

Fire Management Plan

Lot 500 Breakwater Drive, Two Rocks

Prepared for
Acumen Development Solutions
by Strategen

August 2015



Fire Management Plan

Lot 500 Breakwater Drive, Two Rocks

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August 2015

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Client: Acumen Development Solutions

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Draft Report	Rev A	Client review	D Panickar / R Banks	Electronic	30 May 2014
Final Draft Report	Rev 0	Submission to WAPC and CoW	D Panickar / R Banks	Electronic	1 Jul 2014
Final Report	Rev 1	Submission to WAPC and CoW	D Panickar	Electronic	7 Oct 2014
Final Report	Rev 2	Issued for use	D Panickar / R Banks	Electronic	12 Feb 2015
Final Report	Rev 3	Issued for use	D Panickar	Electronic	20 Aug 2015

Filename: TBB14123_01 R001 Rev 3 - 20 August 2015

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1. Introduction

1.1 Background

Acumen Development Solutions (Acumen) is proposing to develop Lot 500 Breakwater Drive, Two Rocks (the project area) into residential lots and public open space as part of a subdivision application. Lot 500 is situated adjacent to bushland to the north and the east as well as having sparse in situ vegetation, which will pose an inherent bush fire risk to proposed life and property assets of the subdivision (Figure 1). It is understood the bushland to the north of the subdivision is proposed to be retained as part of a vegetated corridor which will be considered as part of the bushfire planning process.

Acumen has commissioned Strategen to prepare a Fire Management Plan (FMP) for the project area to guide bush fire protection of the proposed residential development and ensure a suitable and effective bush fire management outcome is achieved for the site. The FMP has been prepared in accordance with *Planning for Bush Fire Protection Guidelines Edition 2* (PFBFP Guidelines; WAPC et al. 2010), with consideration of the Draft State Planning Policy 3.7 Planning for Bushfire Risk Management (DoP & WAPC 2014a) and accompanying Draft Planning for Bushfire Risk Management Guidelines (DoP & WAPC 2014b) for submission to City of Wanneroo (CoW) and Department of Fire and Emergency Services (DFES) for approval. A completed FMP compliance checklist is contained in Appendix 1.

1.2 Purpose and application of the plan

The purpose of the FMP is to provide guidance on how to plan for and manage the potential bush fire risk associated with the project area through implementation of a range of bush fire risk mitigation measures. The FMP outlines how future on-site assets can be protected during the summer months when the threat from bush fire is at its peak. This is particularly relevant when existing fire appliances in the area may be unable to offer a fast emergency suppression response. Therefore, the developer should aim to ensure site assets are self-protecting from bush fire.

Implementation of the FMP applies to the developer (Acumen), CoW, DFES and prospective landowners to ensure bush fire risk treatment and mitigation measures are adopted and implemented on an ongoing basis to achieve bush fire management objectives.

1.3 Stakeholder consultation

Strategen has undertaken consultation with the developer (Acumen), CoW and DFES to ensure aims and objectives of the FMP are in accordance with stakeholder expectations and the FMP maintains compliance with PFBFP Guidelines.

1.4 Document review

This FMP will be updated regularly as necessary following the date of approval to ensure:

1. Implementation is assessed and corrective actions are applied in cases of non-compliance.
2. The effectiveness and impact of fire prevention work is evaluated and any significant changes in development design or the surrounding environment are reassessed in a revised FMP.

The developer will be responsible for updating and revising the FMP until the development has been fully implemented, after which time CoW will be the authority responsible for updating and revising the FMP.

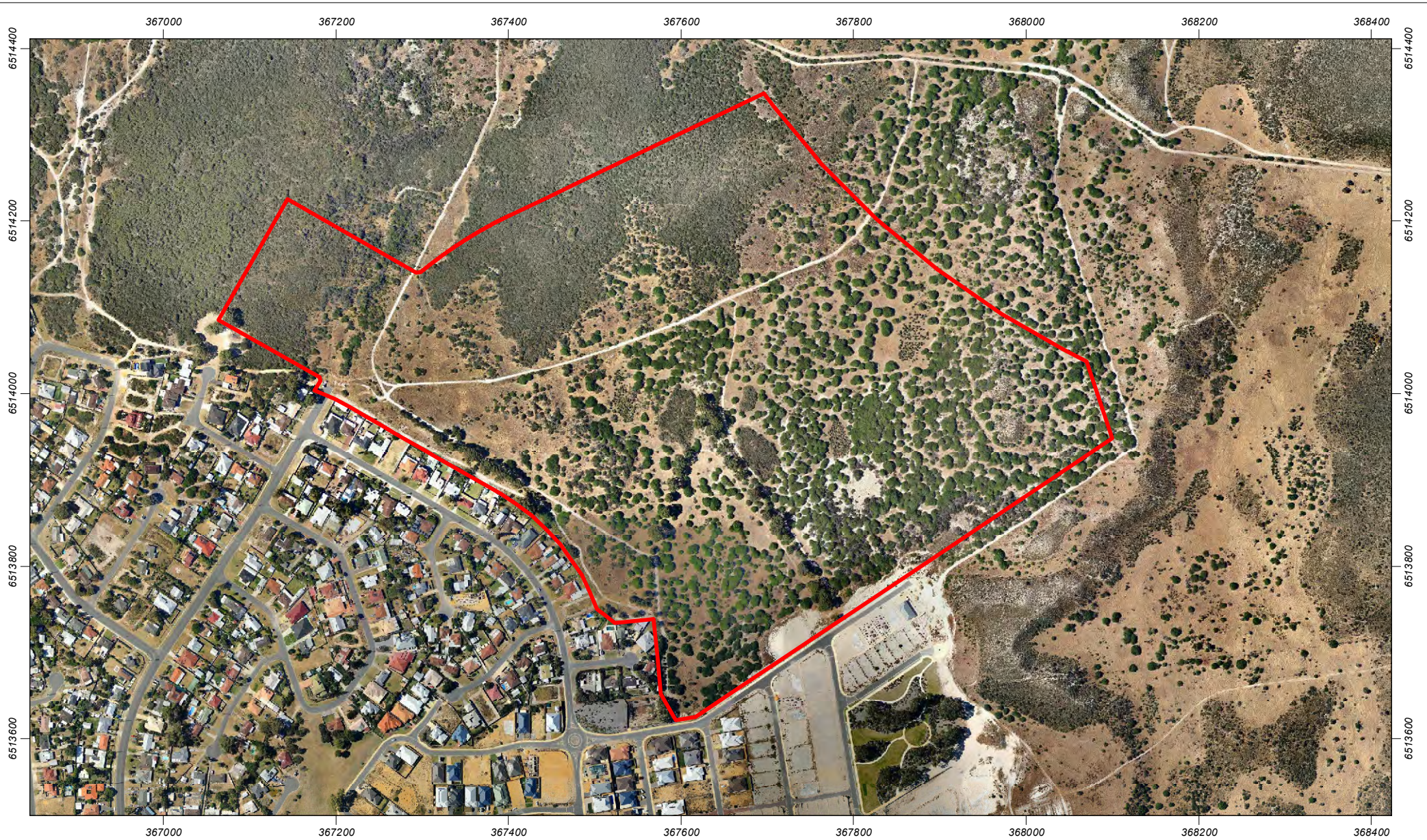



Figure 1 Site overview

Scale 1:6,000 at A4
 0 50 100 150 m

Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 11/02/2015
 Author: JCrute
 Source: Client 2014.

Legend
 Project boundary



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2. Aim and objectives

2.1 Aim

The FMP aims to achieve a reduction in the consequences on the proposed development resulting from uncontrolled bush fires and minimise potential impacts on life and property. This will be achieved by preparing an FMP that:

- quantifies the bush fire hazard and assesses the bush fire risk of the project area
- documents bush fire prevention requirements of the project area to provide ongoing protection to future residents, visitors and built assets of the subject land
- identifies bush fire protection issues, appropriate strategies and those persons and/or organisations who have a responsibility to implement the FMP
- is in accordance with PFBFP Guidelines and is compatible with bush fire management on neighbouring land including proposed subdivisions
- provides guidance for the developer, CoW and prospective landowners to protect the subject land and on-site assets in the event that fire appliances may not be available to offer a fast bush fire suppression response.

2.2 Objectives

Key objectives of the FMP and the relevant section/s of this document in which they are addressed are outlined in Table 1.

Table 1 Key objectives of the FMP

Objective	Section
Define areas where values are located	Section 3.6
Define and rank fire hazard areas	Section 4.2.1
Nominate individuals and organisations responsible for fire management and associated works within the project area	Section 5.7
Propose bush fire risk treatment and mitigation measures for the project area, with due regard for life, property and the environment	Section 5
Define an assessment procedure that will evaluate the effectiveness and impact of proposed fire prevention work and strategies	Section 6.3
Provide performance criteria and acceptable solutions for all fire management works (e.g. development location, vehicular access, water supply, siting of development and design of development)	Section 4.2.2

3. Description of the area

3.1 General overview

The project area comprises of Lot 500 Breakwater Drive in the City of Wanneroo, approximately 56 km north-northwest of the Perth Central Business District and 34 km northwest of the Wanneroo City Centre (Figure 2). The project area occupies approximately 36.48 ha and is bound by residential development to the west and south and bush to the north and east.

Vegetation within the project area has been historically modified from its native structure and is predominantly comprised of a mixture of *Melaleuca* heath, exotic Japanese Pepper woodland and exotic grasslands with scattered shrubs (Plate 1). Adjacent vegetation is contiguous with the vegetation types within the project area and will pose an inherent risk to future life and property assets of the development.



Plate 1: Site overview

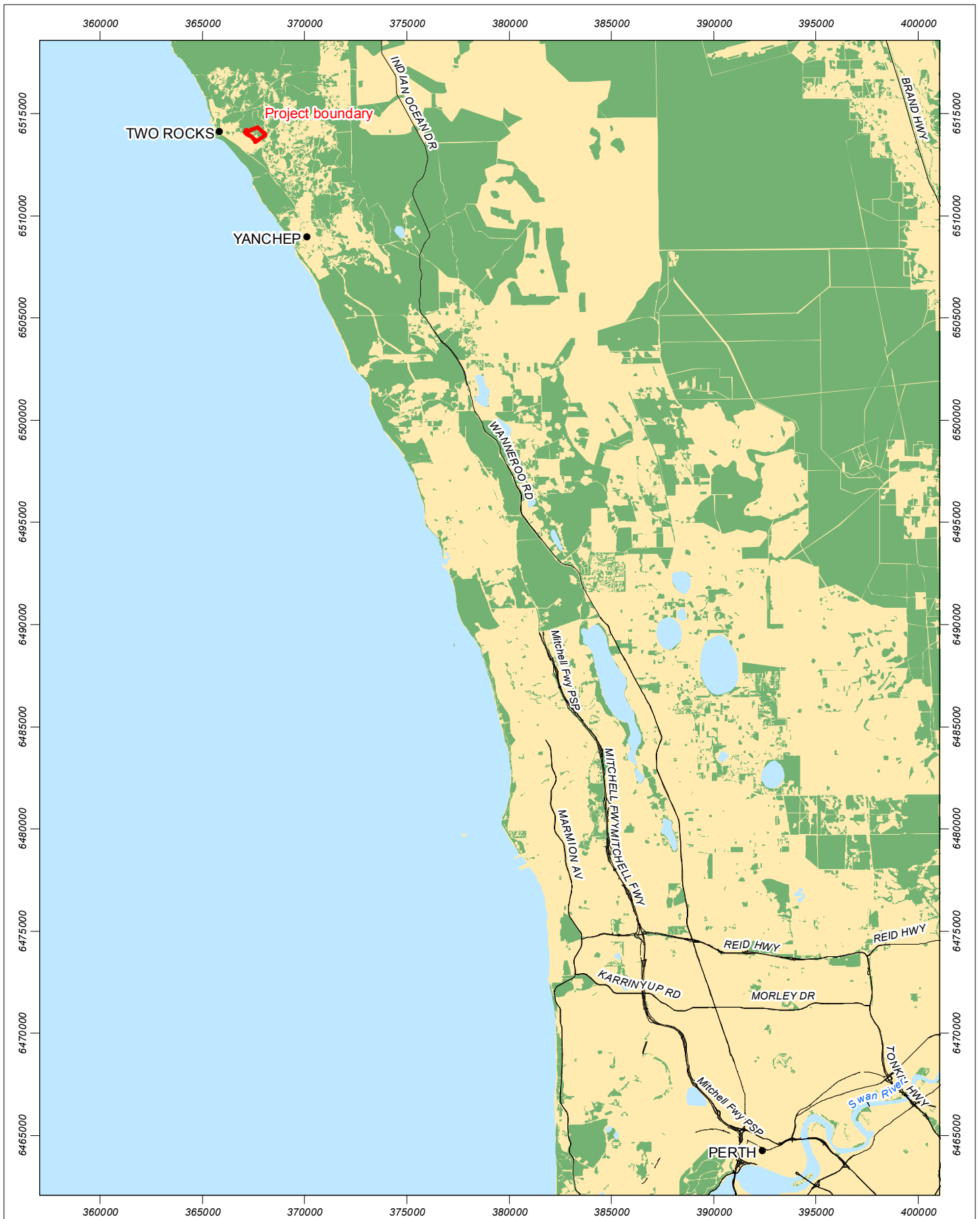


Figure 2 Regional location

Scale 1:250,000 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 11/02/2015
 Author: JCrute
 Source: Topography: Geoscience Australia 2011.



Legend

- Town
- Major road
- Major river
- Lakes
- Native vegetation
- Project boundary

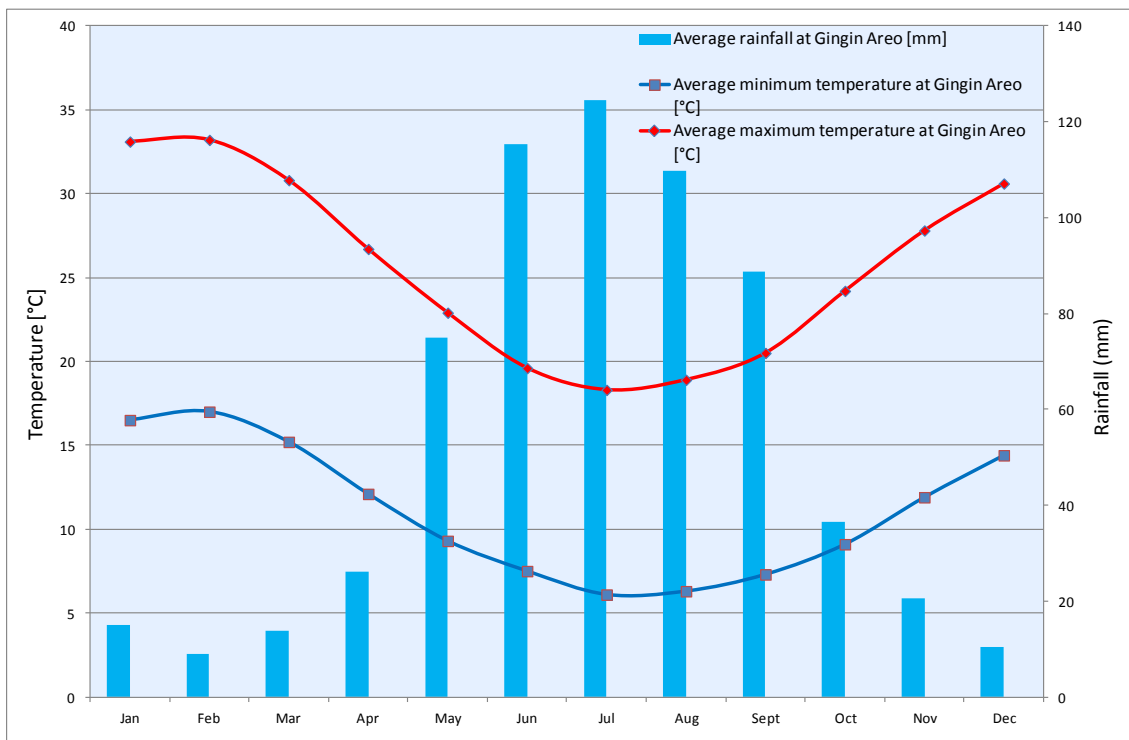


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3.2 Local climate

The Two Rocks locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot dry summers. The Bureau of Meteorology (BoM) weather station at Gingin Area (Station No. 9178), located approximately 26 km northeast of the project area, provides average monthly climate statistics for the locality, as illustrated in Figure 3.

Average annual rainfall recorded at Gingin Area (since 1996) is 649.9 mm (BoM 2014). Rainfall may occur at any time of the year, however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur from December to March, with average monthly maximums ranging from 30.6°C in December to 33.2°C in February (BoM 2014). Lowest temperatures occur from June to September, with average monthly minimums ranging from 6.1°C in July to 7.5°C in June (BoM 2014).



Source: BoM 2014

Figure 3: Average monthly climate statistics for Gingin Area (Station No. 9178)

3.2.1 Fire weather

Southwest Western Australia generally experiences a cool to mild growing season in the months of August through to November of each year, followed by four months of summer drought conditions, which is when the potential for bush fire occurrence is at its peak. The worst fire weather conditions occur during this dry period when a low pressure trough forms off the west coast and strong winds develop from the north or northeast. These conditions are sometimes associated with 'Extreme' or 'Catastrophic' fire dangers, which are consistent with very high temperatures, low relative humidity and strong winds.

Based on the predominant summer climatic conditions of the local area, these high fire risk fire weather conditions are considered to occur less than 5% of the time during the designated bush fire season, which equates to around 9 days between December and March (McCaw & Hanstrum 2003).

Average 9:00 am and 3:00 pm January wind profiles for Gingin Aero are contained in Appendix 2, which illustrate that the predominant winds during this high risk period are from the east and southeast in the morning averaging around 20.9 km/h; and from the southwest in the afternoon averaging around 25.5 km/h (BoM 2014). Mean 9:00 am and 3:00 pm relative humidity in July for Gingin Aero is 80% and 58% respectively and the average maximum summer temperature in February for the area is 33.2°C.

These predominant fire weather conditions correlate with an average fire danger index of 'High', as determined using the Commonwealth Science and Industrial Research Organisation (CSIRO) Fire Danger and Fire Spread Calculator (CSIRO 1999).

3.3 Landform and topography

The project area is located on the Swan Coastal Plain, which is characterised by a low-lying coastal plain, mainly covered with woodlands. *Banksia* and Jarrah-*Banksia* woodlands are the usual vegetation contained within the dune systems (McKenzie *et al.* 2003).

The project area and adjacent land is comprised of undulating dune systems, with site elevation ranging from 21 mAHD (Australian Height Datum) in the southwest to 41 mAHD in the east (Figure 4). On development of the project area, the majority of on-site vegetation will be removed and landforms will be levelled. Therefore, the development footprint will consist of flat land and there will be no classified vegetation under slope within the project area. As a result, no built assets will be located directly up-slope from classified vegetation.

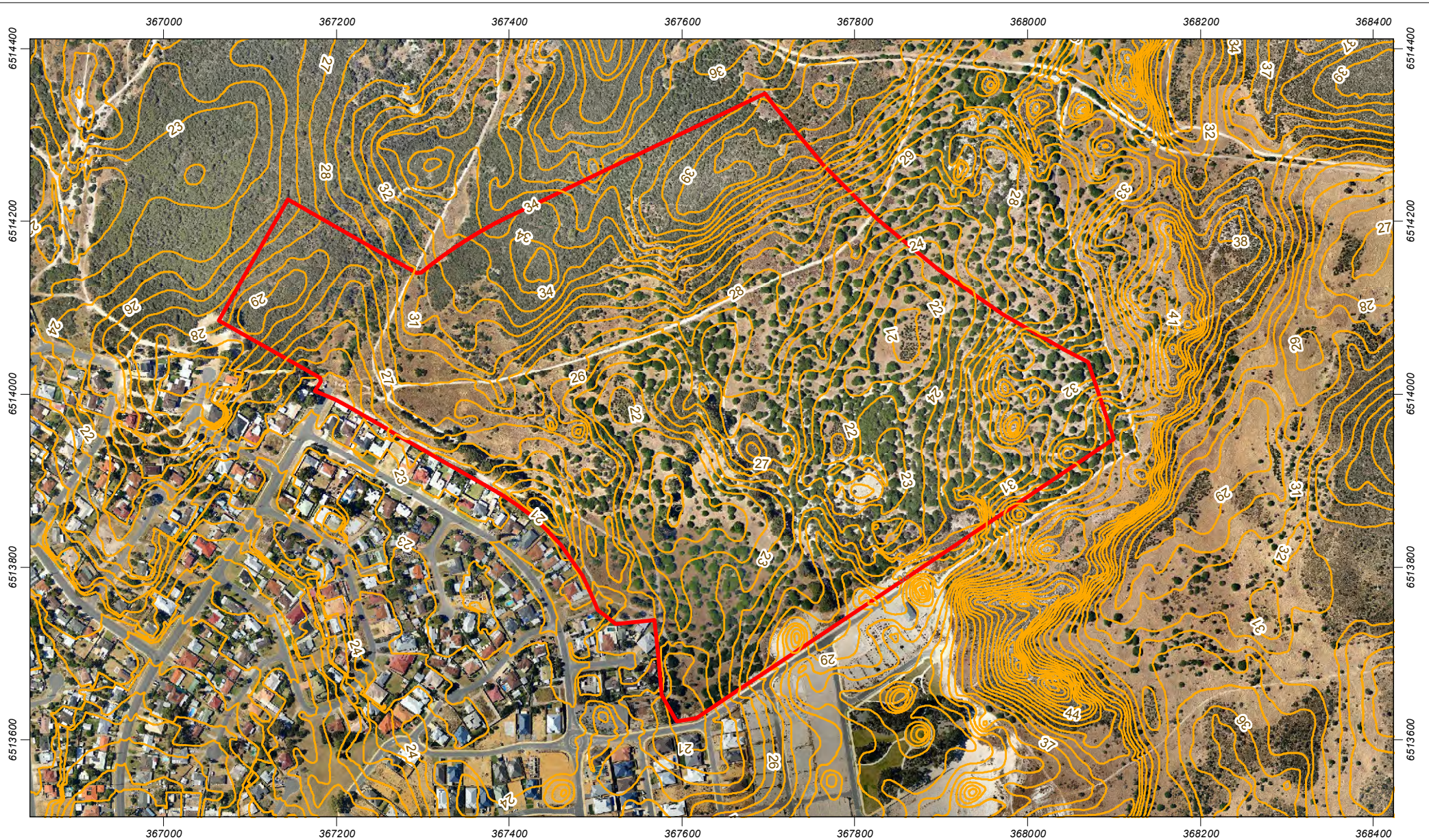




Figure 4 Site topography

Scale 1:6,000 at A4
 0 50 100 150 m

Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 11/02/2015
 Author: JCrute
 Source: Client 2014.

Legend

-  Surface elevation (mAHD)
-  Project boundary



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3.4 Vegetation

3.4.1 Vegetation complexes

Remnant native vegetation on the site is representative of the Quindalup vegetation complex (Hedde *et al.* 1980) as illustrated in Figure 5. This complex can be described as:

- a coastal dune complex consisting mainly of two alliances - the strand and fore dune alliance and the mobile and stable dune alliance. Local variations include low closed forest of *Melaleuca lanceolata* - *Callitris preissii* and closed scrub of *Acacia rostellifera*.

The project area also contains modified variants of this vegetation complex as described in Section 3.4.2.

3.4.2 On-site and surrounding vegetation extent

Native vegetation within the project area is concentrated within the northern portion and adjacent land and comprises *Melaleuca* heath over limestone.

Modified or exotic vegetation is present throughout the remainder of the project area and surrounds and is comprised of exotic Japanese Pepper (*Schinus terebinthifolius*) woodland and exotic grasslands with scattered shrubs.



Figure 5 Vegetation complexes

Scale 1:6,000 at A4
 0 50 100 150 m

Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 11/02/2015
 Author: JCrute
 Source: Vegetation: System 6, DEC 2012. All other data: Client 2014.

Legend

Project boundary

Vegetation complex

Quindalup complex



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3.5 Land use

3.5.1 Current land use

The project area is subject to the provisions of the City of Wanneroo Town Planning Scheme No 2 (TPS No. 2, (DoP 2014), which establishes detailed statutory planning controls for the local government area, consistent with the broader controls under the Metropolitan Region Scheme (MRS). The project area falls within the 'EC2' zone as per map 4 of TPS No. 2. The EC2 zone has environmental conditions imposed upon the land within the zone by the minister under section 48F of the *Environmental Protection Act 1986*. These conditions are detailed in TPS No. 2 and entail:

- Environmental Management Plans
- vegetation and fauna management
- stygofauna and troglobiotic fauna management
- assessment of karst landform
- solid and liquid waste management
- environmental reporting.

3.5.2 Proposed land use

The land is proposed to be developed for residential purposes in accordance with Figure 1. This will result in development of 499 residential lots and two POS lots, along with the provision of road, water, sewerage, power, gas and communication infrastructure.

Long term management of POS areas will be the responsibility of local government.

3.5.3 Surrounding land use

Land zoning surrounding the project area is detailed in Table 2.

Table 2 Adjacent land zoning

Direction	Zoning (as per TPS No. 2)
North	EC2
West	Residential
South	EC2 and residential
East	EC2 and Railway Reserve

3.6 Site assets

The project area currently contains no site assets. Proposed development of the project area will significantly increase the critical life and property assets of the site, with a total of 499 lots proposed. This will significantly intensify the number residents, visitors and built assets across the subject land. There are no identified significant environmental values contained on-site.

3.7 Water and power supply

Water and power supply services will be extended throughout the project area from surrounding areas of residential development, which will result in provision of a reticulated water supply and underground power supply for proposed residences.

3.8 Site access

The proposed vehicular access network will provide multiple links to the surrounding public road network (Figure 1). The proposed vehicular access network will also provide buffers and access for emergency service vehicles between proposed residences and the surrounding bushland extent.

4. Fire problem

4.1 Bush fire history and predominant sources of ignition

The Two Rocks locality within the City of Wanneroo is subject to large bushfires which occur approximately every 2-3 years (Hay P [City of Wanneroo] 2014, pers. comm. 26 May).

Based on the bush fire history of the locality, ignition and occurrence of uncontrolled bush fires is considered to be common, which increases the overall bush fire risk to the subject land. Predominant sources of ignition are:

- intentional causes (e.g. suspected arson)
- accidental causes (e.g. lightning and other natural causes).

There are numerous emergency service resources located in the City of Wanneroo that could provide a suppression response to Lot 500 Breakwater Drive within 30 minutes, including local and career bush fire brigades stationed at Two Rocks, Wanneroo and Quinns Rocks.

4.2 Bush fire hazards

A bush fire hazard assessment aims to classify the bush fire hazard at both the strategic and local level, which leads to an assessment of the Bushfire Attack Level (BAL). A bush fire hazard assessment has been undertaken across the project area and adjacent land in accordance with procedures outlined in PFBFP Guidelines.

4.2.1 Classifying the bush fire hazard

Fuel hazard assessment

A comprehensive fuel hazard assessment of the project area and adjacent land was undertaken by Strategen during a site visit on 12 May 2014. The assessment was undertaken on the basis of a visual inspection of the following factors, cross-referenced with the Swan Coastal Plain Visual Fuel Load Guide (FESA 2012):

- vegetation type and structure
- vegetation condition and density
- fuel age
- scrub extent
- litter and trash accumulation.

On-site and adjacent fuel hazards

Historically, the project area would have represented an admixture of an open woodland and heath vegetation structure. However, due to historical clearing and understorey slashing, the project area now represents a mixture of unmanaged grasslands with available fuel loads of 2-5 t/ha (tonnes per hectare) (Plate 2), open woodland of Japanese Pepper over mixed shrubs and grasses with available fuel loads between 5–8 t/ha (Plate 3) and open *Melaleuca* heath with available fuel loads between 10-15 t/ha (Plate 4). Adjacent vegetation is contiguous with that within the project area and contains the same fuel loads as recorded within the project area. Fuel age throughout the site and adjacent areas was estimated at approximately 15 years.



Plate 2: Exotic grassland (available fuel loads of 2- 5 t/ha)



Plate 3: Open woodland (available fuel loads within 5–8 t/ha)



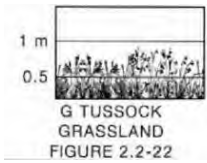
Plate 4: Open *Melaleuca* heath (available fuel loads within 10 -15 t/ha)

Vegetation class and type

An assessment of vegetation class and type within and adjacent to the project area has been undertaken in accordance with procedures outlined in PFBFP Guidelines (Table 3).

Table 3 Predominant vegetation class and type

Predominant vegetation and fuel load	Vegetation class	Vegetation type	Figure (as per PFBFP Guidelines)	Description (as per PFBFP Guidelines)
On-site and adjacent open woodland (5-8 t/ha)	(B) Woodland	Open woodland	<p>B OPEN WOODLAND FIGURE 2.2-06</p>	Trees 10–30 m high; 10-30% foliage cover dominated by eucalypts (Tuart); understorey low trees to tall shrubs typically dominated by <i>Acacia</i> , <i>Callitris</i> or <i>Casuarina</i> .
On-site and adjacent open heath (10-15 t/ha)	(C) Shrubland	Open heath	<p>C OPEN HEATH FIGURE 2.2-11</p>	Found in wet areas and/or areas affected by poor soil fertility or shallow soils. Shrubs 1-2 m high often comprising <i>Banksia</i> , <i>Acacia</i> , <i>hakea</i> and <i>Grevillea</i> . Wet heaths occur in sands adjoining dunes of the littoral (shore) zone. Montane heaths occur on shallow or water-logged soils.

Predominant vegetation and fuel load	Vegetation class	Vegetation type	Figure (as per PFBFP Guidelines)	Description (as per PFBFP Guidelines)
On-site unmanaged grassland (2-5 t/ha)	(G) Grassland (unmanaged)	Tussock grassland		All forms including situations with shrubs and trees if the overstorey foliage cover is less than 10%

Location of bush fire hazards

The location of existing bush fire hazard areas is outlined in the vegetation class map (Figure 6). This map has been created using the abovementioned vegetation class and type descriptions and estimated available fuel loads.

Bush fire hazard levels

Bush fire hazard levels of the predominant vegetation are displayed in the bush fire hazard assessment map (Figure 7). Classifying the bush fire hazard by assessing the predominant vegetation is a key to the initial determination of site suitability for development. This also leads to determination of the potential level of construction standard by the application of AS 3959–2009 *Construction of buildings in bushfire prone areas* (SA 2009) for any proposed development.

The pre-development, on-site bush fire hazard level varies from 'Low' to 'Extreme'; however, since the majority of the site will be cleared to enable development of a built or landscaped footprint throughout proposed residential and POS areas, the on-site bush fire hazard level will be 'Low'.

The bush fire hazard level of adjacent land varies between 'Low' 'Moderate' and 'Extreme' depending on the vegetation class present within any given area.

According to PFBFP Guidelines, land with an assessed 'Moderate' to 'Extreme' bush fire hazard level is classified as bush fire prone land, which triggers implementation of AS 3959–2009 for any adjacent proposed development within 100 m.

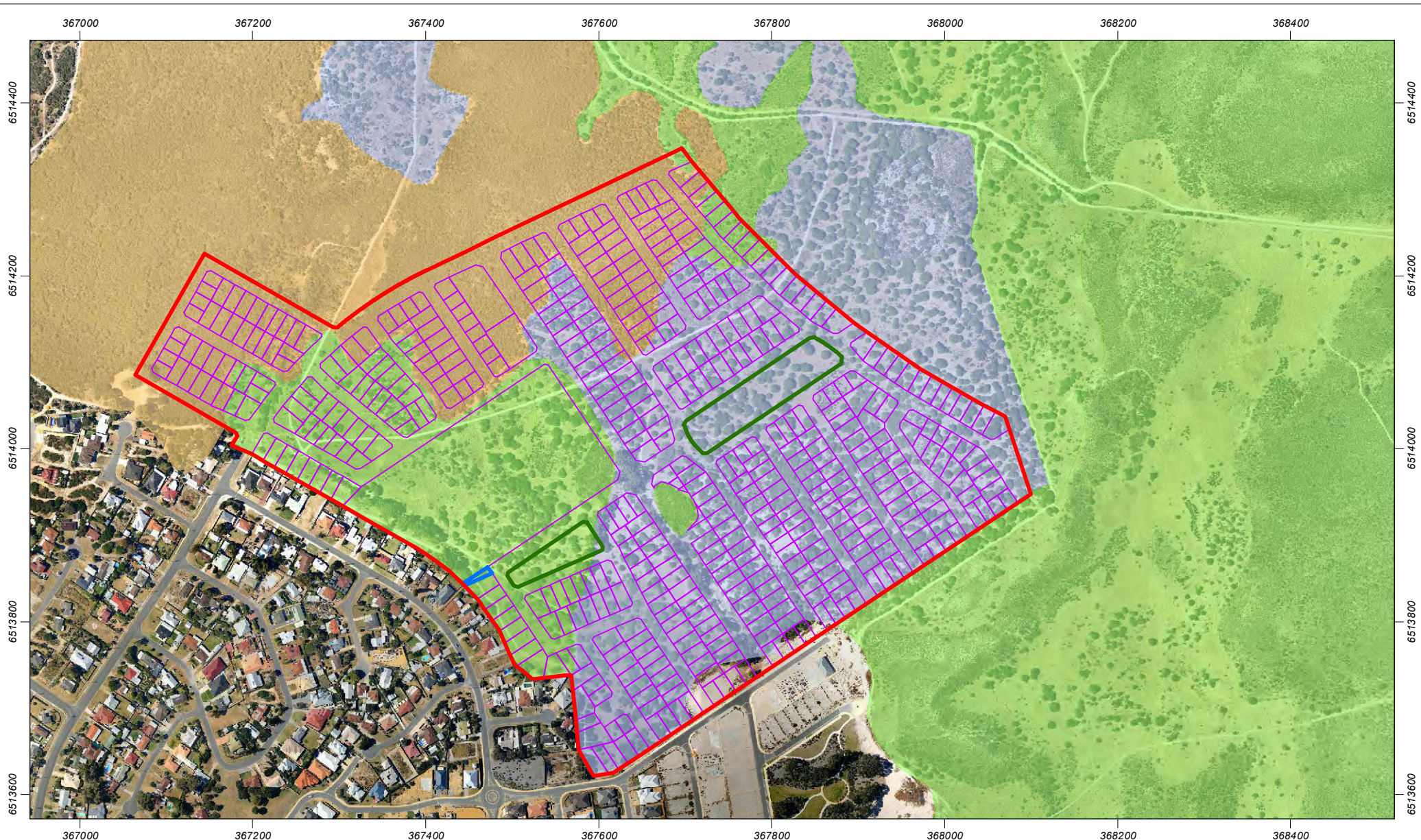


Figure 6 Vegetation class map

Scale 1:6,000 at A4
 0 50 100 150 m
 Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 21/08/2015
 Author: JCrute
 Source: Client 2014.

Legend

- | | | | |
|------------------|-----|-------------------------|------------------------|
| Project boundary | PAW | Vegetation Class | Woodland (5-8 t/ha) |
| Lot boundaries | POS | Grassland (2-5 t/ha) | Shrubland (10-15 t/ha) |



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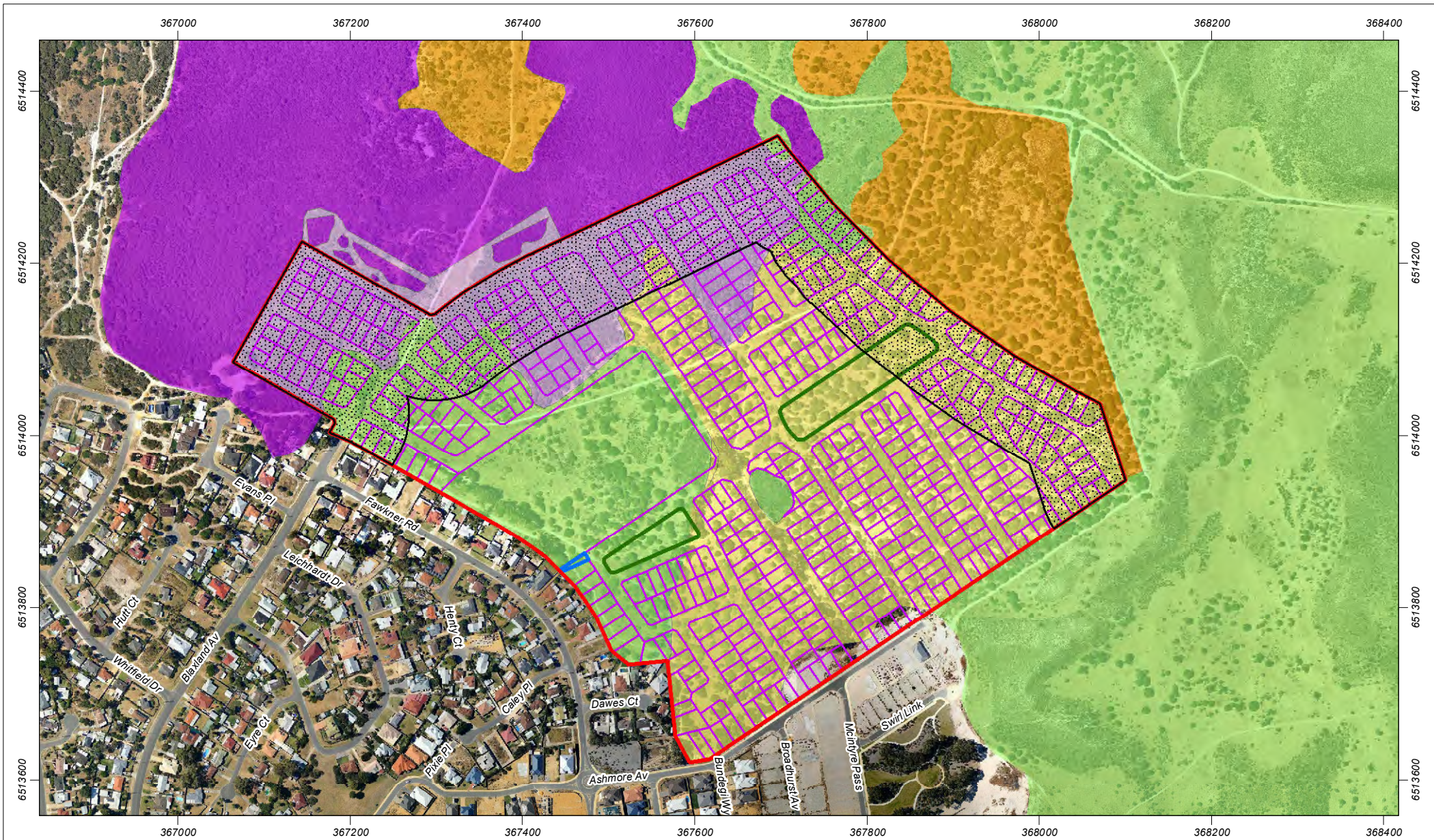







Figure 7 Bush fire risk assessment map



Scale 1:6,000 at A4
 0 50 100 150 m


Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 21/08/2015
 Author: JCrute
 Source: Client 2014.

Legend

-  100 m HSZ
-  Project boundary
-  PAW
-  Lot boundaries
-  POS

Bushfire hazard level

-  Extreme
-  Extreme (Low after development)

 Moderate

 Moderate (Low after development)

 Low



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4.2.2 Bush fire hazard performance criteria

The relationship between various bush fire hazard levels and development performance criteria is set out in Table 4. Built assets of the project area will be contained within a 'Low' bush fire hazard area; however, a portion of these will be situated within 100 m of an 'Extreme' bush fire hazard to the north and a 'Moderate' bush fire hazard to the east, as displayed in Figure 7. Consequently, a comprehensive suite of bush fire risk treatment and mitigation measures, including implementation of AS 3959-2009, will need to be implemented to protect these assets from existing hazard areas.

Compliance with performance criteria for a 'Moderate' bush fire hazard level will be achieved for the proposed development, focussing on the key areas of development location, vehicular access, water supply, siting of development and design of development. Performance criteria will be achieved through adoption of recommended acceptable solutions outlined in PFBFP Guidelines.

Table 4 Bush fire hazard levels and performance criteria

Bush fire hazard level	Bush fire protection performance criteria required
Low hazard	Development does not require special bush fire planning controls. Despite this, DFES strongly recommends that ember protection features be incorporated in design where practicable.
Moderate hazard	Performance criteria for: <ul style="list-style-type: none"> • location (Element 1) • vehicular access (Element 2) • water (Element 3) • siting of development (Element 4) • design of development (Element 5).
Extreme hazard	Development is to be avoided in areas with these hazard levels.

Source: WAPC et al. 2010

Compliance of the proposed development with bush fire protection performance criteria and associated acceptable solutions is documented in a completed compliance checklist (Appendix 1).

4.2.3 Classifying the bush fire attack level

This procedure, as outlined in PFBFP Guidelines and AS 3959–2009, uses a combination of the state-adopted Fire Danger Index rating of FDI 80, vegetation class, slope and the distance maintained between proposed development areas and predominant vegetation to specify the Bushfire Attack Level (BAL). Based on the specified BAL, construction requirements for proposed buildings can then be assigned.

The proposed development site will be cleared to enable development of a significant built and landscaped footprint. Consequently, no vegetation assessed as having a 'Moderate' to 'Extreme' bush fire hazard level will be retained within the development footprint. On-site POS areas will be landscaped and have fuel loads maintained within 2 t/ha.

A portion of the development site will be located within 100 m of vegetation assessed as having an 'Extreme' or 'Moderate' bush fire hazard level, which will require implementation of AS 3959–2009 and increased building construction standards for proposed built assets within the 100 m HSZ (refer to Figure 7). The 'Extreme' and 'Moderate' bush fire hazards apply to open heath and woodland vegetation located upslope from the project area. BALs for proposed built assets within 100 m of this vegetation are outlined in Table 5.

Table 5 Determination of bush fire attack level (BAL)

Vegetation class	Bush fire attack level (BAL)				
	BAL FZ	BAL 40	BAL 29	BAL 19	BAL 12.5
	Distance (m) of the site from the predominant vegetation class				
	Vegetation is upslope and flat land				
(B) Woodland	<10	10–<14	14–<20	20–<29	29–<100
(C) Shrubland	<7	7–<9	9–<13	13–<19	19–<100

Source: WAPC et al. 2010

BAL 12.5 and corresponding construction standards will apply to all buildings within specified lots in accordance with Figure 8. BAL 12.5 has been applied based on the separation distances to 'Extreme' and 'Moderate' bush fire hazard areas and up-slope nature of classified vegetation to proposed residential lots. Hazard separation to these lots will be in the form of firebreaks, building setbacks and road reserves, which will achieve 22 m wide Building Protection Zones (BPZs) at a minimum.

All other lots of the proposed development are considered to be BAL-Low, where there is insufficient risk to warrant specific construction requirements. The risk to these lots is diminished due to an increase in the low fuel separation distance to bush fire hazard areas and shielding properties provided by external lots.

Relevant sections of AS 3959–2009 that outline construction standards for buildings in areas specified as BAL 12.5 are provided in Table 6. Construction standards for BAL 12.5 are fully explained in Appendix 3.

Table 6 Construction standards

Bushfire Attack Level (BAL)	Classified vegetation within 100 m of the site and heat flux exposure thresholds	Description of predicted bush fire attack and levels of exposure	Relevant section of AS 3959–2009
BAL 12.5	$\leq 12.5 \text{ kW/m}^2$	Ember attack	3 and 5

Source: WAPC et al. 2010

4.3 Inherent bush fire risk

Generally, an inherent bush fire risk would quantify the level of risk of loss or damage to current site assets from uncontrolled bush fire, prior to the implementation of the proposed development and associated bush fire risk treatment and mitigation measures.

The risk assessment is derived from the Fire and Emergency Services Authority (FESA, now DFES) *Rural Urban Bush Fire Threat Analysis* (Smith 2003) and Australian Standard/New Zealand Standard *AS/NZS ISO 31000:2009 Risk management – Principles and guidelines* (SA & SNZ 2009).

The inherent bush fire risk is greatly diminished across the project area due to the site containing minimal life and property assets and limited public access. However, the presence of high fuel loads and high likelihood of ignition and bush fire occurrence increases the inherent bush fire risk to the project area to 'Moderate-High' (Table 7).

Table 7 Inherent bush fire risk assessment for the project area

Parameter	Risk to site assets
On-site fuel hazard rating (highest rating)	Extreme
Are assets located up-slope from vegetation?	No
Are assets located in the flame zone?	No
Resident/visitor presence (low, moderate, high)	Low
Values or assets (low, moderate, high)	Low
Fire unit access risk (low, moderate, high)	Low
Fire suppression response time (minutes)	15
Likelihood of ignition and bush fire occurrence (low, moderate, high)	High
Level of bush fire management (low, moderate, high)	Low
Overall inherent risk	Moderate-High

A residual bush fire risk assessment for the proposed development using the above methodology is provided in Section 6.2. This assessment quantifies the level of bush fire risk to proposed life and property assets of the project area following implementation of the development and associated bush fire risk mitigation measures.

4.4 Summary of key bush fire issues

The following is a summary of key bush fire issues that have been considered as part of the FMP to inform development of specified bush fire risk treatment and mitigation measures:

- the Two Rocks locality within the City of Wanneroo is subject to large bushfires which occur approximately every 2-3 years
- the main sources of ignition throughout CoW include intentional causes (e.g. suspected arson) and accidental causes (e.g. lightning strike and natural ignition sources)
- response times in the event that the site is threatened by uncontrolled bush fire is within 30 minutes from local career and volunteer bush fire brigades
- vegetation types present within the project area include woodland, heath and grassland; however, this classified vegetation will be cleared on development of the site, or managed as POS, resulting in creation of a 'Low' bush fire hazard rating across the site
- vegetation types adjacent to the project area include woodland, heath and grassland, assessed as 'Moderate', 'Extreme' and 'Low' bush fire hazard in accordance with PFBFP Guidelines with available fuel loads between 5-8 t/ha, 10-15 t/ha and 2-5 t/ha respectively
- classified vegetation is located either upslope or at equal elevation to the project area
- no built assets are proposed to be constructed within 20 m of vegetation classified as 'Extreme' bush fire hazard level
- proposed lots are situated at varying distances to 'Moderate' and 'Extreme' bush fire hazard areas, some within 100 m, which triggers implementation of AS 3959–2009
- based on the predominant vegetation types, slope and separation distances, bush fire construction standards for BAL 12.5 will apply to all buildings within selected lots in accordance with Figure 8, with provisions for a minimum 19 m wide BPZ
- all other lots of the proposed development are considered to be BAL-Low, where there is insufficient risk to warrant specific construction requirements
- performance criteria and acceptable solutions will be achieved for a moderate bush fire hazard level, focussing on the key areas of development location, vehicular access, water supply, siting of development and design of development
- the inherent bush fire risk to the site was assessed as 'Moderate-High'.

5. Bush fire risk treatment and mitigation

The following subsections outline how the Lot 500 Breakwater Drive development will mitigate the bush fire risk to future life and property and achieve a suitable and effective bush fire management outcome for the site. This will be achieved by meeting performance criteria and associated acceptable solutions in accordance with PFBFP Guidelines. Where applicable, these measures are illustrated on an aerial image of the project area in Figure 8 to assist with implementation of the FMP.

5.1 Development location

Strategic location, layout and management of future development at the planning stage can reduce future fire threat and risk to critical life and property assets.

5.1.1 Residential lots

The proposed built footprint currently intersects areas of 'Low', 'Moderate' and 'High' bush fire hazards (Figure 7). Following clearing, the proposed development footprint will become a 'Low' bush fire hazard area and all buildings will maintain a minimum 20 m low fuel hazard separation to classified vegetation. This means that proposed lots will not be located on land subject to either an 'Extreme' bush fire hazard level or construction standards applicable to BAL 40 or BAL FZ. This meets performance criteria for development location (Element 1) by adopting acceptable solution A1.1.

5.1.2 Public Open Space

Both POS areas will be subject to landscape design and ongoing management with fuel loads maintained to within 2 t/ha.

5.2 Vehicular access

5.2.1 Public access routes

The proposed development will provide a vehicular access network with multiple links to the surrounding public road network (Figure 8).

These measures adopt acceptable solution A2.1 by ensuring all residents and visitors of the development are provided with at least two vehicular access routes connecting to the surrounding public road network at all times.

All public roads, cul-de-sacs and private driveways will be constructed to specifications in accordance with Main Roads WA and DFES requirements, which align with acceptable solutions A2.2, A2.3 and A2.5.

5.2.2 Fire service access routes

Fire service access routes will be along the proposed vehicular access network which provides access to all areas of the proposed development.

A 30 m wide firebreak will be constructed between the eastern most lots in the proposed development and surrounding vegetation. This will provide emergency services with additional access and a defensible space between classified vegetation and homes. This clearing is to occur on lands managed by the Western Australian Planning Commission (WAPC) who have consented to allow the installation of this interim firebreak as outlined in the letter contained in Appendix 5.

A 6 m wide firebreak will be constructed between the most northwest lots (north of Blaxland Avenue) in the proposed development and surrounding vegetation. This firebreak will contain landscaping features such as a gravel or limestone trail and simple revegetation. An additional 3 m wide firebreak will be constructed north of the future extension of Blaxland Avenue to provide additional separation between proposed dwellings and future conservation reserves. These firebreaks will provide emergency services with additional access and a defensible space between classified vegetation and homes. This clearing is to occur on lands to be vested to, or currently managed by the City of Wanneroo (CoW).

The proposed vehicular access network is considered adequate for the purposes of bush fire protection and will ensure the development meets performance criteria for vehicular access (Element 2).

5.3 Water supply

Water supply services will be extended throughout the project area from surrounding areas of residential development, which will result in provision of a reticulated mains water supply for proposed residences.

A network of hydrants will also be provided along the internal road network at locations which meet relevant water supply authority and DFES requirements.

The above measures will ensure the development meets performance criteria for water supply (Element 3) by adopting acceptable solution A3.1.

5.4 Siting of development

When considering the overall bush fire management of the project area, protection should be provided to critical life and property assets (residents, visitors and built assets) as a minimum requirement. Low fuel buffers between fire hazard areas and critical assets, as well as application of AS 3959–2009, can be implemented to achieve this.

Surrounding vegetated areas are considered to be the predominant, long term bush fire risks to the proposed development. In the absence of ongoing vegetation management, these areas will increase in vegetation density and available fuel load (refer to Figure 7).

As such, critical built assets located within 100 m of the abovementioned hazards should be prioritised for bush fire protection measures through provision of low fuel defensible space (BPZs and HSZs) and heightened levels of construction standard. The BAL assessment undertaken in Section 4.2.3 achieves this through the following recommendations:

1. BAL 12.5 will be implemented for any proposed buildings located north of Blaxland Avenue in association with a 22 m BPZ in the form of a 6 m wide firebreak (to be constructed), 13 m road reserve surrounding the residential 'blocks' and a 3 m building setback.
2. All buildings south of Blaxland Avenue within 100 m of classified heath vegetation will be constructed in accordance with BAL 12.5 in association with a 22 m BPZ in the form of the Blaxland Avenue road reserve (18 m) and a 4 m building setback. An additional 3 m wide firebreak will be constructed north of Blaxland Avenue to create further separation between proposed dwellings and future conservation reserves.
3. BAL 12.5 will be implemented for any proposed buildings located on the eastern boundary of the proposed development in association with a 30 m BPZ in the form of a firebreak which will be constructed between the proposed buildings and classified vegetation.
4. Available fuel loads within all BPZs must be maintained within 2 t/ha.
5. Buildings within remaining lots of the proposed development are outside the specified 100 m, so will not require increased construction standards.

The abovementioned recommendations are supported by sound justification and rationale based on potential fire behaviour characteristics of the surrounding vegetation and subsequent risk to proposed life and property assets (refer to Section 4.2.3).

The above measures will ensure the development meets performance criteria for siting of development (Element 4) by adopting acceptable solutions A4.1, A4.2, A4.3, A4.4 and A4.5.

5.5 Design of development

Development design, as indicated in Figure 1, is expected to reduce the vulnerability of life and property assets from the effects of bush fire and greatly assist bush fire prevention and suppression operations. Given the proposed development is considered to comply with development location (Element 1), vehicular access (Element 2), water supply (Element 3) and siting of development (Element 4), compliance with design of development (Element 5) is achieved through adoption of acceptable solution A5.1.

5.6 Additional bush fire risk mitigation

The following measures will be implemented in addition to those outlined previously to provide a more thorough level of bush fire protection to residents, visitors and built assets of the subject land:

1. **Annual fuel inspections:** undertaken by CoW staff in accordance with the current CoW firebreak order under the provisions of the *Bush Fires Act 1954*. Failure to comply with this FMP and the specified requirements of the current CoW firebreak order may result in the issuing of fines (refer to Appendix 4 for the current CoW firebreak order).
2. **Landowner education and awareness:** landowners should be provided a copy of local government and DFES bush fire information booklets that are currently available. In addition, attendance by landowners at annual DFES bush fire awareness briefings would be advantageous.
3. **Section 70 Notification on Title:** to be placed on all Titles of the proposed development to ensure prospective landowners are aware that an FMP exists over the site with responsibilities that may apply.

5.7 Summary of bush fire risk mitigation and works program

A summary of the bush fire risk treatment and mitigation measures described in Section 5, as well as a works program, is provided in Table 8. These measures will be implemented to ensure the ongoing protection of proposed life and property assets is achieved. Additional optional measures are also provided and can be adopted by residents to further mitigate their risk to life and property from uncontrolled bush fires. Timing and responsibilities are also defined to assist with implementation of each management measure.

Table 8 Summary of bush fire risk mitigation measures and works program

Bush fire risk mitigation	Recommended works	Mandatory	Optional	Timing	Responsibility
Development location	Undertake development in accordance with the Lot 500 Breakwater Drive Subdivision Concept Plan to ensure the development occurs within a low bush fire hazard area. Refer to FMP Section 5.1.1.	Yes	No	During implementation of the development	Developer
	Manage available fuel loads within 2 t/ha throughout all POS areas. This can be achieved through mechanical slashing or manual removal of understorey grasses, trash and litter fuels. Refer to FMP Section 5.1.2.	Yes	No	Annually prior to the onset of the designated bush fire season	Developer during development, CoW thereafter
Vehicular access and fire service access	Implement an internal road network providing all residents and visitors of the development with two or more vehicular access routes connecting to the surrounding public road network. Refer to FMP Section 5.2.1.	Yes	No	During implementation of the development	Developer
	Construct all public roads, cul-de-sacs and private driveways in accordance with Main Roads WA and DFES requirements. Refer to FMP Section 5.2.1.	Yes	No	During implementation of the development	Developer
	Ensure proposed road network serves as a fire service access route along the existing road reserve. Refer to FMP Section 5.2.2.	Yes	No	During implementation of the development	Developer
	Construct and maintain an interim 30 m wide firebreak (until adjacent lots are developed) as approved by DoP between the eastern most lots of the proposed development and classified vegetation. Refer to FMP Section 5.2.2 and Appendix 5.	Yes	No	During implementation of the development	Developer
Water supply	Provide a reticulated water supply through extension of the existing reticulated water supply from adjacent development areas. Refer to FMP Section 5.3.	Yes	No	During implementation of the development	Developer
	Provide a network of hydrants along the internal road network at locations which meet relevant water supply authority and DFES requirements. Refer to FMP Section 5.3.	Yes	No	During implementation of the development	Developer
Siting of development	Apply BAL 12.5 and corresponding construction standards to all buildings within specified lots in accordance with Figure 8. Refer to FMP Section 5.4.	Yes	No	During building construction	Developer, builder
	Provide BPZs for specified lots in accordance with Figure 8. Refer to FMP Section 5.4.	Yes	No	During implementation of the development	Developer
Design of development	Comply with all acceptable solutions for development location (Element 1), vehicular access (Element 2), water supply (Element 3) and siting of development (Element 4). Refer to FMP Section 0.	Yes	No	During implementation of the development	Developer
Annual fuel hazard inspections	Comply with the current CoW firebreak order. Refer to Appendix 4.	Yes	No	Annually prior to the onset of the designated bush fire season	Developer, CoW and prospective landowners
	Undertake an inspection of fuel hazards across the development area to assess compliance with the FMP and CoW firebreak order. Refer to FMP Section 5.6.	Yes	No	Annually prior to the onset of the designated bush fire season	CoW staff
	Issue work orders or fines where compliance with the <i>Bush Fires Act 1954</i> , FMP or CoW firebreak order has been compromised. Refer to FMP Section 5.6.	Yes	No	Annually prior to the onset of the designated bush fire season	CoW staff

Bush fire risk mitigation	Recommended works	Mandatory	Optional	Timing	Responsibility
Landowner education and awareness	Distribute bush fire information booklets and attend annual DFES bush fire awareness briefings. Refer to FMP Section 5.6.	No	Yes	Annually	Prospective landowners, CoW, DFES
	Place a Section 70 Notification on all Titles of the proposed development to ensure prospective landowners are aware that an FMP exists over the site with responsibilities that may apply. Refer to FMP Section 5.6.	Yes	No	On creation of Titles	Developer
Optional building requirements	Restrict the installation of evaporative air-conditioners, mesh screens or shutters. Install residential building sprinkler systems.	No	Yes	During implementation of the development	Developer, builder, prospective landowners
Restricted and prohibited burning times	Comply with the annual CoW firebreak order and DFES/CoW-determined burning periods. Refer to Appendix 4.	Yes	No	As specified by DFES/CoW	CoW, Developer, prospective landowners
FMP review and update	Review and update the FMP to ensure: <ol style="list-style-type: none"> 1. Implementation is assessed and corrective actions are applied in cases of non-compliance. 2. The effectiveness and impact of fire prevention work is evaluated and any significant changes in development design or the surrounding environment are reassessed in a revised FMP. 	Yes	No	Annually as required following the date of approval	Developer until development has been fully implemented, CoW thereafter

6. Implementation of the Fire Management Plan

6.1 Implementation of bush fire risk treatment and mitigation

The works program provided in Table 8 provides clear direction for the implementation of all works associated with this FMP, including appropriate timing and responsibilities. In addition, the full range of bush fire risk treatment and mitigation measures, as well as location of implementation as specified in this FMP, is provided in Figure 8. The plan has been overlain on an aerial image of the project area to assist with implementation.

6.2 Residual bush fire risk

The residual bush fire risk is the level of risk remaining following implementation of the residential development and associated bush fire risk treatment and mitigation measures. A residual bush fire risk assessment is provided in Table 9.

The residual bush fire risk to life and property assets was assessed as 'Low', due to the comprehensive level of bush fire risk management proposed across the site and the subsequent expected improvement in building protection, access ability, emergency water supply and fire preparedness.

Table 9 Residual bush fire risk assessment for the project area

Parameter	Risk to site assets
On-site fuel hazard rating (highest rating)	Low
Are assets located up-slope from vegetation?	No
Are assets located in the flame zone?	No
Resident/visitor presence (low, moderate, high)	High
Values or assets (low, moderate, high)	High
Fire unit access risk (low, moderate, high)	Low
Fire suppression response time (minutes)	15
Likelihood of ignition and bush fire occurrence (low, moderate, high)	Low
Level of bush fire management (low, moderate, high)	High
Overall residual risk	Low

6.3 Assessment of bush fire risk treatment and mitigation measures

Implementation of the bush fire risk treatment and mitigation measures outlined in this FMP will ensure that should a bush fire occur within or adjacent to the residential development, fire intensity on-site will be minimised and life, property and environmental assets are expected to be protected. The cost of undertaking the various tasks and initiatives outlined in the FMP will provide significant cost benefit to the developer and landowners when compared with the possible loss of life, infrastructure and environmental values of the site.

Annual review of the FMP will assess the social, financial and environmental effectiveness of the management measures described in Section 5 (refer to Section 1.4 for document review process).

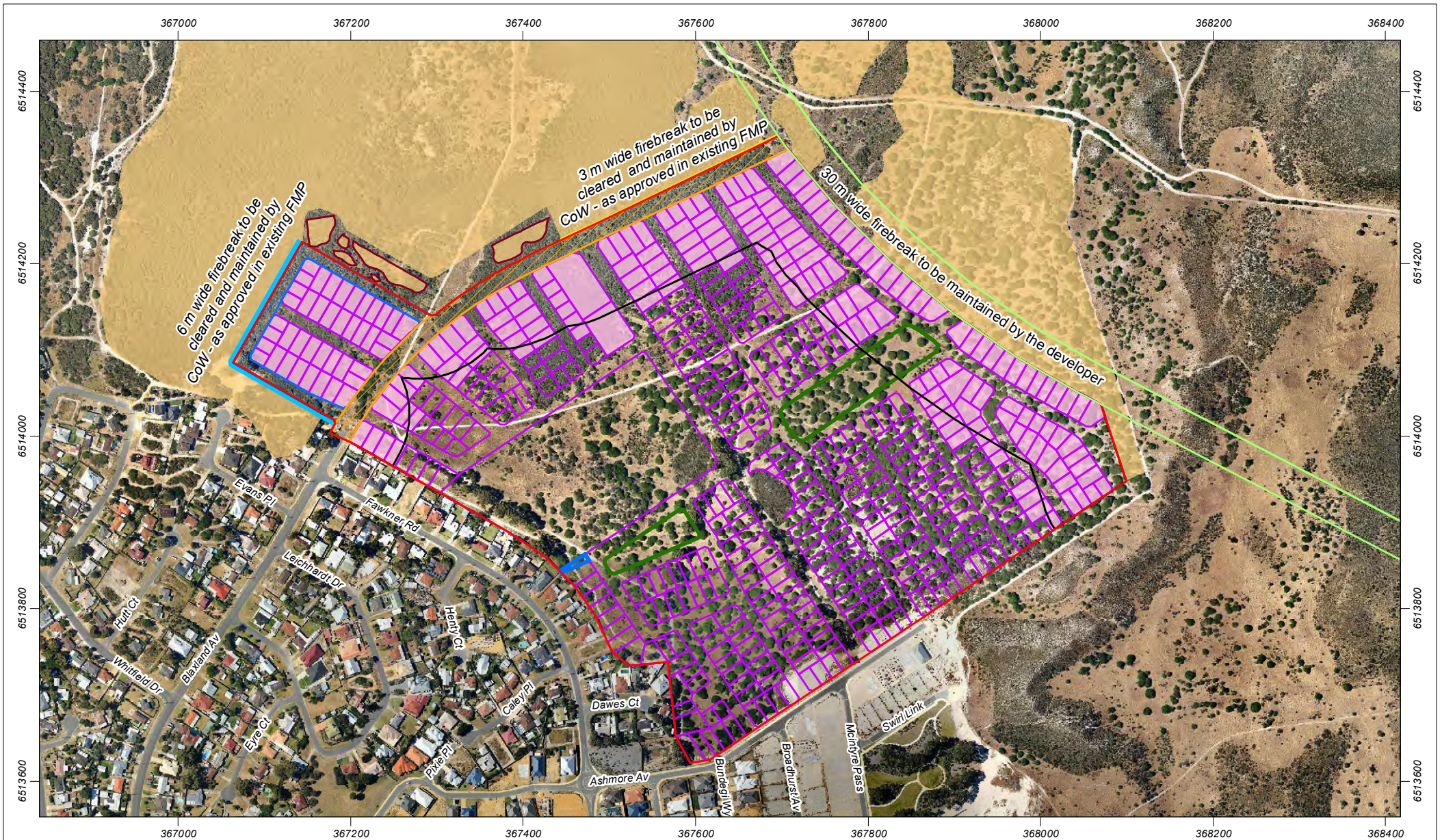


Figure 8 Fire Management Plan: Lot 500 Breakwater Drive, Two Rocks

Scale 1:6,000 at A4
 0 50 100 150 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 21/08/2015

Author: JCrute

Source: Aerial image and Subdivision plan; Client 2014.

Path: Q:\Consult\2014\TBB\TBB14123\ArcMap_documents\R001\Rev3\TBB14123_01_R001_Rev3_F008.mxd

Legend

- Retained vegetation
- Railway reserve
- Project boundary
- ▨ 16 m wide BPZ
- ▨ 22 m wide BPZ
- ▭ 100 m HSZ
- ▭ Lot boundaries
- ▭ PAW
- ▭ 100 m HSZ
- ▭ POS
- ▭ 3m wide firebreak (maintained by CoW)
- ▭ 6m wide firebreak (maintained by CoW)
- ▭ BAL 12.5
- ▭ Bushfire prone areas



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6.4 Legislative requirements, specifications and standards

The legislative requirements, specifications and standards applicable to implementation of this FMP are referenced in Section 7 and Appendix 6 and pertain to the following:

- *Bush Fires Act 1954*
- *Planning and Development Act 2005*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Environmental Protection Act 1986*
- *Wildlife Conservation Act 1950*
- Building Code of Australia
- Planning for Bush Fire Protection Guidelines (Edition 2)
- Australian Standard AS 3959–2009 Construction of Buildings in Bushfire Prone Areas
- CoW annual firebreak order.

7. References

- Bureau of Meteorology (BoM) 2014, *Climate statistics for Australian locations: Monthly climate statistics for Gingin aero*, [Online], Commonwealth of Australia, available from: http://www.bom.gov.au/climate/averages/tables/cw_009178.shtml, [26 May 2014].
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- Department of Planning and Western Australian Planning Commission (DoP & WAPC) 2014a, *Draft State Planning Policy 3.7 Planning for Bushfire Risk Management*, Western Australian Planning Commission, Perth.
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- Fire and Emergency Services Authority (FESA) 2012, *Visual Fuel Load Guide for the scrub vegetation of the Swan Coastal Plain and Darling Scarp including Geraldton Sandplains & Leeuwin Ridge Regions of Western Australia*, Bush Fire and Environmental Protection Branch, Fire and Emergency Services Authority, Perth.
- Hedde EM, Loneragan OW & Havel JJ 1980, *Darling System, Vegetation Complexes*, Forest Department, Perth.
- McCaw L and Hanstrum B 2003, 'Fire environment of Mediterranean south-west Western Australia', in *Fire in Ecosystems of South-West Western Australia: Impacts and Management*, eds I Abbott & ND Burrows, Backhuys Publishers, Leiden, Netherlands, pp. 171–188.
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- Smith R 2003, *Rural Urban Bush Fire Threat Analysis (RUBTA)*, Fire and Emergency Services Authority of Western Australia, Perth.
- Standards Australia (SA) 2009, *Australian Standard AS 3959–2009 Construction of Buildings in Bushfire-Prone Areas*, Standards Australia, Sydney.
- Standards Australia & Standards New Zealand (SA & SNZ) 2009, *Australian Standard/New Zealand Standard AS/NZS ISO 31000:2009 Risk management – Principles and guidelines*, Standards Australia/Standards New Zealand, Sydney/Wellington.
- Western Australian Planning Commission, Department of Planning and Fire and Emergency Services Authority (WAPC et al.) 2010, *Planning for Bush Fire Protection Guidelines (Edition 2)*, Western Australian Planning Commission and Fire and Emergency Services Authority, Perth.

Appendix 1

Fire Management Plan compliance checklist

Compliance checklist for performance criteria and acceptable solutions

Element	Acceptable solution	Compliance	Yes/No	Explanation (if no)
1. Location	A1.1 Development location	Does the proposal comply with performance criteria P1 by applying acceptable solution A1.1?	Yes	
2. Vehicular access	A2.1 Two access routes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.1?	Yes	
	A2.2 Public roads	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.2?	Yes	
	A2.3 Cul-de-sacs	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.3?	Yes	
	A2.4 Battle axes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.4?	Yes	
	A2.5 Private driveways	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.5?	Yes	
	A2.6 Emergency access ways	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.6?	Yes	
	A2.7 Fire service access routes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.7?	Yes	
	A2.8 Gates	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.8?	N/A	
	A2.9 Firebreak widths	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.9?	Yes	
	A2.10 Signs	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.10?	N/A	
3. Water	A3.1 Reticulated areas	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.1?	Yes	
	A3.2 Non-reticulated areas (a)	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.2?	N/A	
	A3.3 Non-reticulated areas (b)	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.3?	N/A	
4. Siting of development	A4.1 Hazard separation – moderate to extreme bush fire hazard level	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.1?	Yes	
	A4.2 Hazard separation – low bush fire hazard level	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.2?	Yes	
	A4.3 Building protection zone	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.3?	Yes	
	A4.4 Hazard separation zone	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.4?	Yes	
	A4.5 Reduction in bush fire attack level due to shielding	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.5?	Yes	
5. Design of development	A5.1 Compliant development	Does the proposal comply with performance criteria P5 by applying acceptable solution A5.1?	Yes	

Element	Acceptable solution	Compliance	Yes/No	Explanation (if no)
	A5.2 Non-compliant development	Does the proposal comply with performance criteria P5 by applying acceptable solution A5.2?	N/A	

Note: Performance criteria and acceptable solutions are in accordance with *Planning for Bush Fire Protection Guidelines (Edition 2)* (WAPC et al. 2010).

Applicant Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Full name: Roger Banks

Applicant signature: 

Date: 30/05/2014

Appendix 2

January wind profiles for Gingin Aero

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 30 Sep 2010)

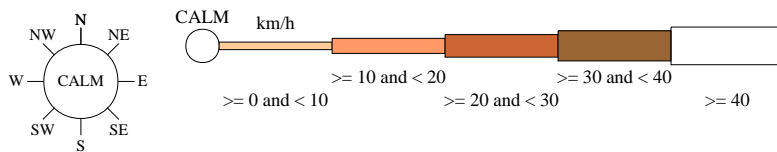
Custom times selected, refer to attached note for details

GINGIN AERO

Site No: 009178 • Opened Jan 1968 • Still Open • Latitude: -31.4628° • Longitude: 115.8642° • Elevation 73m

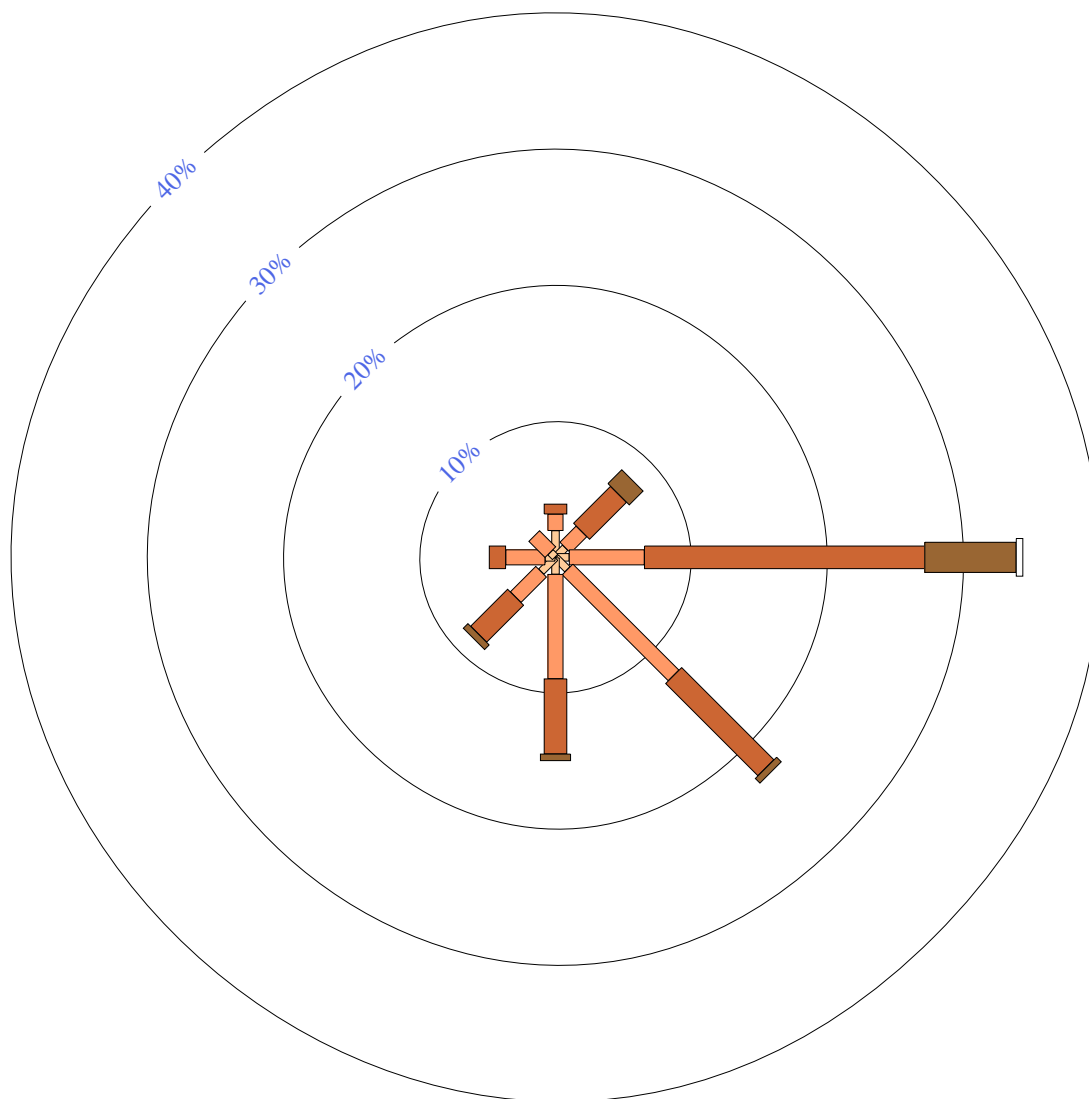
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



9 am Jan
411 Total Observations

Calm *



Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 30 Sep 2010)

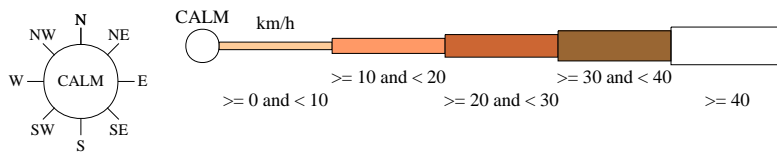
Custom times selected, refer to attached note for details

GINGIN AERO

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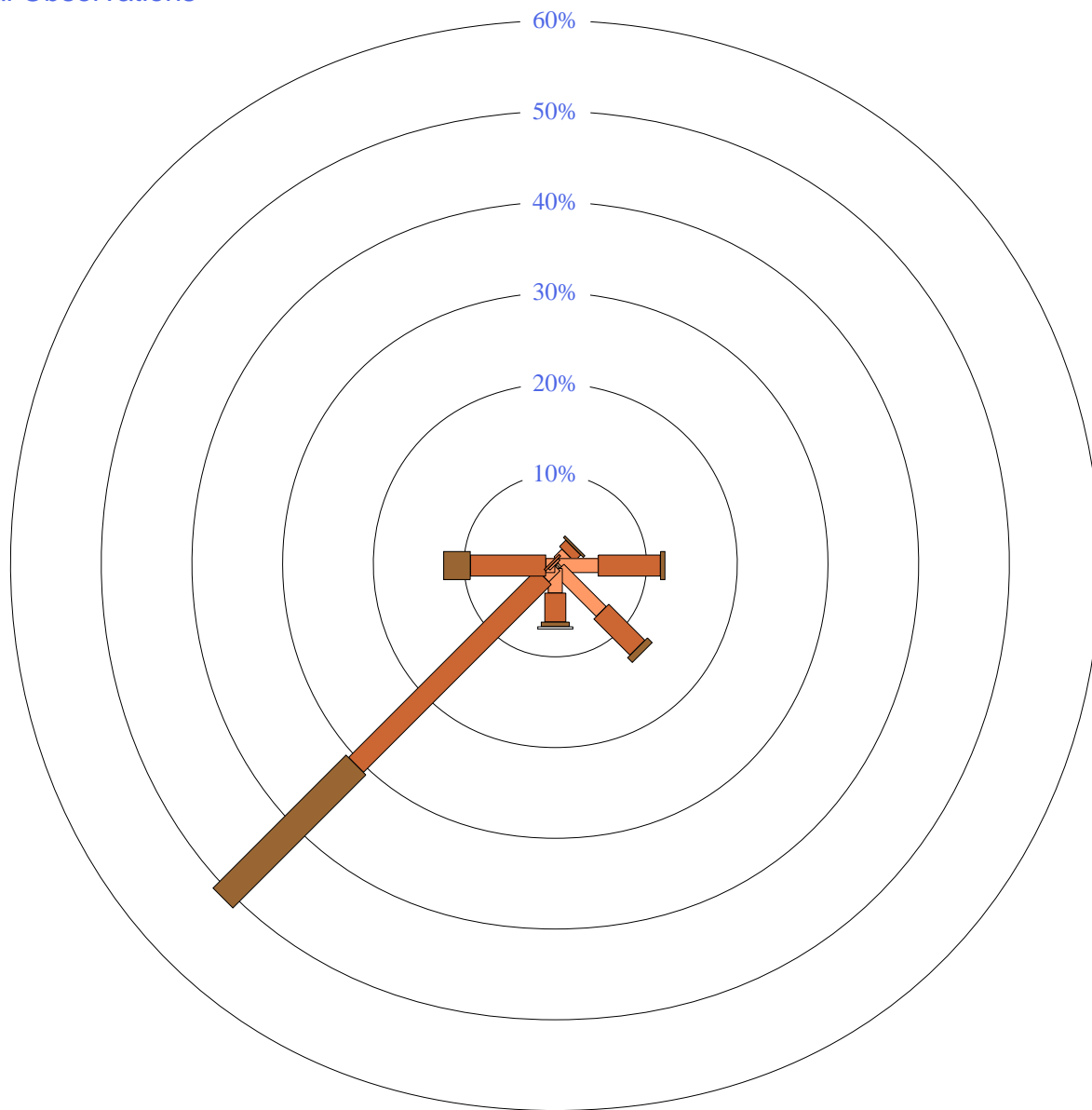
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



3 pm Jan
410 Total Observations

Calm *



Appendix 3

Construction standards for BAL 12.5

as per AS 3959–2009

SECTION 5 CONSTRUCTION FOR BUSHFIRE ATTACK LEVEL 12.5 (BAL — 12.5)

5.1 GENERAL

A building assessed in Section 2 as being BAL—12.5 shall comply with Section 3 and Clauses 5.2 to 5.8.

NOTE: There are a number of Standards that specify requirements for construction; however, where this Standard does not provide construction requirements for a particular element, the other Standards apply.

Any element of construction or system that satisfies the test criteria of AS 1530.8.1 may be used in lieu of the applicable requirements contained in Clauses 5.2 to 5.8 (see Clause 3.8).

NOTE: BAL—12.5 is primarily concerned with protection from ember attack and radiant heat up to and including 12.5 kW/m^2 where the site is less than 100 m from the source of bushfire attack.

5.2 SUBFLOOR SUPPORTS

This Standard does not provide construction requirements for subfloor support posts, columns, stumps, piers and poles.

NOTE: The exclusion of requirements for subfloor supports applies to the principal building only and not to verandas, decks, steps, ramps and landings (see Clause 5.7).

C5.2 Ideally, storage of combustible materials beneath a floor at this BAL would not occur and on this assumption, there is no requirement to enclose the subfloor space or to protect flooring materials from bushfire attack. However, should combustible materials be stored, it is recommended the area be protected as materials stored in the subfloor space may be ignited by embers and cause an impact to the building.

5.3 FLOORS

5.3.1 Concrete slabs on ground

This Standard does not provide construction requirements for concrete slabs on the ground.

5.3.2 Elevated floors

This Standard does not provide construction requirements for elevated floors, including bearers, joists and flooring.

5.4 EXTERNAL WALLS

5.4.1 Walls

That part of an external wall surface that is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less

than 18 degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D) shall be of—

- (a) non-combustible material; or
- (b) fibre-cement external cladding, a minimum of 6 mm in thickness; or
- (c) bushfire-resisting timber (see Appendix F); or
- (d) a timber species as specified in Paragraph E1 and listed in Table E1, Appendix E; or
- (e) a combination of any of Items (a), (b), (c) or (d) above.

There are no requirements for external wall surfaces 400 mm or more from the ground or for external wall surfaces 400 mm or more above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D).

5.4.2 Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed to prevent gaps greater than 3 mm.

Alternatively, sarking-type material may be applied over the outer face of the frame prior to fixing any external cladding.

5.4.3 Vents and weepholes

Vents and weepholes in external walls shall be screened with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium, except where the vents and weepholes are less than 3 mm (see Clause 3.6), or are located in an external wall of a subfloor space.

5.5 EXTERNAL GLAZED ELEMENTS AND ASSEMBLIES AND EXTERNAL DOORS

5.5.1 Bushfire shutters

Where fitted, bushfire shutters shall comply with Clause 3.7 and be made from—

- (a) non-combustible material; or
- (b) a timber species as specified in Paragraph E1 and listed in Table E1, Appendix E; or
- (c) bushfire-resisting timber (see Appendix F); or
- (d) a combination of any of Items (a), (b) or (c) above.

5.5.2 Windows

Window assemblies shall comply with one of the following:

- (a) They shall be completely protected by a bushfire shutter that complies with Clause 5.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) For window assemblies less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), window frames and window joinery shall be made from one of the following:

(A) Bushfire-resisting timber (see Appendix F).

or

(B) A timber species specified in Paragraph E2 and listed in Table E2, Appendix E.

or

(C) Metal.

Or

(D) Metal-reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel and the frame and sash shall satisfy the design load, performance and structural strength of the member.

(ii) Externally fitted hardware that supports the sash in its functions of opening and closing shall be metal.

(iii) Where glazing is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), the glazing shall be Grade A safety glass minimum 4 mm, or glass blocks with no restriction on glazing methods.

NOTE: Where double glazed units are used the above requirements apply to the external face of the window assembly only.

(iv) Where glazing is other than that specified in Item (iii) above, annealed glass may be used.

(v) The openable portions of windows shall be screened with mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

5.5.3 Doors—Side-hung external doors (including French doors, panel fold and bi-fold doors)

Side-hung external doors, including French doors, panel fold and bi-fold doors, shall comply with one of the following:

(a) They shall be protected by a bushfire shutter that complies with Clause 5.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) Doors shall be—

(A) non-combustible; or

(B) a solid timber door, having a minimum thickness of 35 mm for the first 400 mm above the threshold; or

(C) a door, including a hollow core door, with a non-combustible kickplate on the outside for the first 400 mm above the threshold; or

(D) a fully framed glazed door, where the framing is made from materials required for bushfire shutters (see Clause 5.5.1), or from a timber species specified in Paragraph E2 and listed in Table E2, Appendix E.

(ii) Where doors incorporate glazing, the glazing shall comply with the glazing requirements for windows.

(iii) Doors shall be tight-fitting to the doorframe and to an abutting door, if applicable.

(iv) Where any part of the door assembly is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the door (see Figure D3, Appendix D), that part of the door assembly shall be made from one of the following:

(A) Bushfire-resisting timber (see Appendix F).

or

(B) A timber species specified in Paragraph E2 and listed in Table E2, Appendix E.

or

(C) Metal.

or

(D) Metal-reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel and the door assembly shall satisfy the design load, performance and structural strength of the member.

(v) Weather strips, draught excluders or draught seals shall be installed at the base of side-hung external doors.

5.5.4 Doors—Sliding doors

Sliding doors shall comply with one of the following:

(a) They shall be protected by a bushfire shutter that complies with Clause 5.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) Any glazing incorporated in sliding doors shall be Grade A safety glass complying with AS 1288.

(ii) There is no requirement to screen the openable part of the sliding door. However, if screened, the screens shall be a mesh or perforated sheet made of corrosion-resistant steel, bronze or aluminium.

NOTE: The construction of manufactured sliding doors should prevent the entry of embers when the door is closed. There is no requirement to provide screens to the openable part of these doors as it is assumed that a sliding door will be closed if occupants are not present or during a bushfire event. Screens of materials other than those specified may not resist ember attack.

(iii) Sliding doors shall be tight-fitting in the frames.

5.5.5 Doors—Vehicle access doors (garage doors)

The following apply to vehicle access doors:

(a) The lower portion of a vehicle access door that is within 400 mm of the ground when the door is closed (see Figure D4, Appendix D) shall be made from—

(i) non-combustible material; or

(ii) bushfire-resisting timber (see Appendix F); or

(iii) fibre-cement sheet, a minimum of 6 mm in thickness; or

(iv) a timber species specified in Paragraph E1 and listed in Table E1, Appendix E; or

(v) a combination of any of Items (i), (ii), (iii) or (iv) above.

(b) Panel lift, tilt doors or side-hung doors shall be fitted with suitable weather strips, draught excluders, draught seals or guide tracks, as appropriate to the door type, with a maximum gap no greater than 3 mm.

(c) Roller doors shall have guide tracks with a maximum gap no greater than 3 mm and shall be fitted with a nylon brush that is in contact with the door (see Figure D4, Appendix D).

(d) Vehicle access doors shall not include ventilation slots.

5.6 ROOFS (INCLUDING VERANDA AND ATTACHED CARPORT ROOFS, PENETRATIONS, EAVES, FASCIAS, GABLES, GUTTERS AND DOWNPIPES)

5.6.1 General

The following apply to all types of roofs and roofing systems:

- (a) Roof tiles, roof sheets and roof-covering accessories shall be non-combustible.
- (b) The roof/wall junction shall be sealed, to prevent openings greater than 3 mm, either by the use of fascia and eaves linings or by sealing between the top of the wall and the underside of the roof and between the rafters at the line of the wall.
- (c) Roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

5.6.2 Tiled roofs

Tiled roofs shall be fully sarked. The sarking shall—

- (a) have a flammability index of not more than 5;
- (b) be located directly below the roof battens;
- (c) cover the entire roof area including the ridge; and
- (d) be installed so that there are no gaps that would allow the entry of embers where the sarking meets fascias, gutters, valleys and the like.

5.6.3 Sheet roofs

Sheet roofs shall—

- (a) be fully sarked in accordance with Clause 5.6.2, except that foil-backed insulation blankets may be installed over the battens;

or

- (b) have any gaps greater than 3 mm, under corrugations or ribs of sheet roofing and between roof components, sealed at the fascia or wall line and at valleys, hips and ridges by—

- (i) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium; or
- (ii) mineral wool; or
- (iii) other non-combustible material; or
- (iv) a combination of any of Items (i), (ii) or (iii) above.

5.6.4 Veranda, carport and awning roofs

The following apply to veranda, carport and awning roofs:

- (a) A veranda, carport or awning roof forming part of the main roof space [see Figure D1(a), Appendix D] shall meet all the requirements for the main roof, as specified in Clauses 5.6.1, 5.6.2, 5.6.3, 5.6.5 and 5.6.6.

(b) A veranda, carport or awning roof separated from the main roof space by an external wall [see Figures D1(b) and D1(c), Appendix D] complying with Clause 5.4 shall have a non-combustible roof covering.

NOTE: There is no requirement to line the underside of a veranda, carport or awning roof that is separated from the main roof space.

5.6.5 Roof penetrations

The following apply to roof penetrations:

(a) Roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors, shall be adequately sealed at the roof to prevent gaps greater than 3 mm. The material used to seal the penetration shall be non-combustible.

(b) Openings in vented roof lights, roof ventilators or vent pipes shall be fitted with ember guards made from a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(c) All overhead glazing shall be Grade A laminated safety glass complying with AS 1288.

(d) Glazed elements in roof lights and skylights may be of polymer provided a Grade A safety glass diffuser, complying with AS 1288, is installed under the glazing. Where glazing is an insulating glazing unit (IGU), Grade A toughened safety glass, minimum 4 mm, shall be used in the outer pane of the IGU.

(e) Flashing elements of tubular skylights may be of a fire-retardant material, provided the roof integrity is maintained by an under-flashing of a material having a flammability index no greater than 5.

(f) Evaporative cooling units shall be fitted with butterfly closers at or near the ceiling level or, the unit shall be fitted with non-combustible covers with a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(g) Vent pipes made from PVC are permitted.

5.6.6 Eaves linings, fascias and gables

The following apply to eaves linings, fascias and gables:

(a) Gables shall comply with Clause 5.4.

(b) Eaves penetrations shall be protected the same as for roof penetrations, as specified in Clause 5.6.5.

(c) Eaves ventilation openings greater than 3 mm shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

Joints in eaves linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds.

This Standard does not provide construction requirements for fascias, bargeboards and eaves linings.

5.6.7 Gutters and downpipes

This Standard does not provide material requirements for—

- (a) gutters, with the exception of box gutters; and
- (b) downpipes.

If installed, gutter and valley leaf guards shall be non-combustible.

Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible material.

5.7 VERANDAS, DECKS, STEPS, RAMPS AND LANDINGS

5.7.1 General

Decking shall be either spaced or continuous (i.e., without spacing).

There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings.

C5.7.1 Spaced decking is nominally spaced at 3 mm (in accordance with standard industry practice); however, due to the nature of timber decking with seasonal changes in moisture content, that spacing may range from 0–5 mm during service. The preferred dimension for gaps is 3 mm (which is in line with other ‘permissible gaps’) in other parts of this Standard. It should be noted that recent research studies have shown that gaps at 5 mm spacing afford opportunity for embers to become lodged in between timbers, which may contribute to a fire. Larger gap spacings of 10 mm may preclude this from happening but such a spacing regime may not be practical for a timber deck.

5.7.2 Enclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.2.1 Materials to enclose a subfloor space

This Standard does not provide construction requirements for the materials used to enclose a subfloor space except where those materials are less than 400 mm from the ground.

Where the materials used to enclose a subfloor space are less than 400 mm from the ground, they shall comply with Clause 5.4.

5.7.2.2 Supports

This Standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles.

5.7.2.3 Framing

This Standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e., bearers and joists).

5.7.2.4 Decking

This Standard does not provide construction requirements for decking that is more than 300 mm from a glazed element.

Decking less than 300 mm (measured horizontally at deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from—

- (a) non-combustible material; or
- (b) bushfire-resisting timber (see Appendix F); or
- (c) a timber species, as specified in Paragraph E1 and listed in Table E1 of Appendix E;
- (d) PVC-U; or
- (e) a combination of any of Items (a), (b), (c) or (d) above.

5.7.3 Unenclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.3.1 Supports

This Standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles.

5.7.3.2 Framing

This Standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e., bearers and joists).

5.7.3.3 Decking

This Standard does not provide construction requirements for decking unless it is less than 300 mm from a glazed element.

Decking less than 300 mm (measured horizontally at deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from—

- (a) non-combustible material; or
- (b) bushfire-resisting timber (see Appendix F); or
- (c) a timber species, as specified in Paragraph E1 and listed in Table E1, Appendix E; or
- (d) a combination of any of Items (a), (b) or (c) above.

5.7.4 Balustrades, handrails or other barriers

This Standard does not provide construction requirements for balustrades, handrails and other barriers.

5.8 WATER AND GAS SUPPLY PIPES

AS 3959 – 2009

Above-ground, exposed water and gas supply pipes shall be metal.

Appendix 4

City of Wanneroo firebreak order

2014

Protect your home and property from bushfires

NOTICE TO ALL OWNERS OR OCCUPIERS OF LAND IN THE DISTRICT OF THE CITY OF WANNEROO REGARDING FIREBREAKS.

The City of Wanneroo hereby gives notice pursuant to Section 33 of the **Bush Fires Act 1954** to all owners or occupiers of land in its district that they are required on or before 15 November, or within 14 days of becoming the owner or occupier of the land if that occurs after the 15 November, to annually plough, cultivate, scarify, or otherwise clear firebreaks as specified in this Notice and thereafter up to, and including the 30 April, annually, to maintain the firebreaks clear of flammable matter.

1. Land having an area of 2000m² or more

A firebreak not less than 3 metres wide and 3 metres high immediately inside and around all external boundaries of the land must be cleared.

2. Land having an area of less than 2000m²

A firebreak not less than 2 metres wide and 2 metres high immediately inside and around all external boundaries of the land must be cleared.

3. Buildings

A firebreak not less than 3 metres wide immediately around all external walls of every building must be cleared. Whenever a firebreak is cleared by burning the provisions of the Act and Regulations made thereunder must be observed. If pursuant to Item (2) of this Notice, mowing or slashing is carried out the height of vegetation thereafter must not exceed, as far as is reasonably practicable, 20mm over the entire area of the firebreak. The use of chemicals is subject to all restrictions imposed by the Department of Agriculture. Attention is drawn to the Flammable Liquids Regulations made under the Explosives and Dangerous Goods Act 1961, which requires a site on which flammable liquid is stored to be totally cleared of all flammable material for a minimum distance of 5 metres surrounding the site.

If it is considered to be impracticable for any reason to comply with the provisions of this Notice, application may be made not later than the 1st day of November annually to the Council or its authorised officer for permission to provide alternative fire protection measures. If permission is not granted the requirements of this Notice must be complied with.

Penalty

An owner or occupier of land who fails or neglects in any respect to comply with the requirements of this Notice is liable to a maximum fine of \$5,000.

DATES TO REMEMBER

- Firebreaks must be cleared by **15 November (AND KEPT CLEAR UNTIL APRIL 30)**
- Burning permits required all year round
- Burning prohibited between **1 December to 31 March**

When and how to obtain a fire permit

Permits are available from the City of Wanneroo at the following locations:

WANNEROO ANIMAL CARE CENTRE

Located at the rear of the Ashby Operations Centre, 1204 Wanneroo Road, Ashby
The City's Rangers / Fire Control Officers are available to issue permits 7 days a week* from 4pm - 6pm
*Except Good Friday

CITY OF WANNEROO CIVIC CENTRE

23 Dundobar Road, Wanneroo
The City's Fire Control Officers / Permit Issuing Officers are available to issue permits Monday to Friday 9am - 4pm

TWO ROCKS VOLUNTEER FIRE BRIGADE

Captain / Fire Control Officer
Seatrees Estate, Two Rocks
Please phone 0427 026 000 before attending

NEED ADVICE?

Further advice about how to protect your home, constructing firebreaks, and when and how to burn off, is available from the City of Wanneroo during office hours on 9405 5000.



City of
Wanneroo

23 Dundobar Road, Wanneroo, WA 6065

Locked Bag 1, Wanneroo, WA 6946

T : (08) 9405 5000 F : (08) 9405 5499

After Hours : 1300 13 83 93

E : enquiries@wanneroo.wa.gov.au

wanneroo.wa.gov.au  

PROTECT YOUR HOME
AND PROPERTY FROM
BUSHFIRES



City of
Wanneroo

Keeping your home safe from fire

There are a number of ways you can help keep your home safe from fire:

- Install smoke detectors in your home
- Clear vegetation away from the walls of your home
- Clear all rubbish and flammable material from around your home to create a 20 metre circle of safety
- Store firewood, timber, petrol, and kerosene well away from your home
- Prior to summer, clean all leaves and debris from your gutters
- Don't have flammable trees such as conifers near buildings
- Have branches trimmed that overhang the house or powerlines
- Fit wire insect screens or shutters to windows and glass doors

If a firebreak is impractical along your boundary for environmental or other reasons notify the City of Wanneroo by 1 October to obtain permission to install firebreaks in alternative positions, or of a different nature.

ALTERNATIVE METHODS OF REDUCING FIRE HAZARDS ON VACANT LAND

- For urban land less than 2000m², if mowing or slashing is carried out, the height of the vegetation must not exceed, as far as is reasonably practical, 20mm over the entire area of the firebreak
- The use of chemicals is subject to all restrictions imposed by the Department of Agriculture
- Mulching • Disposal at an authorised rubbish tip site

When and how to burn

NO BURNING FROM 1 DECEMBER - 31 MARCH

Burning off - that is, bush/running fire including grass, on any land is totally prohibited between 1 December and 31 March. Fire permits for burning material other than garden rubbish are required all year round.

A person in control of the fire must stay with the fire until it is completely extinguished.

GARDEN RUBBISH AND REFUSE

The burning of garden refuse is permitted between the hours of 6pm and 11pm, provided the fire danger rating is not VERY HIGH, SEVERE, EXTREME or CATASTROPHIC or a TOTAL FIRE BAN has been declared.

Fire danger rating signs are located at the following locations:

- Corner of Joondalup Drive and Wanneroo Road
- Wanneroo Road, south of the Yanchep Beach Road turn off
- Wanneroo Road, Carabooda • Marmion Avenue, Jindalee
- Neaves Road, Mariginiup • Old Yanchep Road, Pinjar
- Gngangara Road, Landsdale • Country Side Drive, Two Rocks

Other points to remember when burning garden refuse and rubbish are:

- All bush and flammable material must be thoroughly cleared within two metres of all points of the site of the fire
- The material must be on the ground, and be no more than one metre wide and one metre high

Only one heap may be burnt at any one time
Incinerators may be used providing:

- The incinerator is properly constructed and designed to prevent the escape of sparks of burning material
- The incinerator is situated not less than two metres away from a building or fence
- An area of two metres surrounding the incinerator is clear of all flammable material

BARBECUES

Only gas or electric barbecues may be lit during VERY HIGH, SEVERE, EXTREME or CATASTROPHIC fire danger rating or declared TOTAL FIRE BAN. The lighting of solid fuel barbecues is not permitted on these days.

SMOKE NUISANCES

City of Wanneroo residents are advised to be mindful of smoke issues associated with any burning that they conduct. Steps should be taken to avoid undue smoke impact to neighbours and adjacent roads. Smoke across roadways can severely impact motorists' visibility and therefore road safety. Issues of smoke nuisance are regulated by the Waste Avoidance and Resource Recovery Act 2007.

CAMPFIRES

Campfires must not be lit on VERY HIGH, SEVERE, EXTREME or CATASTROPHIC fire danger days or declared TOTAL FIRE BAN. A person must remain in attendance at the site during the whole time the fire is burning. The user must extinguish the fire using water or earth before leaving the area.

Hints for safer burning

- Don't light a fire on a hot or windy day
- Don't burn more than you can control
- Let your neighbours know you'll be burning material
- Make sure smoke and sparks will not affect your neighbour's washing or enter open windows
- Cut or rake long grass around trees, building and fences before burning
- Burn against the wind
- On a sloping block, burn from the top down
- Keep a hose or spray pack at hand to dampen down fierce fires
- If in doubt, don't burn material yourself - call the Volunteer Fire Brigade
- Stay with the fire until it is completely extinguished
- Where possible, don't burn any closer than 20 metres from your home or other buildings

Penalties

Under the Bush Fires Act 1954, failing to comply with regulations can result in a fine ranging from \$250 to \$250,000 or imprisonment.

Failure to maintain 2/3 metre firebreak as per firebreak order \$250

Offence relating to lighting fire in the open air \$250
Setting fire to bush during prohibited burning times \$250

Failure of occupier to extinguish bush fire \$250

Major offences result in Court action with fines ranging from \$250 to \$250,000 or imprisonment for 14 years.

THE BIGGEST PENALTY OF ALL

The biggest penalty of all would be losing your loved ones or home to fire. Please ensure you, your family and your home are kept safe by taking the necessary precautions.

Special rural and residential land

Owners and occupiers of special rural and special residential land should be aware of their responsibilities to take bush fire prevention measures, while ensuring they do not contravene Town Planning Scheme provisions which control the removal of vegetation in Special Residential and Special Rural Zones.

These special rural zones were created in areas of natural flora, and the Scheme recognises the importance of preserving the natural environment in these areas. Anyone found cutting down, lopping or damaging trees in these areas without City approval may be guilty of an offence.

However, bush fire prevention, including the installation of firebreaks, is essential regardless of the zoning of the land.

Below are some guidelines for installing firebreaks in special rural zones to prevent bush fires, while minimising damage to the natural environment.

- A 3 metre wide and 3 metre high firebreak should be cleared around the perimeter of special rural or special residential lots
- These firebreaks need not be strictly around the perimeter, but may deviate according to the flora
- The firebreak does not have to be ploughed but can instead be created by clearing and removing all flammable material
- Care should be taken to avoid damaging or removing significant trees and shrubs
- Avoid the build up of undergrowth and leaf litter

Appendix 5

WAPC firebreak installation approval

Daniel Panickar

From: Rachel Chapman [rachel@tbbplanning.com.au]
Sent: Thursday, 5 June 2014 3:14 PM
To: Daniel Panickar
Cc: Preston O'Keefe; Chris Bitmead
Subject: FW: 07/032 | CVJV Two Rocks | WAPC Lot 902

Daniel,

Please find below an email from WAPC confirming they have no objection to the installation of the firebreak.

We can then contact Peter Kane regarding access to the land for this purpose at the time of subdivision and any other approvals required (City of Wanneroo etc).

Regards
Rachel

Rachel Chapman
Associate Director



Taylor Burrell Barnett Town Planning & Design
187 Roberts Road Subiaco WA 6008 Telephone 9382 2911 Facsimile 9382 4586 Mobile 0419 937 316
www.taylorburrellbarnett.com.au

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From: Hillyard, Tim [mailto:Tim.Hillyard@planning.wa.gov.au]
Sent: Thursday, 5 June 2014 1:37 PM
To: Rachel Chapman
Cc: Kane, Peter
Subject: RE: 07/032 | CVJV Two Rocks | WAPC Lot 902

Rachel

Sorry for the delay in responding I also had a telephone call from Jason Carr on the suby application this morning. I will deal with the matter if I can today or on Monday at the latest (I will not be in the office tomorrow). Can you let Jason know.

As to your most recent phone call regarding access to Lot 902 to install a fire break the person to liaise with is the Field Management Coordinator Peter Kane on 65519016 (Mob 0427 089 189). The WAPC has no objections to the installation of a firebreak on Lot 902 which was acquired for the original rail corridor.

cheers

Tim Hillyard | Strategic Property Unit Manager | Strategic Corporate Support
Department of Planning | 140 William Street | Perth WA 6000
T (08) 65519044 | F (08) 6551 9001 | M 0458 970 043
E Tim.Hillyard@planning.wa.gov.au | W www.planning.wa.gov.au



From: Rachel Chapman [<mailto:rachel@tbbplanning.com.au>]
Sent: Tuesday, 3 June 2014 3:37 PM
To: Hillyard, Tim
Cc: Mark Elliss
Subject: 07/032 | CVJV Two Rocks | WAPC Lot 902

Hi Tim,

As per my phone message, Lot 902 (No. 621) Shearwater Ave, Two Rocks (CT attached) is owned by the WAPC and was formerly reserved in the MRS for railway purposes. The land is now zoned for urban purposes and will be subject to future subdivision and development in accordance with the Yanchep-Two Rocks (St Andrews) District Structure Plan (DSP).

We have recently submitted a subdivision application for part of Lot 500 (WAPC Ref: 150054 – subdivision plan attached) which adjoins Lot 902 to the west. It is proposed to be subdivided and developed in accordance with the approved Two Rocks LSP No. 69.

In accordance with WAPC requirements, we have undertaken a bushfire hazard assessment and prepared a draft Bushfire Management Plan which recommends the construction of an interim 30m wide firebreak within Lot 902 (until adjacent land is developed) for emergency services access and to provide a defensible space between vegetation and homes.

In order to implement this recommendation, the developer of Lot 500 will require access to Lot 902 for the purpose of constructing and maintaining a firebreak or a commitment from WAPC that it will construct and maintain a firebreak.

Can you please confirm that WAPC supports the construction and maintenance of such a firebreak by the developer of Lot 902, which is proposed to be undertaken as part of the subdivision works. Can you also confirm the process and agreements required in order to do so.

We would like to commence this agreement process as a matter of priority to ensure we have all necessary approvals in place for commencement of site works in October 2014. We would be happy to meet if necessary and provide copies of plans.

Regards

Rachel

Rachel Chapman
Associate Director



Taylor Burrell Barnett Town Planning & Design

187 Roberts Road Subiaco WA 6008 Telephone 9382 2911 Facsimile 9382 4586 Mobile 0419 937 316

www.taylorburrellbarnett.com.au

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Appendix 6

AFAC bush fire glossary

BUSHFIRE GLOSSARY

Prepared by Rural and Land Management Group for
AFAC Agencies

January 2012



Disclaimer

While all possible care has been taken to ensure a comprehensive and accurate publication, the Australasian Fire Authorities Council and its servants or agents shall not be liable for technical or editorial errors contained herein or omissions there from; nor for incidental or consequential liability in any way resulting from the information or advice that is contained in this publication or use of that material.

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January 2012

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<http://knowledgeweb.afac.com.au/>

Preface

The AFAC Bushfire Glossary has been developed to promote an exchange of information between member agencies on terminology used specifically in bushfires.

The Glossary has been developed based on a set of agreed business rules. It includes the bushfire technical terms, their definition or description as adopted and applied by the AFAC member agencies. It does include some fire terms that are of a general industry wide nature for completeness. It excludes terms for which an agreed definition could not be reached by the member agencies.

This document is not designed to be a text book or to provide a discussion of a term beyond the definition/description of that term. Nor is it an attempt to modify or redefine terms defined in codes, standards or legislation. Terms that have been adopted for use by the fire management industry from another discipline will maintain the meaning ascribed to them in their originating discipline.

It is proposed that this Glossary will be reviewed regularly to ensure that it continues to be relevant and meets the needs of AFAC member agencies. This is the fifth review. It is the current 2012 version.

AFAC acknowledges the significant contribution of the Rural and Land Management Glossary Working Group lead by Greg Esnouf and Country Fire Authority staff, Matthew Fraser and Jo Richards, who contributed generously of their time and expertise in the establishment of this document and the work of the Genesis Institute to provide a framework for refining the glossary.

Previous versions of the Glossary were titled Wildfire Glossary. The term wildfire has been replaced with the term bushfire in line with a trend towards using language more accepted by the general public.

The terms appear in alphabetical order excluding spaces. In this way it is possible to find a compound word without knowing if it is one or two words.

Aim

The purpose of this Glossary is to seek to facilitate a greater understanding by using common language between bushfire and land management agencies and support organisations during the prevention of, preparedness for, response to and recovery from bushfires.

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Bushfire Glossary

Term	Definition
Accelerant	Any substance (such as oil, gasoline, etc) that is applied to a fuel-bed to expedite the burning process.
Adaptor	A fitting used to couple different sized hoses, hoses of the same size with different threads, or different types of couplings, or to connect the male to male, or female to female parts of the same type of coupling.
Adsorption	The taking in of water vapour from the air by dead plant material.
Advance burn	A prescribed fire that reduces fuel through a forest area before felling operations. It is intended to improve the safety of timber harvesting operations and as a silvicultural tool to protect lignotubers and standing trees.
Advancing fire	That portion of the fire with rapid fire spread and higher intensity which is normally burning with the wind and/or up slope.
Aerial detection	The discovering, locating and reporting of fires from aircraft.
Aerial fuel	See: Elevated fuel
Aerial ignition	Ignition of fuels by dropping incendiary devices or materials from aircraft.
Aerial ignition device (AID)	Inclusive term applied to equipment designed to ignite wildland fuels from an aircraft.
Aerial Observer	See: Air Observer
Aerial reconnaissance	Use of aircraft for detection of fires and observing fire behaviour, values-at-risk, suppression activity, and other critical factors to facilitate command decisions on strategy and tactics needed for fire suppression.
Aerosol	Airborne solid or liquid particles dispersed or suspended in a gas stream.
After action review (AAR)	A discussion, focused on performance standards, of an event that enables those involved to discover what happened, why it happened, and how to sustain strengths and improve on weaknesses. An After action review is a tool incident command personnel and units can use to get maximum benefit from every incident. It provides a review of the incident upon its completion to identify and discuss effective and non-effective performance and lessons learned and how to apply them in the future. (adapted from NWCG)
AIIMS structure	The combination of facilities, equipment, personnel, procedures, and communications operating within a common organisational structure with responsibility for the management of allocated resources to effectively accomplish stated objectives relating to an incident (AIIMS).
Air attack	The direct use of aircraft in the suppression of bushfires.
Air attack Supervisor	Primarily responsible for the safety and efficient tactical coordination of aircraft operations when fixed and/or rotary firebombing aircraft are operating at a fire (Air Attack Supervisor Training Manual).
Air base Manager	An experienced, trained person who is appointed to manage all the functions and personnel on an air base or helicopter base.
Air mass	A meteorological term referring to an extensive body of air within which the conditions of temperature and moisture in a horizontal plane are essentially uniform.
Air Observer	The primary role of the air observer is to aerially obtain intelligence to assist the planning of fire suppression operations (NSWRFS).
Air operations	The use of aircraft in support of an incident for the purposes of suppression, transportation of personnel, equipment or supplies, or for aerial reconnaissance.

Bushfire Glossary

Term	Definition
Air operations Manager	The air operations manager position is responsible for overall coordination of air operations and air support activities in support of an incident.
Aircraft Officer	The aircraft officer is responsible for ground operations and overall provision of support, enabling a safe and efficient air operation to be conducted.
Airside	The parts of an airport not normally open to unauthorised people. It comprises the apron, taxiways, runways and the areas containing them.
Allocated resources	Resources working at an incident (AIIMS).
Anchor point	An advantageous location, usually a barrier to fire spread, from which to start constructing a fireline. The anchor point is used to minimize the chance of being flanked by the fire while the line is being constructed (NWCG).
Aqueous film forming-foam (AFFF)	A synthetic amber coloured liquid concentrate mixed with water to form an agent that is capable of forming water-solution films on the surface of flammable liquids that prevent the escape of fuel vapours, excludes oxygen and maintain the surface when disturbed (self healing).
Area ignition	Ignition of several individual fires throughout an area, either simultaneously or in rapid succession, and so spaced that they add to and influence the main body of the fire to produce a hot, fast-spreading fire condition. Also called simultaneous ignition.
Area of origin	General location where the fire started.
Arson	The deliberate setting of a fire where the intent of the person responsible was to cause harm or destruction to life or property.
Aspect	The direction towards which a slope faces.
Asphyxiants	Substances which interfere with the respiratory process.
Assembly area	See Staging area.
Assessment	The process of determining if an individual has the prescribed skills, knowledge and experience needed to acquire a specific capability.
Assets	Anything valued by people which includes houses, crops, forests and, in many cases, the environment.
Assisting agency	An agency directly contributing suppression, support or service resources to another agency.
Atmospheric stability	The degree to which the atmosphere resists turbulence and vertical motion.
Attack time	See Elapsed time
Australasian Inter-service Incident Management System (AIIMS)	A nationally adopted structure to formalise a coordinated approach to emergency incident management.
Automatic dispatch	See Pre-planned dispatch.
Automatic weather station (AWS)	The Bureau's standard AWSs use sensors to monitor temperature, humidity, wind speed and direction, pressure and rainfall. Various advanced sensors are available for specialised applications. These sensors can monitor cloud height (ceilometer), visibility, present weather, thunderstorms, soil temperature (at a range of depths) and terrestrial temperature. (Developed from the BOM)
Available fuel	The portion of the total fuel that would actually burn under various environmental conditions.
Available resources	The resources at an incident and available for allocation at short notice. (AIIMS)

Bushfire Glossary

Term	Definition
Backburn	<p>1. A fire started intentionally along the inner edge of a fireline during indirect attack operations to consume fuel in the path of a bushfire (Australia).</p> <p>2. A counterfire commenced from within continuous fuel for the purpose of fighting a fire (New Zealand).</p>
Back fire	See: Backburn (Preferred term).
Backing fire	The part of a fire which is burning back against the wind or down slope, where the flame height and rate of spread are reduced.
Bark fuel	The flammable bark on tree trunks and upper branches.
Bark heaps	Accumulations of bark and branch material resulting from timber harvesting operations. Soil may be mixed with bark heaps, but generally the heap is formed by a machine dropping fresh bark on the top of the heap.
Basal accumulation	Bark fallen from a tree and forming a relatively high and localized accumulation of fine fuel.
Base camp	A location where personnel are accommodated and fed for a period of time. A base camp usually contains catering, ablution and accommodation facilities, a water supply and a lighting system, and may include other facilities such as car parking maintenance and servicing. (AIIMS)
Bay(s)	A marked indentation (s) in the fire perimeter usually located between two fingers.
Beaufort wind scale	A system for estimating wind speeds based on observation of visible wind effects. A series of descriptions of visible wind effects upon land objects or sea surfaces is matched with a corresponding series of wind speed ranges, each being allocated a <i>Beaufort number</i> .
Blacking out	The process of extinguishing or removing burning material along or near the fire control line, felling stags, trenching logs to prevent rolling and the like, in order to make the fire safe.
Blackspot	An area where two-way radio coverage does not exist.
Blank cap	The metal cap used on delivery outlets and on the suction inlet of the pump to prevent discharge of water.
Blow down	See: Wind throw.
Blow up	Sudden increase in fireline intensity or rate of spread of a fire sufficient to preclude direct control or to upset existing suppression plans. Often accompanied by violent convection and may have other characteristics of a fire storm. (NWCG)
Bole	The trunk of a tree.
Bole damage	The damage to the trunk of a living tree by fire, mechanical equipment or disease.
Bracken	Bracken fern varies significantly in height and density. If Bracken is generally upright (either alive or dead) with the majority of its biomass in the top half of the plant and only the stems in touch with the ground, then it is considered to be part of the elevated fuel. If however, it has collapsed and most of its biomass is in touch with the ground, then it is considered to be Near-surface fuel.
Branch	A tapered pipe, fitted to the end of a hose line, which increases the velocity (converting pressure energy to kinetic energy) of the water or foam solution travelling through the hose, and forms an effective firefighting jet or spray.
Breakaway	The points at which a fire, after it has been contained, escapes into unburnt areas across a fireline or fire edge.

Bushfire Glossary

Term	Definition
Breeching	A device to divide one hose line into two or collect two hose lines into one.
Briefing	A general overview of an operation.
Broad area hazard reduction	Large scale removal of selected fuel before the onset of a bushfire danger period.
Broadcast burning	See: Prescribed burning (Preferred term)
Buffer	A strip or block of land on which the fuels are reduced to provide protection to surrounding lands.
Bulk water carrier	A large tanker used for replenishing water to firefighting tankers.
Burn back	See: Reburn (Preferred term).
Burning brands	Lofted burning material such as bark, usually flaming.
Burning conditions	The state of the combined components of the fire environment that influence fire behaviour and fire impact in a given fuel type. Usually specified in terms of such factors as fire weather elements, fire danger indices, fuel load and slope.
Burning off	Generally setting fire - with more or less regard to areas carrying unwanted vegetation such as rough grass, slash and other fuels.
Burning out	To intentionally light fires to consume islands of unburned fuel inside the fire perimeter.
Burning program	A program of prescribed burns scheduled these for a designated area over a nominated time, normally looking ahead over one fire season (for the coming spring to the following autumn), but can also look ahead five years or more.
Burning rotation	The period between burning of a prescribed area for management purposes.
Burning unit	A specified land area for which prescribed burning is planned.
Burn out	<ol style="list-style-type: none"> 1. A fire set to consume islands of unburnt fuel inside the fire perimeter and between the fire edge and fireline (Australia). 2. A counterfire commenced from a natural or previously constructed firebreak for the purpose of fighting a fire (New Zealand).
Burn over	A section of fire that overruns personnel and/or equipment.
Burn plan	The plan which is approved for the conduct of prescribed burning. It contains a map identifying the area to be burnt and incorporates the specifications and conditions under which the operation is to be conducted.
Bushfire	Un planned vegetation fire. A generic term which includes grass fires, forest fires and scrub fires both with and without a suppression objective.
Bushfire danger period	A period of the year either established by legislation or declared by the relevant agency, when restrictions are placed on the use of fire due to dry vegetation and the existence of conditions conducive to the spread of fire.
Bushfire management	All those activities directed to prevention, detection, damage mitigation, and suppression of bushfires. Includes bushfire legislation, policy, administration, law enforcement, community education, training of fire fighters, planning, communications systems, equipment, research, and the multitude of field operations undertaken by land managers and emergency services personnel relating to bushfire control.
Byram-Keetch Drought index (BKDI)	See: Keetch-Byram Drought Index
Cache	A predetermined complement of supplies stored in a designated location. (CIMS).
Campaign fire	A fire normally of a size and/or complexity that requires substantial firefighting resources, and possibly several days or weeks to suppress.

Bushfire Glossary

Term	Definition
Candle (Candling)	A tree (or small clump of trees) is said to candle when its foliage ignites and flares up, usually from the bottom to top.
Candlebark	Long streamers of bark that have peeled from some eucalypt species that form fire brands conducive to very long distance spotting.
Canopy	The crowns of the tallest plants in a forest – the overstorey cover.
Canopy cover	Canopy cover refers to 2 dimensions (ie plan view, area coverage)
Canopy density	Canopy density refers to 3 dimensions (ie mass/volume)
Catastrophic fire danger	The highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index greater than 100 or a Grassland fire danger index greater than 150.
Central ignition	A method of prescribed burning in which fires are set in the centre of an area to create a strong convective column. Additional fires are then set progressively closer to the outer control lines causing indraft winds to build up. This has the effect of drawing the fires towards the centre.
Chaining	The process of flattening vegetation (usually mallee or scrub) by dragging a heavy chain or cable between two large tractors or bulldozers.
Charged line	A line of fire hose filled with water under pressure and ready to use.
CIMS	Coordinated Incident Management System used in New Zealand.
Class A foam	See: Foam
Class labels	Class labels identify the type of hazardous material being stored or transported. These are grouped under broad classifications according to the predominant type of risk involved.
Climate	The atmospheric conditions of a place over an extended period of time.
Clinometer	An instrument used to measure the angle of a slope.
Cloud cover	The amount of sky covered or obscured by cloud, expressed in eighths. Eight eighths is complete cloud cover.
Coarse fuels	Dead woody material, greater than 25mm in diameter, in contact with the soil surface (fallen trees and branches). Some researchers categorise forest fuels as: fine <6 mm diameter; twigs 6-25 mm diameter; coarse >25 mm diameter.
Code of Practice	Document giving methods developed to assist compliance with acts and regulations in the performance of work.
Cold front	A cold front is the delineation between cold polar air moving towards the equator and undercutting warm tropical air moving poleward. The temperature differences across a cold front can be extreme and associated with strong winds. The warm tropical air is forced to rise and become unstable with the development of large cumuliform clouds. Severe weather such as thunderstorms, squall lines and severe turbulence may accompany these cold fronts. (BOM)
Cold trailing	A method of determining whether or not a fire is still burning, involving careful inspection and feeling with the hand, or by use of a hand-held infrared scanner, to detect any heat source.
Collecting head	A collecting head is used to collect (usually from two to four) lines into the suction inlet of a pump.
Combat agency/authority	See: Control authority
Combustion	Rapid oxidation of fuels producing heat, and often light.

Bushfire Glossary

Term	Definition
Command	The direction of members and resources of an agency in the performance of the agency's role and tasks. Authority to command is established in legislation or by agreement within an agency. Command relates to agencies and operates vertically within an agency.
Communications plan	Details the methods and systems for people to communicate with each other, the incident management structure, including the actual radio channels/mobile phone numbers. (AIIMS)
Compartment	(1) Forestry Definition – A basic administrative unit of a managed forest. (2) Building Definition - An enclosed space with floor, walls and ceiling.
Competency	Skills and knowledge and their application within an occupation to the standard of performance required in the workplace. (Vic report)
Conduction	The transfer of thermal energy between regions of matter due to temperature gradient.
Contained	The status of a wildfire suppression action signifying that a control line has been completed around the fire, and any associated spot fires, which can reasonably be expected to stop the fire's spread. (NWCG)
Contour lines	Contour lines connect points of equal elevation on a topographical map.
Control	The overall direction of response activities in an emergency situation. Authority for control is established in legislation or in an emergency response plan, and carries with it the responsibility for tasking and coordinating other agencies in accordance with the needs of the situation. Control relates to situations and operates horizontally across agencies.
Control authority	The agency, service, organization or authority with legislative responsibility for control of the incident. (Also referred to as the responsible authority or agency.) (AFAC)
Controlled	The stage during fire suppression activities at which the complete perimeter of a fire is secured and no breakaway is expected.
Controlled burning	See: Prescribed burning.
Control line	See: Fireline
Convection	1. As applied in meteorology, atmospheric motions that are predominantly vertical, resulting in vertical transport and mixing of atmospheric properties; distinguished from advection. 2. As applied in thermodynamics is a mechanism of heat transfer occurring because of the bulk movement of fluids.
Convection burn	See: Central ignition
Convection column	The rising column of smoke, ash, burning embers and other particle matter generated by a fire.
Convective activity	General term for manifestations of convection in the atmosphere, alluding particularly to the development of convective clouds and resulting weather phenomena, such as showers, thunderstorms, squalls, hail, and tornadoes. (NWCG)
Convergence zone	1. See: Junction zone. 2. In fire weather, that area where two winds come together from opposite directions and are forced upwards often creating clouds and precipitation. (NWCG)
Convoy	Two or more vehicles driving together under the control of a single Convoy Leader.

Bushfire Glossary

Term	Definition
Coordination	The bringing together of agencies and elements to ensure effective response to an incident or emergency. It is primarily concerned with the systematic acquisition and application of resources in accordance with the requirements imposed by the emergency or emergencies. Coordination relates primarily to resources and operates: <ul style="list-style-type: none"> • vertically, within an agency, as a function of the authority to command; • horizontally, across agencies, as a function of the authority to control.
Cordon	A cordon is the means to maintain an area and is used to restrict movement into and out of an area.
Coupe	A defined forest area in which timber harvesting takes place.
Crew	See: Fire crew.
Crew leader	Person responsible for the supervision and management of crews
Critical burnout time	Total time a fuel can burn and continue to feed energy to the base of a forward-travelling convection column.
Critical incident stress	Unusually strong emotional reactions which have the potential to interfere with the ability of personnel to function, either at the incident scene or later, arising from any situation faced during operations.
Critical incident stress debriefing	The process in which teams of professional and peer counsellors provide emotional and psychological support to incident personnel who are or have been involved in a critical (highly stressful) incident.
Cross bearings	Intersecting lines of sight from two or more points on the same object; used to determine the location of bushfire from lookouts.
Crown fire	A fire that advances from top to top of trees or shrubs.
Crown scorch	Browning of the needles or leaves in the crown of a tree or shrub caused by heat from a fire.
Crowning	A fire ascending into the crowns of trees and spreading from crown to crown.
Crowning potential	A probability that a crown fire may start, calculated from inputs of foliage moisture content and height of the lowest part of the tree crowns above the surface. (NWCG)
Curing	Drying and browning of herbaceous vegetation due to mortality or senescence.
Dead fuel	Fuels with no living tissue in which moisture content is governed almost entirely by absorption or evaporation of atmospheric moisture (relative humidity and precipitation). (NWCG)
Debrief	To gather information from the participants in an action so as to gauge the success or otherwise of the action at the end of the task, shift, tour or incident.
Deep-seated fire	A fire burning far below the surface in duff, mulch, peat, or other combustibles as contrasted with a surface fire.
Defensive strategy	A firefighting strategy used where the protection of life and assets is a priority when a fire is: <ul style="list-style-type: none"> (i) located in inaccessible or remote location OR (ii) too intense to be safely or effectively attacked directly.
Dehydration	Excessive loss of water from the body's tissues. Dehydration may follow any condition in which there is a rapid depletion of body fluids.
Delayed aerial ignition devices (DAID)	An incendiary device that will ignite after a predetermined time.

Bushfire Glossary

Term	Definition
Deliberate fire	A fire resulting from a person placing burning material to cause ignition. The intent of the person may have been to cause harm or destruction to life or property (arson-criminal offence) or to modify fuels and/or vegetation for land management purposes (summary offence). See also Arson.
Delivery hose	Hose used to transport water under pressure.
Delivery valve	On a pump, the valved outlet through which water is discharged.
Demobilisation	The orderly release of resources no longer required at an incident.
Depth of burn	The reduction in forest floor litter thickness (cm) due to consumption by fire. Most commonly used in connection with prescribed burning.
Desiccant	A chemical that, when applied to a living plant causes or accelerates the drying out of its aerial parts.
Desorption	The loss of moisture to the atmosphere from dead plant material.
Detection	The discovery of a fire. Individuals, fire towers, reconnaissance aircraft and automatic devices may be used, either alone or in combination.
Dew	The moisture which collects in small droplets on the surface of substances and vegetation by atmospheric condensation, chiefly at night.
Dew point temperature	This is a measure of the moisture content of the air and is the temperature to which air must be cooled in order for dew to form. The dew-point is generally derived theoretically from dry and wet-bulb temperatures, with a correction for the site's elevation. (BOM)
Dieback	The progressive dying, from the top downward, of twigs, branches or tree crowns.
Diffused pattern	A spray pattern (as opposed to straight stream) of water or foam.
Direct attack	A method of fire attack where wet or dry firefighting techniques are used. It involves suppression action right on the fire edge which then becomes the fireline.
Dispatch	The act of ordering attack crews and/or support units to respond to a fire, or from one place to another.
Division	A portion of the incident comprising of two or more sectors. The number of sectors grouped in a Division should be such as to ensure effective direction and control of operations. Divisions are generally identified by a local geographic name.
Dominant height	Mean height of the largest trees in a stand. A specified number per unit area are generally selected.
Downwind	Away from the wind direction. In the direction opposite to the direction from which the wind is blowing. The direction that smoke will travel.
Dozer	A crawler tractor fitted with a blade which can be transported to a fire on a tray truck or trailer. Dozer is a shortened form of "Bulldozer"
Dozer line	Fireline constructed by the front blade of a dozer.
Drain time	The time (minutes) it takes for foam solution to drop out from the foam mass; for a specified percent of the total solution contained in the foam to revert to liquid and drain out of the bubble structure.
Drift	The effect of wind on smoke or on a water drop.
Drip torch	A canister of flammable fuel fitted with a wand, a burner head and a fuel flow control device. It is used for lighting fires for prescribed burning, backburning and burning out.

Bushfire Glossary

Term	Definition
Drop pass	Indicates that the firefighting aircraft has the target in sight and will make a drop of fire control agent on this run over the target.
Drop pattern	The distribution of an aerially delivered fire control agent drop on the target area in terms of its length, width, and momentum (velocity x mass) as it approaches the ground. The latter determines the relative coverage level of the fire control agent on fuels within the pattern.
Drop zone (DZ)	Target area for firefighting aircraft, or cargo dropping.
Drought	Prolonged absence or marked deficiency of precipitation (rain). (BOM)
Drought index	A numerical value reflecting the dryness of soils, deep forest litter, logs and living vegetation.
Dry bulb temperature	Technically, the temperature registered by the dry-bulb thermometer of a psychrometer. However, it is identical to the temperature of the air. (Degrees Celsius). (NZ)
Dry firefighting	The suppression of a fire without the use of water. This is normally achieved by removing the fuel by the use of hand tools, burning or machinery.
Duff	The layer of decomposing vegetative matter on the forest floor below the litter layer, the original structure still being recognisable.
Ecological burning	A form of prescribed burning. Treatment with fire of vegetation in nominated areas to achieve specified ecological objectives.
Edge burning	A term used to describe perimeter burning of an area in mild conditions prior to large scale prescribed burning. This practice is used to strengthen buffers and to reduce mop-up operations.
Elevated fuel	The standing and supported combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, bark and creepers.
Embers	Glowing particles cast from the fire (as 'showers' or 'storms'). (Vic report)
Emergency centre	A facility where the coordination of the response and support to the incident is provided.
En route resources	Resources despatched to an incident that have not yet checked in. (AIIMS)
Entrapment	A situation in which individuals are exposed to life threatening or potentially life threatening conditions from which they cannot safely remove themselves.
Equilibrium moisture content (EMC)	The moisture content that a fuel element would attain if exposed for an infinite period in an environment of specified constant dry-bulb temperature and relative humidity. When a fuel element has reached its EMC, it neither gains nor loses moisture as long as conditions remain constant.
Equipment	All material supplied to an incident excluding personnel and vehicles.
Escape route	A planned route away from danger areas at a fire.
Evacuation	The temporary relocation of persons from dangerous or potentially dangerous areas to safe areas.

Bushfire Glossary

Term	Definition
Exposures	<p>Parts of the same structure or other structures or property not directly involved in the fire but at risk of being burnt or damaged if the fire is not controlled. In the bushfire context:</p> <ol style="list-style-type: none"> 1. Property that may be endangered by a fire burning in another structure or by a bushfire. In general, property within 12 metres of a fire may be considered to involve an exposure hazard, although in very large fires the danger may exist at much greater distances. 2. Direction in which a slope faces, usually with respect to cardinal directions (N, S, E, W). 3. The general surroundings of a site, with special reference to its openness to winds and sunshine.
Extinguishing agent	A substance used to put out a fire by cooling the burning material or blocking the supply of oxygen, or chemically inhibiting combustion or combinations of these mechanisms.
Extreme fire behaviour	<p>A level of bushfire behaviour characteristics that ordinarily precludes methods of direct suppression action. One or more of the following is usually involved:</p> <ul style="list-style-type: none"> • high rates of spread • prolific crowning and/or spotting • presence of fire whirls • a strong convective column. <p>Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.</p>
Extreme fire danger	The second highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 75 and 99 or a Grassland fire danger index greater between 100 and 149.
Facilities	Permanent and temporary facilities where personnel sleep, cook, maintain and repair equipment. (AIIMS)
Fall back fire control line	Any fire control line which is at a distance from the fire perimeter, and is the second control line at which the fire perimeter may be stopped should it cross the first fire control line. Also known as 'fallback line'.
Fine fuel	Fuel such as grass, leaves, bark and twigs less than 6mm in diameter that ignite readily and are burnt rapidly when dry.
Fingers	Long and narrow slivers of fire which extend beyond the head or flanks. (AFAC)
Fire	The chemical reaction between fuel, oxygen and heat. Heat is necessary to start the reaction and once ignited, fire produces its own heat and becomes self-supporting.
Fire access track	A track constructed and/or maintained expressly for fire management purposes.
Fire behaviour	The manner in which a fire reacts to the variables of fuel, weather and topography.
Fire Behaviour Analyst	Person responsible for developing fire behaviour predictions based on fire history, fuel, weather, and topography. (NWCG)amended
Fire behaviour model	A set of mathematical equations that can be used to predict certain aspects of fire behaviour.
Fire behaviour prediction	Prediction of probable fire behaviour usually prepared by a fire behaviour analyst in support of fire suppression or prescribed burning operations. (NWCG)
Fire behaviour prediction system	A system that uses a set of mathematical equations to predict certain aspects of fire behaviour in wildland fuels when provided with data on fuel and environmental conditions.

Bushfire Glossary

Term	Definition
Fire bombing	A technique of suppressing a bushfire by dropping water, foam or retardants on it from an aircraft.
Fire brand	A piece of flaming or smouldering material capable of acting as an ignition source. eg eucalypt bark.
Fire climate	The composite pattern or integration over time of the fire weather elements that affect fire occurrence and fire behaviour in a given area.
Fire control	See Fire suppression.
Fire control agent	A substance that acts as an Extinguishing agent, and or a Fire retardant and or a Fire suppressant.
Fire control line	See: Fireline.
Fire crew	A general term for two or more firefighters organised to work as a unit. (NWCG)
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. (NWCG)
Fire danger class	A segment of a fire danger index scale identified by a descriptive term and or a colour code. The classification system may be based on more than one fire danger index and an assessment of risk exposure.
Fire danger index (FDI)	A relative number denoting the potential rates of spread, or suppression difficulty for specific combinations of temperature, relative humidity, drought effects and wind speed.
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.
Fire ecology	The study of the relationships between fire, the physical environment and living organisms.
Fire edge	Any part of the boundary of a going fire at a given time. <i>NOTE:</i> The entire boundary is termed the 'fire perimeter'.
Fire effects	The physical, biological and ecological impact of fire on the environment. (NWCG)
Fire environment	The surrounding conditions, influences, and modifying forces of topography, fuel, and weather that determine fire behaviour. (NWCG)
Firefighter	Any employee, volunteer or agent of any fire agency who occupies, or is designated, to undertake a role for the purpose of fire suppression.
Firefighting operations	Any work or activity directly associated with control of fire.
Fire frequency	A general term referring to the recurrence of fire in a given area over time (NWCG). Also see: Fire regime
Fire front	The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smouldering combustion. (NWCG)
Fireground	The area in the vicinity of a fire suppression operations, and the area immediately threatened by the fire. It includes burning and burnt areas; constructed and proposed fire lines; the area where firefighters, vehicles, machinery and equipment are located when deployed; roads and access points under traffic management control; tracks and facilities in the area surrounding the actual fire; and may extend to adjoining area directly threatened by the fire.

Bushfire Glossary

Term	Definition
Fire hazard	A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control.
Fire intensity	See: Fireline intensity.
Fireline	A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of fire.
Fireline intensity	The rate of energy release per unit length of fire front usually expressed in kilowatts per metre (Kw/m). The rate of energy release per unit length of fire front, defined by the equation $I = Hwr$, where I = fireline intensity (kW/m) H = heat yield of fuel (kJ/kg)-16,000 kJ/kg w = dry weight of fuel consumed (kg/m ²) (mean total less mean unburnt) r = forward rate of spread (m/s) The equation can be simplified to $I = w r/2$ where I = fireline intensity (kW/m) w = dry weight of fuel consumed (tonnes/ha) r = forward rate of spread (m/hr)
Fire lookout	A structure strategically located and manned to detect the occurrence and the location of fires. It may be a tower or a structure on a high point
Fire management	All activities associated with the management of fire prone land, including the use of fire to meet land management goals and objectives.
Fire potential	The chance of a fire or number of fires occurring of such size, complexity or impact that requires resources (both a pre-emptive management and suppression capability) from beyond the area of the fire origin. (BCRC)
Fire preparedness	All activities undertaken in advance of bushfire occurrence to decrease its extent and severity and to ensure more effective fire suppression.
Fire prevention	All activities concerned with minimising the incidence of bushfire particularly those of human origin.
Fire regime	The history of fire in a particular vegetation type or area including the frequency, intensity and season of burning. It may also include proposals for the use of fire in a given area. (AFAC)
Fire report	An official record of a fire, generally including information on cause, location, action taken, damage, costs, etc., from start of the fire until completion of suppression action. These reports vary in form and detail from agency to agency (NWCG). Also see Report of Fire
Fire retardant	A chemical generally mixed with water, designed to retard combustion by a chemical reaction. It is applied as slurry from the ground or air to fuels ahead of the fire.
Fire risk	Processes, occurrences or actions that increase the likelihood of fires occurring.
Fire run	A rapid advance of a fire front. It is characterised by a marked transition in intensity and rate of spread.
Fire scar	1) A healing or healed-over injury caused or aggravated by fire on a woody plant. 2) A mark left on a landscape by fire.
Fire season	The period during which bushfires are likely to occur, spread and do sufficient damage to warrant organised fire control.
Fire simulator	A device that imposes simulated fire and smoke on a projected landscape scene, for the purpose of informing fire suppression personnel of potential fire situations either for an actual fire or hypothetical fire(s).
Fire spread	Development and travel of fire across surfaces.

Bushfire Glossary

Term	Definition
Fire storm	Violent convection caused by a large continuous area of intense bushfire often characterised by destructively violent surface indrafts, a towering convection column, long distance spotting, and sometimes by tornado-like whirlwinds. (AFAC)
Fire suppressant	An additive designed to reduce the surface tension of water and/or to hold water in suspension thus increasing water's efficiency as a fire extinguishing agent. Suppressants are applied directly to the burning fuels.
Fire suppression	The activities connected with restricting the spread of a fire following its detection and before making it safe.
Fire suppression organisation	<ol style="list-style-type: none"> 1. The personnel and equipment collectively assigned to the suppression of a specific fire or group of fires. 2. The personnel responsible for fire suppression within a specified area. 3. The management structure, usually shown in the form of an organization chart of the persons and groups having specific responsibilities in fire suppression. (NWCG)
Fire suppression plan	See Incident action plan (IAP).
Fire tetrahedron	An instructional aid in which the sides of the tetrahedron (comprising 4 triangular shaped figures) are used to represent the 4 components of combustion and flame production process-fuel, heat, oxygen and the chemical chain reaction.
Fire threat	The impact a fire will have on a community.
Fire tower	Tower strategically located and manned to detect and report the occurrence and location of fires. A type of Fire lookout
Fire training simulator	A training device that imposes simulated fire and smoke on a projected landscape scene, for the purpose of instructing fire suppression personnel in fire situations and fire suppression techniques.
Fire triangle	Diagrammatic expression of the three elements that are necessary for a fire to occur. FUEL – HEAT – OXYGEN. The removal of any one of these will extinguish a fire.
Fire weather	Weather conditions which influence fire ignition, behaviour, and suppression. (NWCG)
Fire weather forecast	A weather prediction specially prepared for use in wildland fire operations and prescribed fire. (NWCG)
Fire whirl	Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to over 500 feet in diameter. Large fire whirls have the intensity of a small tornado. (NWCG)
Fire wind	The inflow of air close to a fire caused by the action of convection. It is not to be confused with a prevailing wind.
First attack	See: Initial attack
Fixed wing aircraft	A heavier than air aircraft which obtains lift for flight by forward motion of wings through the air.
Flame angle	The angle of the flame in relation to the ground, caused by wind direction or the effect of a slope.
Flame depth	The depth of the zone within which continuous flaming occurs behind the fire edge.

Bushfire Glossary

Term	Definition
Flame height	The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope. (NWCG)
Flame length	The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity. (NWCG)
Flame Zone	The highest level of bushfire attack as a consequence of direct exposure to flames from the fire front in addition to heat flux and ember attack. (AS 3959 - 2009)
Flame zone	The area around fuels where the combustion of gases occurs to form flames.
Flaming zone	See: Flame zone.
Flammability	The ease with which a substance is set on fire.
Flammable	Capable of being ignited and of burning with a flame.
Flank attack	Obtaining control of a fire by attacking its side/s (flank).
Flanks of a fire	Those parts of a fire's perimeter that are roughly parallel to the main direction of spread. (NWCG)
Flare up	Any sudden acceleration of fire spread, or intensification of fire, or a part of the fire. A flare up is of relatively short duration and does not radically change existing control plans. (NWCG)
Flash fire	A fast moving fire consuming most of the fine fuels available.
Foam	Foam is a mass of bubbles formed by mixing air with water and a foam concentrate in specific proportions. It is used as a firefighting agent to form a smothering, cooling and/or ignition preventing layer of the surface over a fuel.
Foam blanket	A layer of foam which forms an insulating and reflective barrier to heat and is used for fuel protection, suppression, and mop-up. (NWCG)
Foam Class A	A mixture of foam concentrate & water specifically formulated for extinguishing bushfires. The foam is biodegradable, non toxic and is used at very low concentrates. It may be delivered aspirated or non-aspirated. (See also Foam solution).
Foam Class B	A foam formulated for application on Class B fires
Foam concentrate	The concentrated foaming agent as received from the manufacturer which, when added to water, creates a foam solution.
Foam inductor	Equipment consisting of an inlet connection, ejector pump and a discharge assembly, for the induction of foam concentrate.
Foam solution	The mixture of water and foam concentrate.
Forest	An area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potentially mature stand height exceeding 2 metres and with existing or potential crown cover of overstorey strata about equal to or greater than 20 per cent. This definition includes Australia's diverse native forests, woodlands and plantations, regardless of age.
Forest fire	A fire burning mainly in forest and/or woodland.
Forest type	A category for describing a forest commonly based on the predominant tree species, tree form and structure.

Bushfire Glossary

Term	Definition
Forward looking infrared (FLIR)	Hand held or aircraft mounted device designed to detect heat differentials and display them. FLIRs have thermal resolution similar to IR line scanners, but their spatial resolution is substantially less; commonly used to detect hot spots and flare ups obscured by smoke, evaluate the effectiveness of firing operations, or detect areas needing mop-up. (NWCG)
Forward rate of spread (FROS)	The speed with which a head fire moves in a horizontal direction across the landscape.
Frontal fire intensity	See: Fireline Intensity
Front end loader	Earthmoving equipment designed to move loose earth and/or loads into vehicles. A multi-purpose bucket is fitted to articulated arms at the front of the vehicle. May be either wheeled or tracked.
Fuel	Any material such as grass, leaf litter and live vegetation which can be ignited and sustains a fire. Fuel is usually measured in tonnes per hectare. Related Terms: Available fuel, Coarse fuel, Dead fuel, Elevated dead fuel, Fine fuel Ladder fuels, Surface fuels, and Total fine fuel.
Fuel age	The period of time lapsed since the fuel was last burnt.
Fuel arrangement	A general term referring to the spatial distribution and orientation of fuel particles or pieces. (NWCG)
Fuel array	The totality of fuels displayed in a location: fine and coarse, live and dead. (Vic report)
Fuel assessment	The estimation or calculation of total and available fuel present in a given area.
Fuel bed depth	Average height of surface fuels contained in the combustion zone of a spreading fire front. (NWCG)
Fuelbreak	A natural or manmade change in fuel characteristics which affects fire behaviour so that fires burning into them can be more readily controlled.
Fuelbreak system	A series of modified strips or blocks tied together to form continuous strategically located fuel breaks around land units.
Fuel continuity	The degree or extent of continuous or uninterrupted distribution of fuel particles in a fuel bed thus affecting a fire's ability to sustain combustion and spread. This applies to aerial fuels as well as surface fuels.
Fuel depth	The average distance from the bottom of the litter layer to the top of the layer of fuel, usually the surface fuel.
Fuel load	The oven dry weight of fuel per unit area. Commonly expressed as tonnes per hectare. (AFAC). (Also known as fuel loading)
Fuel management	Modification of fuels by prescribed burning, or other means. (AFAC)
Fuel map	A map showing areas of varying fuel quantities and types and usually indicates past fire history.
Fuel model	Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified. (NWCG)
Fuel modification	Manipulation or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control (e.g., lopping, chipping, crushing, piling and burning).(NWCG)
Fuel moisture content	The water content of a fuel expressed as a percent of the oven dry weight of the fuel particle. (%ODW)

Bushfire Glossary

Term	Definition
Fuel moisture differential	A term used to describe the situation where the difference in the moisture content between fuels on adjacent areas results in noticeably different fire behaviour on each area.
Fuel profile	The vertical cross section of a fuel bed down to mineral earth.
Fuel quantity	See: Fuel load.
Fuel reduction	Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.
Fuel reduction burning	The planned application of fire to reduce hazardous fuel quantities; undertaken in prescribed environmental conditions within defined boundaries.
Fuel separation	The action of separating fuel for the purpose of providing a mineral earth firebreak. Also means the actual gap between fuel layers or particles eg gap between individual hummock grasses or gap between surface and canopy fuels
Fuel type	An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause predictable rate of spread or difficulty of control under specified weather conditions. (AFAC)
Fuel weight	See Fuel load.
General origin area	The larger area where the fire started that is readily identifiable based on macro scale indicators and witness statements. (NWCG)
Going fire	Any bushfire which is expanding and suppression actions have not yet contained the fire.
Grass fire	Any fire in which the predominant fuel is grass or grass like. (NWCG)
Grassland curing	The proportion of dead material in grasslands – usually increases over summer as tillers die off and dry out, increasing the risk of grassland fire.
Grid ignition	A method of lighting prescribed fires where ignition points are set individually at a predetermined spacing through an area.
Ground crew	See: Hand crew.
Ground fire	Fire that consumes the organic material beneath the surface litter ground, such as a peat fire. (NWCG)
Ground fuel	All combustible materials below the surface litter, including duff, roots, peat and saw dust dumps that normally support a glowing or smouldering combustion without flame.
Habitat	The local environment of conditions in which an animal or plant lives.
Hand crew	A fire suppression crew trained and equipped to fight fire with hand tools.
Hand line	A fireline constructed with hand tools. (NWCG) (Wildfire context)
Hand trail	See Hand line.
Hang up	A situation in which a tree is lodged in another and prevents it from falling to the ground.
Hazard	A source of potential harm or a situation with potential to cause loss.
Hazard reduction	See: Fuel Management
Head	See: Head Fire
Head attack	Directly knocking down the head of a fire. Recommended only for low intensity fires where firefighters can be sure that the fire will not flare up unexpectedly.
Head fire	The part of a fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind or upslope.

Bushfire Glossary

Term	Definition
Heat exhaustion	A form of shock, due to depletion of body fluids resulting from overexposure to a hot environment.
Heat stress	Illness caused by the body overheating.
Heat stroke	A life-threatening condition that develops when the body's temperature-regulating and cooling mechanisms are overwhelmed and body systems begin to fail.
Heat transfer	The transfer of thermal energy from one physical system to another by conduction, convection or thermal radiation.
Heavy fuels	See: Coarse fuels.
Heel	See: Rear (Preferred term).
Heel fire	See: Backing Fire.
Helibase (HB)	A location for parking, refuelling and maintenance of helicopters operating in support of an incident.
Helicopter	A form of heavier-than-air, rotor-wing aircraft whose lift is produced by engine-driven rotors which behave as if they were both propellers and wings.
Helipad (HP)	A designated location which meets specific requirements for a helicopter to take off and land.
Helitack crew	An initial attack crew specially trained in the tactical and logistical use of helicopters for fire suppression.
Heli-torch	An aerial ignition device hung from or mounted on a helicopter to disperse ignited lumps of gelled gasoline. Used for backburns, burnouts, or prescribed burns. (NWCG)
High fire danger	The second lowest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 25 and 49 or a Grassland fire danger index between 25 and 49.
High intensity fire	Fires with an average intensity greater than 3000 kW.m ⁻¹ and flame heights greater than 3 m, causing complete crown scorch or possibly crown fires in forests. Uncontrollable by direct attack. The term is also applied to stationary fires burning in very high fuel loads (such as logging slash).
Hold over fire	See: Sleeper
Hop over	See: Breakaway.
Hose bandage	A means of affecting a temporary repair to a canvas or synthetic hose.
Hose strangler	A crimping device for stopping the flow of water in a hose.
Hot Refueller	A trained person responsible for the operation of the equipment for the 'hot' refuelling of helicopters.
Hot spot	<ol style="list-style-type: none"> 1. A particularly active part of a fire. 2. An area of smouldering fuels requiring to be extinguished during patrol operations.
Humus	Layer of decomposed organic matter on the forest floor beneath the fermentation layer and directly above the soil. It is that part of the duff in which decomposition has rendered vegetation unrecognizable and mixing of soil and organic matter is underway. See Also: Duff & Litter
Hygrometer	An Instrument which measures the humidity in the air.
Ignition	The beginning of flame production or smouldering combustion; the starting of a fire.

Bushfire Glossary

Term	Definition
Ignition pattern	The manner in which a prescribed burn, backburn, or burnout is set, determined by weather, fuel, ignition system, topographic and other factors having an influence on fire behaviour and the objective of the burn.
Ignition source	A source of energy sufficient to initiate combustion.
Incendiary	A burning compound or metal used to produce intense heat or flame, like a bomb.
Incendiary device	Device designed and used to start a fire.
Incident	Any unplanned event requiring emergency intervention. (AIIMS)
Incident Action Plan (IAP)	The plan used to describe the incident objectives, strategies, resources and other information relevant to the control of an incident. (AIIMS)
Incident control	See: Incident management
Incident Control Centre (ICC)	The location where the Incident Controller and various members of the Incident Management Team provide overall direction of response activities. (See also Incident Control Point)
Incident Controller	The individual responsible for the management of all incident control activities across a whole incident (AIIMS)
Incident Control Point (ICP)	The location where the Incident Controller and, where established, members of the Incident Management Team provide overall direction of response activities in an emergency situation. (See also Incident Control Centre)
Incident control system (ICS)	A command structure to systematically and logically manage suppression of emergency incidents including bushfires, from small, simple incidents to large, difficult or multiple situations. It is designed to develop in modular fashion from the top (Incident Controller) downwards. Refer NIMS, AIIMS, CIMS
Incident management	The process of controlling the incident and coordinating resources. (EMA)
Incident Management Team (IMT)	The group of incident management personnel comprising the Incident Controller, and the personnel he or she appoints to be responsible for the functions of Operations, Planning and Logistics. (AIIMS)
Incident objective	An incident objective is a goal statement indicating the desired outcome of the incident. Incident objectives guide the development of the Incident Action Plan and must reflect the policies and needs of the control authority and supporting agencies. All factors affecting the incident and its potential impact must be considered before determining the objective. (AIIMS)
Incident strategies	The incident strategies will be developed from the incident objectives and will describe how the Incident Management Team plans to resolve the incident. There is a requirement for strategies to be developed throughout the incident and they should be reviewed for each operational period. (AIIMS)
Indirect attack	A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuelbreaks and favourable breaks in the topography. The intervening fuel is usually backburnt; but occasionally the main fire is allowed to burn to the line, depending on conditions.(NWCG)
Induced wind	See: Fire wind.
Infrared scanning	Use of an optical-electronic system for identifying or obtaining imagery of thermal infrared radiation to detect non-smoking fires or fire perimeters through smoke.
Initial attack	The first suppression work on a fire.

Bushfire Glossary

Term	Definition
Instability	The tendency for air parcels to accelerate when they are displaced from their original position; especially, the tendency to accelerate upward after being lifted. Instability is a prerequisite for severe weather - the greater the instability, the greater the potential for severe thunderstorms. (Weather Zone)
Interface	See: Urban Rural interface.
Inversion	A layer of the atmosphere in which temperature increases with increasing elevation. A condition of strong atmospheric stability.
Island	An unburnt area within a fire perimeter.
Isobar	Lines on weather maps joining places which have the same air pressure.(BOM)
I zone	See: Urban Rural interface.
Jump fire	See: Spot fire
Jump over	See: Breakaway
Junction zone	An area of greatly increased fire intensity caused by two fire fronts (or flanks) burning towards one another.
Keetch-Byram Drought Index (KBDI)	A numerical value reflecting the dryness of soils, deep forest litter, logs and living vegetation, and expressed as a scale from 0 - 200 where the number represents the amounts of rainfall (mm) to return the soil to saturation.
Knock down	To reduce the flame or heat on the more vigorously burning parts of a fire edge. (NWCG)
Ladder fuels	Fuels that provide vertical continuity between strata. Fire is able to carry surface fuels into the crowns of trees with relative ease.
Lag time	The time delay in fuel moisture content responding to changing environmental conditions (for example, relative humidity). Technically, it is the time necessary for a fuel particle to lose approximately 63% of the difference between its initial moisture content and its equilibrium moisture content.
Lead agency	The organisation with the legislative or agreed authority for control of an incident.
Lee (leeward)	Away from the wind, on the sheltered side of something that the wind is blowing on.
Legislation	A set of rules made by a State, Territory or Federal Government; includes acts and regulation.
Light fuel	An assessment of fuel quantity indicating a low weight.
Lighting pattern	See: Ignition pattern.
Lightning	The flash of light accompanying a sudden electrical discharge which takes place from or inside a cloud, or less often from high structures or the ground or from mountains. A large electrical spark. Caused when the negative charge in the lower part of the cloud and the positive charge in the upper part of the cloud become so great that they can overcome the natural resistance of the air and discharge between negative and positive takes place. (BOM)
Lightning fire	A fire caused by lightning.
Lightning formation	See: Lightning.
Light patrol unit	See: Tanker.
Line ignition	See: Strip burning.

Bushfire Glossary

Term	Definition
Litter	The top layer of the forest floor composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves and needles, little altered in structure by decomposition. (The litter layer of the forest floor). (NWCG)
Litter bed fuel	Dead fine fuel, including surface fuel and fuel lower in the fuel profile.
Litter fall	The addition of litter that falls from vegetation to the forest floor.
Living fuels	Fuels made up of living vegetation.
Living shrub fuel	Living understorey fine fuel less than 2 metres above ground level.
Local winds	Winds which are generated over a comparatively small area by local terrain and weather. They differ from those which would be appropriate to the general pressure pattern. (NWCG)
Log	Documentation of information and actions arising during an incident
Logistics	The provision of facilities, services and materials in support of an incident.
Lookout	<ol style="list-style-type: none"> 1. A person designated to detect and report fires from a fixed vantage point. 2. A member of a fire crew designated to observe the fire and warn the crew when there is danger. 3. For structure see: Fire lookout
Lookout tower	See: Fire tower.
Low intensity fire	A fire which travels slowly and only burns lower storey vegetation, like grass and lower tree branches, with an average intensity of less than 500 kW.m ⁻¹ and flame height less than 1.5m. Usually causes little or no crown scorch and is easily controlled.
Low-moderate fire danger	The lowest fire danger rating as determined by fire agencies and generally with a Forest fire danger index less than 12 or a Grassland fire danger index less than 12.
Medium fuels	See Course fuels.
Mineral earth	When used in the context of fire control refers to a non-flammable surface (either natural or prepared) which provides a break in understorey, litter and humus fuels and hence a barrier (of varied effectiveness depending, amongst other things, on its width and the intensity of the approaching fire) to fire travelling on or near the ground surface.
Mobilisation	The processes and procedures for organisations to activate, assemble, and transport the requested resources to an incident.
Moisture content	See Fuel moisture content.
Mopping up	See Blacking out
Mosaic	Used in reference to the spatial arrangement of burnt and unburnt fuels at either a local or a landscape scale.
Move up method	See: Step-up method
Multi-agency response	The response to an incident where one or more agencies assist the jurisdictional control agency or agencies.
Multiple fire situation	A circumstance of high fire incidence over short periods of time in any administrative unit, usually overtaxing the normal initial attack capability of the unit.
Natural barrier	Any area where lack of flammable material obstructs the spread of vegetation fires.

Bushfire Glossary

Term	Definition
Near surface fuel	Live and dead fuel, including suspended leaves, bark or twigs, effectively in touch with the ground but not lying on it, with a mixture of vertical and horizontal orientation.
Needle bed	A fuel bed consisting mainly of pine needles.
Nozzle	A fitting that is used with a branch to control the size, pattern and/or velocity of water or extinguishing medium being discharged.
One lick method	A progressive system of building a fireline on a wildfire without changing relative positions in the line. Each worker does one to several "licks", or strokes removing a set proportion of the fuel on the line, with a given tool and then moves forward a specified distance to make room for the worker behind. (NWCG)
Operations	The direction, supervision and implementation of tactics in accordance with the Incident Action Plan.
Operations point	The location from which the overall field operations are commanded by the Operations Officer. (AIIMS)
Parallel attack	Method of fire suppression in which fireline is constructed approximately parallel to, and just far enough from the fire edge to enable workers and equipment to work effectively, though the fireline may be shortened by cutting across unburned bays. The intervening strip of unburned fuel is normally burned out as the control line proceeds but may be allowed to burn out unassisted where this occurs without undue delay or threat to the fireline. (NWCG)
Parallel fire suppression	See: Parallel attack.
Parallel method	See: Parallel attack.
Parts of a Fire	See: Bay(s), Fingers, Flanks of a fire, Head.
Patch burning	Burning in patches to prepare sites for group planting or sowing or to form a barrier to subsequent fires. (NWCG)
Patrol	<ol style="list-style-type: none"> 1. To travel over a given route to prevent, detect, and suppress fires. Includes interaction with the public for wildland fire prevention and educational purposes. 2. To go back and forth vigilantly over a length of control line during and/or after construction to prevent breakaways, suppress spot fires, and extinguish overlooked hot spots. 3. A person or group of persons who carry out patrol actions. (NWCG)
Peat	An amorphous organic material formed by anaerobic decomposition which usually means that the area is seasonally or permanently inundated with water. Peat fires burn by smouldering combustion and generate very high amounts of energy per unit area.
Perimeter	See: Fire perimeter.
Peri urban interface	See: Urban rural interface.
Permit burn	A burn carried out under permit from a Fire Authority.
Personal protection equipment (PPE)	The equipment and clothing designed to mitigate the risk of injury from the chemical, physical and thermal hazards that may be encountered at an incident.
Personal protective clothing (PPC)	The clothing designed to mitigate the risk of injury from the chemical, physical and thermal hazards that may be encountered at an incident.
Plan of attack	See: Incident Action Plan (Preferred term)
Planned burning	See: Prescribed burning.
Pocket	See: Island.

Bushfire Glossary

Term	Definition
Point of attack	The part of the fire on which work is started when suppression forces arrive.
Point of origin	The specific location where the fire started.
Portable dam	A temporary water storage used in conjunction with power pumps and hose lines.
Predicted rate of spread	The rate of spread predicted by the application of fire spread models utilising appropriate inputs of fuel conditions, topography and weather. Also see Rate of Spread.
Pre-incident plan	Advanced planning and preparation for an emergency situation.
Pre-suppression plan	See Pre-Incident Plan
Prepared community	A community that has developed effective emergency management arrangements at the local level, resulting in: <ul style="list-style-type: none"> • An alert, informed and active community that supports its voluntary organizations • An active and involved local government • Agreed and coordinated arrangements from prevention, preparedness, response and recovery.
Preparedness	All activities undertaken in advance of the occurrence of an incident to decrease the impact, extent and severity of the incident and to ensure more effective response activities.
Pre-planned dispatch	The pre-planned dispatch of designated suppression forces to fires in predetermined zones. It is usually dependent on the location of the fire, and the forecast fire danger.
Prescribed burn	A fire utilised for Prescribed burning.
Prescribed burn plan	See: Burn plan.
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.
Prescribed fire	Any fire ignited by management actions to meet specific objectives. A written, approved burn plan must exist, and approving agency requirements (where applicable) must be met, prior to ignition.
Prescription	A written statement defining the objectives to be attained during prescribed burning.
Prevention	All activities concerned with minimising the occurrence of incidents, particularly those of human origin.
Profile litter moisture content	The moisture content, expressed as a percentage of oven-dry weight, of the entire leaf litter bed above the mineral soil surface.
Profile moisture content	See Fuel moisture content.
Psychrometer	The general name for instruments designed for determining the relative humidity of the air. A psychrometer consists of wet and dry bulb thermometers, generally with the aid of psychrometric tables or a psychrometric slide rule. (BOM)
Pulaski tool	A combination chopping and trenching tool widely used in fireline construction, which combines a single-bitted axe blade with a narrow adze-like trenching blade fitted to a straight handle. (NWCG)
Pumper	A firefighting vehicle equipped with a large capacity pump, water tank and hose. Generally intended to be operated when stationary, from reticulated or static water supplies.

Bushfire Glossary

Term	Definition
Quick-fill pump	A high volume water pump used for filling tankers.
Rain gauge	The general name for instruments designed to measure the amount of rain that has fallen.
Rakehoe (McLeod tool)	A hand tool used for bushfire fighting, consisting of a combination of a heavy rake and hoe.
Rate of spread (ROS)	The speed with which a fire moves in a horizontal direction across the landscape at a specified part of the fire perimeter. See also Forward rate of spread.
Reaction time	The time taken between the report of a fire or incident, and the departure of the crew. See also Response time.
Rear	<ol style="list-style-type: none"> 1. That portion of a fire spreading directly into the wind or down slope. 2. That portion of a fire edge opposite the head. 3. Slowest spreading portion of a fire edge. Also called heel of a fire. (NWCG)
Reburn	Repeat burning of an area over which a fire has previously passed, but left fuel that later ignites when burning conditions are more favourable. (NWCG)
Reconnaissance	To examine a fire area to obtain information about current and probable fire behaviour and other related fire suppression information. (NWCG)
Recovery	The coordinated process of supporting emergency affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical wellbeing.
Red Flag Warning	A process for passing critical safety information to incident suppression resources and support resources on which they can base decisions regarding strategy, tactics and deployment.
Regeneration burn	A burn lit under prescribed conditions for the purpose of achieving regeneration of a particular vegetation type.
Re-ignition	The action of a material that ignites again after it has been extinguished.
Relative humidity (RH)	The amount of water vapour in a given volume of air, expressed as a percentage of the maximum amount of water vapour the air can hold at that temperature.
Relay pumping	Using a series of pumps positioned at intervals along a line or lines of hose to share the workload of pumping water over a long distance.
Relief	The replacement of personnel whose period of time at the incident has concluded.
Report of fire	The notification of the detection of a fire to the fire service. (AFAC)
Residence time	The time required for the flaming zone of a fire to pass a stationary point; the width of the flaming zone divided by the rate of spread of the fire.
Resources	All personnel and equipment available, or potentially available, for incident tasks.
Response	Actions taken in anticipation of, during, and immediately after an incident to ensure that its effects are minimised, and that people affected are given immediate relief and support.
Response time	The time taken between the report of a fire or incident, and arrival at the scene. It includes both reaction time and travel time.
Responsible authority	See: Control authority.
Retardant	See: Fire retardant.

Bushfire Glossary

Term	Definition
Risk	The exposure to the possibility of such things as economic or financial loss or gain, physical damage, injury or delay, as a consequence of pursuing a particular course of action. The concept of risk has two elements, i.e. the likelihood of something happening and the consequences if it happens. (AS4360)
Risk analysis	A systematic use of available information to determine how often specific events may occur and the magnitude of their likely consequences.
Road Management Point	A strategic position from which traffic can be observed and controlled. (See also Traffic Management Point and Vehicle Control Point)
Rural	Any area wherein residences and other developments are scattered and intermingled with forest, range, or farm land and native vegetation or cultivated crops.
Rural urban interface (RUI)	See Urban rural interface
Safe	The stage of bushfire suppression or prescribed burning when it is considered that no further suppression action or patrols are necessary.
Safety zone	An area cleared of flammable materials used for escape if the line is outflanked or in case a spot fire outside the control line renders the line unsafe. In fire operations, crews progress so as to maintain a safety zone close at hand, allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuelbreaks. They are greatly enlarged areas which can be used with relative safety by fire fighters and their equipment in the event of a blow up in the vicinity. (Vic report)
Scorch height	<ol style="list-style-type: none"> 1. The height above ground level up to which foliage has been browned by a fire. 2. A measurement for determining the acceptable height of flame during prescribed burning.
Scout	A person who checks and reports on conditions in the fire area.
Scrub	Refers to vegetation such as heath, wiregrass and shrubs, which grows either as an understorey or by itself in the absence of a tree canopy.
Scrub fire	Fires burning in scrub.
Secondary fire control line	See: Fall back fire control line.
Sector	A specific area of an incident which is under the control of a Sector Commander who is supervising a number of crews.
Seen area	The ground, or vegetation, that is directly visible from an established or proposed lookout point, or aerial detection flight route.
Severe fire danger	The third highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 50 and 74 or a Grassland fire danger index between 50 and 74.
Shift	The period resources are allocated during an operation at the incident or on the fireground.
Shift change	Replacement of allocated crews and or equipment during operations.
Situation report (Sitrep)	A report on the progress of the fire and the efforts to control it. It confirms the location of the fire, its status and potential and the number, nature and effectiveness of resources deployed. Situation reports are normally provided at regular times until the fire is declared safe.
Size up	The evaluation of a fire to determine a course of action for suppression.
Slash	Accumulated fuel resulting from such natural events as wind, fire, snow breakage, or from such human activities as logging, cutting or road construction.

Bushfire Glossary

Term	Definition
Slash burn	A prescribed burn conducted to consume slash for fire hazard reduction or silvicultural purposes.
Sleeper	<ol style="list-style-type: none"> 1. A fire that starts up again after appearing to have been extinguished. 2. A fire that is detected some time after an ignition opportunity (usually from lightning or hop over events).
Slip-on unit	A tank, a live hose reel or tray, a small capacity pump, and an engine combined into a single one-piece assembly that can be slipped onto a truck bed or trailer and used for spraying water and/or foam on bushfires.
Slop over	See: Breakaway
Smoke management	Used by land managers and meteorologists planning a prescribed burn, to ensure that smoke does not cause problems downwind of the burn.
Smoke Plume	The column of smoke that rises from a fire. (See also Convection Column)
Smoker	An isolated small burning item such as a log, stump or tree, in an area of fire otherwise mopped up.
Softwood	A conventional term used to describe a tree, and the timber of trees, belonging to the group of plants with cones, such as pine and cypress.
Soil Dryness Index (SDI)	A form of Drought Index, usually with slightly more detailed inputs than the Keetch-Byram Drought Index. May be on a scale of 0-200 like the KBDI, but some versions have different scales (for example, Western Australia: 0-2000).
Southern Oscillation Index (SOI)	The comparison of surface air pressure differences between Tahiti and Darwin that shows a strong correlation with rainfall.
Spark arrestor	A device fitted to the exhaust system of machinery for trapping carbon sparks.
Spot fire	<ol style="list-style-type: none"> 1. Isolated fire started ahead of the main fire by sparks, embers or other ignited material, sometimes to a distance of several kilometres. 2. A very small fire that requires little time or effort to extinguish.
Spot ignition	An ignition pattern using a series of spaced points of ignition.
Spot over	See: Breakaway
Spotting	Behaviour of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire. (NWCG)
Staging area	An area where resources are mustered and prepared for allocation to an incident. It may include the provision of welfare and equipment maintenance facilities. (AIIMS)
Stand by	The period during which personnel are to be immediately available at home or other location for fire suppression purposes.
Static water supply	A supply of water in a reservoir or pond, of limited capacity.
Step-up method	A method used by a team of firefighters to construct a firebreak in which each firefighter completely constructs a section of the firebreak after which the entire team 'steps up' to the next section.
Strike teams	A set number of resources of the same type that have an established minimum number of personnel. Strike Teams always have a leader (usually in a separate vehicle), and have a common communications system. Strike Teams are usually made up of five resources of the same type such as: vehicles, crews, earth moving machinery, etc (AIIMS).

Bushfire Glossary

Term	Definition
Strip burning	1. An ignition pattern using lines of continuous fire. 2. In hazard reduction, burning narrow strips of fuel and leaving the rest of the area untreated by fire. (NWCG)
Strip ignition	See: Strip burning.
Stripping	See: Strip burning.
Structure	A constructed object, usually a free-standing building above ground.
Sub surface fire	See: Ground fire
Sub surface fuel	See: Ground fuel
Suction hose	Hose used to draught from static/open water. It has a hard, usually reinforced, exterior to prevent it collapsing when a partial vacuum exists within the hose.
Supply hose	Hose feeding from a water supply to a pump.
Support agency	An organisation contributing services or resources directly to a lead agency.
Surface fire	Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation. (NWCG)
Surface fuel	Litter fuels made up of leaves, twigs, bark and other fine fuel lying on the ground, predominately horizontal in orientation.
Surface moisture content	The moisture content expressed as a percentage of oven dry weight of the top 5-10 mm of leaf litter.
Tactics	These are the tasking of personnel and resources to implement the incident strategies. Incident control tactics are accomplished in accordance with appropriate agency procedures and safety directives. (AIIMS)
Tail fire	See: Backing fire.
Tanker	A mobile firefighting vehicle equipped with a water tank, pump, and the necessary equipment for spraying water and/or foam on bushfires.
Task force	A combination of resources assembled for a specific purpose. Task Force always have a leader (usually in a separate vehicle), and have a common communications system. Task Forces are established to meet tactical needs and may incorporate a mixture of different resources types. (AIIMS)
Task group	A large or complex combination of resources assembled for a specific purpose including intrastate, interstate and international deployments made up of multiple strike teams or task forces and or other response or support resources in any combination.
Technical advisors	Are advisors with special skills needed to support incident activities/functions.(AIIMS)
Temperature (dry bulb)	The ambient air temperature recorded by an exposed thermometer.
Temperature (wet bulb)	Wet bulb temperature is measured by placing a moist, single-layer, muslin sleeve over the bulb of a dry bulb thermometer. The difference between dry and wet bulb readings is used to determine relative humidity and dewpoint values.
Test fire	A controlled fire ignited to evaluate fire behaviour.
Thermal imagery	A display or print out from an infra-red scanning device.
Thermal radiation	The process by which the surface of an object radiates its thermal energy in the form of electromagnetic radiation.

Bushfire Glossary

Term	Definition
Thermohygrograph	An instrument that simultaneously and continuously measures and records temperature and relative humidity, normally by tracing each onto a revolving chart. Charts can be either for one day or one week of continuous recording.
Time lag	See: Lag time
Tongues	See: Fingers
Topography	The surface features of a particular area or region. It may include mountains, rivers, populated areas, roads and railways and fuel types.
Torch	See: Candle
Torching	See: Candle
Traffic Management Point	Point along movement routes that are staffed by emergency personnel to direct and control traffic flow. (See also Road Management Point and Vehicle Control Point)
Travel time	The time taken between the departure of a crew, and arrival at the incident. See also Response time.
Under storey	The lowest stratum of a multi-storeyed forest.
Upwind	Towards the wind direction. In the same direction as the direction from which the wind is blowing. The opposite direction to that smoke will travel.
Urban	Area in which residences and other human developments form an essentially contiguous covering of the landscape, includes most area within cities & towns, subdivisions, commercial and industrial parks, and similar development whether inside city limits or not.
Urban interface	See Urban rural interface
Urban rural interface (URI)	The line, area, or zone where structures and other human development adjoin or overlap with undeveloped bushland.
Values at risk	The natural resources or improvements that may be jeopardised if a fire occurs.
Vehicle Control Point	A point on a vehicle access route controlled by a barrier, or similar means, at which a vehicle is required to stop. (See also Road Management Point and Traffic Management Point)
Very high fire danger	The forth highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 25 and 49 or a Grassland fire danger index between 25 and 49.
Warning device	Audible devise fitted to fire bombing aircraft to alert ground crews of pending drop.
Water bombing	See: Fire bombing.
Water point	Any natural or constructed supply of water that is readily available for fire control operations.
Water tank	A container capable of storing a large volume of water.
Wetting agent	A chemical added in low concentration to water. It is used in firefighting to break down the surface tension of the water and to improve its penetration into fuels.
Widow maker	See: Hang up
Wilderness Area	Places where wilderness quality defined using thresholds of remoteness, naturalness and total area is recognised and valued by society.
Wildfire	See: Bushfire.
Wildfire control plan	See: Incident Action Plan

Bushfire Glossary

Term	Definition
Wildland urban interface (WUI)	See: Urban rural interface
Wind direction	The direction from which the wind blows.
Windfall	See: Wind throw
Wind throw	An area of previously standing timber which has been blown over by strong winds or storms.
Wind speed	The rate of horizontal motion of the air past a given point expressed in terms of distance per unit of time. In the NZ Fire Danger Rating System, wind speed is measured at the standard height of 10 metres in the open, averaged over a 10-minute interval and in kilometres per hour.
Wind strength	Generally measured as wind speed. May be measured by the Beaufort wind scale.
Windrow	A long line of piled slash or debris resulting from forest or scrub clearing.
Windrow burning	The burning of windrows.
Windward	Towards the wind. You are windward if the wind is blowing on your face.
Woodland	A subset of forest plant communities in which the trees form only an open canopy (between 20% and 50% crown cover), the intervening area being occupied by lower vegetation, usually grass or scrub.

