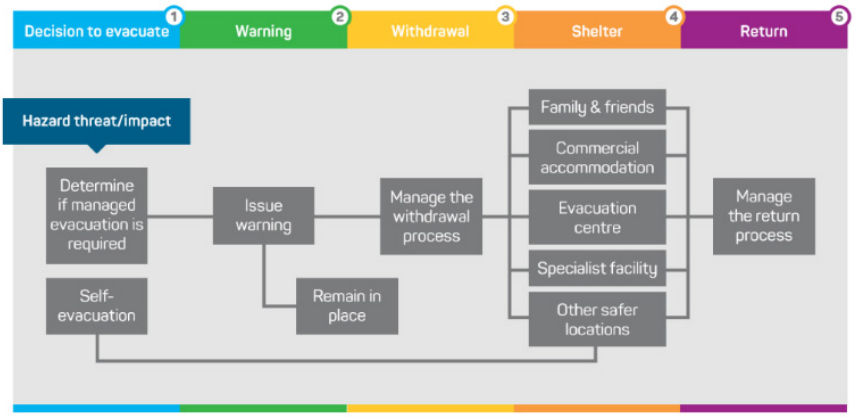
What was found

The 2018 bushfire conditions were unprecedented and challenged all previous experiences of bushfire response in Queensland. The speed and dynamic nature of the event required a pace of planning, decision-making, communications, and actions that are not generally seen in more common severe weather events like floods and cyclones.

Finding 38: The speed of the fires, and their dynamic effect on planning and decision-making made this event stand out in terms of Queensland's experience of regular and slower moving hazards.

Hazard-specific planning

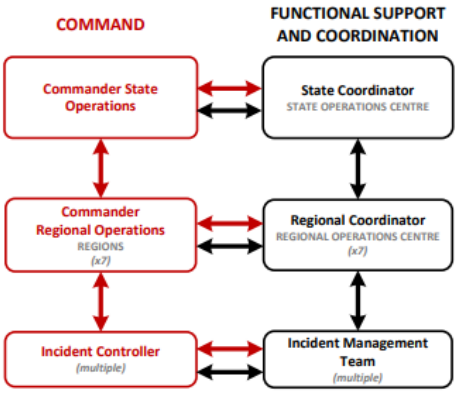
A hazard-specific plan for bushfires does not currently exist for Queensland which, under the State Plan, is the responsibility of the primary agency. The Office was advised QFES has been developing a hazard-specific state bushfire plan with an accompanying internal bushfire preparedness plan for internal activations. QFES has also developed regional wildfire mitigation and readiness plans. However, there is varying consistency to these plans, and limited availability and distribution.



Evacuation process.
Source: Australian Institute for Disaster Resilience Handbook 4: Evacuation Planning

In reviewing a QFES regional operations management wildfire plan, the Office found that it details preparedness and response activities to enable a coordinated approach for bushfire management, ensuring adequate resourcing for bushfire events. It aims to provide an efficient and effective holistic approach to bushfire operations.

While this is an operational plan for the management of bushfires, it outlines when the local and/or district group should be informed and their corresponding recommended activation status. It also provides a guide to the communication required to local government authorities, state agencies and disaster management groups. There is an opportunity to provide greater detail of how all levels of Queensland's disaster management arrangements link with the hazard-specific arrangements for bushfires.



How the command structure works in relation to functional support and coordination.

At the local level, one group's bushfire sub-plan provides greater detail of the general arrangements for the provision of assistance. It acknowledges that other entities may be involved in providing support to a bushfire event.

Finding 39: In hazard-specific events, there is benefit in standardising the roles, responsibilities and functions of supporting entities to ensure a consistent understanding across the local and district levels.

Bushfires are not uncommon across Queensland. From 1 August to 19 August 2018, QFES had recorded more than 1000 vegetation fires and exposures. [172] Typically, these fires have minimal impact on the community and require incident management rather than a coordinated disaster management approach. The bushfires that occurred at the end of November through to December 2018 were different though. They impacted on the community, and their management needed to transition from an incident to an event requiring a significant coordinated response. The Office found that those at state level foresaw this in the early stages of the event.

Finding 40: The potential transition from bushfire fighting as core business of a hazard-specific primary agency to a disaster affecting the community was foreseen at State level. This did not appear as evident to those in other agencies or those fighting fires.

It was found that the doctrine does not provide consistent guidance on how incident or hazard-specific planning escalates into local and district disaster management planning. A key principle of Queensland's disaster management arrangements is that they enable a progressive escalation of support and assistance through the three tiers of local, district and state coordination. Timely activation of the disaster management arrangements is critical to an effective response. This requires escalation procedures and triggers to be clearly documented in disaster management plans at all levels.[173] Doing so would enable coordinated support to the hazard-specific primary agency to be swiftly mobilised. This model should also be applied to business-as-usual incident management plans.

The multi-agency nature of Queensland's disaster management arrangements results in multiple control structures and communication protocols that may function independently to each other. Guidelines and plans for the agencies involved should cover two possibilities.

They should clarify the actions of hazard-specific primary agencies before, during and after hazard-specific events.

They should also show how other disaster management agencies should support the hazard-specific primary agency in transitioning from an incident, to an event requiring a significant coordinated response.

Finding 41: In hazard-ecific events the significant role played by primary agencies results in an additional chain of reporting and decision-making, in parallel to disaster management groups. Communities are best served if other agencies recognise this, the primary agency engages and shares information appropriately and the disaster management system acts in a supporting role.

Finding 42: There is an opportunity to develop hazard-specific criteria and triggers to ensure that, if incidents escalate, there is early notification and activation of the disaster management system and an agreed process to do so. Triggers should be developed at a local level, in collaboration with the local disaster management group. They should clarify the terms 'primary agency' and 'lead agency' in a hazard-specific context. Plans should reflect these, and they should be practiced.

Recommendation 16:

Hazard-specific and disaster management guidelines and plans should explain the circumstances and process for hazard-specific activation of the disaster management arrangements in support of an incident. They should be relevant to local authorities and local and district groups, and used during events.

Recommendation 17:

Hazard-specific plans and guidelines should be published on external websites for access by relevant stakeholders.

Coordination

The 2018 bushfire event did require a significant coordinated response to combat a specific threat.[174] The response saw several coordination centres and control structures operating simultaneously and in isolation of each other. When the bushfire did transition from an incident to a disaster event, the Office heard that it was not clear which agency was leading. In some debriefs, it was learned, control became blurred between QFES as the hazard-specific primary agency, QPS as the authority to exercise declared disaster powers, and the local group responsible for managing operations in the local government area.

> *There needs to be a leader. We cannot have two lead agencies, multi-agency – a decision needs to be made who is actually managing the event and it needs to be clearly communicated. – Local government, central Queensland*

It was found that a significant causal factor for this lack of clarity was that information was not initially shared about the fires by QFES incident control to other agencies. The Office found that various elements contributed to this. One is sheer capacity. This was a very large event that stretched QFES resources beyond anything previously envisaged.

Even later on in the event, there were some limitations in providing replacement liaison officers from other QFES services, as they did not have the required local knowledge. Another limitation was the absence of available hazard-specific plans. Their preparation may have alerted all to the need to share information, and their availability may have prompted those less busy to find ways to make sharing possible. Yet another is the still ongoing cultural change that QFES is embarked on. There were some that the Office heard from that were focused almost exclusively on firefighting – which they did well. Another contributing element is the limitation of information systems, as commented on earlier. The Office is aware of QFES work to lead government efforts to rectify this.

Finding 43: Debriefs for the larger events identified areas where greater integration between response agencies and supporting entities such as Local Disaster Management Groups could provide improved community outcomes.

Finding 44: Information and intelligence products developed at a state level were not immediately available at all levels or to all local groups. These products are essential inputs to good disaster management planning and should be available as a matter of course.

An additional factor was a widespread belief that the disaster management arrangements would operate as they have during the more practised extreme weather events. In this event, like any involving a specific hazard with a large primary agency responsible for its management, a separate chain of decision-making existed. The disaster management arrangements began to adapt, as QPS put liaison officers into QFES control centres to find information. While this worked, it should have been complementary to the existing system of liaison officers at district and local groups, where strong relationships built from regular meetings out-of-season provide the basis for information-sharing.

During this event the disaster management system needed to shift from support for a local group to support for the hazard-specific primary agency. Insights into the change needed are provided during an interview with a DDC involved in the event of that week:

> *The three areas where C4 is needed must be differentiated; the fires, the incident and the support. There was an early question of 'who is in charge?' QFES fight the fires. QPS control the Incident in its totality. LDCC is one of the support groups. This requires the roles of the centres to be flipped.*

Work to develop insights such as these into an agreed approach for future events would seem worthwhile.

Also during this event the primary agency needed to reach out beyond its business-as-usual approach to smaller incidents, engage others and share information to enable that support. A variety of evidence was heard that showed Queensland would benefit if these two needs were understood and satisfied effectively.

Recommendation 18:

Planning for response to bushfire risk should identify all stakeholders to be engaged in the response phase and their roles and responsibilities should be clearly documented.

The Office notes these circumstances – of a hazard-specific primary agency working with the disaster management system – is not unique to bushfires. Simultaneous to the bushfire, Queensland Health was the hazard-specific primary agency managing the response to the heatwave. Lessons identified here are more widely applicable.

EXERCISE TORRES 2018 - A HAZARD-SPECIFIC EXAMPLE

During 2018, the Office was invited to observe Exercise Torres, designed in part to test national and state hazard-specific arrangements for an off-shore oil-spill. The exercise stemmed from recommendations following the Pacific Adventurer oil-spill incident in Queensland in 2010. The Australian Maritime Safety Authority's Strategic Issues Report of the incident included the paragraph:

> *However, the disaster declaration created a number of concerns such as lack of clarity of command and control through the new and untested relationships ... and the potential overlap between agency responsibilities and functions and highlighted the need for greater coordination and integration between the National Plan and disaster management plan response arrangements.*

Exercise Torres was an excellent example of how such issues have been addressed elsewhere. It brought to the fore the critical importance of knowing about other entities' capacity and capability. Its Evaluation Consultation report makes the point.

> *Given the regularity of natural disasters in Queensland, response agencies are familiar with the Queensland Police Service acting as the lead agency. The Exercise provided the opportunity to test alternative arrangements.*

A key factor for the success of the exercise was the robust liaison officer network implemented. The Office observed a healthy flow of current, accurate information from the hazard-specific primary agency to the local and district groups and back again. The Evaluation Consultation report shows that the success was due to early planning:

> *Maritime Safety Queensland invested in a liaison officer network from the outset of exercise planning, recognising that liaison officers enable the timely flow of information.*

The parallels to the bushfire event recently experienced in Queensland are evident. Similar challenges in the availability of hazard-specific information were experienced by those in disaster management roles. From the Exercise Torres experience, the solution lies in breaking down cultural barriers and investing in strong relationships.

Recommendation 19:

All disaster management groups should run an exercise that has full involvement of a hazard-specific primary agency in the next 12 months and regularly thereafter.

Liaison officers

The review heard much about the role of liaison officers. The State Plan outlines that liaison officers may be appointed to coordination centres as determined by the relevant group. Liaison officers provide the conduit between the coordination centre and their parent agency during disaster operations. In the absence of an effective system to provide information and intelligence, liaison officers can help fill the gap. Their responsibilities include:

- coordinating requests for assistance to their agency (liaison officers must have an appropriate level of authority to commit agency resources)
- providing advice and assistance on their agency's tasks, capabilities and resources
- communicating situational awareness to their agency.[175]

During the bushfire event, local and district groups were activated and provided the coordination point for interagency collaboration and information sharing. The event showed some notable good practice in this area.

In the Mackay disaster district, situational awareness in the early stages of the event was limited. To overcome this, a QPS officer with the appropriate authority was embedded in the QFES-led Incident Control Centre and a QFES superintendent was positioned in the QPS-led District Disaster Coordination Centre.

In the Brisbane Disaster District, Queensland Health (Metro South HHS) adapted to the situation that confronted them. Liaison officers were deployed to the Redland LDCC and to the State Health Emergency Coordination Centre to provide situational awareness on the local fire operations on Minjerribah (North Stradbroke Island). In both this situation and in the Mackay disaster district, the deployment of liaison officers to the busiest centres improved situational awareness and information sharing.

Finding 45: Those on the ground displayed initiative by adapting the disaster management system to the circumstances. The information shared as a result contributed to the overall success of the response.

However, this model of deploying liaison officers to the most active operations and coordination centres was not applied universally. Nor was it accompanied everywhere by the normal deployment of agency representatives to their usual local and district groups. The Office heard instances of the QFES disaster management group member being deployed to the fire front, resulting in issues with timely and comprehensive information. While substitute liaison officers were provided, the Office heard that they may not have had disaster management training or an understanding of Queensland's disaster management arrangements, had no established relationships within the sector, and in some cases lacked local knowledge.

A number of QFES personnel recognised the issues this caused for local and district groups, however conceded that they were challenged with managing an event of this size given the available resources. The Office is hopeful that the renewed regional reporting approach being introduced across all QFES services will enable greater intra-regional understanding of QFES's diverse capabilities. Such increased understanding should enable better sharing of information, empower integrated planning, deliver improved interoperability and drive heightened engagement with all stakeholders.

CAPACITY AND CAPABILITY IN COORDINATION CENTRES

The Queensland Public Service C*ommission Directive 10/14 – Critical Incident Response and Recovery* provides the authority for state agencies to provide staff to support response operations. Currently, this is applied at the state level. However, 'the directive also guides the arrangements for agency personnel in the local and district coordination centres.'[176]

The Office heard that in some regional centres the limited number of staff available resulted in key local and district group members carrying out administrative tasks when their skills and experience was more aligned to undertaking operational roles. The application of this directive and greater use of support arrangements at a district and local level should be explored to ensure coordination centres have the capacity and capability to fulfil the requirements of Queensland's disaster management arrangements.

The importance of liaison officers in hazard-specific events should be emphasised by all disaster management groups. Liaison officers from different agencies were used with varying degrees of success. In some places they were deployed outside normal arrangements, and successfully contributed to situational awareness. However, this emergent deployment should not become the default mode. There are significant gaps in the way the liaison officer role is understood, utilised, and valued. These gaps will only be filled if agencies ensure their representatives become known and trusted individuals in the groups they serve.

Finding 46: There is an opportunity for hazard-specific agencies to ensure they have the ability and culture to share information about their activities with others and can deploy liaison officers able to do this.

Finding 47: Suitably trained liaison officers that know their responsibilities, have expected agency-specific knowledge, and can make decisions on behalf of their agency would benefit the disaster management system.

Recommendation 20:

All agencies should identify the capacity and appropriate positions for the role of liaison officers, and ensure sufficient numbers are trained.

Recommendation 21:

Coordinated arrangements for liaison officer deployment should be considered and documented by disaster management groups across the full spectrum of risk identified for their area of responsibility, and not rely on a singular inflexible

CASE STUDY: WORKING TOGETHER IN THE EVACUATION OF GRACEMERE

The following case study is based on evidence drawn from a wide variety of sources including interviews, submissions, debriefs and their reports, and publicly available information, such as online QFES Newsroom warnings.

The evacuation of Gracemere and the surrounding townships of Stanwell and Kabra occurred on Wednesday 28 November 2018. A catastrophic fire weather danger rating had been declared for the Capricornia weather district where these townships are located[177] – a first for Queensland. It should be acknowledged that at the time of the Gracemere fire, there were many severe fires happening in the State, several within the central Queensland area. Those involved in Rockhampton from QFES had been busy for days, striving to resource incident control centres, dealing with multiple local governments, other stakeholders, communications challenges and the pace and change of fast-moving fires. It was a phenomenal effort by the individuals concerned. It is therefore perhaps not surprising that resources, both on the ground and in coordination centres, were stretched, contributing to the events that unfolded.

These events, coming on an undoubtably busy day for Rockhampton, made a lasting impression on those involved. They emphasise the importance of communication, and the extent to which relationships and trust either develop or wither as a result.

Decision

At 10:00am on the morning of 28 November, a critical weather information briefing was provided to local and district group chairs across Queensland from the SDCC. It advised of the potential for dangerous fire weather conditions through localised parts of central and southeast Queensland. As a result of this briefing, the Rockhampton local group moved to Alert at 11:00am.

During that morning, the Rockhampton local group was aware of a bushfire burning in the Stanwell area. Rockhampton Regional Council reported calling a few QFES officers from about 10:30am onwards, and regularly through the day, to validate their concerns about the fire. They were told that it was under control. At 12:51pm the QFES Emergency Services Computer Aided Dispatch (ESCAD) report of this incident shows that residents up to 20 kilometres away from the fire had called to report smoke.

The risk of fire was also noticed by staff from the Department of Education. Their fast response in evacuating schools at potential risk was commendable. At 2:08pm and again at 2:10pm, ESCAD records show that staff at the school in Gracemere called for advice about whether they should evacuate due to the proximity of the fire. QFES has told the Office that at that time, the school was advised to evacuate. The Office heard that by the time local group agencies were able to make contact and advise them to evacuate, they had already arranged and initiated an organised, safe withdrawal of students and staff.

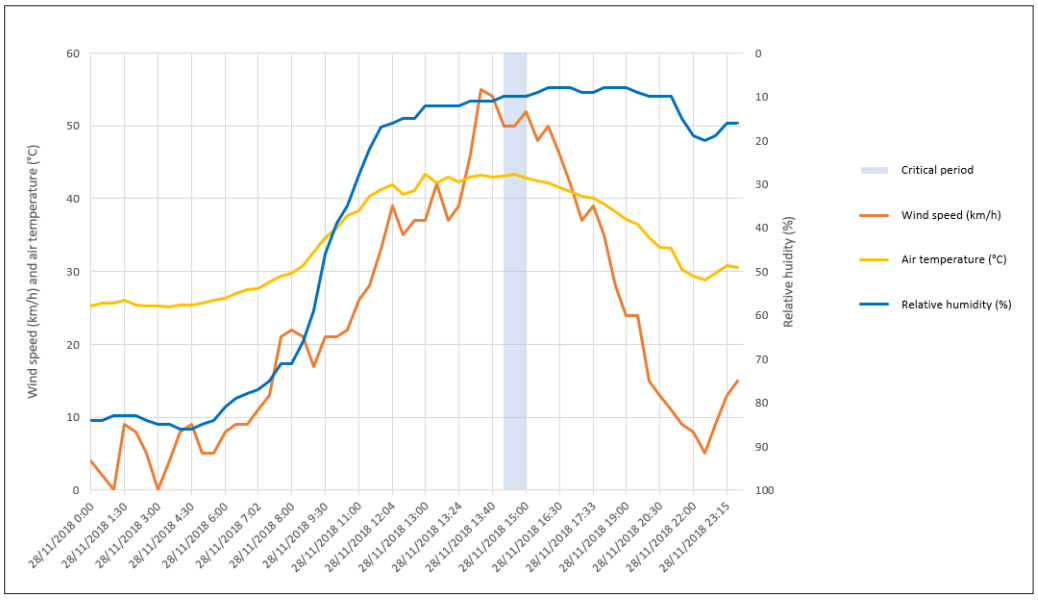
The Office has heard from QFES that at 2:30pm that day, an evacuation plan for Gracemere had been drafted, and the local group was advised of the impending evacuation through the QFES Regional Operations Centre. Certainly, attempts were made by QFES to contact the local group. However, members of the local group could not confirm they ever received this advice.

Around 2:30pm QPS told the Office that they had contacted QFES as smoke was clearly visible from Rockhampton. Again, they were assured that the fire was under control. Local government representatives on the local group report that *they* sought advice from the Regional Operations Centre, and were advised the same.

The conversations that day emphasise the importance the Standard places on 'agreed common language.' To firefighters, 'under control' means exactly that, but that it may still require all allocated resources, including those that may be on their way. It is a point-in-time status report, not an indication of how an event may unfold in the future. This may not have been clear to other agencies unfamiliar with these operational terms.

The weather conditions that day also influenced events. According to Bureau data, the wind speed had been rising, and relative humidity falling, since 5:00am. Wind speeds were strongest between 1:30pm and 4:30pm. Around 2:30pm, humidity dropped to plateau below 10 per cent, and the temperature, above 40 degrees Celsius since late morning, reached its peak of 43.4 degrees Celsius. Peaking weather conditions help to account for the rapid change of conditions on the fire ground.

Gracemere: peaking weather conditions



Shortly after the 2:30pm assurances about the control of the fire were made, a phone call was received by a QPS officer from a colleague who was also an RFS volunteer. They were at the fire front and advised that 'the situation was bad.' At 2:41pm the ESCAD record shows that the code 'RED RED' was used over QFES radio. This code is only used when a critical message is being transmitted that is considered to be life-threatening in nature. It requires clear access to the radio network, indicating that at this point there was a rapid deterioration of conditions at the fire front. During interviews with the Office, the Regional Operations Centre advised that they did not have information about the severity of the fire's escalation until hearing the code 'RED RED' over the radio, at 2:41pm.

The Office understands that the decision to evacuate Gracemere came between 2:41pm and 3:00pm, after advice from the Regional Operations Centre, with agreement from the State Operations Centre and QDMC. It was primarily based on predictive modelling supplied by the Predictive Services Unit in the QFES State Operations Centre in Brisbane. This showed that the fire had the potential to impact the entire township of Gracemere if the ongoing suppression efforts were discounted. The Office understands that other influencing factors in this decision were a lack of definitive advice being received by the Regional Operations Centre from crews on the ground, awareness of the clearly-visible smoke, and 'instinct.'

At the time of decision, whatever attempts there were at communication between the Regional Operations Centre and the LDMG did not have the desired effect. This was affirmed by local government, QPS, QAS and the SES. The local group advised the Office that no notification of the issuing of evacuation advice was received by them, or through the LDCC via established communication channels; members of the local group reportedly learned of the evacuation of Gracemere through a Facebook post. The decision to evacuate was therefore made independently of consultation with other agencies at the local or district level.

At this point, the Office expected to see the control structure adapt to accommodate the changing nature of the event, by more closely integrating the fire response with coordination of the overall event. This would have allowed planning to meet the immediate and future needs of the community to be initiated in a timely manner by appropriate agencies.

Liaison officers from several agencies including QPS, QAS, the local government, and the SES Local Controller employed by local government, were inserted into the Regional Operations Centre at various points later that day. At the decision time, though, they were not yet established, having only recently been made aware of the incident's severity.

During interviews, the opinion of one QFES officer reflected limited understanding of the disaster management arrangements or the importance of following them. A number of QFES regional staff (though not all) were concerned with how engaging with and committing to disaster management arrangements would take valuable resources away from fighting the fires. One agency that the Office spoke to voiced an opinion which echoed that of many others within the disaster management system, stating that:

> *Firies will say 'We don't care about meetings as long as we're saving lives.' We're trying to do that too, but we can't do our jobs if we can't get the information we need.*

Ensuring QFES regional staff are more familiar with Queensland's disaster management arrangements and the benefits of using them to enhance community outcomes would be beneficial. It further supports the notion of a joined-up QFES. The full utilisation of experience and skills across all services within QFES will enable such engagement, and not detract from core firefighting capability or capacity.

QFES is currently working to implement a range of policies and actions to address this issue following the findings of the review it commissioned, and that was undertaken by Major-General (retired) Maurie McNarn AO who found, amongst other things;

> *There are opportunities to strengthen, restructure and provide better role clarity to support an effective C4I system. The current Command and Control structure of the State Operations Centre (SOC), Regional Operations Centres (ROCs) through to the Incident Control Centres/Emergency Operations Centres is confusing and fragmented with multiple chains of command and fragmented communications.*[178]

Warning

In events such as this, the Office would expect to see messaging that is responsive to community needs and that facilitates actions by the community that align to agency plans. This is most effective when the system takes an integrated approach to an event.

At 3:00pm, an Emergency Warning: Leave Immediately was issued by QFES, advising residents to evacuate in an easterly direction toward an evacuation centre at Rockhampton Showgrounds.[179] According to QFES's Emergency Alert Campaign log, an accompanying Emergency Alert telephone (voice) and mobile (text) message campaign followed, beginning at 3:10pm for a large, fast-moving bushfire travelling in an easterly direction from Stanwell towards Kabra and Gracemere. It was received by residents in the surrounding areas.[180] The speed and efficiency with which this Emergency Alert was issued is commendable.

The Rockhampton Showgrounds were nominated as the evacuation centre in the Emergency Alert. The Rockhampton Showgrounds are one of 29 sites nominated in the local plan as a potential evacuation centre. Evacuation centres are chosen for use on a case-by-case basis, based on factors such as the type and location of the hazard and its potential areas of future impact. In this instance, the Regional Operations Centre advised the Office that the location was chosen based on 'instinct.'

Evacuation centres take time to establish. At this stage, there was no established evacuation centre in the Rockhampton area. The local group had not stood up, as there had been no previous communication from QFES that indicated that it might be necessary, despite several agencies calling the Regional Operations Centre to query the state of the fire. The use of a Neighbourhood Safer Place or similar location as an initial staging area for evacuees, to allow time for an evacuation centre to be established, was not proposed by the Emergency Alert message.

The Emergency Warning: Leave Immediately message, was a trigger for the local group. Having sought and received no further advice from the hazard-specific primary agency, and with a significant lack of information about the situation, the local group executives met and took the decision to Stand Up its coordination centre at 3:03pm. They called a meeting of the local group for 5:00pm. At this time, the Office was told, the QFES representatives to the local group were occupied in other roles, in the Regional Operations Centre, advising the local group in another local government area, and managing another incident in Carmila. A QFES liaison officer was appointed to the Rockhampton local group later that evening at around 7:00pm.

Despite the wording 'Emergency Warning: Leave Immediately,' Emergency Warnings and Emergency Alerts are not enforceable on their own. There is no automatic enactment of laws to compel an evacuation when an Emergency Alert, or an Emergency Warning from QFES is issued. For an evacuation to be directed – or mandatory – a concurrent declaration must be made under a relevant Act. In the case of a fire evacuation, the relevant acts are the DM Act, FES Act, and PSP Act. Each give the relevant agency the power to direct movement of people away from the hazard. The power then needs to be used.

The evacuation of Gracemere and the surrounding areas became mandatory at 3:50pm, when QPS enacted a declaration under the PSP Act. This was initiated after conversations between QPS and the Regional Operations Centre. During these it became clear that there was insufficient information about which areas of Gracemere were at most risk, or about how the evacuation should occur. At this point, QPS assumed control of the evacuation process. With assistance from the SES, they began a systematic evacuation of Gracemere.

When the initial Emergency Warning: Leave Immediately message was put out together with its EA, the Office was told that this spurred an influx of residents to Gracemere from their place of work in Rockhampton – toward the fire. One agency representative told the Office that this was due to experience in other events, such as floods, where there is usually time for the community to return home to gather precious belongings before conditions become dangerous. The lack of understanding of the seriousness and immediacy of this warning when it related to fire, and of the fire conditions, exacerbated 'chaotic' traffic conditions. The consequent traffic jam that occurred on the highway between Gracemere and

Rockhampton was, at one point, in the direct path of the catastrophic fire modelled by the Predictive Services Unit. The potential risk to life is self-evident.

Better integration could have helped. If response operations had been more closely aligned with the disaster management system, through earlier use of liaison officers for instance, the risk to the community could have been mitigated. Other agencies could have more effectively provided support. Additional information about the Leave Immediately warning could have been supplied to the community via other agencies such as local government or QPS, in conjunction with messaging through traditional and social media.

Withdrawal

Mass evacuation is best facilitated if a range of agencies can plan and contribute services to support those withdrawing. Such services include assisting with evacuation routes, undertaking traffic control, assisting vulnerable populations to evacuate in a safe and timely manner, setting up evacuation centres or places of refuge, and providing information to the community. The critical weather information briefing referred to above described the potential for extreme fire danger conditions and warned that firefighter and community safety should be the greatest priority on this day. The Office was told by QFES of the fire's potential to escalate due to these extreme conditions.

But agencies in Rockhampton on both the local and district groups reported that when they queried this fire's potential to escalate, they were advised by QFES that it was under control. Records indicate that the modelling produced by QFES was available to the Regional Operations Centre as early as 10:00am, and that it showed the potential risk to the township. The Office was told by QFES that this modelling was not shared with external agencies until the following day; a fact that has been confirmed by other agencies on the local group. While there may be good reason for not sharing complex modelling – misunderstanding or misinterpretation, the overall lack of timely communication about the potential for an evacuation hindered the ability of other agencies within the disaster management system to perform necessary support functions.

Liaison officers were expected to be used during this event, and they were, to varying degrees of effectiveness during the Gracemere incident. The Office heard about difficulties in having a QFES liaison officer with the appropriate level of knowledge and authority assigned to the LDCC. Other agencies were able to supply liaison officers to the LDCC, and inserted liaison staff into the Regional Operations Centre with the aim of opening lines of communication. While this did provide some access to information, the Office heard that even from within the Regional Operations Centre, some liaison officers had difficulty becoming included in information sharing and briefings. Some other agencies removed their liaison officers from the Regional Operations Centre and instead relied on existing relationships, by phoning individuals known to them in the Regional Operations Centre and requesting that they source and provide information. Both methods were successful to an extent.

There were several examples of good interagency cooperation and coordination coming out of the LDCC in Rockhampton. During the withdrawal phase of evacuating Gracemere, the Office expected to see coordinated operations between agencies, with the responsible agency taking the lead. The Office heard about the evacuation of an aged care facility from the potential line of fire. QAS and SES worked well together in supporting and assisting the evacuation of vulnerable aged care patients via ambulance, with QPS providing a police escort to ensure their safe withdrawal to the nominated evacuation centre. Rockhampton Regional Council provided support by supplying buses to transport ambulatory residents.

During the evacuation, several other residents presented at the Gracemere QAS station with smoke inhalation and heat-related illnesses. One QAS crew was diverted from the aged care facility evacuation to provide treatment to these individuals. QPS utilised the Rockhampton Police Station as a mustering point for other vulnerable persons needing assistance to leave. This was all coordinated through the LDCC, with individual agencies operationalising their resources through internal processes.

The Office received conflicting views about the information that was passed on and received during the 'Decision', 'Warning', and 'Withdrawal' phases of is event. That the fires were dynamic and required the

urgent attention of the hazard-specific primary agency throughout the day cannot be disputed. But overall, QFES's reported efforts to communicate did not achieve outcomes satisfactory to the local or district groups. In their telephone briefing to the Rockhampton local group's first meeting at 5:00pm, while the evacuation was underway, the minutes show that QFES openly conveyed the scale, urgency and fluidity of the firefighting. However, by this stage, due to the 'patchiness' of information in the preceding hours, other member agencies of the local group remained sceptical about the information provided by QFES.

The Office found the following in *The Cyclone Debbie Review:*

> *Misunderstanding erodes trust, and trust affects the relationships that are an important enabler of successful disaster management operations.*

The sentiment may be equally applicable to this event.

Shelter

A large number, although not all, residents of Gracemere evacuated when asked to do so. Some estimates show 85 per cent of the Gracemere population evacuated when required – approximately 7100 people. Of the people in Gracemere surveyed, 78 per cent reported that they had left.[181] These figures do not include the townships of Stanwell and Kabra, which were also evacuated as a result of this event.

During the sheltering stage of evacuation, the Office expected to see most residents seeking their own alternate accommodation. Of the several thousand residents who did evacuate, only 268 were recorded as staying in an evacuation centre overnight, indicating that the clear majority sought and found their own alternate accommodation. The primary evacuation centre for this event was located at the Rockhampton Showgrounds, which housed 111 people. Additional accommodation was offered by Central Queensland University in their residential school, housing 157 people overnight.

The evacuation centre at Rockhampton Showgrounds was activated by Rockhampton Regional Council through the LDCC. Considering the limited advance notice and urgency required, it was opened in an exceptionally short amount of time. Rockhampton Regional Council has identified that their extensive experience in opening this centre, gained through other events and repeated exercising with well-trained staff, was a significant advantage. This was achieved in a planned and efficient manner, in line with internal processes.

The Office expected to see evacuation centres being managed by appropriately trained people, who have been requested to assist by the functional lead agency. Rockhampton Regional Council provided the staff to manage the evacuation centre. They were assisted in management by staff from the Australian Red Cross. When spoken to, both agencies told the Office about their good relationships, well-practiced partnership in managing evacuation centres, and the clarity of their roles and responsibilities, which contributed to establishing a successful and positive environment.

Many of the patients from the Gracemere aged care facility that was evacuated by QAS were taken to this evacuation centre. To support their ongoing wellbeing and ensure that an appropriate level of care was provided, QAS established a minimum of one crew at all times within the evacuation centre for the duration of the event. Drawing on existing relationships between the related agencies, QAS also opened lines of communication with the local HHS. Consequently, the potential for pharmacy products and prescriptions to be filled was made available to evacuees at need within the centre. There was also the opportunity for an Emergency Department doctor from Rockhampton Hospital to attend the evacuation centre, should the need for diagnosis, new prescriptions, or immediate medical intervention be required. In *The Cyclone Debbie Review*, the Office recommended the need for all aged care providers to plan and exercise for evacuations to a similar safe establishment. There may be many reasons in these circumstances why this was not possible, however that some of the most vulnerable in the community went to an evacuation centre emphasises the importance of this work.

Return

Discussions around the return of evacuees to Gracemere began in the 9:00pm local group meeting on the night of the evacuation, 28 November. The Office expected to see a planned return, organised and agreed on by the responsible agencies, and undertaken in a timely manner. QPS had enacted a PSP Act declaration in order to direct the evacuation of Gracemere, and this declaration was still in effect. However, the initial decision to evacuate was made by QFES, and as the primary agency responding to the hazard, other agencies involved considered that QFES was best placed to provide assurance that conditions were safe enough for return to occur.

The local group requested formal advice to this effect from QFES that night. This advice was received late the next morning. QPS then lifted the declaration on Gracemere and provided support to other local group agencies in enacting the return plan.

Again, there is evidence of agencies within the local group working well together to disseminate return information to the community and assist those who required it. Notably, QAS supported the return of vulnerable residents back to their aged care facility. This occurred in the late afternoon because the wind had picked up during the day and there was the potential for the situation to escalate again. QAS made the decision to wait until there was a guarantee that the fire was going to continue to be safely contained before returning the most vulnerable elderly residents to the aged care facility by ambulance.

Evacuations

The way that evacuations are undertaken is a microcosm showing the complexity of Queensland's disaster management arrangements, and the importance of cooperation and coordination between different agencies in attaining a satisfactory result.

Of interest are the linkages between hazard-specific response plans owned by primary agencies, and the disaster management arrangements designed to support these operations. The different legislative mechanisms for ordering an evacuation create the need to ensure that each method has a documented, tested linkage with disaster management. This ensures that the disaster management system can activate and respond early; and that it has the right information and situational awareness to respond correctly.

In terms of disaster management, evacuations undertaken under section 77 of the DM Act are done so within existing disaster management arrangements. They are therefore able to be more readily coordinated within the disaster management system. Evacuation of persons using other legislation (such as the PSP Act for example) is done outside of the disaster management arrangements as part of an agency's internal processes – as 'business-as-usual.'

In some cases, these two different systems – disaster management, and incident management – need to act together. For this integration to be effective, the responsible agencies within both systems need to communicate and collaboratively plan their actions. Liaison and consultation between primary agencies and local and district disaster coordination centres is paramount in ensuring that evacuations can be successfully managed in parallel with management of the hazard itself.

When these linkages are unclear, not utilised, or do not exist, the ability for the evacuation arrangements in place within disaster management to be effective is significantly limited. These factors were evident during the 2018 bushfire event. The Office heard that local groups were unaware, in some cases, that large portions of the community had been ordered to evacuate until well after the fact. Due to this, operations to support the evacuation were hampered.

The benefits of enacting a collaborative planning process were also evident during this event. Misunderstandings that existed around agency roles and responsibilities in certain situations such as the management of evacuation centres, could have been avoided if this process had been in place. Planning would also consider whether people will have the means to evacuate.

Overall, evacuation centres were well managed, set up within appropriate timeframes, and catered to the needs of evacuees. However, issues arose where documented roles were not adhered to, and the established process for escalating requests for assistance was not respected. This appears to have occurred due to a combination of factors, including unfamiliarity with the existing plans, and a lack of communication between agencies.

Finding 48: In each of the case studies, the importance of integrated plans, clearly identified and articulated trigger and escalation points for enacting evacuations, and an open and shared planning process, were clear.

Finding 49: Local initiative, decision-making and authority led to the success of evacuations in a number of locations. These could have been enhanced further through the ready availability of accurate and timely information and intelligence.

Finding 50: There is an opportunity to improve the public perceptions and expectations about the location and accessibility of evacuation centres, and how those who go there are kept advised, including of their ability to return.

Finding 51: Consultation with local authorities is an essential part of evacuation planning.

(No Recommendation)

Commonwealth and interstate support arrangements

What was expected

Two parallel systems of external support exist for bushfires. The broader Australian Government arrangements may be activated under the Australian Government Disaster Response Plan, known as COMDISPLAN. QFES may also request fire and emergency services support from counterpart agencies in other Australian states.[182] The number and severity of the Queensland bushfires in November—December 2018 necessitated a call for interstate assistance. The Office was interested to find out how the two parallel systems of interstate support – national and hazard-specific – worked in practice.

Agreed practice in the fire and emergency services sector is to initially seek assistance from adjoining states, with such requests being managed bilaterally. If more extensive support is required, as was the case in November 2018, the Arrangement for Interstate Assistance (AIA) through the National Resource Sharing Centre (NRSC), is activated. The AIA provides a framework for mutual assistance between Australian fire services, emergency services and land management agencies. The Queensland DES, which includes QPWS, can also source interstate firefighting support through this arrangement, although it is not a signatory. DES makes its requests through QFES. When necessary, the Commissioners and Chief Officers Strategic Committee (CCOSC) may meet to support deployment decisions. The nature of the assistance can include, but is not limited to: scientists, technical specialists, information and logistics support, and firefighters. Deployments under the AIA are managed on a non-commercial basis.[183]

Deployment of some specialised firefighting aircraft is coordinated through the National Aerial Firefighting Centre (NAFC). The NAFC provides a cooperative national arrangement for combating bushfires and coordinates a national aircraft fleet of mainly privately controlled aircraft that are contracted to NAFC on behalf of the states and territories. About 130 aircraft, suited to a range of tasks from direct fire attack to observation, are available through NAFC to supplement the arrangements of states.[184] Deployment of these aircraft is managed by contract and 'call when needed' arrangements. NAFC and NRSC are not governed by legislation but operate under the auspices of AFAC.

Once an initial request for assistance has been fulfilled, an interstate liaison unit is established to administer additional or amended requests for assistance. The Office would therefore expect to find ongoing cooperation and coordination between Queensland and interstate agencies throughout the response phase of an event.

Federal government support, via Emergency Management Australia (EMA), is available if a jurisdiction has exhausted all its government, community and commercial options. EMA maintains COMDISPLAN, which governs federal non-financial assistance to Australian states and territories in an emergency or disaster. COMDISPLAN includes provision of assistance from the Australian Defence Force (Defence). Defence can also directly provide local emergency assistance (Defence Assistance to the Civil Community – DACC 1), without recourse to COMDISPLAN, for up to 48 hours. More extensive Defence Assistance to the Civil Community (DACC) assistance may then be formally requested through EMA if a state government can find no alternative or immediate sources of assistance in an emergency or disaster.

The Office would expect to find that requests for interstate assistance would be based on evidence of identified risk, community need and known capacity limits. The arrangements would facilitate deployments to Queensland, of people and assets that match the skills, roles and standards requested.

The Office would expect to find that there is knowledge of the various support arrangements available to Queensland, including which ones are appropriate to the need, what they provide and who is authorised to make requests for assistance. Documented arrangements would be known, and pre-existing relationships would support a coordinated and responsive outcome for the community.

DEPLOYMENT FAST FACTS:

- Thursday 22 November: COMDISPLAN activated
- Monday 26 November 8:00am: New South Wales RFS asked QFES if assistance was required via bilateral MOU
- Monday 26 November 1:00pm: interstate support through NRSC requested by QFES
- Monday 26 November evening: first interstate (New South Wales) crew in, last crew out Wednesday 5 December (a total of 10 days)
- 1202 people deployed: all states and territories and the commonwealth provided assistance
- 59 planes deployed: from NAFC and other resources
- Thursday 29 November – Tuesday 4 December: RAAF Base Amberley used for aerial firefighting aircraft (a total of six days)
- On one day, 47 planes were in the air at the same time

We threw everything and the kitchen sink at this. – QFES Manager.

Queensland Police Service escorting New South Wales fire trucks on their way to Maryborough on 28 November 2018. Photo courtesy of Queensland Fire and Emergency Services

What was found

The triggers used by QFES to identify the need to request interstate resources were: the forecast poor fire weather across most regions; the number of fires already burning across the state; and the forecasted inability of QFES regions to therefore divert resources internally. Only one of QFES's seven Regional Operations Centres did not stand up at some point during the event.

The NRSC arrangements worked effectively in the view of NRSC, QFES and DES. Good pre-existing relationships and a simple process for initiating requests meant a rapid response from other jurisdictions. An offer of assistance was made by New South Wales on the morning of Monday 26 November, using the bilateral memorandum of understanding between QFES and New South Wales Rural Fire Service. The first interstate support arrived from northern New South Wales that evening. The Office heard that the logistical challenge of finding flights at short notice was such that New South Wales chartered aircraft to fly volunteers in more quickly. The Office also heard that, as with other aspects of this event, planning for deployment improved after the first two or three days. At 1:00pm on 26 November, the CCOSC commenced meeting daily by teleconference, for a briefing and to ensure appropriate interstate support was being provided. It is pleasing to note NRSC's good practice of conducting a debrief in December 2018 about the deployments. The debrief proposed a range of improvements to make future deployments operate

more smoothly, but none could be classified as significant gaps or issues.

> *Queensland got everything it asked for and was supported for an extended period. – Interstate liaison officer.*

The range of support received included rural bushfire crews, specialist forest firefighters, liaison officers, Incident Management Team members, Fire Behaviour Analysts and specialist forest fire analysts. The Bureau also deployed forecasters from its interstate offices to provide both extra staff and specialist fire weather advice.

New South Wales fire crews leaving Bundaberg on 6 December 2018.
Photo courtesy of Queensland Fire and Emergency Services

Due to the heatwave conditions, five-day rather than the more common seven-day deployments of front-line firefighting volunteers were agreed on, to support fatigue management. This meant two days travel and three days on the ground. Volunteers deployed to coordination centres still completed seven-day deployments. This change created some additional logistical challenges for QFES in managing the shorter deployments in combination with 1202 visitors over three weeks. A few submissions spoke of experiencing frustration at having some interstate colleagues on the ground for only a short time before they had to depart again. QFES has advised the Office that its internal review is examining the issues experienced regarding engagement protocols, pre-planning and mobilisation of interstate resources. On the other hand, it is remarkable that few heatwave-related illnesses amongst volunteers were reported.

Given predictions for more heatwaves and more intense fire seasons, it is suggested that any available research into the optimal length of field deployments, balancing logistics and human health, should be sourced and applied by leaders to provide an evidence base for future rostering and deployment decisions.

The aircraft used during these events were a combination of NAFC sourced, QFES contracted and New South Wales-owned. Queensland accessed 59 aircraft during the event, the majority from commercial providers and five sourced from NAFC. The use of large air tankers had not been seen in Queensland prior to this event, nor had plans been made to use them, as they are not part of Queensland's standing contracts. At the time of the event, the large air tankers had been contracted to New South Wales through NAFC. As they were not being used, they were offered to QFES with their supporting aircraft, and a contract transfer was arranged through NAFC. Large air tankers can drop water but are more effective when dropping fire retardant or gel mixed with water to provide a chemical firebreak.

Three large aircraft were deployed:

- One Boeing 737 aircraft with a capacity of around 15,000 litres of suppressant, travelling up to 750 kilometres per hour, and
- Two British Aerospace AVRO RJ85 aircraft with a capacity of around 11,000 litres of suppressant, travelling up to 600 kilometres per hour.

DACC arrangements were used to provide support for these aircraft. The Royal Australian Air Force (RAAF) base at Amberley agreed to support an RJ85 with crew, support staff and 'lead in' (Bird Dog) aircraft following a request from the New South Wales RFS for a suitable base in the south-east. In accordance with the arrangements, a Request for Assistance was submitted to the SDCC, which then sent a DACC request to the Senior Officer at the Amberley RAAF base. Despite the duration of support being greater than 48 hours, Defence managed the request as a DACC 1 – 'local emergency assistance for a specific task,' due to the limited requirements.

Helicopter water-bombing a fire on Minjerribah (North Stradbroke Island), 30 November 2018.
Photo courtesy of Queensland Fire and Emergency Services

New South Wales also provided their Firebird 200 helicopter, owned directly by New South Wales RFS. The Firebird has surveillance and intelligence capabilities.

The fire suppression results achieved by the large air tankers were highly praised. In one local government area, a positive effect on community morale was also reported. On one day during these events, 47 firefighting and surveillance aircraft were in the air at one time.[185] Post incident reports from air observers indicated that upwards of 180 structures were saved due to aircraft suppression activities. Although some submissions questioned whether local intelligence was used as effectively as it could have been to schedule and direct aerial fire suppression, the supply of those aircraft through the various arrangements was appropriate and efficient.

However, when they were first deployed, health and environmental fears were expressed by stakeholders about the use of fire retardant and gel due to the chemical content. QFES listened to the community concerns and limited tanker drops to water only until further information about the chemicals had been disseminated.

It is known that Victoria and New South Wales rely heavily on their aircraft fleet and utilise assets not normally deployed in Queensland. These assets come with a large upfront and ongoing infrastructure and maintenance cost. The earlier section in this report about the science behind the fires notes that aircraft should not be relied on as the primary means of fire management. The Office does see them as having a role in suppressing or mitigating a bushfire as part of an overall, coordinated response.

COMDISPLAN was activated early by EMA 'in anticipation of requests for Australian Government assistance in support of the Queensland Government.' Advice of activation by EMA was notified by the SDCC late in the evening of Thursday 22 November. On the morning of Friday 23 November there were 51 fires burning around Queensland. COMDISPLAN states: 'Before a request is made under COMDISPLAN a jurisdiction must have exhausted all government, community and commercial options to provide that effect.'[186]

The Queensland officer authorised under COMDISPLAN to request its activation (Executive Officer, Queensland Disaster Management Committee) was made aware of the activation by receiving an incident brief from the SDCC. Although activated, COMDISPLAN was not used, other than through the locally authorised DACC 1 arrangements at Amberley. Due to the event response being for a single hazard (bushfire), the additional resources required were entirely for fire management, and from Monday 26 November were being sourced federally through NRSC and NAFC.

Observations for the future

The two parallel systems for interstate support worked well in practice, and complemented each other where needed. Each delivered logistic support, staffing and services as appropriate and the Office discerned no overlap or conflict in their operation.

During the past decade, state fire agencies have increasingly needed to share suppression resources domestically during peak demand periods. If climate change accelerates as predicted, there will be changes to the season length, intensity and frequency of bushfires in Australia. Firefighting services may be less able to rely on help from interstate and across the world because of major fires occurring simultaneously. This represents a major challenge for Queensland and Australia.[187]

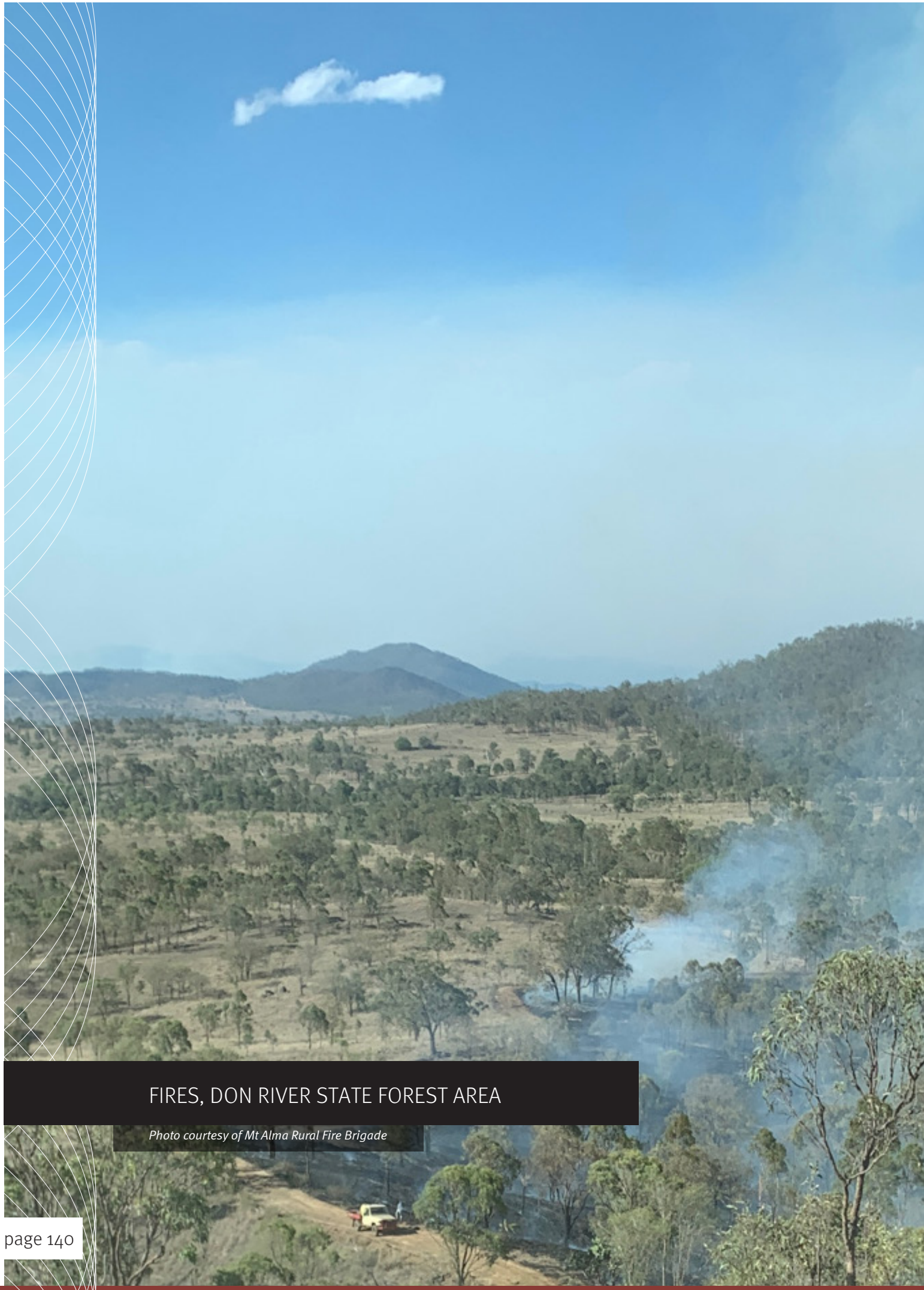
The current approach to prioritising firefighting requests, should that need arise, would be through calling a meeting of CCOSC to discuss arrangements. These meetings are chaired by EMA, thus providing the Commonwealth with an opportunity to moderate and intercede if needed. The Office was told that AFAC is intending to progress planning for prioritising and managing multiple simultaneous calls on fire services. The Office welcomes this, but notes that AFAC's brief covers fire, not other kinds of disasters.

It was proposed to the Office that there could be scope to create national emergency legislation, to regulate decision-making should Australia face the difficult circumstance of multiple disasters at one time. There is, for example, an intergovernmental agreement[188] in place permitting the Commonwealth to enact counter-terrorism laws. Possibly a new national emergency law could be based on a similar model.

A committee of the Council of Australian Governments (COAG), the Australia-New Zealand Emergency Management Committee (ANZEMC), comprises senior representatives from the Australian Commonwealth, state and territory governments, the Australian Local Government Association, and New Zealand. The committee works to strengthen disaster resilience by providing strategic leadership on emergency management policy and supporting related capability and capacity development activities, including the implementation of the National Strategy for Disaster Resilience.[189] It would be beneficial for ANZEMC to lead planning and preparation for a circumstance of multiple disasters, by requesting the development of pre-agreed criteria for prioritisation and deployment, based on risk assessment and operational imperatives, and consistent with community need.[190]

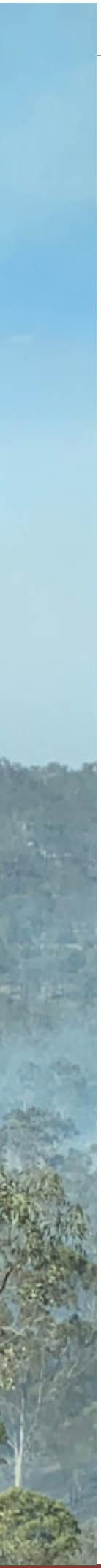
The Office received a small number of submissions that questioned the cost to the system of interstate firefighters and aircraft, with one submission drawing a direct link between the cost of such a response compared to investment in better land and fire management practices. The BNHCRC analysis also states:

> *... there is ample scientific and experiential evidence from Australia and overseas that, done to a standard and at the appropriate spatial and temporal scales, [a properly implemented landscape prescribed burning program] is cost-effective, greatly assists suppression operations and greatly synergises other threat mitigation and community preparedness measures, most of which collapse beyond relatively low fire intensity thresholds... In dry, heavy forest / bushland fuels and under severe fire weather conditions, fires will become very large if they are not suppressed within a very short time after ignition... A reliance on suppression alone, including the deployment of aircraft, will likely fail under severe weather and heavy*



FIRES, DON RIVER STATE FOREST AREA

Photo courtesy of Mt Alma Rural Fire Brigade



fuel conditions, especially when there are multiple synchronous outbreaks. Therefore, it is critical to get the right balance between expenditure on hazard mitigation and suppression capability.[191]

The triggers used by QFES to commence its request for interstate support were straightforward. There may be opportunity to consider whether its knowledge of regional risk and capability limits could be more granular, to support interstate deployment to be more targeted and efficient. One submission suggested that in at least one area there was a surplus of local volunteers, although other contributors welcomed with gratitude the arrival of interstate support. Collaborative planning before an event and greater use of predictive technology would provide intelligence to support the timing and volume of requests for assistance.

The sharing of knowledge and products that occurs during interstate deployments is invaluable and was so again during this event. Deployments provided great acknowledgement and application of the valuable skillsets that exist across the country. Some examples were:

- the Bureau deployment from other offices brought staff more versed in fire prediction, including a specialist analyst from Adelaide who worked closely with the QFES Predictive Services Unit to provide alternative scenarios to support planning.
- New South Wales brought 'line scanning' technology that improved aerial fire observation data (see more about this in the section on Intelligence and technology).
- A number of submissions and interviews pointed to the learnings gained from working alongside crews and individuals from interstate.

Such sharing and integration of resources should continue and significantly expand, including joint exercises, if adequate preparedness and response are to be delivered to the predictions of more severe events.

The lesson for [us] is that we need to do more of that kind of thing, earmark people who are available for that kind of high level event.

Finding 52: The availability and support from interstate firefighting resources worked well and was complemented by Australian Government arrangements where needed.

Finding 53: Through the Australia-New Zealand Emergency Management Committee, Queensland should progress discussions on the prioritisation of resources in the event of simultaneous fires across Australia and New Zealand.

Finding 54: Concern about the safety of chemical suppression agents limited their use during the event. If the large aerial tanker capability is to be fully effective in future, agencies should investigate the potential environmental impacts and conduct a significant community education program about chemical suppression.

Finding 55: Southern states have experience of the health, environmental safety, aircraft technology and deployment factors related to the deployment of aerial suppression assets. There is an opportunity for Queensland to learn from their experience.

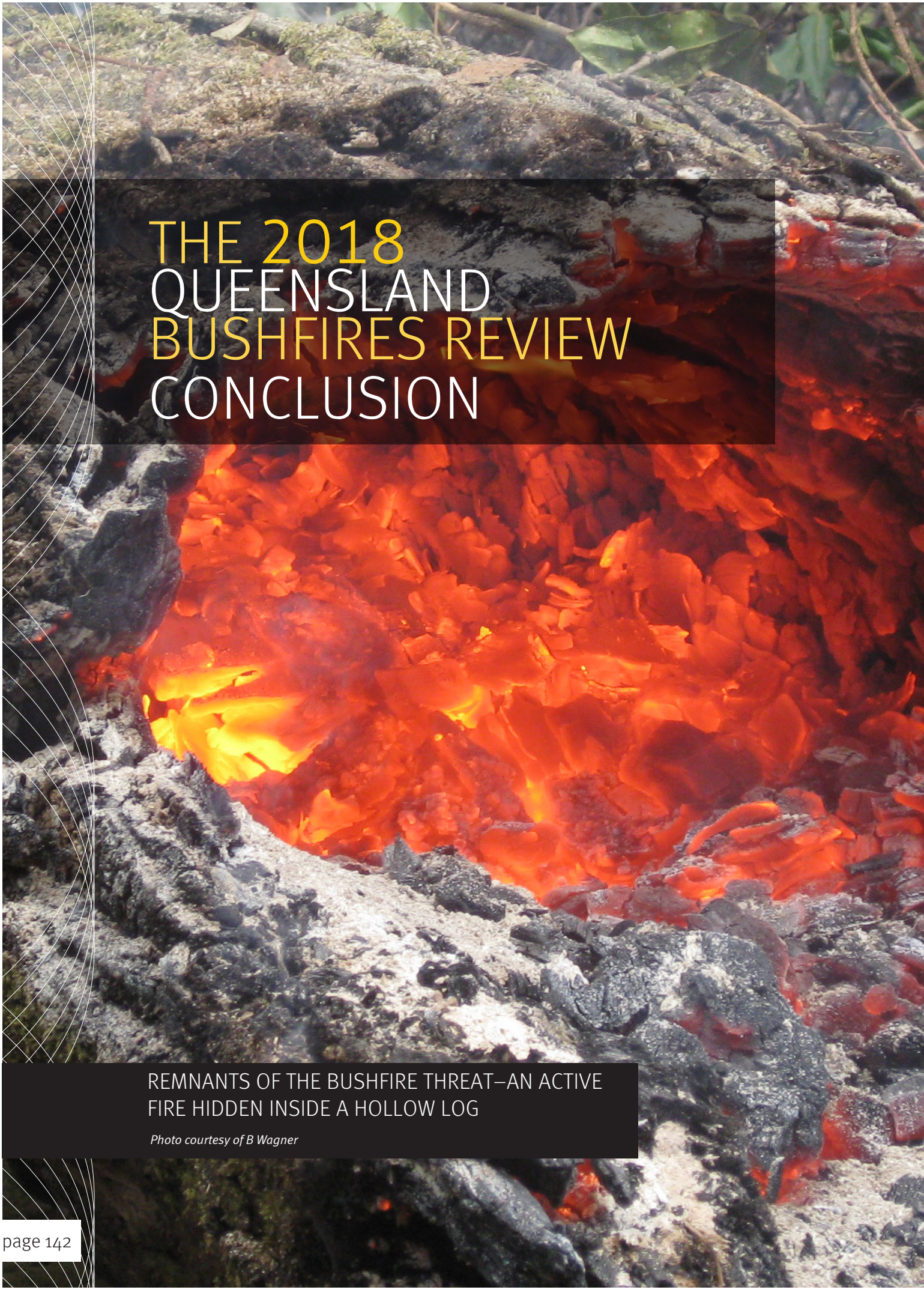
Recommendation 22:

Clear public messaging regarding risks (if any) from the use of suppressants, including to 'organic' producers, should be developed and socialised before the next fire season and be readily available for publication when needed.

Recommendation 23:

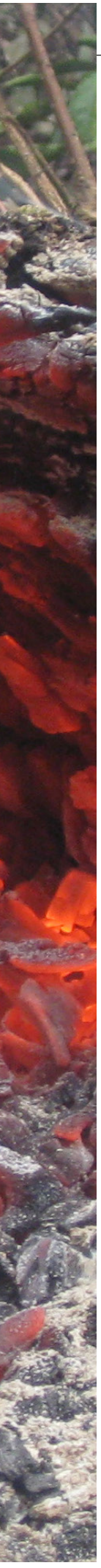
Targeted education about the short- and long-term effects of chemical suppressants should reach those likely to be exposed to them before aerial chemical suppressants are used in Queensland again.

THE 2018 QUEENSLAND BUSHFIRES REVIEW CONCLUSION



REMNANTS OF THE BUSHFIRE THREAT–AN ACTIVE FIRE HIDDEN INSIDE A HOLLOW LOG

Photo courtesy of B Wagner



Conclusion

The review into the fires of 2018 started with a broad scope. From that scope, three issues have emerged where there are the most opportunities for improvement.

The first relates to the fires themselves, and how Queensland prepares to deal with future events. Evidence shows that there is a risk of similar events happening again more often, and that no one wants intense bushfires. This review is about the disaster management system; how it works, both before and during events like the major fires; and what can be done to improve the performance of disaster management agencies for the benefit of all Queenslanders. It is not directly concerned with preserving the economic value of agricultural land, nor is it concerned with preserving biodiversity. However, it is easy to make the link between these topics and preventing future fires. Productive agricultural land keeps people in rural areas who are available to carry out mitigation burns. Biodiversity is important to preserve insect populations that pollinize crops and have other benefits for medicine and tourism. For both agriculture and biodiversity, prescribed burns to lower fuel loads are the single most effective way to reduce the risk of intense fires. It can be concluded that from a purely bushfire mitigation perspective, there is more that can be done to reduce the risk: greater sharing of information, less complicated bureaucracy, more latitude in what can be done to mitigate fires through permits, land clearance, and occasionally compliance, greater cooperation between those who live in bushfire prone areas, and measures to reduce angst about breaking the rules, that could encourage more to be involved.

The second issue relates to the potentially changing risk, and the importance of communicating this to the community. This involves both education and warnings. Messages must be informed by the best available information. In changing circumstances, that does not always mean relying on historical knowledge, important as that is. Greater investment in modelling and the intelligence that flows from it must be built into the warning system. Community understanding must be built on background education and – recognising that Queensland is prone to other kinds of disaster – a common warning approach and language.

The third relates to the way that Queensland's disaster management system adapts to dealing with a hazard that is the responsibility of a large, technically-capable agency. Fire is only one of several such hazards. Queensland has a refined system of dealing with its most common events; floods and cyclones. The local government is deliberately in charge of managing operations in its area. In hazard-specific events that is still necessary. But there will be a hazard-specific chain of decisions and reporting running parallel to the disaster management chain of local, district and state centres. It will influence what happens in the community. It is vital that these two chains have close linkages in planning and liaison. Co-location would be best but may not be practical. So, the disaster management system needs to adapt to supporting the primary agency in dealing with the hazard. The hazard-specific primary agency also needs to reach out beyond its business-as-usual approach to smaller incidents, and engage and share information to enable that support. It will need to plan to do this so that it is not stretched in the worst of times. Many involved saw the need to adapt in this event to achieve this balance. There is an opportunity to build on that adaptation so that the lessons are learned, through engagement, practice and exercises.

This review prompts the opportunity for changes in these directions.

THE 2018 QUEENSLAND BUSHFIRES REVIEW

APPENDICES

Back-burning along a fire break.
Photo courtesy of B Wagner

APPENDIX A: REVIEW TERMS OF REFERENCE

The 2018 Queensland Bushfires Review

Terms of Reference for a review of key preparedness and response elements of the bushfires and hot weather events across Queensland

Purpose

Section 16C of the *Disaster Management Act 2003* provides the Inspector-General Emergency Management with functions including:

- to regularly review and assess the effectiveness of disaster management by the State, including the State disaster management plan and its implementation;
- to review, assess and report on performance by entities responsible for disaster management in the State against the disaster management standards;
- to report to, and advise, the Minister about issues relating to the functions above
- to make all necessary inquiries to fulfil the functions above.

In accordance with these functions, the Office of the Inspector-General Emergency Management will assess the effectiveness of preparedness activity and response to the major bushfires that occurred from late November to early December, and to the associated heatwave by entities responsible for disaster management in Queensland.

Approach

The Review team will work closely with the Queensland Police Service, Queensland Fire and Emergency Services, local, state and federal agencies, and other relevant entities to differentiate between:

- those lessons that are agency-specific
- those that overlap with the disaster management system, and
- those that are specific to the disaster management system.

The Review team will concentrate on the latter two, informed by the first.

The Review will identify lessons that will inform continuous improvement in fire management and disaster management arrangements in Queensland. The scope of these lessons will be bound by the *Standard for Disaster Management in Queensland* and other relevant doctrine. In conducting the Review, the team will consider the views of community members via survey and submissions.

Reporting

The Review report will be based on relevant Shared Responsibilities of the *Standard for Disaster Management in Queensland*.

The Review report will be provided to the Minister for Fire and Emergency Services. Before finalising the Review report, the Review team will consult with relevant entities on draft findings and recommendations.

APPENDIX B: LEGISLATION

Bushfire preparation and mitigation

A number of statutes and subordinate legislation may influence a landholder's decision to prepare and respond to bushfires. The application of the relevant legislative requirements may depend on a range of factors not limited to: the type of vegetation and biodiversity values, cultural and natural values, the location of watercourses, road, rail and energy corridors and associated easements and infrastructure, telecommunication infrastructure, and adjoining properties.

Applicable primary legislation includes:

- *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) – approval required if clearing has a significant impact on matters of national environmental significance
- *Fire and Emergency Services Act 1990* – application for 'permit to light fire' made through local fire warden
- *Nature Conservation Act 1992* (Natural Conservation (Wildlife Management) Regulation 1994) – clearing permit required before clearing protected native plants
- *Vegetation Management Act 1999* – authorises vegetation codes
- *Planning Act 2016* (Planning Regulation 2017) – provides for exemptions for clearing work
- *Local Government Act 1993* – authorises preparation of local laws for vegetation management and to designate bushfire prone areas.

Secondary legislation includes:

- *Disaster Management Act 2003* – identifies prevention, preparedness and response to a disaster should be planned and is a shared responsibility.
- *Environmental Protection Act 1994* – allows industry to develop codes of practices
- *Aboriginal Cultural Heritage Act 2003* – protects Aboriginal cultural heritage
- *Torres Strait Islander Cultural Heritage Act 2003* – protects Torres Strait Islander cultural heritage
- *Queensland Heritage Act 1992* – protects non-Indigenous places of cultural heritage significance
- *Forestry Act 1959* – lessees of State forest, timber reserve or forest entitlement area must prevent fires and notify of fires likely to spread into such areas
- *Fisheries Act 1994* – protects marine plans such as mangroves
- *Transport Infrastructure Act 1994* – road corridor permit required for burning or clearing

Other relevant parties may need to be consulted:

- *Queensland Rail Transit Authority Act 2013* – Queensland Rail/Aurizon may need to be notified of intention to burn near an easement or near rail corridor
- *Telecommunications Act 1997* (Cth) – owners of telecommunication infrastructure may need to be notified of intention to burn
- *Electricity Act 1994* – electricity entity may need to be notified of intention to burn

Evacuation

Different legislation was used during the 2018 bushfire event to enact evacuations. The below is a summary of the Acts that were used in the three areas, and the powers within these to enforce movement of people.

Public Safety Preservation Act 1986:

8 (1)

(d) direct the evacuation and exclusion of any person or persons from any premises and for this purpose may remove or cause to be removed (using such force as is necessary for that purpose) any person who does not comply with a direction to evacuate or any person who enters, attempts to enter or is found in or on any premises in respect of which a direction for the exclusion of persons has been given;

Fire and Emergency Services Act 1991:

53 (2)

(k) require any person not to enter or remain within a specified area around the site of danger;

(l) remove from any place a person who fails to comply with an order given pursuant to paragraph (k) and use such force as is reasonably necessary for that purpose;

Disaster Management Act 2003:

77 (1)

(a) control the movement of persons, animals or vehicles within, into, out of or around the declared area for the disaster situation;

(b) give a direction to a person to regulate the movement of the person, an animal or a vehicle within, into, out of or around the declared area;

(c) evacuate persons or animals from the declared area or a part of the area.

Public information and warnings

1. The Commonwealth *Meteorology Act 1955* prescribes key functions of the Bureau including weather forecasting and the issue of warnings of gales, storms and other weather conditions likely to endanger life or property, including weather conditions likely to give risk to floods or bushfires (Section 7, (1)b and c)

2. Section 8B of the FES Act prescribes the following 'warning-type' functions to QFES:

   (a) *to protect persons, property and the environment from fire and hazardous materials emergencies; and*

   (c) *to provide an advisory service, and undertake other measures, to promote—*

   - *(i) fire prevention and fire control; and*
   - *(ii) safety and other procedures if a fire or hazardous materials emergency happens;*

3. The DM Act prescribes responsibilities to both local and district disaster management groups to ensure the community is aware of how to prepare for, and what to do during and after a disaster.

APPENDIX C: DEFINITIONS

TERM	DEFINITION
Activation	The commencement of a process or activity in response to a trigger. An activation is not a declaration, nor is it dependant on the declaration of a disaster situation (see definition for declaration). For example, activation of relief measure, as detailed in the Queensland Disaster Relief and Recovery Arrangements.
Alert	A level of activation: a heightened level of vigilance due to the possibility of an event in the area of responsibility. Some action may be required. The situation should be monitored by someone capable of assessing the potential of the threat.
All-Hazards Approach	This approach assumes that the functions and activities applicable to one hazard are most likely applicable to a range of hazards
Area Fire Management Group (AFMG)	A network of bushfire management partners and stakeholders organised and chaired by QFES, particularly targeted at public and private large landholders. The group cooperates to manage bushfire impacts and is generally based on local government boundaries.
Briefing	The process of advising personnel of the details of the incident or event with which they will be dealing.
Bushfire	A fire involving grass, scrub or forest.
Capability	The ability to achieve a desired effect in a specific environment/ context.
Capacity	The combination of all the strengths, attributes and resources available within an organisation, community or society to manage and reduce disaster risks and strengthen resilience. Capacity may include infrastructure, institutions, human knowledge and skills, and collective attributes such as social relationships, leadership and management.
Community	» A group with a commonality of association and generally defined by location, shared experience, or function. » A social group which as a number of things in common, such as shared experience, locality, culture, heritage, language, ethnicity, pastimes, occupation, workplace, etc.

Consequence	The outcome or impact of an event that may be expressed qualitatively or quantitatively. There can be more than one consequence from an event. Consequences are generally described as the effects on people, society, the environment and the economy.
Control	The overall direction of emergency management activities in an emergency situation. Authority for control is established in legislation or in an emergency plan and carries with it the responsibility for tasking other organisations in accordance with the needs of the situation. Control relates to situations and operates horizontally across organisations.
Coordination	The bringing together of organisations to ensure disaster management before, during and after an event. It is primarily concerned with a systematic acquisition and application of resources (people, material, equipment, etc.) in accordance with priorities set by disaster management groups. Coordination operates horizontally across organisations and agencies.
Coordination Centre	A centre established at State, district or local government level as a centre of communication and coordination during times of disaster operations.
Debrief	A meeting at the end of an operation with the purpose of assessing the conduct or results of an operation.
Declaration of a Disaster Situation	The formal procedure to enable declared disaster powers under the Disaster Management Act 2003 (ss64-69) as required. Specific powers may be used to prevent or minimise loss of life, injury or damage.
Declaration of an Emergency Situation	An emergency situation declared under the *Public Safety Preservations Act 1986* (s5).
Declared Area	» For a disaster situation declared under s64(1) of the *Disaster Management Act 2003* – the disaster district, or the part of the disaster district, for which the disaster situation is declared; or » For a disaster situation declared under s69 of the *Disaster Management Act 2003* – the State or, if the disaster situation is declared for a part of the State, the part.
Disaster	A serious disruption in a community, caused by the impact of an event, that requires a significant coordinated response by the State and other entities to help the community recover from the disruption.

Disaster Management	Arrangement about managing the potential adverse effects of an event, including, for example, arrangements for mitigating, preventing, preparing for, responding to and recovering from a disaster.
Disaster Management Group	Means the State group, a district group or a local group.
Disaster Management Plan	The State group, district groups and local groups must prepare a plan (State Disaster Management Plan, District Disaster Management Plan and Local Disaster Management Plan) for disaster management in the state, disaster district and local government's area respectively.
Disaster Management Stakeholder	Any individual, group, corporation, business, organisation, agency, who may affect or be affected by a decision, activity or outcome of disasters or hazards and the approach to prevention, preparedness, response or recovery phases.
Disaster Management System	The Queensland disaster management system refers to the legislation, regulations, plans, standards, policies, technology systems, guidelines and associated publications in place to facilitate effective disaster management across the four phases of prevention, preparedness, response or recovery.
Disaster Operations	Activities undertaken before, during or after an event happens to help reduce loss of human life, illness or injury to humans, property loss or damage, or damage to the environment, including, for example, activities to mitigate the adverse effects of an event.
Disaster Risk	The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.
District Disaster Management Group (district group)	The group established under s22 of the *Disaster Management Act 2003*. The district group provides whole- of-government planning and coordination capacity to support local governments in disaster management and operations.
Emergency Alert (EA)	A national telephone warning system that provides Australian emergency authorities with an enhanced ability to warn the community in the event of an emergency. The warning system is another tool available for organisations to issue emergency warnings. Emergency Alerts will be issued via a landline and mobile telephones.

Emergency Management	Emergency management is also used, sometimes interchangeably, with the term disaster management, particularly in the context of biological and technological hazards and for health emergencies. While there is a large degree of overlap, an emergency can also relate to hazardous events that do not result in the serious disruption of the functioning of a community or society.
Evacuation	The planned movement of persons from an unsafe or potentially unsafe location to a safer location and their eventual return.
Evacuation Centre	A building located beyond a hazard to provide temporary accommodation, food and water until it is safe for evacuees to return to their homes or alternative temporary emergency accommodation.
Event	An event means any of the following: » A cyclone, earthquake, flood, storm, storm tide, tornado, tsunami, volcanic eruption or other natural happening » An explosion or fire, a chemical, fuel or oil spill, or a gas leak » An infestation, plague or epidemic » A failure, or disruption to, an essential service or infrastructure » An attack against the state » Another event similar to an event mentioned above. An event may be natural or caused by human acts or omissions.
Exercise	A controlled, objective-driven activity used for testing, practising or evaluating processes or capabilities.
Exposure	The elements within a given area that have been, or could be, subject to impact of a particular hazard. Exposure is also sometimes referred to as the 'elements at risk.'
Fire Danger	Sum of constant danger and variable danger factors affecting the inception, spread, and resistance to control, and subsequent fire damage; often expressed as an index. (Australian Institute for Disaster Resilience, under review)
Fire Danger Rating	A relative class denoting the potential rates of spread, or suppression difficulty for specific combinations of temperature, relative humidity, drought effects and wind speed, indicating the relative evaluation of fire danger. (Australian Institute for Disaster Resilience, under review)

Fire Weather	Weather conditions which influence fire ignition, behaviour, and suppression. (Australian Institute for Disaster Resilience, under review)
Functional Lead Agency	An agency allocated responsibility to prepare for and provide a disaster management function and lead relevant organisations that provide a supporting role.
Functional Plan	A functional plan is developed by lead agencies to address specific planning requirements attached to each function. Although the functional lead agency has primary responsibility, arrangements for the coordination of relevant organisation that play a supporting role are also to be outlined in these plans.
Hazard	A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. (United Nations Office for Disaster Risk Reduction, 2017)
Hazard-specific Plan	A hazard-specific plan is developed by a state agency with assigned lead responsibility to address a particular hazard under the *State Disaster Management Plan*.
Hazard-specific Primary Agency	An agency allocated responsibility to prepare for and respond to a specific hazard based on their legislated and /or technical capability and authority.
Heatwave	A long lasting period with extremely high surface temperature. (Australian Institute for Disaster Resilience, under review)
Incident	An event, occurrence or set of circumstances that: » has a definite spatial extent » has a definite duration » calls for human intervention » has a set of concluding conditions that can be defined » is or will be under the control of an individual who has the authority to make decisions about the means by which it will be brought to an end.
Intelligence	The product of a process of collecting and analysing information or data which is recorded and disseminated as intelligence to support decision making.
Jurisdiction	The state or territory in which an agency, organisation or statutory position has authority or responsibility.

Lean Forward	An operational state prior to 'stand up' characterised by a heightened level of situational awareness of a disaster event (either current or impending) and a state of operational readiness.
Level of Risk (or risk level)	Magnitude of a risk, or a combination of risks, expressed in terms of the combination of vulnerability, consequence and their likelihood.
Levels of Activation	Queensland's Disaster Management Arrangements are activated using an escalation model based on the following levels: » Alert – a heightened level of vigilance due to the possibility of an event in the area of responsibility. Some action may be required and the situation should be monitored by staff capable of assessing and preparing for the potential threat. » Lean forward – an operational state prior to 'stand up' characterised by a heightened level of situational awareness of a disaster event (either current or impending) and a state of operational readiness. Disaster coordination centres are on standby, prepared but not activated. » Stand up – the operational state following 'lead forward' whereby resources are mobilised, personnel are activated and operational activities commenced. Disaster coordination centres are activated. » Stand down - transition from responding to an event back to normal core business and/or continuance of recovery operations. There is no longer a requirement to respond to the event and the threat is no longer present.
Liaison Officer	A person who liaises between a coordination centre and their home entity (e.g. SDCC and Energy Queensland) during disaster operations. Liaison officers communicate and coordinate their activities to achieve the best utilisation of resources or services provided to the centre (e.g. provide technical or subject matter expertise, as well as, capability and capacity of their home entity).
Likelihood	The chance of something happening whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively and described using general terms or mathematically. (Standards Australia/Standards New Zealand Standard Committee, 2009).

Local Disaster Coordinator (LDC)	The person appointed as the local disaster coordinator under s35 of the *Disaster Management Act 2003*. The function of the local disaster coordinator is to coordinate disaster operations in the local government area for the local group.
Local Disaster Management Group (local group)	The group established under s29 of the *Disaster Management Act 2003*, in place to support Local Government in the delivery of disaster management services and responsibilities in preventing, preparing for, responding to and recovering from disaster events.
Local Disaster Management Plan (local plan)	A plan prepared under s57 of the *Disaster Management Act 2003* that documents arrangements to manage disaster planning and operations with the local government area of responsibility.
Mitigation	Activities intended to reduce or eliminate risks, or lessen the actual or potential effects or consequences of an event.
Monitoring	Continual checking, supervising, critically observing or determining the status to identify change from the performance level required or expected. Monitoring can be applied to a risk management framework, risk management process, risk or control. (Australian Emergency Management Institute, 2015)
Natural Hazard	Those which are predominantly associated with natural processes and phenomena. (United National Office for Disaster Risk Reduction, 2017)
Neighbourhood Safer Place	A local open space or building where people may gather, as a last resort, to seek shelter from bushfire.

Network	A group or system of interconnected people or things. (Australian Emergency Management Institute, 2015)
Operational Plan	An operational plan is a response plan which outlines a problem/ concern/ vulnerability and identifies the appropriate action (what? who? how? when?) to address the situation. The operation plan sits within the disaster management plan and is developed after conducting a risk assessment.
Phases of Disaster Management	Prevention, Preparedness, Response and Recovery
Place of Refuge	An alternative or in addition to evacuation where individuals shelter within their homes, workplace or with family/friends if considered safe to do so.
Plan	A formal record of agreed emergency management roles, responsibilities, strategies, systems and arrangements.
Planning Process	The collective and collaborative efforts by which agreements are reached and documented between people and organisations to meet their communities' emergency management needs. It is a sequence of steps which allows emergency management planning to take place.
Policy	Provides a deliberate system of principles and statement of intent to guide decisions and achieve rational outcomes.
Preparedness	The taking of preparatory measures to ensure that, if an event occurs, communities, resources and services are able to cope with the effects of the event.
Prescribed Burning	The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives. It is undertaken in specified environmental conditions. Prescribed burning is also referred to as planned burning; hazard reduction burning; controlled burning; prescription fire; fuel reduction burning; planned fire and prescription burning. (Australian Institute for Disaster Resilience, under review)
Prevention	The taking of preventative measures to reduce the likelihood of an event occurring or, if an event occurs, to reduce the severity of the event.
Queensland's Disaster Management Arrangements (the disaster management arrangements)	Whole-of-government arrangements to ensure the collaborative and effective coordination of planning, services, information and resources for comprehensive disaster management.

Queensland Disaster Management Committee (QDMC)	The group established under s17 of the *Disaster Management Act 2003* and chaired by the Premier to make strategic decisions about prevention, preparedness, response and recovery for disaster events and to build Queensland's resilience to disasters.
Recovery	The taking of appropriate measures to recover from an event, including action taken to support disaster-affected communities in the reconstruction of infrastructure, the restoration of emotional, social, economic and physical wellbeing, and the restoration of the environment.
Residual Risk	The risk that remain in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained. (United Nations Office for Disaster Risk Reduction, 2017)
Resilience	A system or community's ability to rapidly accommodate and recover from the impacts of hazards, restore essential structures and desired functionality, and adapt to new circumstances.
Response	The taking of appropriate measures to respond to an event, including action taken and measures planned in anticipation of, during, and immediately after an event to ensure that its effects are minimised and that persons affected by the event are given immediate relief and support.
Risk	The concept of risk combines an understanding of the likelihood of a hazardous event occurring with an assessment of its impact represented by interactions between hazards, elements at risk and vulnerability. (Geoscience Australia)
Risk Assessment	An approach to determine the nature and extent of risk by analysing potential hazards and evaluation existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend. (United Nations Office for Disaster Risk Reduction, 2017)
Risk Management	The systematic application of management policies, procedures and practices to the tasks of identifying, analysing, assessing, mitigating and monitoring risk. (Australian Emergency Management Institute, 2015)
Risk Management Framework	A set of components that provide the foundations and organisational arrangements for designing, analysing, assessing, mitigating and monitoring risk. (Australian Emergency Management Institute, 2015)

Risk Register	A table, list or other representation of risk statements describing sources of risk and elements at risk with assigned consequences, likelihoods and levels of risk. Risk registers are produced by risk assessment processes, summarising the outputs of these processes to inform decision making about risks. Risk registers record the identification, analysis and evaluation of emergency risks. (Australian Emergency Management Institute, 2015)
Shelter in Place	An alternative or in addition to evacuation where individuals shelter within their homes, workplace or with family/friends if considered safe to do so.
Situational Awareness	Situational awareness or situation awareness is the perception of environmental elements and events with respect to time or space, the comprehension of their meaning, and the projection of their status after some variable has changed, such as time, or some other variable, such as a predetermined event. It is also a field of study concerned with understanding of the environment critical to decision makers.
Stand Down	Transition from responding to an event back to normal core business and/or continuance of recovery operations. There is no longer a requirement to respond to the event and the threat is no longer present.
Stand Up	The operational state following 'lean forward' whereby resources are mobilised, personnel are activated and operational activities commended. Disaster coordination centres are activated.
State Disaster Coordination Centre	A permanent state level operational facility located at the Emergency Services Complex, Kedron, Brisbane.
State Disaster Management Plan (State Plan)	A plan prepared under s49 of the *Disaster Management Act 2003* that documents planning and resource management for disaster management for the state.
Volunteers	People who are formally affiliated with an emergency service organisation or non-government organisation, and act under the respective organisations direction and authority.

Vulnerability	Vulnerability in relation to disaster events is a fluid and complex concept. The definition of vulnerability in the Queensland Vulnerability Framework comprises three components: » target group statement – people who would benefit from additional and targeted assistance to prepare for, respond to, and recover from disasters » vulnerability indicators – for example, proximity to an event, lack of financial resources, and disruption to, or lack of available services, supports/carers, medication, aids and equipment » four protective factors – wellbeing, connection, knowledge and security.
Wildfire	See Bushfire

APPENDIX D: CONSULTATION AND ENGAGEMENT

Consultation about the report and its recommendations occurred with those agencies involved in the heatwave and bushfires and that are most likely to be involved in their implementation.

Agency

Bureau of Meteorology
Central Highlands Regional Council
Department of Aboriginal and Torres Strait Islander Partnerships
Department of Agriculture and Fisheries
Department of Communities, Disability Services and Seniors
Department of Education
Department of Environment and Science
Department of Housing and Public Works
Department of Local Government, Racing and Multicultural Affairs
Department of Natural Resources, Mines and Energy
Department of State Development, Manufacturing, Infrastructure and Planning
Department of the Premier and Cabinet
Department of Transport and Main Roads
Gladstone Regional Council
Mackay Regional Council
Queensland Ambulance Service
Queensland Fire and Emergency Services
Queensland Health
Queensland Police Service
Queensland Reconstruction Authority
Queensland Treasury
Rockhampton Regional Council

APPENDIX E: RELEVANT RECOMMENDATIONS FROM PREVIOUS REVIEWS

REPORT	RECOMMENDATION	REC. NO.
The Cyclone Debbie Review 2017-18	**Intelligence:** A strategy should be developed to improve the availability of information to decision-makers and other audiences. Information should be searchable, more specific, timely, and allow stakeholders to find what they want.	**Recommendation 10** *(status is 'in progress' – ref weather event catalogue.)*
The Cyclone Debbie Review 2017-18	**Intelligence:** Significant effort should be invested to provide disaster decision-makers at every level with a shared understanding of risks, the situation, and capability, so that they can agree the best decisions for the communities they serve.	**Recommendation 11** *(status is 'in progress' – ref QERMF assessments and weather event catalogue.)*
Comment: The Office notes the progress made since the TC Debbie review to share information more widely across the sector. The findings from this review reinforce the recommendations from *The Cyclone Debbie Review* and indicate that the sharing of modelled predictions should continue to be given priority.		
Review of local governments' emergency warning capability 2014-15	**Warnings:** The *Queensland State Disaster Management Plan* is reviewed to include direction for primary agencies to ensure local groups are included in the development and issue of hazard-specific warnings and public information	**Recommendation 1** *(status is 'delivered.' Ref 4.11.2 and App. F.*
Comment: While this recommendation has been completed, the current review provides useful reflections on the extent to which this direction has been implemented.		
The Cyclone Debbie Review 2017-18	**Cooperation and coordination; Evacuation**: Exercising should focus on vertical integration and include all levels of the system. A strategic program of exercises should be developed and implemented.	**Recommendation 18** *(status is 'delivered')*
Comment: The current review demonstrates the value of exercising for hazard-specific disasters across Queensland's disaster management arrangements, including, but not limited to, bushfire, both locally and at the state level. In its submission to this review, QFES has identified that more regularly exercising the integration of agency specific bushfire response with the wider disaster management system would be beneficial. A useful example exists in the 2018 exercise developed by the Australian Maritime Safety Authority and Maritime Safety Queensland to practice management of an oil spill in the Torres Strait. Participants included community liaison officers, hazard-specific agencies, state response and recovery agencies, DDCC and LDCC representatives.		

Review of State Agency Integration at a local and district level 2014-15	**Planning:** That Queensland's disaster management arrangements are reviewed to enhance integration. Specifically, to integrate hazard-specific agency planning at all levels of the arrangements (This may include legislative, policy and procedural considerations).	**Recommendation 1** *(status is 'delivered')*
Comment: Findings from the current review indicate that planning for bushfire and heatwave require more engagement with stakeholders across the disaster management arrangements, including the community. Plans should be accessible to all stakeholders and reviewed, assessed and exercised regularly.		
The Cyclone Debbie Review 2017-18	**Lessons and culture:** Queensland should implement and maintain a system-wide lesson management program.	**Recommendation 1** *(status is in progress)*
Comment: The current review reinforces the value to the sector of creating a system-wide lessons management program. The Office has commenced the development of this program. Of paramount importance to the success of a system-wide lessons program is the existence of a 'culture of learning' as described in *The Cyclone Debbie Review.*[192] During this review, the Office saw examples of individuals being unwilling to openly discuss their concerns or solutions due to a fear of reprisal. If these fears are genuine, then a fully functioning lessons management program will never be realised in Queensland. '…The consequence of failing to learn is potential loss of property, or worse, lives. Learning must occur in collaboration and challenge siloed thinking. Multi-agency, multi-group and system-wide lesson learning and information sharing is crucial to improve future practice.'[193]		

APPENDIX F:
TECHNICAL REPORTS

The following reports were commissioned by the Office to inform and provide supporting evidence for the lines of inquiry in this review. The full reports are published on the Office's public-facing website.

2018 Queensland Bushfires Review: Quantitative Research with Community Members

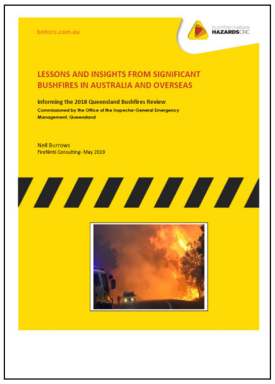
(Market and Communications Research, 2019)

The science behind the Queensland bushfire and heatwave event

(Bushfire and Natural Hazards Cooperative Research Centre, 2019)

Lessons and insights from significant bushfires in Australia and overseas

(Bushfire and Natural Hazards Cooperative Research Centre, 2019)



ENDNOTES

1 Hughes L, Hanna E, and Fenwick J 2016, The Silent Killer: Climate Change and the Health Impacts of Extreme Heat, Climate Council of Australia, viewed 12 April 2019, https://www.climatecouncil.org.au/resources/silentkillerreport/

2 Queensland in November 2018: Exceptional heat along the east coast at the end of the month, Bureau of Meteorology, Australian Government, viewed 5 January 2019, http://www.bom.gov.au/climate/current/month/qld/archive/201811.summary.shtml

3 Bureau of Meteorology, Special Climate Statement 67—an extreme heatwave on the tropical Queensland coast, Australian Government, Canberra, p.8, viewed 6 January 2019, http://www.bom.gov.au/climate/current/statements/scs67.pdf

4 Annual climate statement 2018, Bureau of Meteorology, Australian Government, viewed 6 January 2019, http://www.bom.gov.au/climate/current/annual/aus/#tabs=Events

5 Annual climate statement 2018, Bureau of Meteorology, Australian Government, viewed 6 January 2019, http://www.bom.gov.au/climate/current/annual/aus/#tabs=Events

6 Bureau of Meteorology, Special Climate Statement 67—an extreme heatwave on the tropical Queensland coast, Australian Government, Canberra, p.8, viewed 6 January 2019, http://www.bom.gov.au/climate/current/statements/scs67.pdf

7 Office of Economic and Statistical Research 2009, Queensland Past and Present: 100 Years of Statistics 1896-1996, Queensland Government, Brisbane, pp29-51, viewed 10 January 2019, http://www.qgso.qld.gov.au/products/reports/qld-past-present/qld-past-present-1896-1996-ch02-sec-02.pdf

8 Nairn J, Fawcett R, and Ostendorf B, Heatwaves in Queensland, Bureau of Meteorology, Australian Government, Canberra, p4, viewed 18 January 2019, https://www.bnhcrc.com.au/file/6507/download?token=wnVRKuwD.

9 Queensland in November 2018: Exceptional heat along the east coast at the end of the month, Bureau of Meteorology, Australian Government, viewed 5 January 2019, http://www.bom.gov.au/climate/current/month/qld/archive/201811.summary.shtml

10 Coates, L, Haynes, K, O'Brien, J, McAneney, J and De Oliveira, FD 2014, Exploring 167 years of vulnerability: An examination of extreme heat events in Australia 1844-2010, Environmental Science and Policy, vol 42, pp.33-44.

11 Improved BOM heatwave service for the summer of 2018/19, Bureau of Meteorology, Australian Government, viewed 6 January 2019, http://media.bom.gov.au/releases/546/improved-bom-heatwave-service-for-the-summer-of-2018-19/

12 About the heatwave service, Bureau of Meteorology, viewed 18 January 2019, http://www.bom.gov.au/australia/heatwave/about.shtml

13 About the heatwave service, Bureau of Meteorology, viewed 18 January 2019, http://www.bom.gov.au/australia/heatwave/about.shtml

14 Queensland Health 2015, Queensland Heatwave Response Plan, Queensland Government, Brisbane, viewed 14 February 2019, https://www.health.qld.gov.au/__data/assets/pdf_file/0032/628268/heatwave-response-plan.pdf

15 Queensland Future Climate Dashboard, 2018, Queensland Government, viewed 28 February 2019, https://app.longpaddock.qld.gov.au/dashboard/

16 Trancoso R and Syktus, J 2018, 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, Brisbane.

17 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

18 Queensland Fire and Emergency Services 2017, Queensland State Natural Hazard Risk Assessment, Queensland Government, Brisbane, viewed 10 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Emergency-Risk-Mgmt/QLD-State-Natural-Risk-Assessment-2017.pdf

19 Queensland Fire and Emergency Services 2017, Queensland State Natural Hazard Risk Assessment, Queensland Government, Brisbane, p.74, viewed 10 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Emergency-Risk-Mgmt/QLD-State-Natural-Risk-Assessment-2017.pdf

20 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

21 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p38, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

22 Queensland Health 2004, Queensland Heatwave Response Plan, Queensland Government, Brisbane.

23 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

24 Queensland Health 2004, Queensland Heatwave Response Plan, Queensland Government, Brisbane, pp9-18.

25 Queensland Health 2015, Queensland Heatwave Response Plan, Queensland Government, Brisbane, viewed 14 February 2019, https://www.health.qld.gov.au/__data/assets/pdf_file/0032/628268/heatwave-response-plan.pdf

26 Queensland Health 2015, Queensland Heatwave Response Plan, Queensland Government, Brisbane, viewed 14 February 2019, https://www.health.qld.gov.au/__data/assets/pdf_file/0032/628268/heatwave-response-plan.pdf

27 Department of Health 2012, State Emergency Management Plan For Heatwave, Western Australian Government, Perth, viewed 18 January 2019, https://www.fsh.health.wa.gov.au/~/media/Files/Corporate/general%20documents/emergency%20disaster/PDF/WESTPLAN_Heatwave.pdf

28 Queensland Health 2017, Queensland Heatwave Response Communications Protocol, Queensland Government, Brisbane, viewed 14 February 2019.

29 Queensland University of Technology 2010, Impacts and Adaptation Response of Infrastructure and Communities to Heatwaves: The Southern Australian Experience of 2009, National Climate Change Adaptation Research Facility, Gold Coast, viewed 11 January 2019, https://www.nccarf.edu.au/publications/impacts-and-adaptation-responses-infrastructure-and-communities-heatwaves

30 Queensland University of Technology 2010, Impacts and Adaptation Response of Infrastructure and Communities to Heatwaves: The Southern Australian Experience of 2009, National Climate Change Adaptation Research Facility, Gold Coast, viewed 11 January 2019, https://www.nccarf.edu.au/publications/impacts-and-adaptation-responses-infrastructure-and-communities-heatwaves

31 Queensland University of Technology 2010, Impacts and Adaptation Response of Infrastructure and Communities to Heatwaves: The Southern Australian Experience of 2009, National Climate Change Adaptation Research Facility, Gold Coast, viewed 11 January 2019, https://www.nccarf.edu.au/publications/impacts-and-adaptation-responses-infrastructure-and-communities-heatwaves

32 Northern Victoria Emergency Management Cluster 2018, Northern Victorian Cluster - Municipal Heatwave Plan, Campaspe Shire Council, viewed 20 March 2019, https://www.campaspe.vic.gov.au/assets/page-files/live/Municipal-Heatwave-Plan.pdf

33 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p24, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

34 Queensland Fire and Emergency Services 2017, Queensland State Natural Hazard Risk Assessment, Queensland Government, Brisbane, viewed 10 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Emergency-Risk-Mgmt/QLD-State-Natural-Risk-Assessment-2017.pdf

35 Business Queensland 2016, Electricity Generation, Queensland Government, viewed 20 February 2019, https://www.business.qld.gov.au/industries/mining-energy-water/energy/electricity/queensland/generation

36 Aggregated Price and Demand Data – November 2019, Australian Energy Market Operator, viewed 20 February 2019, https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Data-dashboard#aggregated-data

37 State Update 9, 0700hrs 30 November 2018 to State Update 15, 1500hrs 3 December 2018.

38 State Update 9, 0700hrs 30 November 2018.

39 State Update 13, 0700hrs 2 December 2018. State Update 14, 1500hrs 3 December 2018.

40 State Update 15, 1500hrs 3 December 2018.

41 State Update 15, 1500hrs 3 December 2018.

42 State Update 11, 1500hrs 1 December 2018. State Update 12, 0700hrs 2 December 2018.

43 Lund University 2018, More 'heatwave' summers will affect animals, Science Daily, viewed 22 March 2019, https://www.sciencedaily.com/releases/2018/12/181212135036.htm

44 Kim, S 2018, Extreme heat wipes out almost one third of Australia's spectacled flying fox population, ABC News, viewed 15 March 2019, https://www.abc.net.au/news/2018-12-19/heat-wipes-out-one-third-of-flying-fox-species/10632940

45 Cox, L 2019, Spectacled flying fox declared endangered after Queensland heatwave wipeout, The Guardian, viewed 15 March 2019, https://www.theguardian.com/environment/2019/feb/19/spectacled-flying-fox-declared-endangered-after-queensland-heatwave-wipeout

46 Queensland Health 2018, Can't touch this – heatwave bats are off limits, Queensland Government, Brisbane, viewed 15 March 2019, https://www.health.qld.gov.au/news-alerts/news/161204-heatwavebats

47 Qld heatwave decimates bat population, SBS News, viewed 15 March 2019, https://www.sbs.com.au/news/qld-heatwave-decimates-bat-population

48 Cluff, R 2018, Flying fox deaths raise public health threat as residents are forced to do the clean-up themselves, Tropic Now, viewed 15 March 2019, https://www.tropicnow.com.au/2018/november/29/bat-deaths-raise-public-health-concerns-as-residents-are-forced-to-do-the-clean-up.html

49 Cluff, R 2018, Flying fox deaths raise public health threat as residents are forced to do the clean-up themselves, Tropic Now, viewed 15 March 2019, https://www.tropicnow.com.au/2018/november/29/bat-deaths-raise-public-health-concerns-as-residents-are-forced-to-do-the-clean-up.html

50 Kim, S 2018, Extreme heat wipes out almost one third of Australia's spectacled flying fox population, ABC News, viewed 15 March 2019, https://www.abc.net.au/news/2018-12-19/heat-wipes-out-one-third-of-flying-fox-species/10632940

51 Department of Human Services 2009, Heatwave Planning Guide: Development of heatwave plans in local councils in Victoria, Victorian Government, Melbourne, viewed 12 January, https://www2.health.vic.gov.au/about/publications/policiesandguidelines/Heatwave%20Planning%20Guide%20Development%20of%20heatwave%20plans%20in%20local%20councils%20in%20Victoria

52 Department of Human Services 2009, Heatwave Planning Guide: Development of heatwave plans in local councils in Victoria, Victorian Government, Melbourne, viewed 12 January, https://www2.health.vic.gov.au/about/publications/policiesandguidelines/Heatwave%20Planning%20Guide%20Development%20of%20heatwave%20plans%20in%20local%20councils%20in%20Victoria

53 Department of Human Services 2009, Heatwave Planning Guide: Development of heatwave plans in local councils in Victoria, Victorian Government, Melbourne, viewed 12 January, https://www2.health.vic.gov.au/about/publications/policiesandguidelines/Heatwave%20Planning%20Guide%20Development%20of%20heatwave%20plans%20in%20local%20councils%20in%20Victoria

54 Victorian Auditor-General 2014, Heatwave Management: Reducing the Risk to Public Health, Victorian Government, Melbourne, viewed 15 March 2019, https://www.audit.vic.gov.au/sites/default/files/2017-07/20141014-Heatwave-Management.pdf

55 Victorian Auditor-General 2014, Heatwave Management: Reducing the Risk to Public Health, Victorian Government, Melbourne, viewed 15 March 2019, https://www.audit.vic.gov.au/sites/default/files/2017-07/20141014-Heatwave-Management.pdf

56 Inspector-General Emergency Management 2014, Review of state agency integration at a local and district level - Report 2: 2014-15, Queensland Government, Brisbane, viewed 12 March 2019, https://www.igem.qld.gov.au/reports-and-publications/Documents/State-Agency-Integration-Review-Report.pdf

57 Telecross REDi (SA), Red Cross Australia, viewed 14 March 2019, https://www.redcross.org.au/get-help/community-services/telecross/telecross-redi

58 Red Cross volunteers responding to European heatwave 2017, International Federation of Red Cross, viewed 14 March 2019, https://media.ifrc.org/ifrc/2017/06/28/european-heatwave-set-peak-portugal-fire-survivors-begin-recovery/

59 Australian Institute for Disaster Resilience, 2017, Australian Disaster Resilience Handbook 4: Evacuation Planning, p.3, viewed 26 March 2019, https://knowledge.aidr.org.au/media/5617/aidr-evacuation-planning-handbook.pdf

60 Bushfire and Natural Hazards Cooperative Research Centre 2018, Northern Australia Seasonal Bushfire Outlook, Hazard Note, issue 49, https://www.bnhcrc.com.au/hazardnotes/49

61 Department of Fire and Emergency Services 2014, What is the Keetch-Byram Drought Index?, Government of Western Australia, viewed 15 March 2019, https://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/BushfireInfoNotesPublications/DFES-InfoNote-WhatisKBDI.pdf

62 Department of Fire and Emergency Services 2017, The Effects of Pyrocumulonimbus on Fire Behaviour and Management, Government of Western Australia, viewed 15 March 2019, https://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/BushfireInfoNotesPublications/The%20Effects%20of%20Pyrocumulonimbus%20on%20Fire%20Behaviour%20Management%20Info%20Note.pdf

63 Queensland Fire and Emergency Services 2017, Queensland State Natural Hazard Risk Assessment, Queensland Government, Brisbane, viewed 16 March 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Emergency-Risk-Mgmt/QLD-State-Natural-Risk-Assessment-2017.pdf

64 About Wet Tropics, Climate Change in Australia, viewed 19 March 2019, https://www.climatechangeinaustralia.gov.au/en/impacts-and-adaptation/wet-tropics/

65 About East Coast, Climate Change in Australia, viewed 19 March 2019, https://www.climatechangeinaustralia.gov.au/en/impacts-and-adaptation/east-coast/

66 Department of Environment and Science 2018, Mount Archer National Park – Nature, culture and history, Queensland Government, viewed 19 March 2019, https://parks.des.qld.gov.au/parks/mount-archer/culture.html

67 Mackay Local Disaster Management Group 2018, Local Disaster Management Plan, Mackay Regional Council, viewed 20 March 2019, http://www.mackay.qld.gov.au/__data/assets/pdf_file/0009/119358/Local_Disaster_Management_Plan_-_Version_5_-_Jan_2018.pdf

68 Local Disaster Management Group 2013, Local Disaster Management Plan, Gladstone Regional Council, viewed 20 March 2019, http://www.gladstone.qld.gov.au/c/document_library/get_file?uuid=66da7d76-7758-4174-8144-a98f75ba7050&groupId=1570002

69 Rockhampton Regional Council, Bushfire Management Strategy, viewed 21 March 2019, https://www.rockhamptonregion.qld.gov.au/files/assets/public/regional-services/disaster-management/reports/bushfire-management-strategy.pdf

70 Lloyd S 2018, Bushfire versus wildfires: What's the difference?, ABC News, viewed 30 March 2019, https://www.abc.net.au/news/2018-08-22/bushfires-versus-wildfires-which-term-is-correct/10146766

71 Gladstone Regional Council 2017, Ready? Your Guide to Preparing for Natural Disasters, and Emergencies, viewed 19 March 2019, http://www.gladstone.qld.gov.au/documents/1570002/2190828/%27Ready%27

72 Mackay Regional Council, Types of disasters, viewed 19 March 2019, http://www.mackay.qld.gov.au/__data/assets/pdf_file/0020/231824/Types_of_disasters.pdf

73 Rockhampton Regional Council, Bushfire Management Strategy, viewed 19 March 2019, https://www.rockhamptonregion.qld.gov.au/files/assets/public/regional-services/disaster-management/reports/bushfire-management-strategy.pdf

74 Department of Environment and Heritage Protection 2017, Pathways to a climate resilient Queensland – Queensland Climate Adaptation Strategy 2017-2030, Queensland Government, Brisbane, viewed 20 March 2019, https://www.qld.gov.au/__data/assets/pdf_file/0017/67301/qld-climate-adaptation-strategy.pdf

75 Australian Government Department of the Environment, the Commonwealth Scientific and Industrial Research Organisation and the Australian Bureau of Meteorology 2015, Technical Report: Projections for Australia's NRM Regions, Climate Change in Australia, p.49, viewed 22 March 2019, https://www.climatechangeinaustralia.gov.au/media/ccia/2.1.6/cms_page_media/168/CCIA_2015_NRM_TechnicalReport_WEB.pdf

76 Queensland Government 2018, Emergency Management Sector Adaptation Plan for climate change, viewed 20 May 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Adaptation-Plan/EM-SAP-FULL.pdf

77 Office of Inspector-General Management 2018, Queensland Disaster Management Lexicon, Queensland Government, Brisbane, p.11, https://www.igem.qld.gov.au/assurance-framework/Documents/2018%2010%2019%20Qld%20Disaster%20Management%20Lexicon%202018.pdf

78 Nogrady B 2015, Bushfire basics: what you need to know, CSIROscope, viewed 21 January 2019, https://blog.csiro.au/bushfire-basics/

79 Nogrady B 2015, Bushfire basics: what you need to know, CSIROscope, viewed 21 January 2019, https://blog.csiro.au/bushfire-basics/

80 Australasian Fire and Emergency Service Authorities Council 2016, National Position on Prescribed Burning, Australian Institute for Disaster Resilience, https://knowledge.aidr.org.au/media/4869/national-position-on-prescribed-burning.pdf

81 *Fire and Emergency Services Act 1990 (Qld)*, s8B.

82 Queensland Audit Office 2014, Bushfire prevention and preparedness, Report 10:2014-15, Queensland Government, Brisbane, p.5, https://www.qao.qld.gov.au/reports-parliament/bushfire-prevention-and-preparedness

83 Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, viewed 26 March 2019, https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

84 *Nature Conservation Act 1992 (Qld),* s.5.

85 *Nature Conservation Act 1992 (Qld),* s.16-17.

86 Queensland Fire and Emergency Services 2016, Obtaining a Permit to Light Fire, viewed 4 April, 2019, https://www.ruralfire.qld.gov.au/Using_Fire_Outdoors/Pages/Obtaining-a-Permit-to-Light-Fire.aspx

87 Queensland Fire and Emergency Services 2016, Obtaining a Permit to Light Fire, viewed 4 April, 2019, https://www.ruralfire.qld.gov.au/Using_Fire_Outdoors/Pages/Obtaining-a-Permit-to-Light-Fire.aspx

88 Queensland Government 2018, Vegetation clearing requirements, viewed 29 March 2019, https://www.qld.gov.au/environment/land/management/vegetation/clearing

89 Queensland Government 2018, Monitoring and compliance of clearing activities, viewed 29 March 2019, https://www.qld.gov.au/environment/land/management/vegetation/monitoring

90 Department of Natural Resources, Mines and Energy 2018, List of exempt clearing work, Queensland Government, Brisbane, p. 6, viewed 29 March 2019, https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0009/847800/vegetation-clearing-exemptions.pdf

91 Department of Natural Resources, Mines and Energy 2019, Vegetation management laws, viewed 29 March 2019, https://www.dnrme.qld.gov.au/land-water/initiatives/vegetation-management-laws

92 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p.24, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

93 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p.38, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

94 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p.111, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

95 Queensland Fire and Emergency Services 2017, Queensland State Natural Hazard Risk Assessment, Queensland Government, Brisbane, p.76, viewed 21 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Emergency-Risk-Mgmt/QLD-State-Natural-Risk-Assessment-2017.pdf

96 Nogrady B 2015, Bushfire basics: what you need to know, CSIROscope, viewed 8 February 2019, https://blog.csiro.au/bushfire-basics/

97 Department of Environment and Science Annual report 2017-2018. The State of Queensland, September 2018 , https://www.des.qld.gov.au/our-department/documents/annual-reports/2017-2018/annual-report-2017-18.pdf viewed 30 April 2019.

98 Department of National Parks, Recreation, Sport and Racing 2013 Fire Management – Managing parks and forests, Queensland Government, Brisbane, https://parks.des.qld.gov.au/managing/pdf/fire-mgmt-brochure.pdf

99 What is biodiversity 2017, Queensland Government, viewed 19 March 2019, https://www.qld.gov.au/environment/plants-animals/biodiversity/about

100 Queensland Government, Towards a new biodiversity strategy for Queensland, Queensland Government, Brisbane, viewed 19 March 2019, https://www.qld.gov.au/__data/assets/pdf_file/0017/88100/proposed-biodiversity-strategy-framework-queensland.pdf

101 Moran, C and Boulter, S 2018, Biodiversity and Ecosystems Climate Adaptation Plan, The National Climate Change Adaptation Research Facility, Brisbane, viewed 29 March 2019, https://www.nccarf.edu.au/

102 Bowman D, Professor of Pyrogeography and Fire Science, University of Tasmania, as cited in Doman M 2018, From space, the ferocity of Queensland's bushfires is revealed, ABC News, https://www.abc.net.au/news/2018-12-08/from-space,-the-ferocity-of-queenslands-bushfires-is-revealed/10594662

103 Queensland Fire and Emergency Services 2018, Queensland Emergency Risk Management Framework Risk Assessment Process Handbook, Queensland Government, Brisbane, p29, viewed 14 January 2019, https://www.disaster.qld.gov.au/dmg/st/Documents/H1102-QFES-Risk-Assessment-Process-Handbook.pdf

104 Queensland Fire and Emergency Services 2018, Queensland Emergency Risk Management Framework Risk Assessment Process Handbook, Queensland Government, Brisbane, p29, viewed 14 January 2019, https://www.disaster.qld.gov.au/dmg/st/Documents/H1102-QFES-Risk-Assessment-Process-Handbook.pdf

105 United Nations Office for Disaster Risk Reduction - cited in Queensland Fire and Emergency Services 2018, Queensland Emergency Risk Management Framework Risk Assessment Process Handbook, Queensland Government, Brisbane, p29, viewed 14 January 2019, https://www.disaster.qld.gov.au/dmg/st/Documents/H1102-QFES-Risk-Assessment-Process-Handbook.pdf

106 Queensland Fire and Emergency Services 2018, Queensland Emergency Risk Management Framework Risk Assessment Process Handbook, Queensland Government, Brisbane, p29, viewed 21 March 2019, https://www.disaster.qld.gov.au/dmg/st/Documents/H1102-QFES-Risk-Assessment-Process-Handbook.pdf

107 Department of National Parks, Recreation, Sport and Racing 2014 Annual Report 2013-2014, Queensland Government, Brisbane, p2, viewed 29 April 2019, https://www.des.qld.gov.au/our-department/documents/annual-reports/nprsr-annual-report-2013-14.pd

108 The Malone Review into Rural Fire Services in Queensland 2013

109 Keelty, M 2013, Sustaining the Unsustainable: Police and Community Safety Review – final report, Queensland Government, Brisbane, https://statements.qld.gov.au/Content/MediaAttachments/2013/pdf/Police%20and%20Community%20Safety%20Review%20Report.pdf

110 Queensland Audit Office 2014, Bushfire prevention and preparedness, Report 10:2014-15, Queensland Government, Brisbane, p.20, https://www.qao.qld.gov.au/reports-parliament/bushfire-prevention-and-preparedness

111 Department of National Parks, Sport and Racing 2015, QPWS fire management - frequently asked questions, Queensland Government, Brisbane, viewed 26 March 2019, https://parks.des.qld.gov.au/managing/pdf/fire-mgmt-faqs.pdf

112 Department of National Parks, Sport and Racing 2013, Fire management – Managing parks and forests, p3, Queensland Government, Brisbane, viewed 23 April 2019, https://parks.des.qld.gov.au/managing/pdf/fire-mgmt-brochure.pdf

113 Gill, M 2012, Australian National University's Fenner School of Environment and Society, https://blog.csiro.au/fire-ecology-and-management-is-not-rocket-science-it-is-much-harder-than-that/

114 Department of Natural Resources, Mines and Energy 2019, Submission to the Commonwealth Standing Committee on Agriculture and Water Resources inquiry into the impact on the agricultural sector of vegetation and land management policies, regulations and restrictions, p.5, viewed 4 March 2019, https://www.aph.gov.au/Parliamentary_Business/Committees/House/Standing_Committee_on_Agriculture_and_Water_Resources/Landpolicyimpacts/Submissions

115 Department of Natural Resources, Mines and Energy 2019, Submission to the Commonwealth Standing Committee on Agriculture and Water Resources inquiry into the impact on the agricultural sector of vegetation and land management policies, regulations and restrictions, p.5, viewed 4 March 2019, https://www.aph.gov.au/Parliamentary_Business/Committees/House/Standing_Committee_on_Agriculture_and_Water_Resources/Landpolicyimpacts/Submissions

116 Queensland Government 2017, What is biodiversity, viewed 7 May 2019. https://www.qld.gov.au/environment/plants-animals/biodiversity/about.

117 Queensland Government 2018, Request a property report and vegetation maps, viewed 28 March 2019, https://www.qld.gov.au/environment/land/management/vegetation/maps/map-request

118 Queensland Government 2018, Vegetation clearing requirements, viewed 28 March 2019, https://www.qld.gov.au/environment/land/management/vegetation/clearing

119 Queensland Fire and Emergency Services 2016 Lighting Fires in Queensland, viewed 29 March 2019, https://www.ruralfire.qld.gov.au/Using_Fire_Outdoors/Pages/Lighting-Fires-in-Queensland.aspx

120 Queensland Fire and Emergency Services 2016 Lighting Fires in Queensland, viewed 29 March 2019, https://www.ruralfire.qld.gov.au/Using_Fire_Outdoors/Pages/Lighting-Fires-in-Queensland.aspx

121 Queensland Government Chief Information Office 2017, Digital 1st 2017-2021, viewed 22 March 2019,

https://digital1st.initiatives.qld.gov.au/documents/digital-strategy.pdf

122 Department of Natural Resources, Mines and Energy 2019, Submission to the Commonwealth Standing Committee on Agriculture and Water Resources inquiry into the impact on the agricultural sector of vegetation and land management policies, regulations and restrictions, p.5, viewed 4 March 2019, https://www.aph.gov.au/Parliamentary_Business/Committees/House/Standing_Committee_on_Agriculture_and_Water_Resources/Landpolicyimpacts/Submissions

123 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, pp12, 47, 75, 77, viewed 21 January 2019, https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

124 Office of the Inspector-General Emergency Management 2015, Review of Seqwater and SunWater Warnings Communications, Queensland Government, Brisbane, https://www.igem.qld.gov.au/reports-and-publications/Documents/DamWarningsCommunications.pdf

125 O'Flynn, J 2007, From new public management to public value: paradigmatic change and managerial implications, The Australian Journal of Public Administration, vol.66, no.3, pp.353-366.

126 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, p37, viewed 21 January 2019, https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

127 Australian Institute for Disaster Resilience 2018, Australian Disaster Resilience Handbook 16 Public Information and Warnings, Australian Government, p13, viewed 1 April 2019, https://knowledge.aidr.org.au/resources/public-information-and-warnings-handbook/

128 Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p.23, viewed 1 April 2019, https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

129 Australian Institute for Disaster Resilience 2018, Australian Disaster Resilience Handbook 16 Public Information and Warnings, Australian Government, p3, viewed 1 April 2019, https://knowledge.aidr.org.au/resources/public-information-and-warnings-handbook/

130 Australian Institute for Disaster Resilience 2018, Australian Disaster Resilience Handbook 16 Public Information and Warnings, Australian Government, p7, viewed 1 April 2019, https://knowledge.aidr.org.au/resources/public-information-and-warnings-handbook/

131 Attorney-General's Department 2013, Australia's Emergency Warning Arrangements, Commonwealth Government, Canberra, p.3, viewed 21 January 2019, https://www.ag.gov.au/Publications/Documents/AustraliasEmergencyWarningArrangements/Australias-Emergency-Warning-Arrangements.pdf

132 Lindell, M, and Hwang, SN 2008, Households' Perceived Personal Risk and Responses in a Multihazard Environment, Risk Analysis, vol.28, no.2, pp.539-556.

133 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p25, https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

134 Australasian Fire and Emergency Services Council 2009, A national systems approach to community warnings.

135 Australian Emergency Management Committee 2009, National Framework For Scaled Advice and Warnings to the Community, Australian Institute of Disaster Resilience, https://knowledge.aidr.org.au/media/5937/national-framework-scaled-advice-warnings.pdf

136 Australian Emergency Management Committee - National Bushfire Warnings Taskforce 2009, Australia's revised arrangements for bushfire advice and alerts – 2009/2010 Fire Season.

137 Australasian Fire and Emergency Services Council, 2012. Bushfires and Community Safety Position, version 5.0.

138 Australasian Fire and Emergency Services Council, 2016. Community Safety Messaging for Catastrophic Bushfires: Lessons Learnt from Black Saturday Bushfires, Victoria 2009.

139 Australian Institute for Disaster Resilience 2018, Australian Disaster Resilience Handbook 16 Public Information and Warnings, Australian Government, viewed 21 January 2019, https://knowledge.aidr.org.au/resources/public-information-and-warnings-handbook/

140 Office of the Inspector-General Emergency Management 2015, Review of Seqwater and SunWater Warnings Communications, Queensland Government, Brisbane, p.8, https://www.igem.qld.gov.au/reports-and-publications/Documents/DamWarningsCommunications.pdf

141 Office of the Inspector-General Emergency Management 2015, Review of Seqwater and SunWater Warnings Communications, Queensland Government, Brisbane, p.9, https://www.igem.qld.gov.au/reports-and-publications/Documents/DamWarningsCommunications.pdf

142 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, p.23. https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

143 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, p.23, https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

144 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, p.23. https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

145 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, pp.25-28, https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

146 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, p.23. https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

147 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p.23. https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

148 Office of the Inspector-General Emergency Management 2017, Review of Seqwater and SunWater Warnings Communications Report 1: 2015-16, Queensland Government Brisbane, pp 13 and 14 viewed 9 May 2019 https://www.igem.qld.gov.au/reports-and-publications/Documents/DamWarningsCommunications.pdf

149 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

150 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p.16. https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

151 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p.23. https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

152 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p.23. https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

153 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p.25, https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

154 Office of the Inspector-General Emergency Management 2014, Emergency Management Assurance Framework, Queensland Government, Brisbane, p.25. https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

155 Get Ready Queensland Facebook post 14 March 2019 – included link to 'What are your disaster risks?' with information on both bushfire and heatwave https://getready.qld.gov.au/natural-disasters/

156 National Bushfire Warnings Taskforce 2009, Australia's Revised Arrangements for Bushfire Advice and Alerts, p.6.

157 Rural Fire Service, Fire Danger Rating, Queensland Government, https://www.ruralfire.qld.gov.au/Pages/FDR.aspx

158 Queensland Reconstruction Authority, 2019, Central Queensland Bushfires Recovery Plan 2018 – 2021, Queensland Government, viewed 4 April 2019, https://www.qra.qld.gov.au/sites/default/files/2019-04/Central%20Queensland%20Bushfires%20Recovery%20Plan%202018%20%E2%80%93%202021.pdf

159 National Framework for Scaled Advice and Warnings to the Community. September 2009, Agreed at the Australian Emergency Management Committee, viewed March 2019 https://knowledge.aidr.org.au/media/5937/national-framework-scaled-advice-warnings.pdf

160 Emergency Alert: Be Warned. Be Informed. Viewed 25 March 2018, http://www.emergencyalert.gov.au/

161 Market and Communications Research 2019, 2018 Queensland Bushfires Review: Quantitative Research with Community Members.

162 Queensland Fire and Emergency Services 2018, Welcome to the QFES Newsroom – where fire, emergency and disaster news will be published 24/7, Queensland Government, https://newsroom.psba.qld.gov.au/Content/Home/02-Home/Article/Welcome-to-the-QFES-Newsroom-where-fire-emergency-and-disaster-news-will-be-published-24-7-/-2/-2/3825

163 Australasian Fire and Emergency Services Authorities Council 2013, The Australian Inter-Service Incident Management System, p.153.

164 Australasian Fire and Emergency Services Authorities Council 2013, The Australian Inter-Service Incident Management System, p.154.

165 Australasian Fire and Emergency Services Authorities Council 2013, The Australian Inter-Service Incident Management System, p.154.

166 *Disaster Management Act 2003 (Qld),* s.13.

167 *Disaster Management Act 2003 (Qld),* s.13.

168 Queensland State Disaster Management Plan (2018), Appendix C, Disaster Management Roles and Responsibilities, pp.76, 90 and 92.

169 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p.38, viewed 11 January 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

170 Queensland Fire and Emergency Services 2018, Queensland Disaster Management Arrangements Participant Guide, Queensland Government, Brisbane, p.54, viewed 27 March 2019, https://www.disaster.qld.gov.au/dmp/Documents/Queensland-Disaster-Management-Arrangements-Participant-Guide.pdf#search=QDMA%20participant%20guide

171 Queensland Fire and Emergency Services 2018, Queensland Disaster Management Arrangements Participant Guide, Queensland Government, Brisbane, p.54, viewed 27 March 2019, https://www.disaster.qld.gov.au/dmp/Documents/Queensland-Disaster-Management-Arrangements-Participant-Guide.pdf#search=QDMA%20participant%20guide

172 Queensland Government 2018, More than 1000 vegetation fires reported already this Queensland fire season, viewed 29 February 2019, http://statements.qld.gov.au/Statement/2018/8/19/more-than-1000-vegetation-fires-reported-already-this-queensland-fire-season

173 Queensland Fire and Emergency Services 2018, Queensland Disaster Management Arrangements Participant Guide, Queensland Government, Brisbane, p.22, viewed 27 March 2019, https://www.disaster.qld.gov.au/dmp/Documents/Queensland-Disaster-Management-Arrangements-Participant-Guide.pdf#search=QDMA%20participant%20guide

174 Queensland Fire and Emergency Services 2018, Queensland Disaster Management Arrangements Participant Guide, Queensland Government, Brisbane, p.22, viewed 27 March 2019, https://www.disaster.qld.gov.au/dmp/Documents/Queensland-Disaster-Management-Arrangements-Participant-Guide.pdf#search=QDMA%20participant%20guide

175 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p.46, viewed 27 March 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

176 Queensland Disaster Management Committee 2018,, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p.46, viewed 27 March 2019, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

177 State Update 5, 0700hrs 30 November 2018.

178 McNarn M 2018, C4I Foundations Review: Command, Control, Coordination, Communications and Intelligence (C4I), viewed 8 April 2019.

179 Queensland Fire and Emergency Services 2018, Kabra (formerly Stanwell/Kabra)- bushfire as at 11.15am Tue 4 Dec, https://newsroom.psba.qld.gov.au/Content/Local-News/ENL/Article/Kabra-formerly-Stanwell-Kabra-bushfire-as-at-11-15am-Tue-4-Dec/1017/1071/14448

180 Queensland Fire and Emergency Services 2018, Emergency alert for Stanwell as at 3.00pm Wed 28 November, Queensland Government, https://newsroom.psba.qld.gov.au/Content/Default/Releases/Article/Emergency-Alert-for-Stanwell-as-at-3-00pm-Wed-28-Nov-/-3/27/14449

181 Market and Communications Research 2019, 2018 Queensland Bushfires Review: Quantitative Research with Community Members, p.106.

182 Queensland Disaster Management Committee 2018, Queensland State Disaster Management Plan, Queensland Government, Brisbane, p46, viewed 27 March 2019, pp.19-20, https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf

183 Arrangement for Interstate Assistance, Fire and Emergency Services, Part 1- Principles, paragraph 9.

184 Fleet, National Aerial Firefighting Centre, viewed 14 March 2019, http://www.nafc.org.au/?page_id=168

185 C. Crawford, Minister for Fire and Emergency Services, Queensland Parliament, debate of motion to launch a parliamentary enquiry into Bushfire Prevention and Preparedness in Queensland,13 February, transcript p.182.

186 COMDISPLAN 2017, s.1.4.6

187 Alexander D, Hughes L 2016, Be Prepared: Climate Change and the Queensland Bushfire Threat, Climate Council of Australia, p.9, https://www.climatecouncil.org.au/resources/queensland-bushfire-report/

188 Attorney-General's Department, Agreement on Counter-terrorism Laws 2004, Australian Government, Canberra, viewed 28 March 2019, https://www.ag.gov.au/NationalSecurity/Counterterrorismlaw/Pages/Australiascounterterrorismlaws.aspx

189 Australia-New Zealand Emergency Management Committee 2018, Australian Government, viewed 15 March 2019, https://www.directory.gov.au/portfolios/home-affairs/australia-new-zealand-emergency-management-committee

190 Office of the Inspector-General Emergency Management 2014,Emergency Management Assurance Framework, Queensland Government, Brisbane, p.30, https://www.igem.qld.gov.au/assurance-framework/Documents/IGEM-EMAF.pdf

191 Burrows, N 2019, Lessons and Insights from recent significant wildfires in Australia and Overseas, Bushfire and Natural Hazards Cooperative Research Centre, p.42.

192 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, pp.31-32, https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

193 Office of the Inspector-General Emergency Management 2017, The Cyclone Debbie Review, Queensland Government Brisbane, p.32, https://www.igem.qld.gov.au/reports-and-publications/reports/Pages/Review-Reports.aspx

THE 2018 QUEENSLAND BUSHFIRES REVIEW

REPORT 2: 2018-2019

A climate for good neighbours

Queensland Government