

01 October 2015

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NOTICE
The Approved Plan of Development for Development Approval
RL/44/2008/C
subject to changes in the conditions of approval and there not being a Court consent order that changes the development approval.

Dear Ian

Addendum to Bushfire Hazard Assessment Report and Management Plan for Stages 15-18 of Spring Mountain Estate, Greenbank

We write with regard to the abovementioned project and additional ecology detail which has been provided since the report was compiled.

Following a review of this detail and the content of the attached report we confirm the content of the bushfire hazard assessment report for Stages 15-18 of the Spring Mountain Estate, as attached, remains accurate and correct.

The bushfire management plan has since been updated to reflect additional information received following reparation of the original report, and these plans remain attached to the bushfire hazard assessment report at Attachment D.

We trust the information attached is sufficient for Council's needs however, if there are any queries please do not hesitate to contact us.

Yours faithfully



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LOGAN CITY COUNCIL
APPROVED DOCUMENT
This is an approved document for Development Application
RL/44/2008/K

BUSHFIRE HAZARD MANAGEMENT PLAN

Spring Mountain Estate Stages 15-18

TULLY ROAD, GREENBANK



Prepared for:

MTAA Superannuation Fund (Flagstone Creek and Spring Mountain Park)

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DISCLAIMER

This report is prepared on the basis the subject land is identified to be 'at risk' of bushfire. Any buildings or structures located on such land subsequently inherit this risk. This report does not seek to remove this risk, but provide detailed siting, layout, building and / or servicing information to assist the ability of the land-owner to manage the threat of this risk.

This assessment is prepared based upon local, State and Federal legislative provisions relating to bushfire protection, as relevant at the time of production. Jensen Bowers Group Consultants Pty Ltd maintains relevant knowledge with regard to planning and development in bushfire prone areas. However, it is important to note that whilst bushfires generally maintain certain scientific attributes, bushfire events vary in intensity, duration, location and 'typical' behavioural characteristics. Bushfires do not always conform to scientific and widely-understood predictabilities and remain subject to variation across fire seasons by virtue of changes in ground fuel loads and vegetation, prevailing weather and wind conditions and topography.

It remains the land owner's responsibility to understand and prepare for the event of bushfire, which requires year-round property maintenance, a proficient understanding of local bushfire knowledge and what do in the event of a bushfire. A personal bushfire safety plan is recommended, and decisions regarding what to do in an event should be made well in advance of any particular bushfire threat. Regular contact with your local fire authority is advised.

Whilst every care has been taken in the preparation of this report to advise upon the bushfire risk of the property, it forms no guarantee with respect to the safeguard of life and property.

Jensen Bowers Group Consultants Pty Ltd accepts no responsibility for any damage or loss of life or property as a result of bushfire or any other cause which may in any way be taken to be the subject of this report. This report and the information within it is provided on the understanding that reasonable care will be taken when using it. If there remains any uncertainty regarding the application of the information within the report in a specified circumstance, further professional advice should be sought. Jensen Bowers Group Consultants Pty Ltd does not accept responsibility for how the information within this report is applied or relied upon.

1

INTRODUCTION

Jensen Bowers Group Consultants Pty Ltd has been engaged on behalf of MTAA Superannuation Fund (Flagstone Creek and Spring Mountain Park) to undertake a site-based bushfire hazard management plan as an update to the original report prepared by Everyday Engineers, Planners and Surveyors dated 2010. This report is prepared pursuant to the subdivision approvals in place relating to Stages 15 – 18 of the Spring Mountain Estate on Tully Road specifically relating to a permissible change application relating to the proposed layout.

It is understood Stages 15 – 18 of the Spring Mountain Estate were approved by Council in 2011. The original bushfire management plan approved by Council is now superseded by statutory amendments with respect to bushfire hazard mitigation. To this end, this revised bushfire hazard management plan is prepared.

The focus of this assessment report remains two-fold, both with respect to the satisfaction of revision requirements set out in the original approved report and also end-user consideration, being the purchasers of the constructed allotments.

Stages 15 - 18 of Spring Mountain Estate are subject to the Bushfire Hazard Overlay of the Logan City Plan 2015. The site is also identified on the State Planning Policy (SPP) bushfire hazard mapping recently released by the Queensland Government however, the provisions of the SPP have since been incorporated within the local planning scheme and thus, do not require specific assessment.

This assessment report aims to mitigate the risk to life and property from bushfire threat and the impact of bushfire attack which includes:

- direct flame contact
- ember and firebrand attack
- radiant heat
- fire-driven wind.

This assessment does not seek to remove the threat of bushfire risk, but provide relevant siting, layout, building and / or servicing information to assist the ability of land-owners to manage the threat of this risk. This assessment report is prepared in accordance with best practice industry standards as applicable in Queensland and pursuant to both State and local government bushfire hazard policies and guidelines.

1.1 Impetus for Updated Bushfire Hazard Assessment

Approval for the reconfiguration of Stages 15 – 18 was issued by Council in 2011. Pursuant to these approvals, conditions of development were imposed requiring compliance with the original approved Bushfire Management Plan. However, this report is now five years old and time dated by recent statutory amendments relating to bushfire hazard mitigation both in planning and building construction contexts. As such, this report has been subsequently prepared and draws

upon advice provided by the previous report in order to ensure ongoing consistency but also takes into account amendments to local, State and national bushfire policies and guidelines since this time.

1.2 Site Details

Site address	Tully Road, GREENBANK
Local Government	Logan City Council
Real property description	Lot 808 on RP819222 Lot 37 on SP311685 Lot 59 on SP312118
Area of Site	Approximately 203 hectares
Tenure	Freehold
Applicant's name	MTAA Superannuation Fund (Flagstone Creek and Spring Mountain Park)
Fire Authority	Rural Fire Service Queensland (RFSQ) RFSQ South Eastern Region (Greenbank RFS Brigade)
Current Land Use	Vacant
Proposed Land Use	Approved lifestyle / rural residential subdivision
Adjoining Properties	Freehold and Council-owned reserve

1.3 Site Locality



Figure 1: Site locality (Source: Queensland Government, 2012)

2

CHARACTERISTICS OF BUSHFIRE HAZARD

Bushfires have long remained a fundamental characteristic of the Australian bush landscape, and likewise Australians have long retained a strong affinity with bush environments. There remain a number of common factors which are associated with bushfire events and these include the incidence of fire weather, availability of fuel along with its type, structure and continuity or fragmentation, and development at urban / bushland interface.

2.1 Bushfire Attack Methods

Bushfire attack refers to the various methods in which bushfire may impact upon life and property and principally encompass:

- direct flame contact
- ember and firebrand attack
- radiant heat flux
- fire-driven wind
- smoke.

In the progression of a bushfire event, these methods (with the exception of smoke) all interact either exclusively or in concert. 80% of dwellings lost to bushfire are located within 100m of the bushland interface, hence the relevance of statutory provisions and recommendations of this assessment which respond to dwellings within 100m of adjacent classifiable vegetation.



Figure 2: The typical phases of bushfire attack (derived from Ramsay & Rudolph, 2003)

2.1.1 Direct Flame Contact

Direct flame attack refers to flame contact from the main fire front, where the flame which engulfs burning vegetation is one and the same as that which assumes contact with the dwelling. It is estimated that only 10 to 20 percent of dwellings lost to bushfire occur as a direct result of flame attack.

2.1.2 Ember and Firebrand Attack

The convective forces of bushfire raise burning embers into the atmosphere on prevailing winds and deposit them to the ground ahead of the fire front. Typically, ember attack occurs approximately 30 minutes prior to the arrival of the fire front and continues during the impact of the fire front and for several hours afterwards, thus it is the longest lasting impact of bushfire attack. Firebrands occur in a very similar manner but relate to larger items of debris that may still be carried by the wind when alight, such as candle and ribbon bark.

In essence, building loss via ember attack relates largely to the vulnerabilities and peculiarities of each building, its distance from the classifiable vegetation and whether an occupant (or the like) is present to actively defend it. It is estimated by the CSIRO that approximately 80 to 90 per cent of dwellings lost by bushfire are lost as a result of ember attack either in isolation or in combination with radiant heat impact.

2.1.3 Radiant Heat Flux

Exposure to radiant heat remains one of the leading causes of fatalities associated with bushfire events. Measured in kilowatts per m², radiant heat is the heat energy released from the fire front which radiates to the surrounding environment, but deteriorates rapidly over distance. In terms of impacts on buildings, radiant heat can pre-heat materials making them more susceptible to ignition, or it can ignite certain materials without a piloted ignition if the energy reaches a threshold level. Radiant heat can also damage building materials such as window glazing, allowing openings into a building.

In terms of radiant heat exposure for humans, it can cause pain to unprotected skin in milder situations or life threatening and fatal injury in higher exposure thresholds.

2.1.4 Fire-Driven Wind

The convective forces of bushfire typically result in strong to gale force fire-driven winds which in itself, can lead to dwelling damage. The typical effects of fire driven wind include the conveyance of embers, damage from branches and debris hitting the building, as well as direct damage to vulnerable building components such as lifting roofs or roof materials and the damage / breakage of windows.

2.1.5 Smoke

Smoke emission remains a secondary effect of bushfire and is one which is typically not addressed by bushfire hazard assessment. Irrespective, it is important to note the potentially

severe impact of smoke emission on the human respiratory system. It can lead to difficulties in breathing, severe coughing, blurred or otherwise compromised vision, and can prove fatal. It is also important to note that toxic smoke can occur during bushfire, particularly where dwellings and other buildings or materials are ignited.

2.2 Vegetation Elements

Fuel load and arrangement represents a considerable component in dictating to a large degree the behaviour of fire in terms of intensity, rate of spread and flame height, and typically relates to dead plant material less than 6mm thick, and live plant material thinner than 3mm. On this basis, it stands to reason that different vegetation groups yield very different fire behaviour and intensity by virtue of their characteristics and fuel load output. The characteristics are not necessarily related to ecological values, but remain a function of the propensity for certain groups of vegetation to ignite and sustain fire, it can guide estimates on how quickly fire might spread and the likely fire behaviour and intensity which may occur.

Vegetation type, density and arrangement can further influence fire behaviour and intensity. Vertical and horizontal continuity is also a significant element. Thus, vegetation forms a critical element of analysis throughout this report.

2.3 Topography

Topography (effective slope) and to a lesser degree, aspect, are also factors which influence fire behaviour and intensity. Topography can have a drastic affect, with the rate of speed doubling for every 10 degrees of upslope and slowing by half for every 10 degrees of downslope, as a general rule. Aspect can also affect bushfire behaviour where areas with northerly and / or westerly aspects experience a higher level of solar access than those areas with a southern or eastern aspect. Notwithstanding, in times of drought and below average rainfall moisture levels in soil and vegetation in more sheltered areas with southerly and easterly aspects can also decrease substantially giving rise to significantly higher fuel abundance where the preceding fire regime has been less frequent or intense. Thus, aspect is of less consequence.

2.4 Landscape Fire Hazard and Localised Fire Hazard

Two types of risk are relevant in terms of bushfire hazard including:

- landscape risk – where large expanses of bushland over tens to hundreds of hectares are located in immediate proximity to, and may traverse, urban periphery townships
- localised risk – which is most commonly presented by fragmented areas of vegetation larger than 1 hectare in size.

These two types of hazard present different types of fire behaviour, fire intensity and potential rate of spread characteristics.

Landscape fire events are typically a function of the following factors:

- higher fuel loads (particularly where unmanaged land and forests)
- steeper terrain
- higher fire weather conditions
- inaccessible areas with difficulties in early suppression
- long fire runs
- continuity of landscape with few fragmentations of fuel
- instability or increased mixing in the atmosphere above the fire.

These characteristics are typically associated more with south-eastern Australian States which experience periods of prolonged hot, low-humidity days during the spring and summer fire season and are experienced to a lesser degree in Queensland, largely by virtue of increased relative humidity. However, they are not unknown to Queensland.

By contrast, localised bushfire risk relates to fragmented areas of vegetation and may include corridors and patches where fire can potentially propagate. Fire events in these locations are more likely associated with point ignition (i.e. via ember) rather than an intensive fire run by virtue of location, orientation with regard to the subject site and constrained size which, for the most part, would combine to limit any potential fire activity from reaching maximum rate of spread in these particular locations.

In the context of the subject site, both landscape and localised bushfire hazard exists by virtue of the extent of vegetation to the west and south of the site and also, the fragmented nature of surrounding vegetation which traverses Spring Mountain Estate. These elements are discussed in further detail throughout this report.

2.5 Fire Weather

It remains important to understand the influence of fire weather with regard to how it can affect bushfire risk levels on a daily, weekly or seasonal basis.

In South East Queensland, hot-air fire wind is typically generated by north-west and south-westerlies and cool-air fire wind is generated by south-westerlies which are prevalent during Southern Queensland's fire season which extends from August to March, annually. In some situations however, south-easterlies can also drive bushfire behaviour.

Notwithstanding the above, it is noted bushfires do not always conform to widely-accepted characteristics. Other fire weather conditions must also be contemplated such as preceding weather conditions (such as low rainfall or drought), air temperature and relative humidity. If the area has been subject to drought or low rainfall for a period of time, vegetation health tends to deteriorate with increased leaf drop, curing and drying. This contributes to increased ground fuel loads and general ignition susceptibility. Prolonged dry periods also reduce soil moisture content.

Air temperatures of above 30 degrees Celsius are typically conducive to increased fire weather, as are extended periods of higher than average air temperatures. In conjunction, low relative humidity (i.e. low air moisture content) is also a contributing factor to increased fire weather.

In concert, all of the above factors can impact on the ability for fire to propagate, and alter behaviour and intensity characteristics and as such, fire weather is a significant component of bushfire hazard. Whilst an assessment of vegetation types, fuel loads, effective slope and other factors can be readily undertaken, fire weather can fluctuate across days, weeks and seasons and can have a significant impact on the potential for bushfire threat as well as influence bushfire behaviour and intensity.

The Fire Danger Index (FDI) is a commonly used method to readily advise the community of the likely ability of fire suppression based on fire weather, which is used to inform the Fire Danger Rating (FDR) System at Figure 3. It is important to maintain awareness as to the level of local fire danger during the fire season.

In considering the above, it is important to understand the frequency of more extreme fire weather days in South East Queensland. **The number of days per decade (10 years) on which an FDI of 50 (Severe) is exceeded is 11.7 days, and an FDI of 75 (Extreme to Catastrophic) is exceeded only 0.9 days out of each decade** (Lucas, 2007). The influence of climate change may alter these statistics into the future however at present, this data accurately indicates the current risk profile posed by such fire weather conditions.

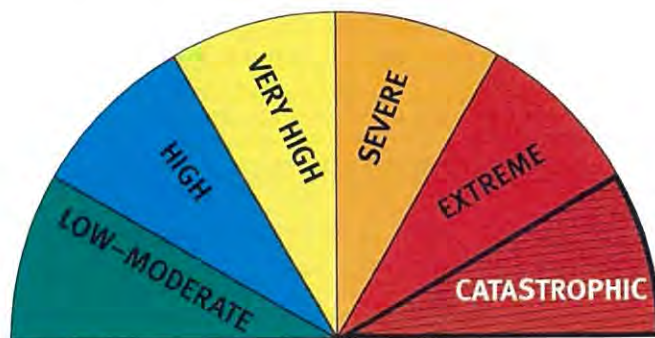


Figure 3: Fire Danger Ratings (Source: RFSQ, 2013)

3

APPROVED DEVELOPMENT

The development relates to a previously approved lifestyle / rural residential subdivision, specifically Stages 15 - 18 of the Spring Mountain Estate. It is noted at the time of production of this report the subdivision had not yet been constructed and clearing had not yet occurred. It is noted that whilst the reconfiguration is previously approved, a permissible change relating to minor layout amendments is now proposed.

Stages 15 – 18 are currently accessed via Spring Mountain Drive and Tully Road. Spring Mountain Drive remains the primary point of access for the entirety of Spring Mountain Estate and provides connection with the Mount Lindesay Highway approximately 6.5 kilometres to the east. The rural residential sized allotments created measure between 2,000m² and 10,000m². That area which surrounds the approved allotments is external to the site and will remain in a bushland context. A waterway corridor that traverses the site will be retained as park, understood largely to remain in its natural bushland state, but supplemented with open space and recreational facilities and dedicated to the Council. Refer to **Attachment A** for the proposed amended reconfiguration plan for Stages 15 - 18.



4 SITE CONTEXT AND LOCALITY

The approved lifestyle residential subdivision is located at the south-western periphery of a previously-developed rural residential community which forms part of the Spring Mountain Estate in the south-western area of Greenbank. At the time this report was prepared clearing had not yet commenced and the site remained in its natural state. Stages 15 – 18 are enveloped by bushland to the west, south and east on freehold titles. Spring Valley Road adjoins the site adjacent to its western and southern boundaries however, this road remains unformed at present. To the west and south, the site adjoins with Flinders – Karawatha Bioregional Corridor which is identified as maintaining significant ecological values and is not intended for future development. Existing rural residential development currently adjoins the site immediately to the north and further to the east, noting intervening bushland also occurs in this location. The site is traversed by a creek (tributaries of Oxley Creek) and is understood to be transferred to park, though remaining in its natural bushland state, and dedicated to the Council upon completion of the development. This area is to also be supplemented by open space and recreational facilities.

It is understood Stage 16 will be the first of the Stages to be constructed, followed by Stages 15, 17 and 18.



Figure 4: Spring Mountain Road viewed to the south from Tully Road (Source: Jensen Bowers, 2015)

An established fire trail / access track network is currently established across the site which remains a legacy of previous access needs. The majority of these trails will be overtaken in time by construction of the allotment reconfiguration. An extension to this network is currently conditioned as part of the existing approval to provide emergency access / egress to the east at the south-eastern corner of the site, as part of Stage 17.



Figure 5: View from Spring Mountain Road to the west (Source: Jensen Bowers, 2015)

5 STATUTORY BUSHFIRE HAZARD ASSESSMENT

5.1 State Planning Policy

The single State Planning Policy (SPP) was released by the State Government in December 2013 and amended in July 2014, and comprises a range of State-interest requirements for planning scheme preparation and interim development assessment provisions.

Pursuant to Section 2.1(1) of Part 2 of the Logan City Plan 2015, the State planning policy relating to natural hazards, including bushfire, has been integrated with the scheme and as such, does not require any exclusive assessment.

5.2 Local Government Provisions

The Logan City Plan 2015 came into effect in May 2015 and introduced a new Bushfire Hazard Overlay Map, Overlay Code and Planning Scheme Policy. As evidenced at Figure 6, Council's Bushfire Hazard Overlay Mapping is based upon the SPP mapping methodology and identifies the site as containing and adjoining areas of medium and high potential hazard. It is noted the vegetation context of the area has changed since this mapping was last updated.

A bushfire hazard site assessment for each stage is provided pursuant to the Logan City Plan 2015 Bushfire Hazard Planning Scheme Policy, refer to Section 6. Assessment of the proposed development against the Bushfire Hazard Overlay Code is included at **Attachment B**.

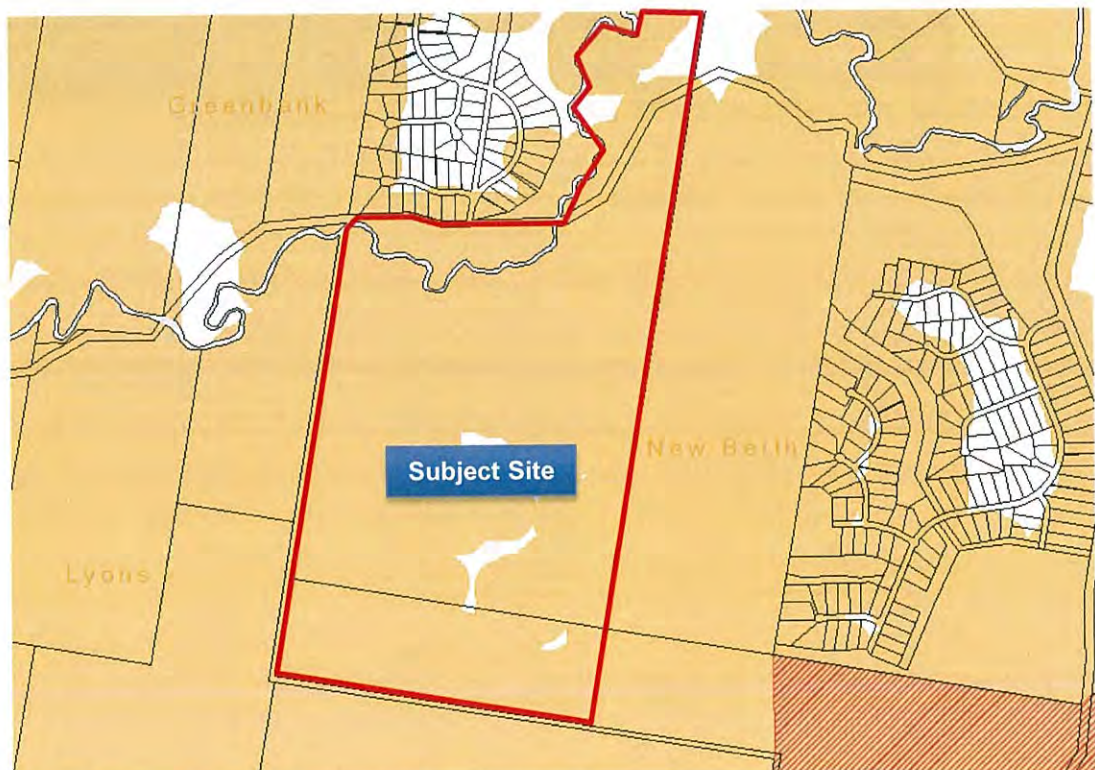


Figure 7: Excerpt from Logan City Plan 2015 Bushfire Hazard Overlay (Source: Logan City Council, 2015)

6

BUSHFIRE SITE ASSESSMENT

6.1 Methodology

The following assessment was carried out in accordance with the provisions of the State Planning Policy, Logan City Plan 2015 and in a preliminary context with regard to AS3959-2009 – Construction of Buildings in Bushfire Prone Areas. It is noted this assessment is undertaken pursuant to existing reconfiguration approvals from Council and taking into account the proposed permissible change for minor alterations to the lot layout.

This assessment utilises a range of data, collected both on-site and via desktop analysis. A site inspection was carried out on Tuesday 4 August 2015 during fine Winter season conditions. The site inspection was undertaken in the early stages of the 2015 / 16 South East Queensland fire season. It is noted there had been an absence of substantial rainfall in the area in the period leading up to the site inspection. To this end, the vegetation as observed on-site is considered typical of fire season vegetation characteristics.

It is noted the site inspection took in a number of areas across the site.

In addition to the site inspection and overall fuel hazard assessments, a range of instruments have also been utilised to perform a desktop analysis to complement the data collected via the site inspection and inform the proposed development approach for Stages 15 - 18. These instruments include:

- local and State bushfire hazard mapping
- State-based vegetation mapping
- Spring Mountain Estate Masterplan
- aerial imagery
- AS3959-2009 – Construction of Buildings in Bushfire Prone Areas.

In terms of assessment methodology, it is noted that the Fire Danger Index (FDI) is calculated at 40 with a flame temperature of 1,090k, as per the provisions of the Australian Standard as relevant to Queensland. On this basis and as required by the SPP and Council Bushfire Hazard mapping and AS3959-2009, the site assessment area encompasses that area within 100m of the identified hazard contained within and adjacent to the development sites.

The classification of vegetation is carried out in accordance with Table 2.3 of AS3959-2009, refer to Figure 8 below.

TABLE 2.3
CLASSIFICATION OF VEGETATION

Vegetation classification (see Tables 2.4.2–2.4.5)	Vegetation type	Figure No. in Fig. 2.3 and Figs 2.4(A) to 2.4(G)	Description	
A Forest	Tall open forest Tall woodland	01 02	Trees over 30 m high; 30–70% foliage cover (may include understorey ranging from rainforest and tree ferns to low trees and tall shrubs). Found in areas of high reliable rainfall. Typically dominated by eucalypts.	
	Open forest Low open forest	03 04	Trees 10–30 m high; 30–70% foliage cover (may include understorey of sclerophyllous low trees and tall shrubs or grass). Typically dominated by eucalypts.	
	Pinac plantation	Not shown in Figure 2.3	Trees 10–30 m in height at maturity, generally comprising <i>Pinus</i> species or other softwood species, planted as a single species for the production of timber.	
B Woodland	Woodland Open woodland	05 06	Trees 10–30 m high; 10–50% foliage cover dominated by eucalypts; understorey of low trees to tall shrubs typically dominated by <i>Acacia</i> , <i>Callitris</i> or <i>Casuarina</i> .	
	Low woodland Low open woodland Open shrubland	07 08 09	Low trees and shrubs 2–10 m high; foliage cover less than 10%. Dominated by eucalypts and <i>Acacia</i> . Often have a grassy understorey or low shrubs. <i>Acacia</i> and <i>Casuarina</i> woodlands grade to <i>Atriplex</i> shrublands in the arid and semi-arid zones.	
	C Shrubland	Closed heath Open heath	10 11	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.
		Low shrubland	12	Shrubs <2 m high; greater than 30% foliage cover. Understoreys may contain grasses. <i>Acacia</i> and <i>Casuarina</i> often dominant in the arid and semi-arid zones.
D Scrub	Closed scrub	13	Found in wet areas and/or areas affected by poor soil fertility or shallow soils; >50% foliage cover. Dry heaths occur in rocky areas. Shrubs >2 m high. Typical of coastal wetlands and tall heaths.	
	Open scrub	14	Shrubs greater than 2 m high; 10–30% foliage cover with a mixed species composition.	
E Mullec/ Mulga	Tall shrubland	15	Vegetation dominated by shrubs (especially eucalypts and acacias) with a multi-stemmed habit; usually greater than 2 m in height; <30% foliage cover. Understorey of widespread to dense low shrubs (acacias) or sparse grasses.	
F Rainforest	Tall closed forest Closed forest Low closed forest	16 17 18	Trees 10–40 m in height; >90% foliage cover; understorey may contain a large number of species with a variety of heights.	
G Grassland (See Note 1)	Low open shrubland Hummock grassland Closed tussock grassland Tussock grassland Open tussock Sparse open tussock Dense sown pasture Sown pasture Open herbfield Sparse open herbfield	19 20 21 22 23 24 25 26 27 28	All forms, including situations with shrubs and trees, if the overstorey foliage cover is less than 10%.	
	Tussock Moorland	Not shown in Figure 2.3	All forms of vegetation where the overstorey is dominated by the species <i>Buttongrass Gymnoschoenus sphaerocephalus</i> . Only occurs as a significant vegetation type in Tasmania.	

NOTES:

- Grassland managed in a minimal fuel condition is regarded as low threat vegetation for the purposes of Clause 2.2.3.2.
- Overstoreys of open woodland, low open woodland, tall open shrubland and low open shrubland should be classified to the vegetation type on the basis of their understoreys; others to be classified on the basis of their overstoreys.
- Vegetation height is the average height of the top of the overstorey.

Figure 8: Excerpt of Table 2.3 of AS3959-2009 (Source: Standards Australia, 2011)

6.2 Stage 15 Assessment

6.2.1 Vegetation Classification

Vegetation classification is important for a number of reasons, namely it indicates the level of fire intensity and fire behaviour associated with specific stands of vegetation and it also indicates the fuel loads which may exist in certain locations.

The majority of the site will be cleared to make way for subdivision construction. The clearing methodology includes the entire removal of understorey on each proposed allotment with the exception of vegetation within a vegetation corridor or buffer area. Isolated tree specimens will be maintained. All vegetation will be removed to construct road reserves, with the odd mature tree retained. The identified vegetated corridors on the site will be maintained in their current state with a level of rehabilitation and weed removal.

That area of the site which will be cleared for development is not assessed as the approach of the Planning for Bushfire Protection Guideline 2006 prepared by the NSW Rural Fire Service which is referenced in the absence of an equivalent guideline is Queensland. The vegetated corridors and buffers internal to the site will remain capable of conveying fire and thus, continue to constitute classifiable vegetation.

6.2.1.1. North

With specific regard to Stage 15, it is noted construction will commence after Stage 16 is constructed. To this end, classified vegetation will be located to the north, east and west. To the north, the land transitions to a low lying wetland area. The lots in this location are the largest of the entire development measuring almost 1 hectare each. It is understood the building envelopes for these allotments are located toward the Tully Road frontage. Taking into account the site of the lots and lack of vegetation within and external to these lots, **no bushfire hazard** is identified to the north of the site, being low threat vegetation in accordance with the low fuel provisions of AS3959-2009.

6.2.1.2. East

To the east, land largely remains heavily treed comprising mostly eucalypt tree species and including a mix of riparian vegetation species in proximity to lower-lying gully areas which transitions to swamp to the north-east. The area immediately adjacent to the eastern boundary of the site is identified by Broad Vegetation Group Mapping and Regional Ecosystem Mapping prepared by the Queensland Herbarium as comprising '*Eucalyptus crebra* +/- *E. tereticornis*, *Corymbia tessellaris*, *Angophora* spp., *E. melanophloia woodland*', '*Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra open forest*' and '*Eucalyptus acmenoides*, *E. major*, *E. siderophloia* +/- *Corymbia citriodora* subsp. *variegata woodland*'. On this basis, the vegetation in this location is classified as **Open Forest** (with corresponding fuel load estimates) in accordance with Table 2.3 of AS3959-2009.

6.2.1.3. West

To the west of Stage 15 is vegetation internal to the site. In the northern central area, vegetation is minimal, being associated with the northern floodplain area however, it is possible that grassland fire may occur in this area. More central to the site, a vegetated corridor effectively divides the site into two areas. Most of the vegetation in these corridors is to be retained, with specific rehabilitation and weed management activities undertaken. Vegetation in these areas is identified by the Queensland Herbarium as comprising 'swamps with *Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp. As set out by DEHP in the fire management guidelines for this regional ecosystem type, it will burn in conjunction with surrounding ecosystems however, the threat is somewhat lower. On this basis the vegetation classification of the central vegetated corridors (to the west of Stage 15) is identified as **Woodland** (with corresponding fuel load estimates) pursuant to Table 2 of AS3959-2009.

6.2.2 Effective Slope

Effective slope relates to the topography beneath classified vegetation, as this influences fire speed and fire spread - namely, that the speed of fire doubles for every 10 degrees incline. An on-site effective slope assessment has been conducted via GIS slope analysis along with survey and contour data.

Attachment C includes the slope analysis for the subject site, with additional contour data utilised for surrounding areas as the most accurate determination of topography. Ridgelines run north-south toward the east and west boundaries of the site, with gully areas occurring through the centre. The western area is largely upslope, rising considerably to the ridgeline in that location whilst the eastern boundary transitions on a downslope toward swamp and low lying areas to the east. Bushfire behaviour likewise will vary across the area, with more intense fire runs likely to ensue on uphill and through gully areas as a combined result of effective slope and fuel loads. Bushfire advancing from the west is likely to slow considerably on descent down the western slope toward the site.

The effective slope has been integrated with the bushfire assessment on a detailed site-by-site basis in order to determine the accurate level of bushfire attack levels across the site based on vegetation and slope within 100m of each allotment. Refer to **Attachment D** for the bushfire management plan.

6.3 Stage 16 Assessment

6.3.1 Vegetation Classification

Vegetation classification is important for a number of reasons, namely it indicates the level of fire intensity and fire behaviour associated with specific stands of vegetation and it also indicates the fuel loads which may exist in certain locations.

The majority of the site will be cleared to make way for subdivision construction. The clearing methodology includes the entire removal of understorey on each proposed allotment with the exception of vegetation within a vegetation corridor or buffer area. Isolated tree specimens will be maintained. All vegetation will be removed to construct road reserves, with the odd mature

tree retained. The identified vegetated corridors on the site will be maintained in their current state with a level of rehabilitation and weed removal.

That area of the site which will be cleared for development is not assessed as the approach of the Planning for Bushfire Protection Guideline 2006 prepared by the NSW Rural Fire Service which is referenced in the absence of an equivalent guideline is Queensland. The vegetated corridors and buffers internal to the site will remain capable of conveying fire and thus, continue to constitute classifiable vegetation.

6.3.1.1. North and West

With specific regard to Stage 16, it is noted construction of this stage will commence ahead of all other stages. To this end, classified vegetation will be located to the north, south, east and west. To the north and west, vegetation is internal to the site with a vegetated corridor which effectively divides the site into two areas. Most of the vegetation in these corridors is to be retained, with specific rehabilitation and weed management activities undertaken. Vegetation in these areas is identified by the Queensland Herbarium as comprising '*swamps with Cyperus spp., Schoenoplectus spp. and Eleocharis spp.*'. As set out by DEHP in the fire management guidelines for this regional ecosystem type, it will burn in conjunction with surrounding ecosystems however, the threat is somewhat lower. On this basis the vegetation classification of the central vegetated corridors (to the north and west of Stage 16) is identified as **Woodland** (with corresponding fuel load estimates) pursuant to Table 2 of AS3959-2009.

Land forming part of Stage 15 to the north will be eventually cleared to make way for subdivision construction of that stage. In the interim, clearing of land for a distance of 100m adjoining Stage 16 is required (except for retained vegetated corridors) to ensure interim vegetation does not inadvertently pose a bushfire risk to Stage 16.

6.3.1.2. East

To the east, a retained vegetated corridor extending from lands further to the east traverses the site. The vegetation in this location is defined as '*Eucalyptus acmenoides, E. major, E. siderophloia +/- Corymbia citriodora subsp. variegata woodland*'. The vegetation in this location is dominated by eucalypt specimens with ground and elevated fuels also present, increasing the fuel load in this location. The vegetation in this location is identified as **Open Forest** pursuant to Table 2.3 of AS3959-2009.

6.3.1.3. South

Vegetation to the south will be eventually cleared to make way for construction of Stage 17. In the interim, clearing of land for a distance of 100m adjoining Stage 16 is required (except for retained vegetated corridors) to ensure interim vegetation does not inadvertently pose a bushfire risk to Stage 16.

6.3.2 Effective Slope

Effective slope relates to the topography beneath classified vegetation, as this influences fire speed and fire spread - namely, that the speed of fire doubles for every 10 degrees incline. An

on-site effective slope assessment has been conducted via GIS slope analysis along with survey and contour data.

Attachment C includes the slope analysis for the subject site, with additional contour data utilised for surrounding areas as the most accurate determination of topography. Ridgelines run north-south toward the east and west boundaries of the site, with gully areas occurring through the centre. The western area is largely upslope, rising considerably to the ridgeline in that location whilst the eastern boundary transitions on a downslope toward swamp and low lying areas to the east. Bushfire behaviour likewise will vary across the area, with more intense fire runs likely to ensue on uphill and through gully areas as a combined result of effective slope and fuel loads. Bushfire advancing from the west is likely to slow considerably on descent down the western slope toward the site.

The effective slope has been integrated with the bushfire assessment on a detailed site-by-site basis in order to determine the accurate level of bushfire attack levels across the site based on vegetation and slope within 100m of each allotment. Refer to **Attachment D** for the bushfire management plan.

6.4 Stage 17 Assessment

6.4.1 Vegetation Classification

Vegetation classification is important for a number of reasons, namely it indicates the level of fire intensity and fire behaviour associated with specific stands of vegetation and it also indicates the fuel loads which may exist in certain locations.

The majority of the site will be cleared to make way for subdivision construction. The clearing methodology includes the entire removal of understorey on each proposed allotment with the exception of vegetation within a vegetation corridor or buffer area. Isolated tree specimens will be maintained. All vegetation will be removed to construct road reserves, with the odd mature tree retained. The identified vegetated corridors on the site will be maintained in their current state with a level of rehabilitation and weed removal.

That area of the site which will be cleared for development is not assessed as the approach of the Planning for Bushfire Protection Guideline 2006 prepared by the NSW Rural Fire Service which is referenced in the absence of an equivalent guideline is Queensland. The vegetated corridors and buffers internal to the site will remain capable of conveying fire and thus, continue to constitute classifiable vegetation.

6.4.1.1. East

To the east, land largely remains heavily treed comprising mostly eucalypt tree species and including a mix of riparian vegetation species in proximity to lower-lying gully areas which transitions to swamp to the north-east. The area immediately adjacent to the eastern boundary of the site is identified by Broad Vegetation Group Mapping and Regional Ecosystem Mapping prepared by the Queensland Herbarium as comprising '*Eucalyptus crebra* +/- *E. tereticornis*, *Corymbia tessellaris*, *Angophora* spp., *E. melanophloia woodland*', '*Corymbia citriodora subsp.*

variegata +/- *Eucalyptus crebra* open forest' and '*Eucalyptus acmenoides*, *E. major*, *E. siderophloia* +/- *Corymbia citriodora* subsp. *variegata* woodland'. On this basis, the vegetation in this location is classified as **Open Forest** (with corresponding fuel load estimates) in accordance with Table 2.3 of AS3959-2009.

6.4.1.2. South

Vegetation to the south is largely dominated by eucalypt species with a grass and shrub understorey which fluctuates in density across various areas. This area is defined by the Queensland Herbarium as comprising '*Eucalyptus fibrosa* subsp. *fibrosa* woodland', '*Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest' and '*Eucalyptus crebra* +/- *E. tereticornis*, *Corymbia tessellaris*, *Angophora* spp., *E. melanophloia* woodland'. Based upon the density of vegetation and fuel structure, vegetation in this location is identified as **Open Forest** pursuant to Table 2.3 of AS3959-2009.

6.4.1.3. West

With specific regard to Stage 17, vegetation to the west is internal to the site with a vegetated corridor which effectively divides the site into two areas. Most of the vegetation in these corridors is to be retained, with specific rehabilitation and weed management activities undertaken. Vegetation in these areas is identified by the Queensland Herbarium as comprising '*swamps with Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp'. As set out by DEHP in the fire management guidelines for this regional ecosystem type, it will burn in conjunction with surrounding ecosystems however, the threat is somewhat lower. On this basis the vegetation classification of the central vegetated corridors (to the west of Stage 17) is identified as **Woodland** (with corresponding fuel load estimates) pursuant to Table 2 of AS3959-2009.

6.4.2 Effective Slope

Effective slope relates to the topography beneath classified vegetation, as this influences fire speed and fire spread - namely, that the speed of fire doubles for every 10 degrees incline. An on-site effective slope assessment has been conducted via GIS slope analysis along with survey and contour data.

Attachment C includes the slope analysis for the subject site, with additional contour data utilised for surrounding areas as the most accurate determination of topography. Ridgelines run north-south toward the east and west boundaries of the site, with gully areas occurring through the centre. The western area is largely upslope, rising considerably to the ridgeline in that location whilst the eastern boundary transitions on a downslope toward swamp and low lying areas to the east. Bushfire behaviour likewise will vary across the area, with more intense fire runs likely to ensue on uphill and through gully areas as a combined result of effective slope and fuel loads. Bushfire advancing from the west is likely to slow considerably on descent down the western slope toward the site.

The effective slope has been integrated with the bushfire assessment on a detailed site-by-site basis in order to determine the accurate level of bushfire attack levels across the site based on vegetation and slope within 100m of each allotment. Refer to **Attachment D** for the bushfire management plan.

6.5 Stage 18 Assessment

6.5.1 Vegetation Classification

Vegetation classification is important for a number of reasons, namely it indicates the level of fire intensity and fire behaviour associated with specific stands of vegetation and it also indicates the fuel loads which may exist in certain locations.

The majority of the site will be cleared to make way for subdivision construction. The clearing methodology includes the entire removal of understorey on each proposed allotment with the exception of vegetation within a vegetation corridor or buffer area. Isolated tree specimens will be maintained. All vegetation will be removed to construct road reserves, with the odd mature tree retained. The identified vegetated corridors on the site will be maintained in their current state with a level of rehabilitation and weed removal.

That area of the site which will be cleared for development is not assessed as the approach of the Planning for Bushfire Protection Guideline 2006 prepared by the NSW Rural Fire Service which is referenced in the absence of an equivalent guideline is Queensland. The vegetated corridors and buffers internal to the site will remain capable of conveying fire and thus, continue to constitute classifiable vegetation.

6.5.1.1. East

With specific regard to Stage 18, vegetation to the east is internal to the site with a vegetated corridor which effectively divides the site into two areas. Most of the vegetation in these corridors is to be retained, with specific rehabilitation and weed management activities undertaken. Vegetation in these areas is identified by the Queensland Herbarium as comprising '*swamps with Cyperus spp., Schoenoplectus spp. and Eleocharis spp.*'. As set out by DEHP in the fire management guidelines for this regional ecosystem type, it will burn in conjunction with surrounding ecosystems however, the threat is somewhat lower. On this basis the vegetation classification of the central vegetated corridors (to the east of Stage 18) is identified as **Woodland** (with corresponding fuel load estimates) pursuant to Table 2 of AS3959-2009.

6.5.1.2. West

Vegetation to the west is largely dominated by eucalypt species with a grass and shrub understorey in lower lying areas, which becomes sparser toward the middle and upper slopes. This area is defined by the Queensland Herbarium as comprising '*Eucalyptus fibrosa subsp. fibrosa woodland*', '*Corymbia citriodora subsp. variegata +/- Eucalyptus crebra open forest*' and '*Eucalyptus crebra +/- E. tereticornis, Corymbia tessellaris, Angophora spp., E. melanophloia woodland*'. Based upon the density of vegetation and fuel structure, vegetation in this location is identified as **Open Forest** pursuant to Table 2.3 of AS3959-2009.

6.5.1.3. South

Vegetation to the south is largely dominated by eucalypt species with a grass and shrub understorey which fluctuates in density across various areas. This area is defined by the

Queensland Herbarium as comprising '*Eucalyptus fibrosa subsp. fibrosa woodland*', '*Corymbia citriodora subsp. variegata +/- Eucalyptus crebra open forest*' and '*Eucalyptus crebra +/- E. tereticornis, Corymbia tessellaris, Angophora spp., E. melanophloia woodland*'. Based upon the density of vegetation and fuel structure, vegetation in this location is identified as **Open Forest** pursuant to Table 2.3 of AS3959-2009.

6.5.2 Effective Slope

Effective slope relates to the topography beneath classified vegetation, as this influences fire speed and fire spread - namely, that the speed of fire doubles for every 10 degrees incline. An on-site effective slope assessment has been conducted via GIS slope analysis along with survey and contour data.

Attachment C includes the slope analysis for the subject site, with additional contour data utilised for surrounding areas as the most accurate determination of topography. Ridgelines run north-south toward the east and west boundaries of the site, with gully areas occurring through the centre. The western area is largely upslope, rising considerably to the ridgeline in that location whilst the eastern boundary transitions on a downslope toward swamp and low lying areas to the east. Bushfire behaviour likewise will vary across the area, with more intense fire runs likely to ensue on uphill and through gully areas as a combined result of effective slope and fuel loads. Bushfire advancing from the west is likely to slow considerably on descent down the western slope toward the site.

The effective slope has been integrated with the bushfire assessment on a detailed site-by-site basis in order to determine the accurate level of bushfire attack levels across the site based on vegetation and slope within 100m of each allotment. Refer to **Attachment D** for the bushfire management plan. With particular respect to fire approaching the site from the west, which is typically the most likely scenario based on historical fire weather patterns for South East Queensland, the site is benefited by being on the lee-ward slope on the eastern side of the ridgeline, whereby fire intensity and seep will reduce considerably as it moves down the hill. In addition, it is noted this slope is considerably rocky, interrupting horizontal fuel connectivity and reducing the opportunity for intense or erratic fire behaviour. Notwithstanding this, localised wind phenomenon's can impact on bushfire behaviour and the above principles remain a guide only.

6.6 Site-Based Bushfire Hazard and Behaviour and Qualitative Assessment

Two types of risk are relevant in terms of bushfire hazard including landscape risk where large expanses of bushland over tens to hundreds of hectares are located in immediate proximity to, and may traverse, urban periphery townships, and local bushfire hazard risk which is most commonly presented by fragmented areas of vegetation larger than 1 hectare in size.

Based on the characteristics of the locality, both landscape and localised bushfire risk is present.

The predominant form of bushfire hazard relevant to Stages 15 – 18 is from the west, south-west and south and to a limited degree, from the east. Over time it is anticipated the threat from

the east will be highly moderated / removed by future residential development but, for the moment remains a consideration.

To the west are areas which form part of the Flinders – Karawatha Bioregional Corridor. The land in these locations incorporates steeper terrain with larger expanses of vegetation which allow for longer and larger fire runs, and can promote more intense fire activity and behaviour and less opportunity for the implementation of active firefighting techniques. Some rural residential development is located to the north-west of the site through a valley area which is likely to limit the advancement of fire from the north-westerly direction toward the site.

Notwithstanding, the topography immediately adjoining the site is also relevant in terms of its influence on fire behaviour. The intensity of fire is likely to fluctuate on the basis of a number of factors including terrain and fuel connectivity. Particularly to the west, fuel connectivity is affected by the presence of rocky outcrops where ground fuels are largely absent. Land to the west is also largely uphill from the subject site, with fire approaching from the direction likely to slow and reduce in intensity upon descent down the slope toward the subject site.

Fire approaching the site from the south, south-east and east is perhaps less likely than a fire advancing from the west, but may still occur on a rare south-easterly fire wind. The topography in these locations also fluctuates but typically falls away from the site, resulting in an uphill fire run toward the site. On this basis, the allotment-based consideration of vegetation class and effective slope is critical in deriving associated bushfire attack levels, as well as taking into account the clearing methodology for proposed allotments.

Localised bushfire hazard may occur within the vegetated corridors surrounding and traversing the site, most likely via point ignition (from ember attack developing into spot fires) than via line ignition (fire front attack). The constant changes in the orientation of the corridors as well as their width limits, to a certain degree, the extent and anticipated behaviour or intensity of potential fire in such locations. The breaks in these corridors by roads and other infrastructure may assist in limiting fire development and provides effective opportunities to undertake fire suppression activities.

Irrespective of the above estimations, it is important to note that bushfire behaviour can fluctuate on any given day, remaining a direct function of fire weather conditions which can change rapidly over a period of hours.

7

BUSHFIRE MANAGEMENT AND MITIGATION MEASURES

This report identifies a range of bushfire hazard mitigation measures which focus on increasing resilience to bushfire attack via a range of methodologies. Essentially, these mitigation methodologies are focused upon:

- Vegetation management and landscaping approaches for fuel management
- accessibility and egress
- fire trail networks
- fencing and retaining provisions
- water supply and firefighting infrastructure
- bushfire awareness and education
- building construction requirements.

7.1 Vegetation Management

The bushland areas and corridors which adjoin the development site must be managed so as to reduce the build-up of unacceptable fuel loads. Regular inspections by the Council and local rural fire brigade are required to limit the opportunity for increased fire intensity by virtue of ground fuel load build-up and the propagation of weeds or swathes of long grass where in proximity to the site.

Management processes should ideally be undertaken prior to and during summer. Prescribed burning should only occur during winter months when the FFDI is low and weather conditions permit. The management of bushland surrounding the site should be included in Council's bushfire management plan and undertaken in accordance with Council policy.

The following rationale for vegetation management, clearing and landscaping is identified to ensure fire risk is not inadvertently increased by such activities:

- limiting potential for fuel accumulation on the site
- breaking opportunities for propagation of fire
- implementing fuel / fire breaks
- ensuring defensible space is implemented and maintained in perpetuity
- landscape design which does not inadvertently increase bushfire attack risk.

7.1.1 Clearing

It is noted all the allotments will be cleared of understorey vegetation (outside of vegetation retention areas only), with only mature trees to be retained as isolated specimens, and bushland within vegetated corridors to be retained. Any trees retained should have canopies which are separated from that of other trees, and not forming groups of vegetation. The bushfire management plan assessment is based upon this rationale. Should the allotments not be cleared in this fashion, a more tailored, site-based assessment for each dwelling will be required at building approval stage.

Following subdivision construction, owners are responsible for maintaining these cleared areas in a low-fuel condition in perpetuity (i.e mown grass or low ground covers, no shrubs within the drip line of any tree and no planting of new trees within 5m of any boundary adjoining a hazard source) unless otherwise required to maintain protected bushland areas.

Individual tree species within road reserves and building envelope areas may only be retained provided vertical and horizontal fuel connectivity is removed (i.e ensure tree canopies are separated and understorey is removed to prevent fire moving between species and from ground and surface fuels in a ladder effect to the tree canopy). Retention of trees should be avoided where possible within 5m of any boundary adjoining a hazard source unless otherwise required by the Vegetation Clearing and Management Plan. The fire trails set out in the Bushfire Management Plan (BMP) at **Attachment D** are to be cleared in accordance with the provisions outlined at Section 7.3 of this report.

In terms of staging, land within 100m of any lot forming part of Stage 16 will need to be cleared (unless forming part of a protected vegetation corridor) to mitigate against any interim bushfire hazard during subdivision construction.

7.1.2 Landscaping

The landscaping rationale for private residential allotments plays a significant role in enhancing the ability of dwellings to withstand bushfire attack. Landscape design and plant selection is a critical element.

All approved allotments must be landscaped within the building envelope areas so as to reduce opportunity for spot fires via ember attack and to maintain adequate defendable space / separation distance around each dwelling.

Fire authorities in other jurisdictions which experience a higher level of bushfire risk have completed significant work in the area of landscaping for bushfire hazard. The CFA has produced a 'Plant Selection Key' to assist in the identification of suitable 'fire-wise' plantings. The CFA in particular has done much work focusing on the characteristics of 'fire-wise' plants as opposed to specific species and thus, maintains a national relevance. It is recommended a copy of the CFA's 'Landscaping for Bushfire' Guideline be provided to all property purchasers, a copy of this document is included at **Attachment E**.

'Fire-wise' species maintain a number of characteristics which reduce their propensity for ignition. In detail:

- any trees or shrubs must comprise smoother bark or attached tightly on trunks as opposed to loose, stringy or ribbon bark. Avoid species which shed bark on an annual basis
- chose species with a high moisture content, with coarse and broad leaves which are thinly spread such as succulents
- select species with foliage which is less dense and open and loosely branching.

Notwithstanding the above and irrespective of the characteristics of such species, certain weather conditions can impact upon the propensity for ignition and propagation of fire within any vegetation. It must be noted that no vegetation can be considered 'fire proof'. In this respect, landscape design is a critical element for consideration and as outlined in the 'Landscaping for Bushfire' Guideline, it is recommended that owners:

- do not provide garden beds immediately adjoining a house or garage, but instead provide a gravel or concrete path at least 500mm in width in between the house and any garden bed
- select plants which accord with the characteristics outlined in the CFA's Plant Selection Key
- ensure vegetation layers avoid providing horizontal and / or vertical fuel continuity by separating out plant types by height and groupings
- consider the type of plants located near any windows or doors which may apply heat to glazing, do not provide such plantings in these vulnerable locations
- consider plantings which help to filter possible embers and wind but are of a nature which complies with the CFA's Plant Selection Key.

It is noted the easiest and most effective way of managing bushfire threat on rural properties is to manage ground fuel loads and regrowth in a minimal fuel condition. Year-round property maintenance is required to ensure excess or build-up of ground fuels (dead plant material) is removed prior to and during each annual fire season.

7.2 Access, Egress and Road Networks

Road design is significant in terms of a range of aspects of bushfire prevention and ability for bushfire fighting. Road design must cater for emergency access and egress in times of potential bushfire events. Based on existing Council approvals, the road design and general subdivision layout has been previously assessed and approved as acceptable by Council pursuant to the former SPP 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide.

The approved internal road network maintains wider than average road widths and connectivity to Tully Road and Spring Mountain Drive, a district connector road. This remains the most direct route out of the Estate. A secondary emergency access is condition via the existing approval for a fire trail at the south-eastern corner of the site, extending 400m to the east to connect with another residential estate. The emergency egress / access option seeks to provide a secondary access option in the event of emergency.

7.2.1 Driveways

It is noted the approved development comprises lifestyle and rural residential sized allotments at a very low-density. Driveway access, length and siting are largely dictated by the size of the allotments, the majority of lots will maintain relatively short driveways. Where future dwellings may be located toward the centre or rear of lot, thereby requiring a longer driveway access, it is recommended the driveway be suitably sealed to support a tanker appliance up to 25 tonnes with a width of a minimum of 4m and height clearance of 4m from overhanging branches. Any

bends in the driveway should provide a turning area equivalent to a 20m diameter. If the driveway is relatively straight, sufficient space should be available to allow a fire appliance to manoeuvre on-site and leave the property in a forward gear.

Access to fire trail easements are required to permit 24 hour access to the easement as required and must not be gated or otherwise obstructed.

Residents are encouraged to consider their evacuation route and evacuation destination prior to any specific bushfire event and at what stage they will evacuate ensuring it is early enough to ensure safe evacuation. Residents are strongly discouraged from adopting a 'wait and see' approach and should prepare a personal / household bushfire survival plan and ideally, speak with officers of the local rural fire brigade for advice in advance of any particular bushfire event.

7.3 Fire Trails

It is noted that fire trails are to be established at the outer boundary of many of the allotments, refer to **Attachment D**, as established by the initial hazard assessment report for the approved development. These trails connect with the road network to be established and must be maintained by the relevant authorities. A range of access easements are also located on individual allotments to allow for periodic access and egress along the trail. The purposes of these trails specifically seek to aid in the management of the parkland areas throughout the development as well as fire management (hazard reduction) and fire appliance access (if so required) in the event of bushfire. It is noted these trails will be located on Council-owned land, unless for the purposes of access easements.

In terms of design specifications, all fire trails must comply with the following:

- access to all formalised fire trails must be available at all times
- signage at all access and egress points where trails join with the formal road network which read 'Fire Trail Access' to be maintained
- suitable fire trail gate systems currently installed are to be appropriately maintained and accessible by both Council and the local rural fire brigade
- fire trails are to provide a 4m wide carriageway with additional fuel management for 3m either side (10m in total) and regularly maintained in a low ground fuel condition. A minimum 4m overhead clearance to branches must be achieved, however it is recommended that overhanging branches are avoided where possible. If slashed, all debris and cuttings must be removed from the fire trail. Trees immediately alongside the fire trails should have branches lopped to a height of 2m to prevent fire propagation within the tree canopy
- dead or dying trees adjacent to the fire trail which may pose a risk to the fire trail or those using it are to be removed
- fire trails are a maximum grade of 15 degrees if sealed and 10 degrees if unsealed or as otherwise provided for by local government fire trail design provisions
- the crossfall of any fire trail is not more than 10 degrees
- unsealed fire trails should comprise a regularly mowed grass cover
- appropriate drainage and erosion controls are provided to prevent scouring or damage to the fire trail and surrounds

- all fire trails are to be regularly inspected and maintained, particularly in the lead up to annual fire seasons. On-going vegetation management along all fire trails is required to mitigate opportunity for vegetation encroachment.

7.4 Building Envelopes

Building envelopes are provided over each allotment which identify the building and conservation envelopes which apply. The building envelopes identified are quite large in size and provide for dwelling construction within a number of locations and formats within each allotment. It is noted that a small number of allotments include vegetated areas which must be retained in an unmanaged state (i.e. no clearing is permitted).

In accordance with the clearing provisions set out at Section 7.1.1, all building envelopes and fenceline clearing areas are to be cleared of vegetation and be managed in a low-fuel condition by owners, in perpetuity. It remains the responsibility of individual owners to understand and implement various fire and vegetation management approaches to ensure their property and that of their neighbours is not inadvertently placed at risk due to landscaping and poor vegetation management.

7.5 Fencing and Retaining

Fencing materials can have a considerable impact on the propagation of fire. Likewise, some fencing materials can alleviate exposure to radiant heat which can assist life and property survival.

It is noted that rural style fencing is currently provided throughout the Spring Mountain Estate and which is likely to continue in this development, with timber-framed mesh fencing along property frontages and rural mesh fencing to side and rear boundaries.

Any fencing is recommended to align with styles which limit the use of timber (i.e. are 75% open style / transparent or use fire resistant and fire retardant materials). Colorbond, masonry or rock fencing is acceptable however, traditional timber paling fences are not recommended.

In addition, any retaining walls required should be constructed of fire resistant or fire retardant material such as concrete, stone, masonry or the like and not constructed from timber.

7.6 Water Supply and Firefighting Infrastructure

It is understood the site is to be connected to reticulated water. As per any new residential subdivision the reticulated water network must comply with Council's Subdivision Design and Construction Manual, which includes specific provisions for firefighting requirements. It is understood the site is serviced by a low pressure reticulated water supply with fire hydrants.

In some circumstances, reticulated water (pressure or supply) may not be guaranteed in the event of bushfire. This can be for a number of reasons including power outages to pump stations or damage to pump stations via bushfire or large amounts of water being drawn from the mains by fire services and the wider community. On this basis, it is recommended that

owners thoughtfully consider supplementing dwellings with a 10,000 litre water tank or pool capable of draughting water for personal firefighting use in the event of ember attack.

Should water tanks be provided, they are not to be constructed of any material which may fail when exposed to excessive heat and must be located on that side of the building which is furthest away from any nearby bushland vegetation. Access around the entire perimeter of each dwelling should be maintained and any hoses and equipment should likewise be capable of reaching all external areas of the dwelling, including roof valleys.

Water tanks must also include a 50mm male camlock fitting for emergency fire service use (or as otherwise instructed by the local rural fire brigade). External hose connections both to reticulated water supplies and directly to the storage tank are recommended. The location of these on each property relative to the siting of the dwelling should ideally be discussed with the local rural fire brigade.

External firefighting systems for dwellings such as 30m fire hoses and roof and gutter-mounted sprinkler systems may be contemplated by prospective owners to enhance firefighting ability however this is not specifically required. It is noted that such systems do have certain limitations which should be considered prior to installation, if so desired. Such systems cannot guarantee the preservation of life or property in the event of a bushfire.

Plastic gas fittings are not acceptable.

7.7 Bushfire Awareness

Landowners are responsible for developing their own knowledge and understanding of the level of bushfire risk specific to their respective properties. A household bushfire plan is required and must take account of matters such as where occupants are during the day (at home, work or school), if any occupants require special assistance (i.e infants, the elderly or the ill), evacuation routes available, evacuation destinations, property maintenance and preparation and arrangements for pets. Planning ahead of any perceived bushfire event is essential.

Understanding what to do in the event of bushfire emergency is critical, residents may not always receive an extended warning or warning to evacuate and fire appliances may not always be available to render assistance. Thus, prior knowledge as to the steps to take during the lead up to a fire event, during the passage of bushfire and what to do immediately after the fire front has passed is critical.

The RFSQ's 'Bushfire Survival Plan' provides detailed information on how to prepare for the bushfire season and how to take action to survive in the event of bushfire. A copy of this publication is enclosed at **Attachment F**.

Alternatively, residents are encouraged to volunteer with the local rural fire brigade to not only gain bushfire education which can be shared with family, friends and neighbours, but assist the local community in a variety of capacities. More information on rural fire brigade volunteering is available at <https://ruralfire.qld.gov.au/>.

7.8 Building Construction Requirements

Bushfire attack levels (BAL) are derived from AS3959-2009 to distinguish the level of attack buildings may experience based on a range of factors, being those addressed in Section 5.

A BAL is defined as 'a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire' (Standards Australia, 2011).

Vegetation typologies, effective slope and separation distances maintain a significant bearing on the likely behaviour and intensity of a bushfire and how these factors may combine to impact upon nearby buildings.

The Australian Standard adopts six distinct BAL categories including a 'low' category for areas where bushfire risk is limited, these categories are outlined below. The categories themselves are based upon the level of radiant heat flux which may be experienced during a bushfire event and generally relates to how close or far a building is from classifiable vegetation. These BAL levels are translated to specific construction requirements to enhance the ability of buildings to withstand bushfire attack.

BUSHFIRE ATTACK LEVELS AND CORRESPONDING SECTIONS FOR SPECIFIC CONSTRUCTION REQUIREMENTS

Bushfire Attack Level (BAL)	Classified vegetation within 100 m of the site and heat flux exposure thresholds	Description of predicted bushfire attack and levels of exposure
BAL—LOW	See Clause 2.2.3.2	There is insufficient risk to warrant specific construction requirements
BAL—12.5	$\leq 12.5 \text{ kW/m}^2$	Ember attack
BAL—19	$> 12.5 \text{ kW/m}^2$ $\leq 19 \text{ kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux
BAL—29	$> 19 \text{ kW/m}^2$ $\leq 29 \text{ kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux
BAL—40	$> 29 \text{ kW/m}^2$ $\leq 40 \text{ kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames
BAL—FZ	$> 40 \text{ kW/m}^2$	Direct exposure to flames from fire front in addition to heat flux and ember attack

Figure 9: Excerpt from AS3959-2009 (Source: Standards Australia, 2011)

As BAL categories for building construction are based upon distance from classifiable vegetation, dwelling siting is particularly important to accurately identify the appropriate building measures required.

The BAL categories identified for particular sites in the bushfire management plan at **Attachment D** contemplates the clearing rationale as identified in the Vegetation Clearing and Management Plan and the clearing provisions identified at Section 7.1.1 of this report. It also considers the building construction provisions as per AS3959-2009. This being the case, a range of BAL categories is identified over certain properties depending on where a dwelling may locate. Where a dwelling is located across two or more categories, the highest BAL category will apply to that dwelling. Alternatively, owners may engage a suitably qualified specialist to undertake a more tailored BAL assessment based on building and siting plans. As this information is not currently available, the BAL provisions as set out at **Attachment D** remain applicable.

In addition, the BAL categories identified are based upon site clearing / vegetation management (understorey removed). If such activities are not undertaken as recommended by this report, higher BAL categories for dwelling construction will prevail and a tailored BAL assessment specific to the proposal will be required, prepared by a suitably qualified specialist. As noted, no clearing is permitted within the conservation envelopes on relevant properties which thus requires separation distance from vegetation located on-site (or on adjoining allotments) with respect a small number of allotments.

7.8.1 Limitations of AS3959-2009

The Australian Standard provides that although its provisions are:

'designed to improve the performance of buildings when subjected to bushfire attack in designated bushfire-prone areas there can be no guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions.'

It is significant to also understand the objective of AS3959-2009, which is to *'prescribe particular construction details for buildings to reduce the risk of ignition from a bushfire, appropriate to the:*

- a) *potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire; and*
- b) *intensity of the bushfire attack on the building.'*

Further and as set out previously in this report, the FFDI provisions pursuant to AS3959-2009 adopted for Queensland is 40 and as such the design parameters in this context are designed to a maximum of Very High (FDI 25-49). Thus, fire days in excess of this (Severe, Extreme and Catastrophic days) are not accommodated by existing statutory building instruments and is beyond design parameters. As advised by the RFSQ at **Attachment F**, early evacuation on fire danger days above Very High is recommended, even if properties are well-prepared.

Importantly, the enhancement of survival of life and property relies upon a range of mitigation measures, including regular and on-going property and vegetation management as well as BAL construction requirements. Again, whilst all reasonable care and diligence has been applied throughout the preparation of this assessment and the identification of BAL provisions, these provisions in no way form a guarantee against the loss of life or property as a result of bushfire

and it remains the responsibility of property owners to investigate, self-educate and understand how best to protect their property and lives in the event of bushfire. A range of helpful resources are listed in Section 10 of this report.

8

SUMMARY OF RECOMMENDATIONS

This report contains a number of recommendations relating to specific bushfire mitigation measures. These recommendations are summarised below and must be implemented by the purchasers and / or Logan City Council.

1. Provide a copy of this report to Logan City Council, the local rural fire brigade and all current and potential purchasers for review
2. Undertake all clearing, vegetation management and landscaping provisions as outlined at Section 7.1 of this report
3. Clear all ground and surface (understorey) vegetation on each allotment (except where within a protected vegetated corridor) and ensure all trees retained are isolated individuals with separated canopies
4. Owners are to maintain each allotment in accordance with Section 7.1 of this report on an on-going basis
5. Install rural mesh fencing where fencing is required. If rural mesh fencing is not preferred, provide masonry or colorbond fencing as an alternative to traditional timber paling fencing. Timber paling fencing is not recommended
6. Maintain the established fire trail network and its points of access as identified at **Attachment D** and pursuant to design specifications set out in Section 7.3 where required
7. Ensure property setbacks and BAL provisions comply as per the requirements set out at **Attachment D**, or unless otherwise assessed by a qualified specialist or building certifier where a property-specific assessment is undertaken pursuant to AS3959-2009
8. Potential purchasers seek advice from a qualified and registered builder, suitably qualified bushfire specialist and / or building certifier with regard to the construction requirements identified for respective properties set out in **Attachment D**
9. Ensure the collective range of bushfire mitigation measures as identified within this report and illustrated at **Attachment D** are implemented to ensure the bushfire attack levels identified can be achieved
10. Where dwellings are located toward the centre or rear of lot, thereby requiring a longer driveway access, it is recommended the driveway be suitably sealed to support a tanker appliance up to 25 tonnes with a width of a minimum of 4m and height clearance of 4m from overhanging branches. Any bends in the driveway should provide a turning area equivalent to a 20m diameter
11. If a driveway is relatively straight, sufficient space should be available to allow a fire appliance to manoeuvre on site and leave the property in a forward gear
12. 24 hour access to all fire trail access easements must remain available. No fencing or gates or obstructive structures or landscaping should be provided across or within these easements
13. Council and / or the local rural fire brigade are required to undertake regular inspections and maintenance of all Council-owned land to be dedicated. Removal of ground fuel matter and

management of vegetation (mowing, pruning, thinning, etc) is required prior to every fire season

14. The CFA's 'Landscaping for Bushfire' guide is utilised in garden design and plant selection process for all properties. Purchasers should be aware of how to create and maintain a 'fire-wise' garden so as to limit fuels surrounding dwellings
15. Owners are strongly recommended to consider the installation of a 10,000 litre water tank (and stand-alone pump) with necessary emergency firefighting attachments for personal fire-fighting purposes. This may assist to provide additional capacity to protect against ember attack should the need arise
16. Owners ensure water tanks are always full prior to each bushfire season
17. Plastic gas fittings for individual dwellings are not acceptable and should not to be used
18. Purchasers should consider additional fire preparedness at the dwelling design stage, a number of helpful tips are provided for guidance purposes only at **Attachment G**. This may be in the form of:
 - a. limiting the number of roof valleys and wall articulations (forming re-entrant corners) so as to reduce the number of points around the dwelling where embers may lodge and accumulate
 - b. include window and door sills of 18 degrees or higher to allow embers to easily roll off or blow away
 - c. consider glass type and protection to reduce the possibility of fracturing from radiant heat
 - d. provide gutter guards to keep leaf litter and vegetation debris out of gutters and roof valleys, which may catch alight via ember attack
 - e. consider roof tie-down to protect against fire-driven wind
 - f. consider the use of mounted sprinklers and / or hoses for additional fire-fighting protection external to the house
 - g. design dwellings to accommodate higher BAL construction requirements than required under the Australian Standard
19. Land-owners seek to educate and inform themselves and their family members on how to appropriately manage bushfire risk, how to prepare themselves and their properties for a bushfire event and what to do in the event of a bushfire.

9

CONCLUSIONS

This report considers the bushfire mitigation measures required for Stages 15 - 18 as part of the Spring Mountain Estate. Based upon on-site inspections and analysis, a range of mitigation measures are identified to aid in the defence against bushfire with respect to areas of classifiable vegetation which surround the development site.

Based on this assessment, a range of recommendations has been derived. In addition, it is significant to note that bushfire remains a natural process which is endemic to the Australian bush and it remains subject to a range of contributing factors which are variable almost on a daily basis. As such, it is extremely difficult to predict the behaviour and intensity of a fire event at any given time. On this basis, it remains of the upmost importance that residents within identified bushfire prone areas obtain knowledge and remain aware of their options in the event of a bushfire to ensure the preservation of both life and property.



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AUTHOR'S PROFILE

Laura Gannon is a Senior Town Planner and qualified specialist in the area of bushfire planning and management with Jensen Bowers Group. With almost 10 years of industry experience, Laura's expertise focuses on bushfire risk and resilience including planning policy, bushfire responsive strategic planning and planning for development in bushfire hazard areas. Laura's experience spans the private and public sectors, including both local and state government.

QUALIFICATIONS

Laura holds a diversity of tertiary level qualifications, including:

- Bachelor of Regional and Town Planning (Hons), University of Queensland
- Graduate Diploma in Bushfire Protection, University of Western Sydney
In partial completion of Masters Program (expected completion in 2017)
- Building and Development in Bushfire Prone Areas, University of Technology Sydney
- Practice in Risk Based Land Use Planning (National Qualification Code: 10020NAT), Australian Emergency Management Institute
- Graduate Certificate in Project Management, University of South Australia.

Specific areas Laura is qualified and experienced in include:

- bushfire behaviour
- bush firefighting
- planning and development control for bushfire prone areas
- building and development in bushfire prone areas in accordance with AS3959-2009
- radiant heat flux analysis
- emergency management for bushfire prone areas
- alternative (non-complying) solutions for bushfire prone areas
- risk-based land use planning (natural hazard planning)
- bushfire responsive urban design
- bushfire risk assessment and management in accordance with AS/NZS 4360-2004.

AFFILIATIONS

- Corporate Member of the Planning Institute of Australia
- Member of the Fire Protection Association of Australia (BPAD Accreditation pending)
- Member of the Australian Institute of Emergency Services.

PROFESSIONAL REPRESENTATION

- Convener of the PIA Queensland Environmental Planning Chapter
- Committee Member, PIA Queensland Division Committee
- Committee Member, PIA National Climate Change Advocacy Group
- Member, Queensland Government Climate Adaptation Strategy Partnership Group
- Deputy Chair, Australian Sustainable Built Environment Council (ASBEC)'s Resilience Strategy Task Group
- Member, Queensland Government Bushfire Risk Advisory Group.

PUBLICATIONS

- *The New Risk Frontier: Bushfire Risk and Land Use Planning Challenges in a Changing Climate*, Queensland Planning Journal, Autumn Ed. 2015, Planning Institute of Australia
- *Bushfire Hazard Planning Policy*, Proceedings of the Climate Change Adaptation, Planning and the Law Workshop held in Brisbane on 21 November 2014, DLA Piper and the University of Queensland
- *Urban Planning, Bushfire Risk and Emergency Management*, National Emergency Response Journal, Vol. 27, No. 3, Australian Institute of Emergency Services
- *Placing People in the Landscape: Towards a Robust Policy Framework for Bushfire Hazard Planning in Queensland*, (Refereed), Proceedings of the 2014 PIA Queensland Conference, Planning Institute of Australia

AWARDS

2011 PIA Australian Young Planner of the Year

2010 Robert Swider Memorial Award for PIA Queensland Young Planner of the Year

10

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**CFA'S LANDSCAPING FOR BUSHFIRE
GUIDELINE**

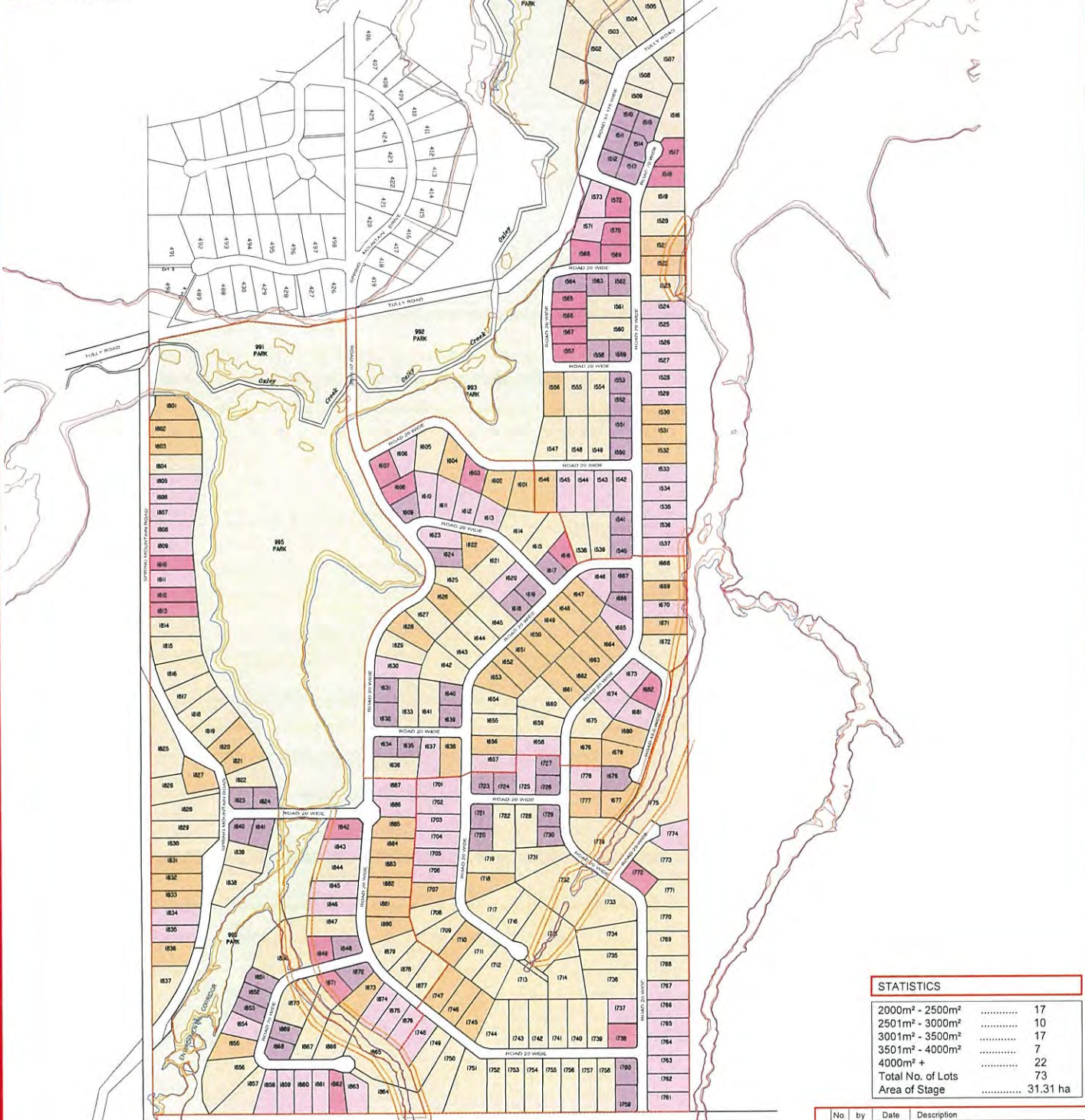


**BUILDING DESIGN TO REDUCE BAL
CONSTRUCTION COSTS**





- 2000m² - < 2500m²
- 2500m² - < 3000m²
- 3000m² - < 3500m²
- 3500m² - < 4000m²
- > 4000m²
- Open Space
- Q2 Floodline
- Q20 Floodline
- Q100 Floodline
- Buffer Areas



STATISTICS	
2000m ² - 2500m ²	17
2501m ² - 3000m ²	10
3001m ² - 3500m ²	17
3501m ² - 4000m ²	7
4000m ² +	22
Total No. of Lots	73
Area of Stage	31.31 ha

No	by	Date	Description
A	AJB	04/05/15	Original Issue
B	AJB	13/07/15	Layout amended

Scale 1:4000 - Lengths are in Metres

SH saunders havill group
 Saunders Havill Group Pty Ltd ABN 24 144 972 949
 Brisbane • Emerald • Gladstone
 Head Office: 9 Thompson St Bowen Hills Q 4006
 phone: 1800 123 5HG web: www.saundershavill.com
 • surveying • town planning • urban design • environmental management • landscape architecture

Plan of **PROPOSAL PLAN**

Project **SPRING MOUNTAIN ESTATE - GREENBANK**

Client **MTAA Superannuation Fund (Flagstone Creek and Spring Mountain Park) Property Pty Ltd**

town planning

Scale @A1 1:4000
 @A3 1:8000

Dwg No 7081 P 02 PP C

Part 8 Overlays

8.2 Overlay codes

8.2.3 Bushfire hazard overlay code

8.2.3.1 Application

- (1) This code applies to self-assessable and assessable development for which the Bushfire hazard overlay code is identified in the assessment criteria column in Table 5.10.3.1—Bushfire hazard overlay map OM–03.00 in Part 5—Tables of assessment.
- (2) When using this code, reference should be made to section 5.3.2—Determining the level of assessment and, where applicable, section 5.3.3—Determining the assessment criteria located in Part 5—Tables of assessment.

Note— Pursuant to section 32(a) of the *Building Act 1975* and section 12 of the *Building Regulation 2006*, land identified as a Bushfire hazard area on Bushfire hazard overlay map—OM–03.00 is a 'designated bushfire prone area' for the Building Code of Australia and the Queensland Development Code.

8.2.3.2 Purpose

- (1) The purpose of the code is to protect people and premises in a Bushfire hazard area.
- (2) The purpose of the code will be achieved through the following overall outcomes:
 - (a) Development protects people and premises from bushfire risk:
 - (i) through allotment design and siting of development envelope areas and asset protection zones;
 - (ii) by providing vehicular access, fire maintenance trails and evacuation routes that are safe and facilitate easy way finding;
 - (iii) by providing an accessible water supply for firefighting purposes;
 - (iv) by ensuring the function of community infrastructure is not adversely impacted by bushfire;
 - (v) by protecting personal health and safety and the environment from hazardous materials.

8.2.3.3 Criteria for assessment

Part A—Criteria for self-assessable and assessable development

Table 8.2.3.3.1—Bushfire hazard overlay code: self-assessable and assessable development

Performance outcomes	Acceptable outcomes	Comments
For self-assessable and assessable development		
Location, design and siting of development		
<p>PO1 Development is designed to: (a) minimise risk of bushfire hazard; (b) provide safe premises; (c) create efficient emergency access for fire-fighting and other emergency vehicles.</p> <p><small>Note—Planning scheme policy 6—Management of bushfire hazard provides guidelines on how to achieve this outcome.</small></p>	<p>AO1 Development: (a) does not increase the number of persons living in, or lots in, the Bushfire hazard area identified on Bushfire hazard overlay map—OM—03.00; or (b) is on a site that a bushfire hazard assessment prepared in accordance with the methodology in planning scheme policy 6—Management of bushfire hazard determines is of low bushfire hazard.</p>	<p>Performance Outcome The subject site is located in an area which is currently transitioning from rural to rural residential and adjoins several rural residential subdivisions. The bushfire hazard of the site has been previously assessed by Council pursuant to the original approval and former hazards SPP. A combined range of mitigation measures are identified within the attached hazard assessment report, seeking to minimise the level of risk exposure.</p>

Performance outcomes	Acceptable outcomes	Comments
<p>PO2 Development is sited and constructed to minimise the bushfire hazard and maximise the protection of life and property from bushfire.</p>	<p>AO2 Development is located and constructed:</p> <p>(a) where there is no bushfire management plan approved by an existing development approval:</p> <ul style="list-style-type: none"> (i) such that the bushfire attack level is less than or equal to BAL--29; (ii) away from the most likely direction of a fire front; (iii) so that elements of the development least susceptible to fire are sited closest to the bushfire hazard; (iv) such that asset protection zones are sited on land with a slope less than 18 degrees; (v) such that asset protection zones are entirely within the boundaries of the private property of the development site; <p>or</p> <p>(b) where an approved bushfire management plan directs development to be located.</p> <p><small>Note—BAL = Bushfire attack level is the radiant heat flux a building will experience during a bushfire and is a measure of heat energy impacting on a surface expressed as kW/m². BAL is calculated from the following factors: vegetation type, fuel loads, distance to vegetation, Forest Fire danger Index (FDI), flame length, fire behaviour/intensity and slope. BAL is used to determine the required construction level of a building and the size of asset protection zones (inner and outer radiation zones). Further information on calculating the BAL can be obtained from AS3959–2009.</small></p> <p><small>Editor's note—Asset protection zones are not located on slopes greater than 18 degrees to ensure maintenance is practical, soil stability is not compromised and the potential for crown/canopy fires is reduced.</small></p> <p><small>Editor's note—Planning scheme policy 6—Management of bushfire hazard contains guidance on the preparation of bushfire management plans.</small></p>	<p>Acceptable outcome</p> <p>The proposed subdivision design includes sufficiently sized allotments which allow dwellings to be sited away from adjoining areas of bushfire hazard. The clearing rationale for the site incorporates removal of understorey on allotments (except where within a protected vegetation corridor) and retention of mature trees, only a isolates specimens. This approach allows for the siting of dwellings on those areas of allotments at lowest risk, noting the vast majority of lots incorporate large BAL-12.5 areas, or are not subject to hazard at all.</p> <p>A bushfire management plan has been prepared, identifying the range of relevant mitigation measures required, supplemented by the hazard assessment report.</p>

Performance outcomes	Acceptable outcomes	Comments
<p>PO3</p> <p>Reconfiguring a lot ensures that lots are designed to minimise bushfire hazard and provide safe sites for people, property and buildings.</p>	<p>AO3</p> <p>Lots:</p> <p>(a) are suitable for people, property and buildings by:</p> <p>(i) having a bushfire attack level less than or equal to BAL-29; or</p> <p>(ii) containing a development envelope area that has a bushfire attack level less than or equal to BAL-29;</p> <p>(b) provide asset protection zones that:</p> <p>(i) are located on land with a slope less than 18 degrees;</p> <p>(ii) are located on the same lot.</p>	<p>Acceptable outcome</p> <p>The proposed subdivision design includes sufficiently sized allotments which allow dwellings to be sited away from adjoining areas of bushfire hazard. The clearing rationale for the site incorporates removal of understorey on allotments (except where within a protected vegetation corridor) and retention of mature trees, only a isolates specimens. This approach allows for the siting of dwellings on those areas of allotments at lowest risk, noting the vast majority of lots incorporate large BAL-12.5 areas, or are not subject to hazard at all.</p> <p>A bushfire management plan has been prepared, identifying the range of relevant mitigation measures required, supplemented by the hazard assessment report.</p>

Vehicular access and fire maintenance trails

<p>PO4</p> <p>Access for fire management and evacuation is provided by access that:</p> <p>(a) separates premises from adjoining vegetation;</p> <p>(b) is safely accessible by fire fighting vehicles;</p> <p>(c) has regular vehicular access points for bushfire management, response and evacuation;</p> <p>(d) has regular vehicle passing and turning areas for bushfire management, response and evacuation;</p> <p>(e) allows access at all times for fire fighting vehicles;</p>	<p>AO4</p> <p>Access for fire management and evacuation is provided by vehicular access in the form of a perimeter road:</p> <p>(a) with a minimum reserve width of 20 metres;</p> <p>(b) located between the premises and adjoining vegetation;</p> <p>(c) with a maximum gradient of 12.5 percent;</p> <p>(d) constructed to otherwise comply with section 3.4–Movement infrastructure standards of planning scheme policy 5–Infrastructure;</p> <p>(e) that has a layout that does not include a cul-de-sac.</p>	<p>Performance outcome</p> <p>It is noted this development is subject to an existing approval which was assessed via the former SPP. Perimeter roads are provided in the majority of locations however, by virtue of the lot sizes which remain ample to site dwellings away from the source of hazard, perimeter roads are not necessary to the entire site. Most of the allotments comprise generous areas of low or no bushfire construction requirement, being located sufficiently away from the source of the hazard based upon the clearing methodology for proposed allotments.</p>
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Performance outcomes	Acceptable outcomes	Comments
<p>(f) allows for maintenance, burning off and bushfire response;</p> <p>(g) has vehicular links to an alternative through road;</p> <p>(h) is readily maintained.</p> <p>Editor's note—Planning scheme policy 6— Management of bushfire hazard provides details on alternative solutions for providing fire management access and evacuation</p>		
Water supply		
<p>PO5 Development has access to adequate water supply for fire fighting purposes.</p>	<p>AO5 Development:</p> <p>(a) is connected to a reticulated water supply scheme that has sufficient flow and pressure characteristics for fire fighting purposes at all times with a minimum pressure and flow of 10 litres per second at 200kPa; or</p> <p>(b) has an on-site water storage in accordance with Table 8.2.3.3.2—Water storage for fire fighting, dedicated or retained for fire fighting purposes that is made of fire resistant materials and is:</p> <p>(i) a separate tank; or</p> <p>(ii) a reserve section in the bottom part of the main water supply tank.</p> <p>Editor's note—The requirement in AO5 is:</p> <ul style="list-style-type: none"> - in addition to the requirement for potable water supply/storage in AO2 in Table 9.4.3.3.2—Infrastructure code: self-assessable and assessable development.; - reflected in AO5 in Table 9.4.3.3.2—Infrastructure code: self-assessable and assessable development. 	<p>Acceptable outcome</p> <p>The proposed development will be connected to reticulated water supply, with separate tank recommended for those lots subject to a BAL classification.</p>

Performance outcomes	Acceptable outcomes	Comments
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For assessable development

Community infrastructure

<p>PO6 Community infrastructure is not located in a bushfire hazard area or is able to function effectively during and immediately after a bushfire event.</p>	<p>AO6 Community infrastructure is: (a) not located in a Bushfire hazard area identified on Bushfire hazard overlay map—OM—03.00; or (b) located to ensure that: (i) the core services provided by the community infrastructure is able to function effectively during bushfire events; (ii) access to the community infrastructure is not compromised by bushfire events; (iii) the safe storage of valuable records, public records and items of cultural or historic significance is able to be maintained during a bushfire event.</p>	Not applicable
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Hazardous materials

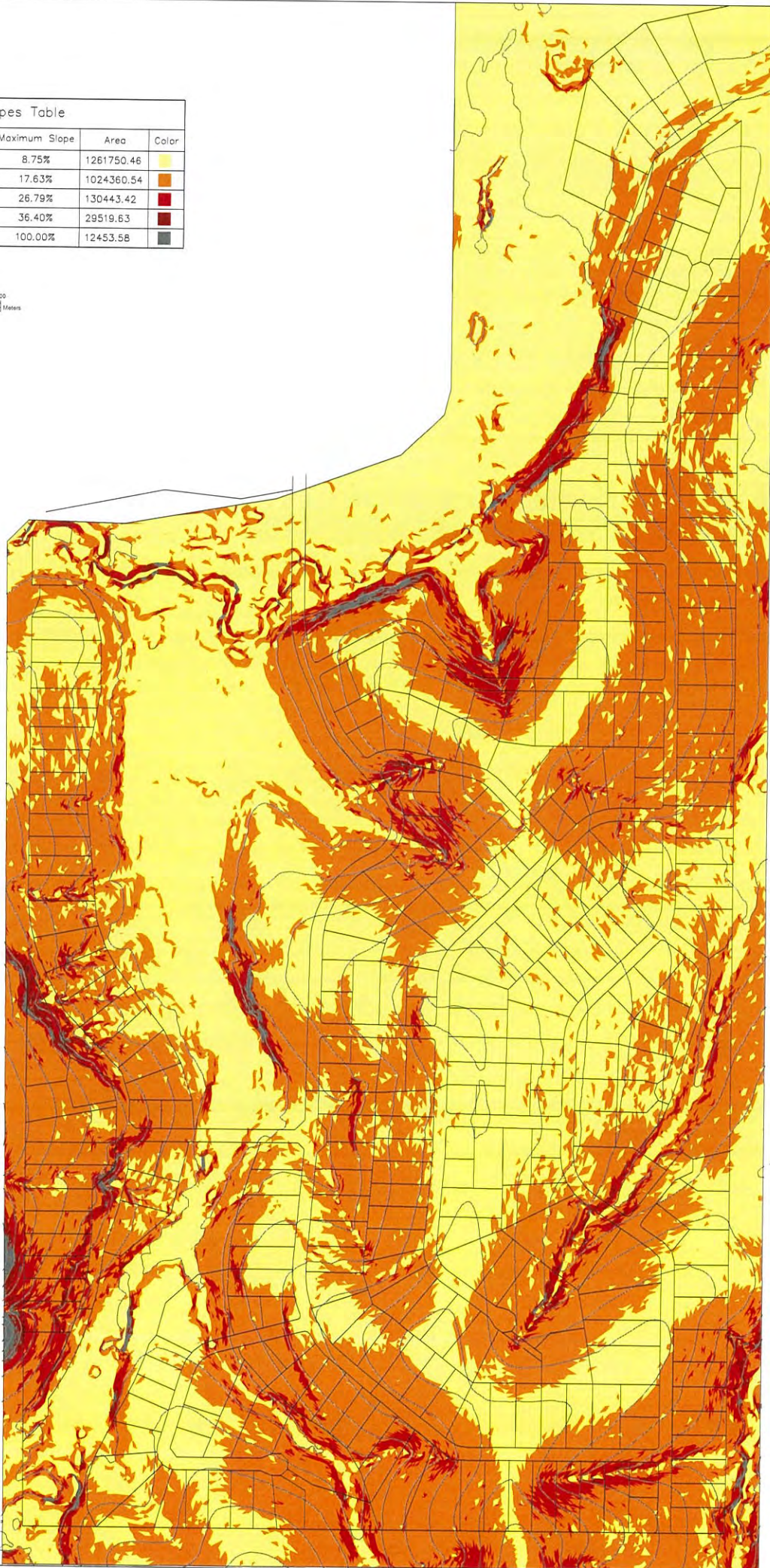
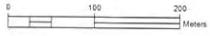
<p>PO7 Public safety and the environment are not adversely affected by the adverse impacts of bushfire on hazardous materials including fuels, explosives and flammable chemicals manufactured or stored in bulk on premises.</p>	<p>AO7 Hazardous materials: (a) storage is in compliance with AS1940—The storage and handling of flammable and combustible liquids; (b) manufacturing does not occur in a Bushfire hazard area on Bushfire hazard overlay map—OM—03.00.</p>	Not applicable
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Table 8.2.3.3.2–Water storage for fire fighting







Column 1	Column 2
Lot size / use type	Water requirement
For each residential lot:	
(a) less than 1000m ²	5000 litres
(b) between 1000m ² and less than 1 hectare	10,000 litres
(c) greater than 1 hectare	20,000 litres
Multiple dwelling	5000 litres per dwelling up to a maximum of 20,000 litres
A use other than Multiple dwelling	5000 litres or the prevailing rural fire brigade standard

Slopes Table

Number	Minimum Slope	Maximum Slope	Area	Color
1	0.00%	8.75%	1261750.46	Yellow
2	8.75%	17.63%	1024360.54	Orange
3	17.63%	26.79%	130443.42	Red
4	26.79%	36.40%	29519.63	Dark Red
5	36.40%	100.00%	12453.58	Dark Grey



- Complete tree removal within 10m of dwellings and any associated garages is required.
- The BAL classifications derived for the purposes of this BMP are based upon complete removal of understorey vegetation internal to allotments, with only isolated tree specimens retained (unless as otherwise required for the purposes of protected vegetated corridors)
- The bushfire attack levels identified on this Bushfire Management Plan (BMP) are based upon the risk analysis and vegetation management provisions as set out in the accompanying report.
- Specific BAL levels are derived from building siting and separation distances to unmanaged vegetation. The BAL assessment provided via this BMP represents an appropriate attack level assessment based on information available at the time this BMP was prepared. Clearing for a 10m wide fire trail (including easements) is required in accordance with this BMP and the provisions outlined in the accompanying report. Vehicle turnaround areas must be in accordance with the dimensions as indicated and scaled on this BMP unless otherwise identified by OFES, RFSQ or Council. The indicative fire trail corridor identifies that area within which the fire trail and all turnaround areas are to be established however, clearing is only required to establish the fire trail network and is not intended to identify clearing of the entire corridor.
- A specific site-based BAL assessment based on building plans and building site may be conducted by a suitably qualified specialist.
- Any construction within the red zone on identified allotments is outside the recommendations of the accompanying report and will require a site based BAL assessment based on building plans & building siting.
- Conservation envelopes constitute unmanaged vegetation and clearing is not authorised in these locations as per council approval requirements.
- BAL categories identified are based upon site clearing / vegetation management (understorey removed) on an ongoing basis within the building envelope if such activities are not undertaken as recommended by this report, higher BAL categories for dwelling construction will prevail and tailored BAL assessment specific to the suitability qualified specialist.
- Where a dwelling is located across two or more BAL categories, the highest BAL category will apply.
- Refer to the Vegetation Clearing and Management Plan accompanying the attached report for further detail with regard to building envelope locations and vegetation clearing areas.

Legend	
	BAL - 12.5
	BAL - 19
	BAL - 29
	Bush Fire Access Trail - 10m Wide
	Building Exclusion Zone (Pool and steel garden shed acceptable) Further BAL assessment required for buildings at BA stage to locate in this zone.
	Grassland provisions apply



Approved to the extent of Stage 15A only. Refer to Bushfire Management Plan, Sheets 4 to 6, document reference SME 01, Rev B, dated 3/09/2019, by Meridian Urban for Stage 15B and 15C.

NOT FOR CONSTRUCTION

Status Stamp	WORKING PLOT
Date Stamp	
Scale	1:4000
Drawing No.	BMP-7763-009-A
Rev.	A

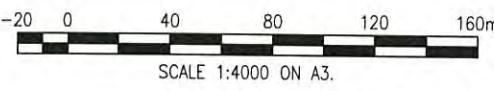
SPRING MOUNTAIN ESTATE - GREENBANK
STAGE 15 - BUSHFIRE MANAGEMENT PLAN



DESIGNED	DRAWN	CAD REVIEW	DES CHECK	REVIEWED	APPROVED	APP.	DATE	PROF. REGISTRATION:
NOT APPROVED								
A. ISSUED FOR CONCEPT DESIGN REVISIONS								

Legend	
	BAL - 12.5
	BAL - 19
	BAL - 29
	Bush Fire Access Trail - 10m Wide
	Building Exclusion Zone (Pool and steel garden shed acceptable) Further BAL assessment required for buildings at BA stage to locate in this zone.

- Notes**
- Complete tree removal within 10m of dwellings and any associated garages is required.
 - The BAL classifications derived for the purposes of this BMP are based upon complete removal of understorey vegetation internal to allotments, with only isolated tree specimens retained (unless as otherwise required for the purposes of protected vegetated corridors).
 - The bushfire attack levels identified on this Bushfire Management Plan (BMP) are based upon the risk analysis and vegetation management provisions as set out in the accompanying report.
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 - A specific site-based BAL assessment based on building plans and building site may be conducted by a suitably qualified specialist.
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 - Where a dwelling is located across two or more BAL categories, the highest BAL category will apply.
 - Refer to the Vegetation Clearing and Management Plan accompanying the attached report for further detail with regard to building envelope locations and vegetation clearing areas.



NOT FOR CONSTRUCTION

WORKING PLOT

Spring Mount Estate - Greenbank
Stage 16 - Bushfire Management Plan

MWH

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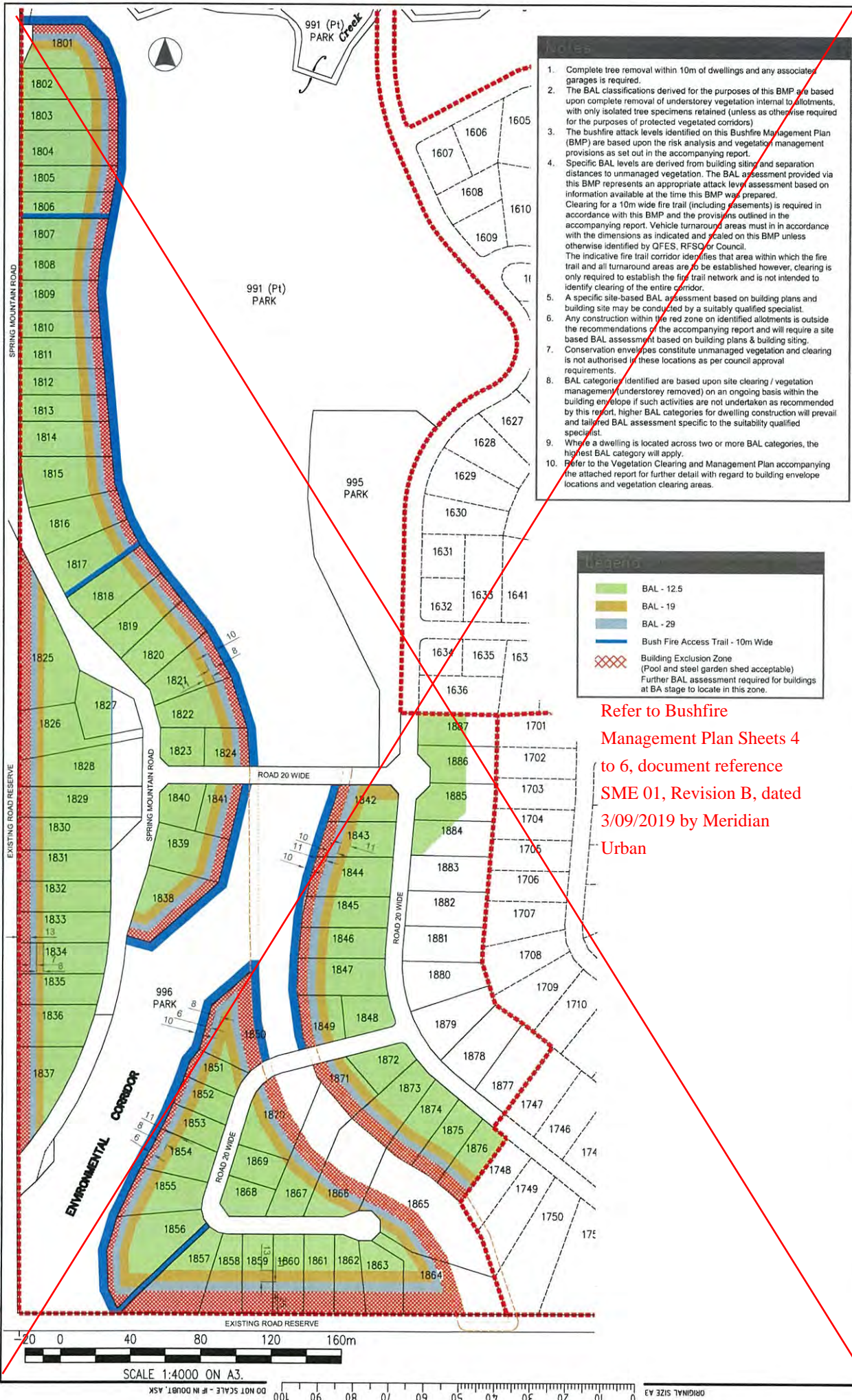
NOT APPROVED

A. ISSUED FOR CONCEPT DESIGN REVISIONS

REV. 1

BMP-7763-010-A

Rev. A



- NOTES**
1. Complete tree removal within 10m of dwellings and any associated garages is required.
 2. The BAL classifications derived for the purposes of this BMP are based upon complete removal of understorey vegetation internal to allotments, with only isolated tree specimens retained (unless as otherwise required for the purposes of protected vegetated corridors)
 3. The bushfire attack levels identified on this Bushfire Management Plan (BMP) are based upon the risk analysis and vegetation management provisions as set out in the accompanying report.
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 8. Where a dwelling is located across two or more BAL categories, the highest BAL category will apply.
 9. Refer to the Vegetation Clearing and Management Plan accompanying the attached report for further detail with regard to building envelope locations and vegetation clearing areas.

LEGEND

	BAL - 12.5
	BAL - 19
	BAL - 29
	Bush Fire Access Trail - 10m Wide
	Building Exclusion Zone (Pool and steel garden shed acceptable) Further BAL assessment required for buildings at BA stage to locate in this zone.

Refer to Bushfire Management Plan Sheets 4 to 6, document reference SME 01, Revision B, dated 3/09/2019 by Meridian Urban

NOT FOR CONSTRUCTION

Spring Mountain Estate - Greenbank
Stage 18 - Bushfire Management Plan

MWH

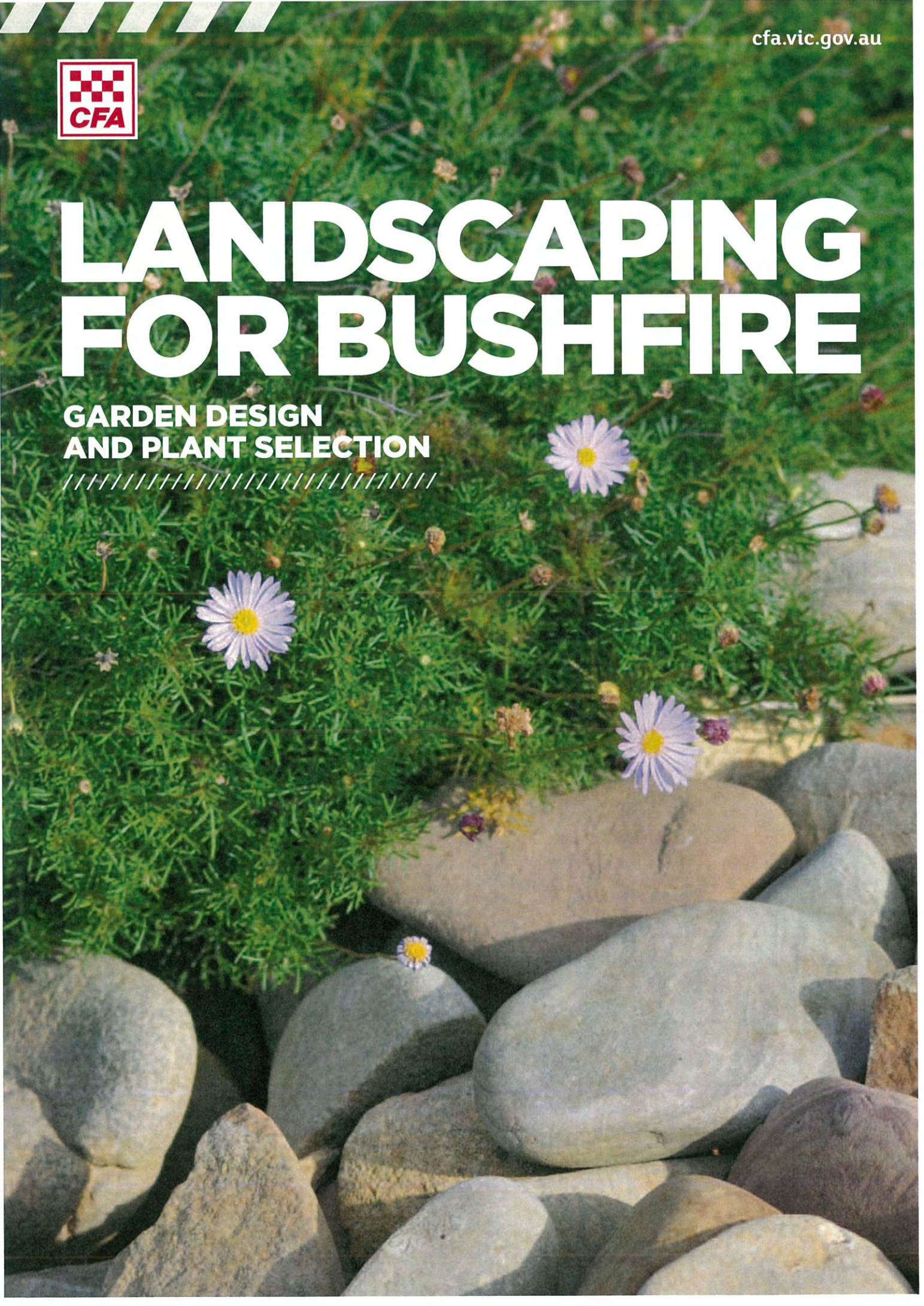
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Drawing No: BMP-7763-012-A
Rev: A



LANDSCAPING FOR BUSHFIRE

**GARDEN DESIGN
AND PLANT SELECTION**



FOREWORD

The type, quantity and condition of fuel has a very important effect on bushfire behaviour. The survivability of buildings, and of those who occupy and shelter in them, can be significantly enhanced or endangered by the type of plants around the building.

Landscaping for Bushfire has been developed by CFA in response to Recommendation 44 from the Victorian Bushfires Royal Commission. It forms just one part of our approach to help Victorian communities prepare for the fire season.

Residents in high bushfire risk areas need to be aware of their environment and the risks they face during the fire season. Planning ahead is essential for surviving the coming fire season. The most effective way to reduce risk in the garden is to focus on the location and arrangement of fuel on your property.

Even though all plants burn, measures can be taken to reduce fire intensity from garden plants. This guide identifies what you can do within defensible space to minimise the risk of losing your house or threatening the lives of occupants in a bushfire.

Landscaping for Bushfire is a valuable resource for home gardeners, landscape architects and nursery staff as well as CFA Fire Safety Officers, Vegetation Management Officers and Home Bushfire Advice Service consultants.

Landscaping for Bushfire bridges the gap between vegetation management and the Bushfire Management Overlay (BMO), providing advice on how to plan and maintain a garden while meeting planning permit conditions within the BMO.



Euan Ferguson AFSM
Chief Officer

The views and final content of this document remain the responsibility of CFA.

CFA makes this information available on the understanding that you take reasonable care when using it. If you have any uncertainty about the application of the information to your particular circumstance, you should obtain further professional advice.

CFA does not accept responsibility for how you apply or rely on the information in this publication.

Cover image

Brachyscome, photo courtesy of Owen Gooding.

LFB 11/2011

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ABOUT THIS PUBLICATION

CFA has developed *Landscaping for Bushfire: Garden Design and Plant Selection* for new and established homes in high-risk areas. This includes properties in the Bushfire Management Overlay (see below). The focus is on residential gardens, but the design principles can be applied to larger developments and subdivisions.

WHAT INFORMATION IS COVERED?

This publication provides information on landscaping to minimise the effects of direct flame contact and radiant heat on a house during a bushfire.

Sections 2-5 are a guide to the planning and design process. There are four example gardens with landscape plans, design notes and suitable plant options. These gardens illustrate the design principles of landscaping for bushfire for gardens in coastal, hilly, rural and suburban environments.

Section 6 draws attention to the importance of garden maintenance.

Section 7 includes a Plant Selection Key. This tool can be used to help choose suitable plants with low flammability. The key is also available as an online tool at cfa.vic.gov.au/plants

Section 8 provides information on further resources and references.

WHAT IS LANDSCAPING FOR BUSHFIRE?

Landscaping for bushfire involves planning, designing, planting and managing the area around a house.

The aim is to keep the area around a house and other structures (such as carports and sheds) free of plants that can easily catch fire and then ignite the buildings.

Landscaping for bushfire can be used to create new – or modify existing – gardens. It takes into account a number of factors that include:

- understanding how fire behaves
- creating defensible space
- the location of plants within the garden
- the flammability of individual plants
- the need for ongoing maintenance.

BUSHFIRE MANAGEMENT OVERLAY

The Bushfire Management Overlay is a planning control that applies to high bushfire risk areas in Victoria. It identifies areas where the bushfire hazard requires specified bushfire protection measures to be implemented.

The Bushfire Management Overlay is identified by planning schemes and can be found at Clause 44.06. It sets out:

- the types of development that require a planning permit
- the information that must be submitted with a planning permit application
- the objectives, standards, mandatory standards and decision guidelines that must be considered in a planning permit application.

Visit dpcd.vic.gov.au for further details.

WHY IS LANDSCAPING FOR BUSHFIRE IMPORTANT?

Victoria is one of the most bushfire-prone areas in the world. The combination of vegetation, climate and topography creates ideal conditions for bushfire. Population growth in high-risk locations means that these communities need to be well prepared for bushfires.

Landscaping using appropriate design principles and plant selection can increase the likelihood of a house surviving a bushfire – even if the plan is to leave early.

Poorly located vegetation that burns readily may expose a house to increased levels of radiant heat and flame contact.

Well-placed vegetation with low flammability may actually help protect houses by:

- reducing the amount of radiant heat received by a house
- reducing the chance of direct flame contact on a house
- reducing wind speed around a house
- deflecting and filtering embers
- reducing flammable landscaping materials within the defensible space.

A holistic approach is the best way to ensure proper preparation. It involves a combination of bushfire protection measures. These include:

- house construction and maintenance
- preparing a Bushfire Survival Plan (see the *Fire Ready Kit* – available at cfa.vic.gov.au)
- having an adequate water supply and road access
- garden design and plant selection.

FIRE RESISTANT, FIRE RETARDANT OR FIREWISE?

These terms are often used when talking about flammability characteristics of a plant. They have very specific and quite different meanings and should not be confused.

Fire resistant is a term that describes plant species that survive being burnt and will regrow after a bushfire. They are resistant to being killed by a bushfire, but not to being burnt. Therefore, they may be highly flammable and inappropriate for a garden in a high bushfire risk area.

Fire retardant can also be misleading when referring to plants. It implies that a plant will not burn readily or may slow the passage of a fire. It cannot be emphasised enough that all plants will burn under the right conditions.

Firewise, in this document, refers to the flammability ranking system applied to a plant by the Plant Selection Key (see Section 7). The term is linked with advice about maintenance and where that plant should be located within a garden.



IMPORTANT



FIRE DANGER RATING

While a well-planned garden is important, it is only one aspect of preparing for bushfire. It should not be relied upon in isolation. In high-risk areas on **Severe, Extreme** and **Code Red** days, leaving early is always the safest option.

BUSHFIRE BEHAVIOUR

Understanding how bushfire behaves and destroys houses is important when planning, designing and selecting suitable plants for a garden. There are three major factors that influence bushfire behaviour: topography, weather conditions and vegetation.

TOPOGRAPHY (OR SLOPE)

Fire burns faster uphill. As the slope increases so does the speed of the fire and its intensity.

Flames and radiant heat preheat the vegetation ahead of the fire. This dries it out, making it easier to burn.

WEATHER

Hot, dry and windy days provide ideal conditions for a bushfire. In summer, these are common weather conditions that increase the flammability of vegetation.

Low humidity and high temperatures, which are fuelled by hot winds, dry out vegetation, allowing it to readily ignite.

VEGETATION (FUEL)

Plants are the primary source of fuel for a bushfire.

The amount of fuel available to a bushfire and where the fuel is located can directly impact on house survival. Understanding how vegetation influences fire behaviour is important when planning a garden.

Within a property, vegetation management and the placement of other flammable objects around the house can determine the amount of fuel available to a bushfire.

The amount, type (flammability) and arrangement of vegetation affects how easily a bushfire will spread throughout a garden.

Fine fuels such as leaf litter readily dry out, ignite and can be carried as embers. Shrubs, vines and other elevated fuel can act as ladder fuels, allowing fire to climb into the canopies of trees, significantly increasing bushfire intensity.

Breaking up the continuity of the vegetation can limit the spread of fire within the garden.

Remember there are no 'fire proof' plants. All plants can burn under the right conditions – typically in extreme fire weather following extended drought.

See Section 4 for more information about how to minimise bushfire risk through garden design.



Leaf litter and dead plant material on and around houses and gardens can be cleared to reduce the risk of them catching fire or becoming burning embers.

HOW BUSHFIRE DESTROYS HOUSES

House survival is influenced by many interacting factors. The four main ways houses are destroyed during a bushfire are:

- ember attack
- radiant heat
- direct flame contact
- wind.

Ember attack is the most common way houses catch fire during a bushfire. Ember attack occurs when small burning twigs, leaves and bark are carried by the wind, landing in and around houses and their gardens.

If they land on or near flammable materials, such as leaf litter and dead plant matter, they can develop into spot fires. Embers can also ignite a house if they land on or near vulnerable parts of the building.

Radiant heat is the heat created from combustion during a bushfire. It can:

- ignite surfaces without direct flame contact or ember attack. This is due to the heat being received from the fire
- dry out vegetation ahead of the bushfire so that it burns more readily
- crack and break windows, allowing embers to enter a building
- distort and melt materials such as plastic.

Flame contact occurs when flames touch a house. Any burning vegetation can directly ignite a house if it is planted too close.

Wind can be very destructive to houses in a bushfire because it:

- carries embers
- can cause trees to fall onto buildings
- can break windows
- can loosen roof tiles
- can blow roofs off houses under severe conditions.

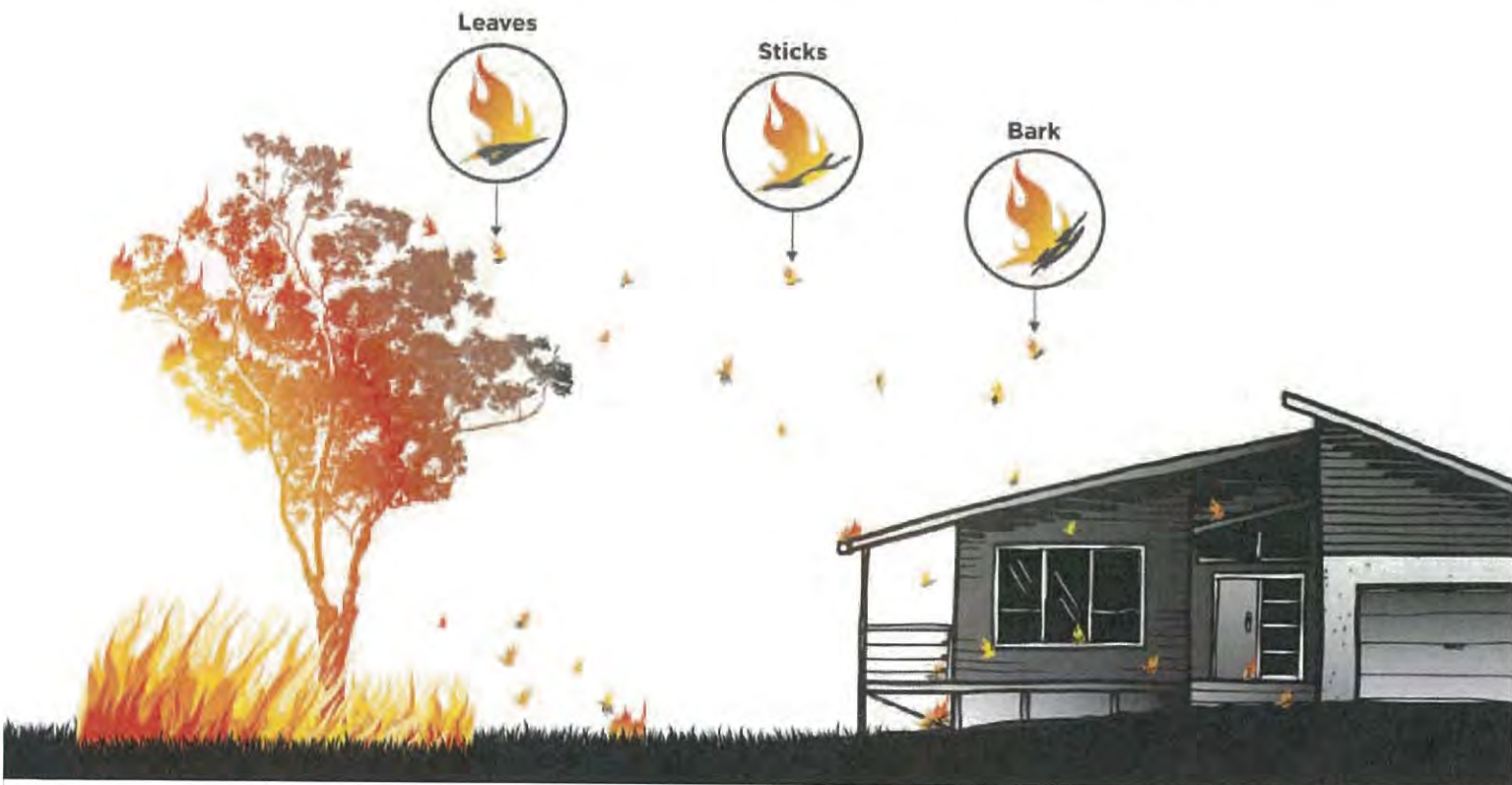
Leaves



Sticks



Bark



Ember attack

PLANNING A GARDEN

Before designing a garden, there are a number of factors to consider. Reducing bushfire risk to any house is most effective when considered early in the planning process.

NEW HOUSES

Property layout

Think strategically about where the house is located and how the garden around it is designed. That way, it is possible to achieve multiple outcomes – bushfire safety considerations are incorporated but are not the only function of the garden.

Find out what building and planning regulations apply to the property. Visit land.vic.gov.au or talk to the local council. Depending on the bushfire risk, these regulations may influence:

- where the house can be built
- the construction level required
- how to manage the vegetation within the property.

Information in this section is based on the bushfire protection requirements for building in high bushfire risk areas.

The requirements are fully set out in Planning Schemes at Clause 52.47 Bushfire Protection: Planning Requirements (see Further Resources) but are summarised below.

Understanding how these factors influence bushfire can avoid unnecessarily increasing the risk within properties.

Bushfire protection requirements

SITING AND DESIGN

One of the most effective ways to reduce bushfire risk is the appropriate location of a house within a property. Features of the topography can be used to help minimise bushfire spreading into and within the property. Houses should be located away from unmanaged vegetation, steep slopes, saddles or narrow ridge tops. They should ideally be located close to public roads and accessways.

Look at the landscape in and around the property:

- What is the bushfire risk from the surrounding area?
- Is there existing vegetation within or close to the property that will pose a significant bushfire hazard?

Anywhere that embers can lodge or enter a house can start a fire.

There are areas of a house that contribute more to overall bushfire risk than others. These include decks, windows, doors and roof areas. Complex designs that may create nooks and crannies allow dead plant material and embers to drop and accumulate.

DEFENDABLE SPACE

Defendable space is an area of land around a building where vegetation is modified and managed to reduce the effects of flame contact and radiant heat associated with bushfire. It breaks up continuity and reduces the amount of fuel available to a bushfire.

It is one of the most important aspects of preparing properties for bushfire. This is because defendable space separates the bushfire hazard and the house. The greater the separation from the bushfire hazard, the lower the risk.

Defendable space can prevent direct flame contact and minimise the effects of radiant heat on the house. This reduces the risk of house loss during a bushfire, regardless of active defence.

Defendable space:

- comprises an inner and outer zone with different vegetation management requirements
- needs careful garden design that considers the location of all flammable objects
- requires regular maintenance that should be included as part of every Bushfire Survival Plan.

Requirements for defendable space will vary depending on the type of development and the level of bushfire risk to a property. Section 4 provides further detail about defendable space requirements.



Complex house designs allow dead plant material and embers to accumulate.

CONSTRUCTION

The way a building is constructed can help reduce the risk of house loss via radiant heat and ember attack.

Construction standards are linked to defensible space. The greater the area of defensible space, the lower the construction requirement under Australian Standard AS3959-2009: Construction of Buildings in Bushfire-prone Areas.

A bushfire site assessment is required to determine the construction standard that will apply to any house. Details for undertaking a bushfire site assessment in the Bushfire Management Overlay can be found in Department of Planning and Community Development (DPCD) *Practice Note 65: Bushfire Management Overlay and Bushfire Protection: Planning Requirements* (see Further Resources).

PROVISION OF SERVICES

Water is essential for firefighting.

The amount and reliability of water is critical for all properties and must be considered in relation to the bushfire risk.

In all areas the water supply must have appropriate pressure, access and fittings. In the Bushfire Management Overlay, a water supply must be provided.

Access is just as important as it provides a way for residents to get out and the fire services to get in. Roads must be capable of accommodating fire trucks and will require specific construction standards, as well as width and clearance, depending on the property.

For minimum water supply and access requirements that apply to a property in the Bushfire Management Overlay, refer to *CFA Fire Service Guideline: Land Use Planning 0002: Requirements for Water Supply and access in a Bushfire Management Overlay* (see Further Resources).

HOME BUSHFIRE ADVICE SERVICE

Book a free Home Bushfire Advice visit for help assessing bushfire risk at a particular property.

To book an appointment, complete the online form on the CFA website. One of CFA's trained Fire Safety Officers will provide tailored advice, delivered on the property.

Self assessment of bushfire risk can be undertaken by using the Online Household Bushfire Self-Assessment Tool at cfa.vic.gov.au



Paths provide separation between garden beds

Water feature

Non-flammable outdoor furniture

Water feature

LANDSCAPING

Once the layout of the property is decided there are some decisions to make about what type of garden will be planted.

Gardening is a personal activity and when planning any garden there are many considerations apart from bushfire.

While this publication focuses on gardening to reduce bushfire risk, any garden must meet the needs of those that are using and maintaining it. If a garden suits the needs of residents it is more likely to be maintained from year to year.

There are many different styles of gardening. Some focus on native vegetation, productive or water-sensitive design.

Whatever style is chosen the garden must be appropriate to the local area. Seek advice from the local council (see Further Resources) about species that are suited to a particular location. This will help to avoid planting environmental weeds or invasive plants.

Consider bushfire risk early in the garden planning process. By incorporating the design principles in Section 4, costs can be minimised and bushfire mitigation will complement other functions of the garden.

When planning a garden some things to consider include:

- budget
- the local growing conditions that may affect plant selection
- ongoing maintenance requirements
- function and style of the garden.

Think about how the features below are incorporated into the overall garden design as they may reduce the spread of fire by providing separation between the house and bushfire hazards. For example:

- paths
- pools or water features
- tennis courts
- vegetable gardens

EXISTING HOUSES

The information outlined on page 6 about defensible space and landscaping is relevant to planning a garden for existing houses.

However, there are also some specific points that need consideration:

CONSTRUCTION

The resilience of existing houses can be improved by retrofitting some building elements:

More advice can be obtained from *A guide to retrofit your home for better protection from a bushfire* (see Further Resources).

PROVISION OF SERVICES

In high bushfire risk areas, it is recommended that a dedicated water supply is installed for firefighting purposes. Where possible, access should meet the requirements as outlined for new houses.

RULES FOR VEGETATION CLEARANCE AROUND EXISTING HOUSES

Throughout Victoria there are restrictions for vegetation clearance on private property. These are contained in the planning scheme of each municipality. In many cases, a planning permit is required to remove vegetation.

In areas where bushfire is a risk, there are particular circumstances where a permit is not required for vegetation removal around existing houses.

For example, the Victoria Planning Provisions Clause 52.17 Native Vegetation outline exemptions that apply for removing, destroying or lopping native vegetation for fire protection. Clause 52.48 Bushfire Protection Exemptions refers to the 10/30 and 10/50 rules.

To find out if these exemptions apply in a particular council, refer to the relevant planning scheme (see Further Resources).

The 10/30 rule

The 10/30 rule applies to a building used for accommodation that was:

- constructed before 10 September 2009 or approved by a planning or building permit issued before 10 September 2009.

It allows landowners to:

- Remove, destroy or lop any vegetation within 10 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation, except for trees within 30 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation for a combined maximum width of 4 metres either side of an existing fence on a boundary. The fence must be between properties of different ownership and have been constructed before 10 September 2009.

The 10/50 rule

The 10/50 rule applies only to land in the Bushfire Management Overlay. It applies to a building used for accommodation that was:

- constructed before 10 September 2009 or lawfully erected before 18 November 2011 without the need for a planning permit.
- approved by a planning or building permit before 10 September 2009 and erected before 18 November 2011.
- approved by a building permit before 10 September 2009 and erected before 18 November 2011.

The 10/50 rule allows landowners to:

- Remove, destroy or lop any vegetation within 10 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation, except trees, within 50 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation for a combined maximum width of 4 metres either side of an existing fence on a boundary between properties. The fence must be between properties of different ownership and have been constructed before 10 September 2009.

IMPORTANT

In high bushfire risk areas properties may need a greater amount of defensible space. Clearance over the distances stipulated in the 10/30 and 10/50 rules require a planning permit.

DESIGNING A GARDEN

Effective defensible space, house construction, water and access in new and existing gardens can all be compromised by inappropriate landscaping.

The location, type and ongoing maintenance of vegetation within a property have a significant impact on the bushfire risk to any house. These factors can prevent the accumulation of debris and prevent the spread of fire towards a building.

When designing a new or modifying an existing garden, carefully consider the placement of garden beds, trees and other vegetation to reduce the bushfire risk to the house.

When selected and located correctly, plants can filter embers, absorb radiant heat and break up fuel in the path of a bushfire.

However, plants can also contribute to house loss by:

- providing a continual fuel path to the house, allowing direct flame contact
- dropping leaf litter on the ground, which readily ignites and can become embers
- dropping limbs or tree branches onto the house
- adding to fuel loads on or near the house, such as creepers over pergolas, fences or verandahs
- if located too close, producing radiant heat that may ignite the house or cause windows to break, allowing embers into the house
- acting as ladder fuel from the ground into tree canopies, increasing the intensity of the fire.

Vegetation should always be kept clear of access to and from the house and property.



Vines and creepers act as ladder fuels.



Vegetation located too close to a house poses a threat during bushfire.



Garden bed framed by non-flammable landscape materials.
Australian Garden, Royal Botanic Gardens Cranbourne.

The following design principles outline how defensible space can be used to reduce radiant heat, prevent flame contact and minimise ember attack on the building.

These design principles are based on the bushfire protection requirements within the Bushfire Management Overlay.

These principles should be followed in all types of gardens.

**DESIGN PRINCIPLE 1
CREATE DEFENDABLE SPACE**

**DESIGN PRINCIPLE 2
REMOVE FLAMMABLE OBJECTS
FROM AROUND THE HOUSE**

**DESIGN PRINCIPLE 3
BREAK UP FUEL CONTINUITY**

**DESIGN PRINCIPLE 4
CAREFULLY SELECT,
LOCATE AND MAINTAIN TREES**

DESIGN PRINCIPLE 1 CREATE DEFENDABLE SPACE

What is it?

Defendable space is an area of land around a building where vegetation is modified and managed to reduce the effects of direct flame contact and radiant heat associated with bushfire. It breaks up continuity and reduces the amount of fuel available to a bushfire.



Managing vegetation within the defendable space does not mean clearing all plants and trees. There may be opportunities to retain existing vegetation depending on its flammability, location and management.

Whether starting from scratch or making changes to an existing garden, there are ways to design an effective defendable space.

Defendable space needs careful garden design and regular maintenance. It consists of an inner and an outer zone.

- The **inner zone** is the area immediately around the house. It provides separation from fuel sources, reduces radiant heat, eliminates direct flame contact and reduces ember attack. Vegetation needs significant and intensive management. Fuel is managed to a minimum level in this zone.
- The **outer zone** sits between the inner zone and unmanaged vegetation (beyond the defendable space). Vegetation is managed to a more moderate level to substantially decrease the ground fuel and restrict the fuels available to an approaching bushfire.

How to calculate it

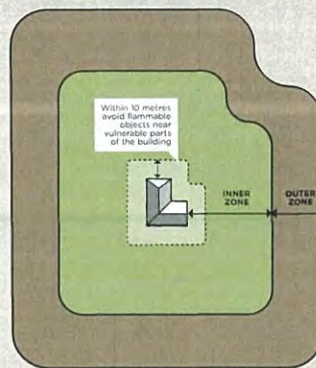
Requirements for defendable space will vary. They depend on the type of development and the level of bushfire risk to the property.

New houses in a Bushfire Management Overlay

As part of the planning permit process, defendable space requirements are determined by a bushfire site assessment. Permit conditions will prescribe the inner and outer zone distances for vegetation management. The site assessment process is outlined in *DPCD Practice Note: 65: Bushfire Management Overlay and Bushfire Protection: Planning Requirements* (see Further Resources).

In the **inner zone** fuel should be managed to the following condition:

- Within 10 metres of a building, flammable objects such as plants, mulches and fences must not be located close to vulnerable parts of the building such as windows, decks and eaves.
- Trees must not overhang the roofline of the building, touch walls or other elements of a building.
- Grass should be no more than 5 centimetres in height. All leaves and vegetation debris are to be removed at regular intervals.
- Shrubs should not be planted under trees.
- Plants greater than 10 centimetres in height at maturity must not be placed directly in front of a window or other glass feature.
- Tree canopy separation of 2 metres and overall canopy cover no more than 15 per cent at maturity.



The **outer zone** fuel should be managed in the following condition:

- Grass must be no more than 10 centimetres in height and leaf and other debris mowed, slashed or mulched.
- Shrubs and trees should not form a continuous canopy.
- Tree branches below 2 metres from ground level should be removed.
- Trees may touch each other with an overall canopy cover of no more than 30 per cent at maturity, with few shrubs in the understorey.
- Shrubs should be in clumps no greater than 10 square metres, which are separated from each other by at least 10 metres.

For both the **inner zone** and **outer zone**:

- Non-flammable features such as tennis courts, swimming pools, dams, patios, driveways or paths should be incorporated into the proposal, especially on the northern and western sides of the proposed building.
- Features with high flammability, such as doormats and firewood stacks, should not be located near the structure.

Existing houses and houses outside the Bushfire Management Overlay

Defendable space can be calculated using CFA's online Household Bushfire Self Assessment Tool available at cfa.vic.gov.au. Ideal defendable space requirements can be worked out using this tool.

What to include

Plants and other flammable objects provide fuel for bushfires and defendable space requires ongoing maintenance.

When modifying an established garden, it is critical to consider existing vegetation and other flammable objects within the defendable space.

If planting new vegetation, ensure that it is not compromising the effectiveness of the defendable space by significantly increasing the amount of fuel or adding to its continuity.

Landscaping for bushfire should:



- Locate areas of low fuel between the house and the bushfire hazard (for example, maintained lawn, ponds, pools and tennis courts).
- Locate farm machinery, sheds and poison well away from the house (as they too may become fuel in a bushfire).



- Use landscaping features to provide barriers to wind, radiant heat and embers (such as stone walls and non-combustible fences).
- Use materials such as brick, earth, stone, concrete and galvanised iron. These can act as radiant heat barriers.



- Use driveways and paths to create separation between vegetation and the house. Suitable materials include clay, concrete, gravel and pebbles.

- Locate non-combustible water tanks to act as radiant heat barriers.

DESIGN PRINCIPLE 2

REMOVE FLAMMABLE OBJECTS FROM AROUND THE HOUSE

The area immediately surrounding a house should be clear of flammable objects that can catch fire during a bushfire.

Within 10 metres of a building, flammable garden materials (such as plants, mulches and fences) must not be located close to vulnerable parts of the building (such as windows, doors, decks, pergolas and eaves). The intention is to prevent flame contact on the house.

There are a number of things that can be done to support this design principle:

- Locate non-flammable surfaces (such as paths, driveways and paved areas) against the house.



- Ensure trees are planted away from the house so they do not cause damage if they fall. They must not overhang the house and should be located 1.5 times their mature height from the house.

For example, if a mature tree height is 8 metres, it should be planted at a minimum of 8 metres x 1.5 = 12 metres away.

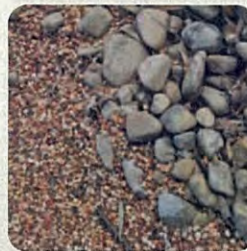
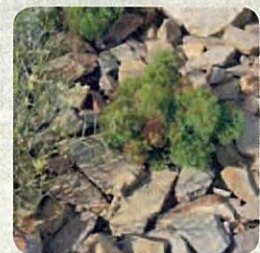
- Maintain grass to no more than 5 centimetres in height in the inner zone and 10 centimetres in the outer zone.



- Use non-combustible, moveable containers and pots that can be relocated in the summer.

- Avoid flammable mulches within the defendable space. Mulch is used to improve the quality of soil, improve water efficiency and keep plants cool and moist in the summer. Most mulch used in gardens can also be a bushfire hazard as it will dry out and burn.

Alternatives include gravel, scoria, pebbles, shells or recycled crushed bricks. These materials provide the same role and come in a variety of shapes and colours.



- Remove other flammable objects from around the house. These include sheds, caravans, outdoor furniture, barbecues, gas bottles, wood piles and organic mulch.

These should not be placed within 10 metres of the house and must have adequate separation from other flammable objects, including plants.

DESIGN PRINCIPLE 3

BREAK UP FUEL CONTINUITY

One of the most effective ways to reduce the spread of fire within a garden is to create separation between plants, garden beds and tree canopies.

Fire spreads easily when plants are located close together.

When a plant catches fire it can preheat and ignite the vegetation around it through radiant heat or direct flame contact.

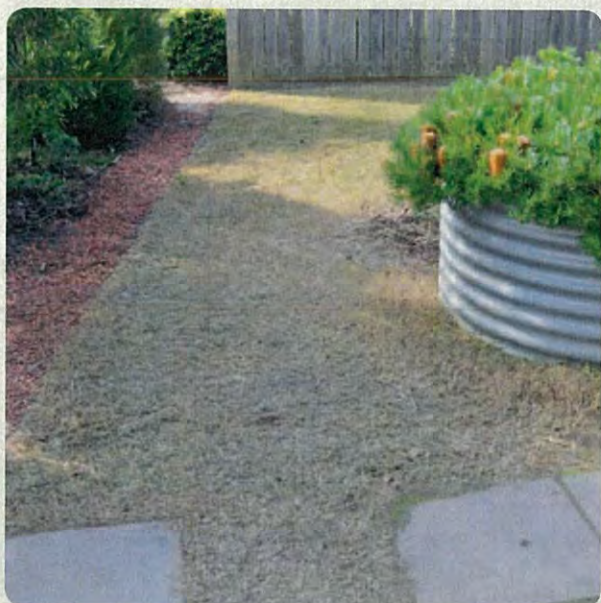
If there is continuous vegetation leading up to and surrounding a house, fire is likely to spread throughout the garden to the house. Grouping plants and garden beds with areas of low fuel between them can help avoid this by breaking up fuel continuity.

Ways to reduce fuel continuity include:

- Locating shrubs or other flammable objects away from trees. If planted under trees, vegetation can act as a ladder fuel and carry fire into canopies.
- Clumping shrubs and trees so they do not form a continuous canopy and are separated by areas of low fuel.
- Using gravel paths, non-flammable mulch and mown grass to provide separation and areas of low fuel between plant groupings and garden beds.
- Pruning branches to a minimum of 2 metres above the ground. This increases the vertical separation between fuel at ground level and the canopy.



Paths can be used to break up fuel continuity.
Australian Garden, Royal Botanic Gardens Cranbourne.



Mown grass provides separation between garden beds.
Australian Garden, Royal Botanic Gardens Cranbourne.

DESIGN PRINCIPLE 4

CAREFULLY SELECT, LOCATE AND MAINTAIN TREES

Trees can be useful during a bushfire, provided they are:

- selected carefully
- properly maintained
- located at a safe distance from the house.

Bushfires are often accompanied by strong winds, which may cause branches to break or whole trees to blow over. Trees can also catch fire, burn through and fall over.

Correctly selected and located trees can:

- reduce wind speed
- absorb radiant heat
- filter embers.

Fire is rarely sustained in the tree canopy, unless there is a fire burning in the plants or leaf litter under the tree.

When implementing this design principle:



- Avoid trees with loose, stringy or ribbon bark.
- Separate tree canopies by at least 2 metres.
- Canopies should cover less than 15 per cent of the inner zone and 30 per cent of the outer zone.
- Prune branches to a minimum of 2 metres above the ground increasing the vertical separation between fuel at ground level and the canopy.
- Locate trees at a safe distance from all other buildings, driveways, water supplies and powerlines. They should be at least 1.5 times their mature height away.
- Do not plant trees near shrubs, as shrubs can carry fire into tree canopies.



- Periodically remove dead leaves, bark and branches as well as leaf litter from underneath trees around the house.

Windbreaks

Trees can also be planted for windbreaks but are most effective in a fire of low to moderate intensity.

However, windbreaks are only one of many factors that affect the speed and progression of a bushfire.

Windbreaks are not a stand alone solution because:

- it takes time for trees to grow and they may not provide protection for some years
- wind direction can change and spot fires occur, allowing bushfires to approach from any direction.

Other things to remember are that:

- there needs to be adequate separation between a building and the windbreak
- a windbreak should not be planted within the defensible space
- trees should be carefully selected and will require ongoing maintenance
- highly flammable trees will become a fire hazard
- the windbreak should be planted at right angles to prevailing winds
- the windbreak should allow some wind to pass through
- the windbreak should have a continuous length of at least 100 metres if possible
- slashed, well-watered grass should be planted underneath the windbreak
- routine maintenance must be carried out to remove leaf litter and other dead plant material from underneath the windbreak.

TYPES OF GARDENS

The following four gardens provide practical examples of landscaping for bushfire, using the design principles outlined earlier in this section.

Plants have been selected for each location for their characteristics of low flammability (see the Plant Selection Key in Section 7).

The example gardens also highlight the importance of proper maintenance.

LEAVING EARLY

In high-risk areas, bushfire behaviour will be driven by the heavily vegetated landscape. While garden design and maintenance can improve the chances of a house surviving a bushfire, do not rely on these in isolation. A garden will not provide protection in a bushfire.

A holistic approach to bushfire preparation is critical. Appropriate water supply, access, house construction and general property maintenance are all important.

On **Severe, Extreme** and **Code Red** days leaving early will always be the safest option.

MODEL 1 COASTAL GARDEN

Establishing and maintaining a garden in a coastal location can be particularly challenging. Strong, seasonal winds, sometimes coupled with high levels of airborne salt, provide difficult growing conditions. These can reduce the height and modify the shape of many garden plants and limit overall growth potential.

Coastal landscapes are also typically exposed to high light conditions and elevated temperatures. These factors, often coupled with sandy, shallow soils with poor water retention, mean that horticultural practices to retain soil moisture, such as addition of organic matter and mulches, become critical for garden success.

Creating microclimates through shelter and screening can minimise these problems and enable a larger range of plants to be grown successfully.

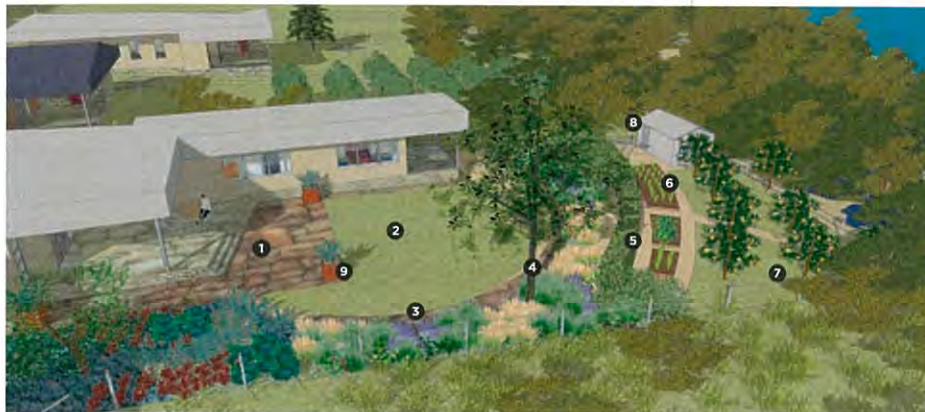
When planning a coastal garden, consider the local site's topography, aspect and neighbouring vegetation.

Gardens located on slopes are more likely to experience the effects of strong winds than those in protected locations.

North-facing gardens are more likely to rapidly dry out during hot summer days. Those in a southerly aspect are more protected.

Natural vegetation growing near the coast is often highly flammable and in some places will be in close proximity to a home garden.

In any of these situations the application of the design principles, such as incorporation of a defensible space and location and arrangement of plants, is particularly important.



EXAMPLE: COASTAL MODEL GARDEN

The numbers here refer to the illustration below and those on pages 20-21.

The paved sitting area (1), lawn (2) and low-sitting wall (3) provide separation between the house and the direction of the most likely fire hazard.

A small tree (4) is located well away from the house. It provides shade and may also catch embers during a fire. Planting beneath the tree has been kept very low and short. The lower branches of the tree are pruned up to 2 metres from ground level to prevent a fire from moving into the canopy. Behind the tree, a fleshy-leaved hedge (8) is managed as a long, barrier planting. This will also help catch embers.

The area within the property that is most likely to be impacted first by fire has been planted out as a vegetable garden (5) and orchard (6). Good separation is provided between all trees and garden beds to help slow fire spread. The entire area is irrigated to keep plants lush over hot summer days. The service area (7), with a shed and washing line, is kept well away from the house in the garden's south-west corner.

Large steel pots with upright succulent plants (9) soften the paved area and can be moved away from the house during summer. The low stone wall acts as a radiant heat barrier and forms an attractive garden feature.

The area north of the house (3) includes smaller growing succulents that minimise the amount of flammable material near the carport (4). Both the carport and the pergola against the house (5) are constructed of steel. Using this material avoids adding fuel close to the house. The driveway and carport (4) have 4 metres vertical and horizontal clearance for vehicle access.

Small deciduous trees (6) have been planted well away from the house and carport. This ensures there are no overhanging branches and they do not obstruct the driveway. Good separation between the canopies has been provided. Other characteristics such as smooth bark and an open habit contribute to the low flammability rating of these trees.

The gravel driveway (7) and portions of the front garden include bands of decorative stone as a design feature. The front garden also includes strips of lawn (2) between the beds of low shrubs and groundcovers. This provides good separation between plantings and reduces potential fire movement across the garden.

Plants chosen for the model garden have been selected for their firewise properties.

SMALL ORCHARD AND VEGETABLE GARDEN

Located on the coastal side of the property, this area adjoins the remnant indigenous vegetation. The orchard includes widely spaced *Citrus* trees (Lemon, Orange) and a lawn of *Stenotaphrum secundatum* 'Sir Walter' (Sir Walter Buffalo Grass). The vegetable garden includes small soil-raised beds edged by rock and is drip irrigated from tank water on site.

HEDGE

The plant used for the medium-sized hedge (2m x 1m) is *Corynocarpus laevigatus* (Karakara). It is a fleshy, evergreen shrub from New Zealand. While maintenance of the hedge is important to reduce plant litter build-up, it is a good example of a firewise plant. This species retains very little dead foliage and has low levels of oils, waxes and resins in the plant tissues.

See also next page



PERENNIALS

A decorative mix of evergreen and herbaceous perennials and short grasses are planned for this part of the garden to provide colour and textural qualities for most of the year. Where located near the tree, they will be maintained to a low height to ensure good separation.

Plants selected include *Festuca glauca* (Blue Fescue), *Euphorbia* (Compton Ash), *Kniphofia* cv. (Red Hot Pokers), *Perovskia atriplicifolia* (Russian Sage), *Phormium* cv. (New Zealand Flax), *Salvia nemorosa* (Woodland Sage), *Salvia microphylla* (Baby Sage) and *Sedum* (Matrona).

SMALL TREES

The trees are planted across the garden with low, herbaceous vegetation planted beneath them. This planting arrangement will maximise separation between the vegetation and their canopies. The canopies will also be maintained 2 metres apart to reduce fire spread.

Brachyctenon x rosea (Hybrid Flame Tree) has been placed more than 10 metres from the house. It has an open, branching habit, fleshy stems and plays a role in ember catching.

Ficus carica (Common Fig) is a small, deciduous, productive tree with an open habit, smooth bark, large leaves stems and plays a role in ember catching.

Lagerstroemia indica (Creepe Myrtle) is also a deciduous tree with smooth bark and open habit. In this garden it will be managed as a pollarded tree (a tree whose

top branches have been cut back to the trunk so that it produces a dense growth of new shoots). This treatment reduces its overall height, as well as keeping lower branches and canopy clear from the ground.

LOW SUCCULENT PLANTINGS

A small linear bed planting of succulents is planted near the house and carport. In the example above, the succulent plants are low in height, have very low flammability and are set well below the house windows. This provides good separation between succulent plantings and vulnerable areas of the house.

Species used here include: *Agave attenuata* (Swans Neck Agave), *Agave parryi*, *Aeonium arborescens* (Tree Aeonium), *Cotyledon macrantha* (Flap Jacks), *Klenia mandraliscae* (Blue Chalk Sticks), *Aeonium 'Velour'* and *Sedum rubrotinctum* (Jelly Beans).

GROUND COVER INDIGENOUS PLANTS

These consist of low-growing, indigenous ground cover plants. They have low flammability features, such as leaf and stem succulence and low litter carrying.

They include *Carpobrotus rossii* (Karkalla), *Rhagodia candolleana* (Coastal Salt Bush), *Atriplex cinerea* (Grey Saltbush), *Zygophyllum billardieri* (Coast Twin-leaf) and *Correa alba prostrata* form (Dwarf White Correa).

TURF AREAS

The turf species used here is *Stenotaphrum secundatum* 'Sir Walter' (Sir Walter Buffalo Grass), a soft, low-growing and drought-tolerant grass.

MODEL 2 HILLS GARDEN

The foothills and mountains of Victoria generally provide exceptional conditions for growing gardens. They typically have higher rainfall, cooler temperatures, deeper soils and well-drained sites. This environment enables a wide range of plants to be grown successfully.

As a result, hills gardens often display great diversity and layers of vegetation, from large trees and shrubs through to ground covers and herbaceous perennials.

The design of a hills garden should carefully consider the local site and context. Many gardens will be located in areas adjoining native forests or tall trees that are highly flammable. In these high-risk sites bushfire can move readily across the landscape (see page 17). Leaving early is the safest option.

Dual-access driveways and multiple entry points should be considered in the design of a garden. This will improve access into and from the site. Using stone or masonry retaining walls is preferable to timber structures. Terracing should be considered on very steep sites to support level areas.

Good garden maintenance is essential in a hills garden. These gardens can produce large amounts of plant growth, including litter, bark and dead leaves.

To reduce fuel load build-up, removal of litter through tree and shrub canopies, such as dry bark hanging from trees and on the ground, is an important garden maintenance task. Pruning trees to raise the canopy 2 metres from the ground and placing trees to ensure canopies are at least 2 metres apart reduces potential fire spread into and between the canopies.

The most suitable vegetation to plant around the house is irrigated, green lawns. Any trees should be placed at least 1.5 times their mature height from the house. Choose low flammable and lush vegetation, particularly in high-risk areas. Locate plants in clumps, away from the house and other flammable structures.

Remember fire can spread from any direction, regardless of slope and aspect.



EXAMPLE: HILLS MODEL GARDEN

The numbers here refer to the illustration below and those on pages 24 and 25.

This hills garden is located within steeply sloping, dense *Eucalyptus regnans* (Mountain Ash) forest. It is typical of many areas including the Dandenongs and the Macedon and Kinglake Ranges.

Some indigenous eucalypts have been retained within the property 1 but only those that are located more than 10 metres from the house. They have been retained in clumps and do not overhang the house. Any hanging bark and litter from these trees will be removed from surrounding garden plants during the summer months to help prevent fire ladders into the high canopies 2.

The vegetation chosen beneath these trees 3 includes herbaceous ground covers. They ensure maximum separation between vegetation and the canopy. These have been carefully chosen for their low flammability and dense, lush summer growth.

The orchard trees 4 are planted with 2 metres between the mature canopies to reduce potential fire spread. The extensive lawn areas slope downwards to the house 5 and those at the property's southern end 6 provide areas of low fuel within the defensible space. They will be irrigated and mown low over summer.

Stone terracing 4 reduces the steepness of the slope and makes necessary maintenance easier. The house has been located along the eastern side of the property to provide maximum separation between the house and the main fire hazard to the west.

A vegetable garden 7 and orchard 8 sit in a series of terraces between the unmanaged vegetation and the house. They have been included in the defensible space because of their low flammability. They will be kept well-watered over summer using the adjacent steel water tanks 9.

The retaining walls on the slope 3 are all constructed of stone. Stone paving 2 and a lawn area 1 located between the house and potential fire hazard maximise separation opportunities. The eastern side of the house 5 is maintained with gravel as a vehicle storage area and includes steel retaining walls 3.

The caravan in this space would be moved off the property during summer and the clothes line and wood shed 6 have both been located well away from the house.

Plants chosen for the model garden have been selected for their firewise properties.

FEATURE TREE

The small feature tree in the main lawn, *Parrotia persica* (Persian Ironwood), has been chosen for its attractive autumn foliage and summer shade. It also has a deciduous lifecycle, smooth bark, open, diffuse habit and low leaf-litter production over summer – all low flammability characteristics.

GROUND COVERS

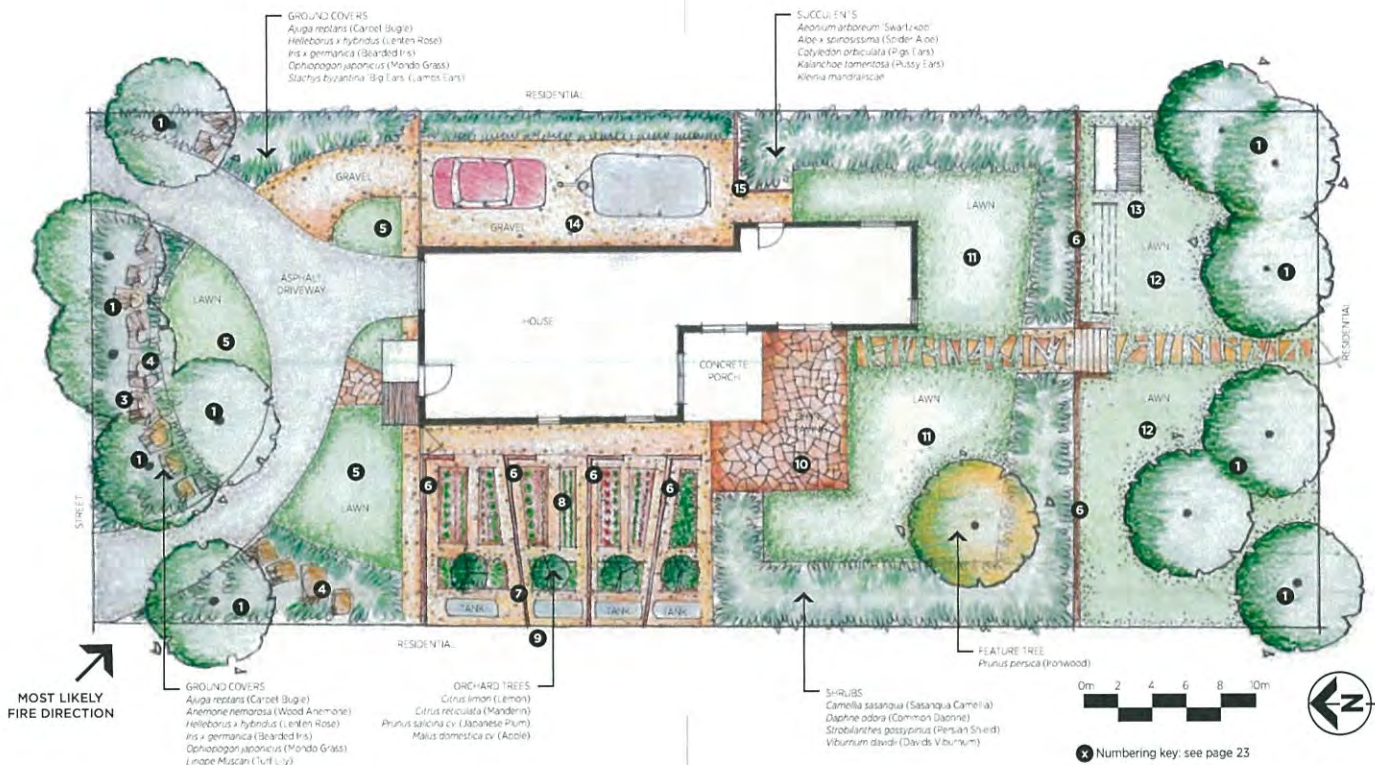
Herbaceous plants are used in the front garden to provide ground cover throughout the year and seasonal colour over winter, spring and summer. All are shade-tolerant perennials with a low-growing habit (to 30 centimetres in height) and have leaves that maintain a high moisture content.

They include *Ajuga reptans* (Carpenter Bugle), *Anemone nemorosa* (Wood Anemone), *Helleborus x hybridus* (Lenten Rose), *Iris x germanica* (Bearded Iris), *Liriope muscari* (Turf Lily), *Ophiopogon japonicus* (Mondo Grass) and *Stachys byzantina* (Big Ears (Lamb's Ears)).

TURF

The lawn areas are planted with *Stenotaphrum secundatum* 'Sir Walter' (Sir Walter Buffalo Grass), a soft-leaf, hard-wearing turf species. It can be managed to a low height and will be irrigated over summer. This maintenance helps create a defensible space.

See also next page.



GROUND COVERS
Asuga reptans (Carpet Bugle)
Helleborus x hybridus (Lenten Rose)
Iris x germanica (Bearded Iris)
Ophiopogon japonicus (Mondo Grass)
Stachys byzantina (Big Ears / Lamb's Ears)

SUCCULENTS
Aeonium arborum (Swarzkopf)
Aloe x spinosissima (Spider Aloe)
Cotyledon orbiculata (Pigs Ears)
Kalanchoe tomentosa (Pussy Ears)
Kleinia mandraliscae

GROUND COVERS
Asuga reptans (Carpet Bugle)
Anemone nemorosa (Wood Anemone)
Helleborus x hybridus (Lenten Rose)
Iris x germanica (Bearded Iris)
Ophiopogon japonicus (Mondo Grass)
Liriope Muscari (Turk's Foot)
Stachys byzantina (Big Ears / Lamb's Ears)

ORCHARD TREES
Citrus limon (Lemon)
Citrus reticulata (Mandarin)
Prunus salicina cv. (Japanese Plum)
Malus domestica cv. (Apple)

SHRUBS
Camellia sasanqua (Sasanqua Camellia)
Daphne odora (Common Daphne)
Strobilanthes gossypinus (Persian Shield)
Viburnum davidii (David's Viburnum)

FEATURE TREE
Prunus persica (Peach)



Numbering key: see page 23

ORCHARD AND VEGETABLE GARDEN

This includes raised beds of vegetables and a collection of small productive fruit trees. They include a *Citrus limon* (Lemon), *Citrus reticulata* (Mandarin), two *Prunus salicina* (Japanese Plum cultivars) and two *Malus domestica* (Apple cultivars). The vegetables and trees are all irrigated using water supplied from the adjacent steel water tanks.

SHRUBS

Groupings of shade-tolerant evergreen shrubs are planted on the boundary of the garden's middle terrace. They include *Camellia sasanqua* (Sasanqua Camellia), *Daphne odora* (Common Daphne), *Strobilanthes gossypinus* (Persian Shield) and *Viburnum davidii* (David's Viburnum).

Their broad and fleshy leaves, open habit and coarse texture are low flammability characteristics. All shrubs will be pruned regularly to maintain their height to below 2 metres.

SUCCULENTS

Close to the eastern side of the house are garden beds containing low-growing succulent plants. They include *Aeonium arborum* (Swarzkopf), *Aloe x spinosissima* (Spider Aloe), *Cotyledon orbiculata* (Pigs Ears), *Kalanchoe tomentosa* (Pussy Ears), and *Kleinia mandraliscae* (Blue Chalk Sticks).

MODEL 3 RURAL GARDEN

When planning a rural garden, consider house and garden location, the placement of other structures, elements and services, and good planting design strategies.

Many rural gardens are on larger farming properties surrounded by pasture paddocks and grasses. These can dry rapidly over summer, causing fire to spread from the paddock to the garden.

Other rural gardens are located just outside cities and larger towns. They generally form part of a small 'farmlet', with larger productive and/or ornamental gardens.

One of the most effective ways to reduce fire risk in rural sites is to have defensible space around the house.

Placing farm dams in the direction of the most likely path of a fire provides a fuel-free area and further separation between the bushfire hazard and the house. Dams also form a useful irrigation source for the garden. Keeping plants well hydrated will help reduce heat stress over summer when they often become more flammable.

Sheds and outbuildings should always be located well away from the house, particularly those used for storage of chemicals, fertilisers or hay.

Planting design solutions in the rural garden include the use of lawns, gravel surfaces and kitchen gardens.

These features ensure there are areas of low fuel directly around the house.

Careful placement of all vegetation in the garden is important. In particular, break up the continuity of fuel available to any fire and provide adequate separation between vegetation and the house. This includes locating trees at least 1.5 times their mature height from the house and locating other plants away from vulnerable areas (such as windows, decks and eaves).

The strategic placement of windbreak trees or hedges outside the defensible space of the house block can reduce wind speed and catch embers produced by the fire. Tree selection should consider low flammability characteristics and good maintenance practices need to be applied.

Effective ways to minimise the spread of fire within the garden is by using irrigated, well-spaced orchard trees and good separation of plantings throughout the garden. This can also be achieved with vertical and horizontal separation of garden plantings. In particular, separation between shrubs and trees will remove ladder fuels and break up direct fuel corridors to the house.

EXAMPLE: RURAL MODEL GARDEN

The numbers here refer to the illustration below and those on pages 28 and 29.

The garden and home paddock design aims to reduce spread of a grassfire to the house from surrounding paddocks and properties. It also aims to limit the spread of fire within the garden to the house.

In this garden example, the most likely direction of fire is from the north-west. However, fire can spread from any of the paddocks surrounding the house. Therefore, landscaping for bushfire design principles should be applied throughout.

The farm dam (1) is placed in the most likely direction of the fire. The front lawn (2), tennis court (3) and front driveway (4) all provide further separation and areas of low fuel between the fire hazard and the house.

A mass planting of irrigated ornamental orchard trees (5) acts as a windbreak and helps provide protection from ember attack in the home paddock. Shrub masses (6) between the house and these trees are ornamental and are kept away from the tree canopies to prevent them acting as ladder fuels. There is also good separation provided between the shrub beds to break up the spread of fire.

Planting has been kept away from the house with lawn and gravel paths. Planting near the driveway (7) softens the view from the house with low succulent plants. These are also planted away from vulnerable areas of the house. Decks around the house are replaced with non-flammable materials, such as concrete and steel.

Densely planted windbreaks are provided on the southern and western boundaries (8) outside the defensible space. While these are common features on rural properties, choosing low flammable species in this example reduces the fire risk.

The shed with chemical stores (9), clothes line (10) and fire wood (11) are all located well away from the house. Non-combustible water tanks (concrete or corrugated iron) are fed off the roof of the shed (12) and may provide an additional water source during a fire. Grapes and berry plants (13) are located at the rear of the property near the shed and are kept well-watered over the summer months to reduce their flammability.

Plants chosen for the model garden have been selected for their firewise properties.

TREES

In the orchard, a mixed collection of small fruiting trees have irrigated lawn beneath.

They include *Prunus avium* (Sweet Cherry), *Prunus salicina* (Japanese Plums) and *Prunus domestica* (European Plums). All are trained to an open form and maintained with their lower branches pruned to provide separation.

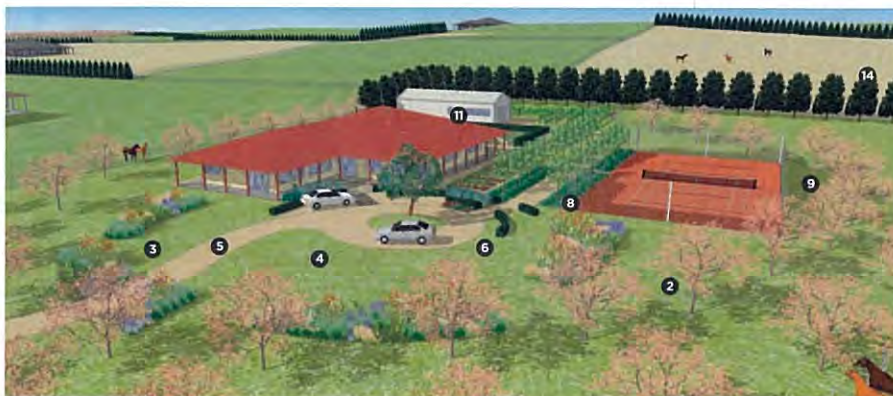
A small, decorative tree *Arbutus x andrachnoides* (Hybrid Strawberry Tree) is located in the lawn turning circle. With smooth bark, an open habit, attractive flowers and form, this display specimen is easily viewed from the house.

BOUNDARY WINDBREAKS

At the outer perimeter of the home paddock on two sides are windbreak plantings.

The species selected includes *Acmena smithii* (Lilly Pilly) on the southern boundary and *Casuarina cunninghamiana* (River Oak) on the western boundary of the home paddock.

These trees have a moderately dense habit and retain little dead leaves or twigs. The grass beneath these trees is mowed low and is well-watered during summer.



See also next page.

MODEL 4 SUBURBAN GARDEN

In recent years, severe fires have moved beyond the rural fringe and into metropolitan suburbs of Canberra and Melbourne.

Planning a garden using the principles in Section 4 can help reduce the bushfire risk in suburban areas. However, a garden only forms one component of preparing for bushfire. There are many other things to consider (see Section 1).

The hard landscaping in a garden involves making changes to material selection. Use brick, stone, steel or concrete materials for retaining walls and garden edging. Gravel products are suitable for pathways and mulches. These design selections can reduce fire risk from within the garden.

In most areas timber should be avoided as this can provide a way of directly moving a fire further into the property. In a garden in a high bushfire risk area, timber fences should be replaced with non-combustible options.

Swimming pools or ponds can help when creating a defensible space if placed between the most likely direction of a fire and the house.

Removing other potential fuel sources from directly around the house is important. This includes sheds, garden tools and machinery areas, woodpiles, outdoor furniture, clothes lines and shade screens. These should all be positioned at least 10 metres away from the house.

Planting design should focus on plants that have low flammable characteristics that are placed away from the house. Plants in containers can be an effective way to create seasonal interest and bring productivity into the suburban garden. They can also be readily moved away from the house.

EXAMPLE: SUBURBAN MODEL GARDEN

The numbers here refer to the illustration below and those on pages 32 and 33.

Existing indigenous trees of *Eucalyptus polyanthemos* (Red Box) have been retained in the suburban garden ❶ but those within 10 metres of the house have been removed. Vegetation beneath the trees is confined to short-cut lawn, very low shrub and fleshy ground cover plantings. These plantings avoid ladder fuels that can carry fire into the canopy. Any low hanging branches have also been removed up to 2 metres as part of the regular garden maintenance.

A dual access driveway ❷ at the front of the property has been provided. The pool ❸ has been placed between the house and a possible fire front. It includes a small area of adjoining timber decking ❹ that is well separated from the house. Stone paving ❺ and gravel pathways ❻ are used in the area directly surrounding the house. The pathways have been designed to provide separation between garden beds and areas of low fuel around the house.

The slope of the site has been partially terraced using large rocks ❶. Both the rear portion of the garden ❷ and the lawn area to the east of the house ❸ are maintained as open lawns. This design element reduces fuel loads within the defensible space.

Garden beds are separated by areas of maintained lawn that break up fuel continuity. The lawn also allows easy access for maintenance throughout the garden.

The clothes line and shed ❹, which includes swimming pool chemicals and fire wood, are located in this area well away from the house. The eastern boundary of the garden has three large non-combustible water tanks ❺ adjoining the fence. These help shelter the house from radiant heat and provide water for the adjacent vegetable garden ❻. The vegetation is low around the tanks so that they can be accessed if there is a fire.

Plants chosen for the model garden have been selected for their firewise properties.

POOL AREA

At the back of the pool area is a mixed display planting of short grasses and ornamental shrubs. These include *Festuca glauca* (Blue Fescue), *Cotinus 'Grace'* (Smoke bush), *Échium candicans* (Pride of Madeira), *Euphorbia characias* subsp. *wulfenii* (Wulfen Spurge) and *Senecio vira vira*.

Adjoining the paving area (between the house and the pool) are low-growing (to 30 centimetres in height), drought-tolerant herbaceous plants. These include *Aloe x spinosissimum* (Spider aloe), *Chrysocephalum apiculatum* (Common Everlasting), *Coreopsis 'Moonbeam'*, *Dianthus caryophyllus* (Pinks) and *Nepeta fassenii* (Catmint).

SIDE PLANTING IN THE FRONT YARD

A mix of grouped shrub plantings (0.5-2 metres in height) is located away from the house. These shrubs are pruned after flowering to maintain an open form, reduce plant litter and encourage repeat flowering.

These Australian native plants include *Alyogyne hueglinii* (Native Hibiscus), *Banksia blechnifolia* (Creeping Banksia), *Correa pulchella* (Salmon Correa), *Crocea exalata*, *Eremophila maculata* (Emu Bush) and *Philotheca* (Bounda Beauty).



See also next page



CHOOSING SUITABLE PLANTS

After planning and designing, the next task is to choose suitable plants for the garden. Some plants have intrinsic characteristics that reduce the likelihood of ignition. Choosing these plants and locating them correctly will help reduce bushfire risk within a garden.

There are a number of characteristics that influence how flammable a plant is. It is important to know which factors contribute to plant flammability. This will assist in making informed decisions when selecting plants for a garden.

A consistent approach for determining the flammability rating of a plant is provided by the Plant Selection Key (see Section 7).

The key takes the user through a series of questions about the characteristics of the plant and provides:

- an overall flammability rating
- firewise rating
- maintenance requirements
- advice on where to locate that plant within a garden.

Before working through the key, there are elements of plant flammability that should be further explained.

PLANT FLAMMABILITY

Determining the flammability of plants is not straightforward. Although it can be tested under controlled circumstances in a laboratory, the flammability of a plant may vary in a bushfire, where the conditions are often unpredictable. Some plants are more flammable than others but all plants in a garden – living and dead – can provide fuel for a bushfire.

Plant flammability is described as a combination of:

- the time taken for a plant to ignite
- how readily it burns when the ignition source is removed
- how much material there is to burn
- how long it takes for all available fuel to be consumed.

Flammability will vary depending on:

- a plant's age, health, physical structure and chemical content

- the daily and seasonal climatic variations
- location of the plant in relation to other vegetation and flammable objects
- the specific part of a plant – some parts of plants are also more flammable than others.

PLANT MOISTURE CONTENT

Foliage moisture content is the most critical factor that determines plant flammability. It influences how readily a plant will ignite.

Plants with high foliage moisture content will not burn until sufficient moisture in its foliage has been removed.

Plants with low moisture content will ignite more rapidly and continue to burn when the ignition source is removed.

Plants in the path of an oncoming bushfire will dry out as a result of the radiant heat and wind generated by the fire. Even fully hydrated plants will eventually dry out and burn if they are exposed to bushfire heat for long enough.



This succulent ground cover has a high moisture content.

REMEMBER

The arrangement of vegetation within a garden, rather than the flammability of individual plants, has a greater impact on how a bushfire will spread.



Thick, succulent leaves



Soft, fleshy leaves

Moisture content depends on a number of interacting factors:

The time of day

- Before sunrise, plants will typically have their maximum moisture content (influenced by the moisture content of the soil and humidity).
- As they transpire during the day their foliage moisture content decreases until the plant stops transpiring after sunset.
- Generally plants are most flammable in the mid- to late-afternoon when their foliage moisture content is at its lowest.

The season

- During summer as the soil dries out, the moisture content of the plant will decrease and the flammability of the plant will increase.

The part of the plant

- The leaves and new growth on a plant will generally have a higher moisture content than the stems or branches.
- Dead leaves and twigs have a very low moisture content that is driven by the relative humidity. On hot, dry days they become highly flammable as fine fuels.

Where it is planted

- The amount of sun or shade, the availability of water, drainage and soil type will affect plant moisture content.

Environmental conditions

- High temperatures, low humidity and periods of drought will increase the flammability of plants.

The age of the plant and its growth stage

- Many plants start as moisture-rich shoots but become woody as they age. As plants approach the end of their life they tend to dry out.
 - New growth on a plant will usually be soft and fleshy and become woody after the growing season.
-

ENVIRONMENTAL WEEDS

In most high bushfire risk areas, houses are located in close proximity to unmanaged vegetation. Some popular garden plants have become environmental weeds by escaping to the bush and displacing native species. Environmental weeds often contribute to high fuel loads, which increases bushfire risk. Priority should be given to removing environmental weeds within the property.

Avoid planting environmental weeds. Contact local council to find out which weed species are a problem in the area. The Department of Primary Industries also has information about weed species at dpi.vic.gov.au

When selecting plants, consider using local native species with low flammability. These are well suited to local conditions and will add to the habitat value of the bushland.

CHARACTERISTICS

The following plant characteristics are used throughout the Plant Selection Key. They all contribute to plant flammability to varying degrees and should not be considered in isolation.

BRANCHING PATTERN

This influences the distribution and density of foliage within the plant.



- Choose plants with open and loose branching as well as leaves that are thinly spread.



- Plants with closely packed leaves and branches have more fuel available within the plant and are usually more flammable.



- Plants with branches at least 2 metres above the ground are better than those with continuous foliage from the ground to the canopy. Under-pruning increases separation.



- Separation between ground fuel and foliage on the rest of the plant prevents lower branches acting as ladder fuels.

TEXTURE

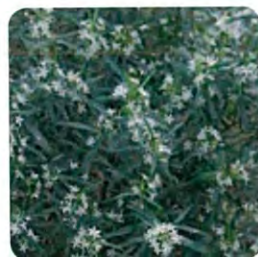
This describes the overall appearance of the plant.

In coarse textured plants, it is easy to distinguish each branch or leaf from a distance of 3 metres.

Plants with a coarse texture have a lower surface-area-to-volume ratio making them less flammable than plants with a fine texture.



➤ Coarse textured plants



➤ Medium textured plants



➤ Fine textured plants

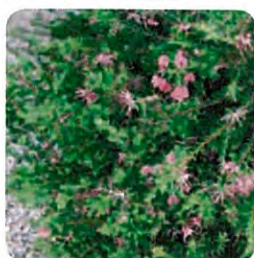


DENSITY

This describes the amount and arrangement of fuel within the plant.

A dense plant is difficult to place a hand into and is not easy to see through.

Plants that are very dense are often more flammable as there is a higher fuel load readily available to burn.



➤ Very dense



➤ Moderately dense



➤ Sparsely dense



LEAVES

The fineness, size and shape of leaves affect their flammability.



- Wide, flat and thicker leaves (such as those on maples, camellias and oaks) and those that are soft and fleshy have more plant tissue in their leaves. This usually means a higher moisture content relative to their surface area.



- Leaves with a high moisture content take longer to dry out and therefore longer to catch fire.



- Small, thin and narrow leaves have a high surface-area-to-volume ratio, which tends to make them more susceptible to drying out.

- Generally, the higher the surface-area-to-volume ratio, the more flammable a leaf will be. Some plants with high surface-area-to-volume have leaves with high levels of oils (such as paperbark, tea trees, eucalypts) or resins (conifers such as pine trees). These combined properties increase flammability.



- The shape of leaves influences how easily they are caught in vegetation when they fall off the plant. If leaves are caught within plants it will increase that plant's flammability as leaf litter dries out and ignites readily. Dead pine needles are a good example of leaves that readily catch in other plants.

BARK TYPE

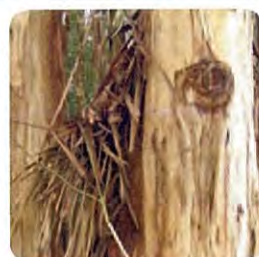
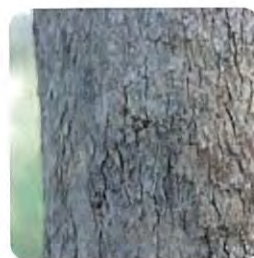
Some bark types ignite more readily than others.



- Bark that is loose, stringy or fibrous will ignite easily and can break off to create burning embers that are carried ahead of a bushfire.
- These types of bark can also act as ladder fuels that carry fire into the canopy of a tree, increasing the intensity of the fire. Examples of such plants include stringybark eucalypts and some paperbarks.



- Bark that is attached tightly to the trunk or is smooth is usually less flammable because it is more difficult to ignite and will not be easily carried as an ember, for example Box Barks.



- However, some smooth-barked trees shed their bark annually and trap large ribbons of bark in their branches or on the ground below. These ribbons of bark are highly flammable, can be carried as embers and can also act as a ladder fuel, for example Manna Gums.

OILS, WAXES AND RESINS

Some chemicals that are found naturally in plants will increase their flammability.

The leaves of plants containing significant amounts of oils, waxes and resins will often have a strong scent when crushed. For example rosemary, lavender and eucalyptus have oil in their foliage and pines can have high resin content.



- Waxes and resins have a similar effect of increasing flammability of plants although there are a number of characteristics that contribute to the overall flammability of a plant.
- Plants with high amounts of resins or oils should be limited and placed carefully within a garden.



RETENTION OF DEAD MATERIAL



- Dead leaves, twigs, bark and branches that are retained on the plant or accumulate on the ground or in shrubs can increase the flammability of an otherwise firewise plant.
- Regular pruning and maintenance of all trees and shrubs to remove these fine fuels is necessary.

MAINTAINING THE GARDEN

Remember that establishing a garden takes time. Buildings may not change but the plants in a garden will. To ensure a garden is effective over many years it will require ongoing maintenance of the defendable space around the house.

Replacement planting will need to be considered, as well as the periodic assessment of the suitability of the plants within the garden. Use the Plant Selection Key in Section 7 to assess plant flammability.

Diseased, stressed or dead plants are more flammable and moisture content will be lower in summer when bushfires are most prevalent.

Regular maintenance of the garden must be carried out and should be included as part of overall preparation for bushfire.

Incorporate maintenance into a Bushfire Survival Plan to ensure the garden is ready for the upcoming bushfire season.



Branches should be pruned up to 2 metres above ground level to increase separation from ground fuels.

Regular maintenance actions:

- Clear ground fuel from underneath plants, on and around the house.
- Prune plants with low-hanging branches, providing separation of at least 2 metres above the ground.
- Replace plants that die or become diseased.
- Keep plants well hydrated through watering and mulch. Watering less frequently but for longer encourages the plants to develop deep roots reducing moisture loss during dry periods.
- Replace or cover organic mulch such as woodchips, straw or dead plant matter with non-flammable mulches.
- Remove other flammable objects from your defendable space.
- Remove any fine, dead material that might accumulate in plants.
- Remove weeds from defendable space as these often contribute to high fuel loads.



Use non-flammable mulch.



Remove fine, dead material.

PLANT SELECTION KEY

About the key

The Plant Selection Key is a practical tool developed to guide you in choosing plants suitable for use in a garden in a high bushfire risk area.

The key comprises a series of questions and information about plant characteristics and their relative flammability. The key provides:

- › an overall flammability rating
- › a firewise rating
- › advice about maintenance
- › advice about whether the plant is appropriate for a garden.

An interactive version of this key is available online at **cfa.vic.gov.au/plants**

This Plant Selection Key is based on Behm AL, Long AJ, Monroe MC, Randall CK, Zipperer WC, Hermansen-Baez LA (2004) *Fire in the Wildland-Urban Interface: Preparing a Firewise Plant List for WUI Residents*. Circular 1453, School of Forest Resources and Conservation, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

Address: Southern Center for Wildland-Urban Interface Research and Information,
408 W. University Ave., Suite 306, USDA Forest Service, Gainesville, FL 32601.
Email (ahermansen@fs.fed.us) or fax (1-352-376-4536).

The Plant Selection Key has been customised to better suit Australian conditions and is intended to provide an indication of plant flammability. The flammability of plants is highly variable and in periods of drought or in the path of an oncoming bushfire, plants will dry out and become highly flammable. If there is uncertainty about the results this key produces, seek professional advice from a plant specialist.

PLANT SELECTION KEY

USING THE KEY: A THREE STEP PROCESS

1. Make a list of plants to be used in the garden

As a starting point, make an initial list of plants you want to plant in a garden. In doing this, it is important to:

- Choose plants that are suited to the local growing conditions.
- Check with your local council about legislative controls that may apply to your property. These may influence what and where you can plant.
- Check for characteristics that influence flammability. These are outlined in Section 5.
- Identify the plant species, including both the common name and the scientific name. This is important as even closely related plants in the same genus can vary greatly in their flammability.
- Take note of the size and form of the plant at maturity. Plant labels often focus on plant size within five to ten years of planting and may not be reliable for this assessment.
- Note how the plant will look in summer and whether it is susceptible to disease, insects or pests. This information can be obtained from plant websites, books, the local nursery or council.

2. Work through the key

- Begin at 1. *What type of plant is it?* and follow the prompts to the next number.
- Record how many 'Less Firewise' or 'Not Firewise' results the plant receives in the record sheet on page 62 at the end of the key.
- Collate the results in the record sheet.

3. Rate each plant for its suitability in the garden

The table on page 45 outlines four firewise ratings – Not Firewise, At-Risk Firewise, Moderately Firewise and Firewise – and a corresponding flammability rating. The flammability rating of individual plants depends on the number of 'Less' or 'Not Firewise' results you record.

Once you have established the firewise and flammability rating for each plant, you can determine the plant's suitability for use within a garden, where it should be planted (presuming it is suitable) as well as maintenance requirements.

FIREWISE AND FLAMMABILITY RATINGS

NOT FIREWISE

If you record any **NOT FIREWISE** results, regardless of any **LESS FIREWISE** results, then that plant is **NOT FIREWISE**.

- **Flammability = Extreme**
- Where to plant: These plants should not be planted in a garden or used when landscaping for bushfire.

AT-RISK FIREWISE

If you recorded three or more **LESS FIREWISE** results, then that plant is **AT-RISK FIREWISE**.

- **Flammability = High**
- Where to plant: Avoid using these plants in a garden. If you are on a large property, they may be planted outside the defensible space.

MODERATELY FIREWISE

If you recorded one or two **LESS FIREWISE** results, then that plant is **MODERATELY FIREWISE**.

- **Flammability = Moderate**
- Where to plant: These plants can be used in a garden but they need regular maintenance to keep them in a less flammable condition.

FIREWISE

If after finishing the key you had no **LESS FIREWISE** results, then that plant is **FIREWISE**.

- **Flammability = Low**
- Where to plant: These plants can be used in a garden as they are not known to be particularly flammable.

BEGIN
PLANT
SELECTION KEY



PLANT SELECTION KEY

1. What type of plant is it?



Tree

- Has single or multiple woody trunks and grows from 5-30 metres or over at maturity.
- Single-stem trees typically branch well above the ground, while multiple-stemmed trees typically branch close to the ground.
- Foliage is concentrated in the canopy allowing other vegetation to grow underneath.
- Has highly variable leaf and bark types.

Go to 2



Palm or palm-like

- Vary greatly in height.
- Generally have a single woody trunk topped by fronds.
- Many species retain dead fronds which can be flammable.
- Australian palm-like plants include tree-ferns, screw-palms, cycads and grass-trees. They can grow several metres tall and also have a 'skirt' of dead fronds or leaves close to the ground. This is an important flammability characteristic as it can act as a ladder fuel.

Go to 9



Shrubs

- Are shorter and generally more compact than trees, typically 3-4 metres in height with branching close to the ground.
- Have dense, bushy foliage and woody stems.
- Because of this structure, shrubs can carry fire from the ground to the tree canopy.

Go to 13



Vines and climbers

- Have soft or woody stems and are climbing or scrambling plants. Are often grown over fences, pergolas or trellises and can grow over other plants.
- Can be deciduous or evergreen. Some accumulate large amounts of dead leaves.
- Can act as ladder fuel and carry flames up into shrubs, trees or supporting structures.
- Examples include grapes, Virginia Creeper, Coral pea, Running Postman or Happy Wanderer.

Go to 17



Herbaceous plants

- Have soft and fleshy leaves with non-woody stems.
- Are low-growing, often less than 50 centimetres tall.
- Include most smaller flowering plants grown in gardens. Can look 'shrubby', form clumps or grow as groundcovers.
- Moisture content is usually higher than most woody shrubs. Often droop when dry.
- Examples include violets and pansies.

Groundcovers

- Are woody or herbaceous. Woody groundcovers spread without climbing.
- Are generally less than 50 centimetres tall.

Grasses or grass-like

- Leaves are usually long, fine or strappy.
- Vary from a few centimetres to over 2 metres tall. Clump size can be up to 1 metre in diameter.
- Most grasses grown in gardens are perennial rather than annual. Many of these form clumps called tussocks. Examples include Wallaby Grass and Canary Grass.
- Perennial tussock grasses accumulate dead material mixed with the living leaves and are quite flammable, although they usually only burn for a short time.
- Other grasses grow as a continuous mat, such as lawn grasses.
- Leaves of grass-like plants are often coarse and thick and may accumulate dead leaves in the living clump. Examples include Mat rush, New Zealand Flax, Iris and Gladiolus.

Go to 18



2. What type of tree is it?



Eucalypts

- Can have woolly fibrous bark (stringy bark), deeply corrugated and dense bark (iron bark), 'chippy' or platy bark (box bark) or smooth (gum bark).
- All flower and have leaves that hang vertically.
- Their bark can be extremely flammable.
- Examples include trees from the genera *Eucalyptus*, *Corymbia* (includes Flowering Gums) and *Angophora* (includes Smooth Barked Apple and Dwarf Apple that are similar in appearance to smooth barked gums).

Go to 3



Conifer or conifer-like

- Develop woody cones and have needle-like or scale-like leaves.
- Examples include pines, hemlocks, spruces, junipers, cedars and cypress.
- Native Australian examples include Cypress Pine, Cherry Ballart and she-oaks.

Go to 7



Other tree types

- This category contains all trees that are not eucalypts, conifers or conifer-like.
- Leaf type can vary greatly. For example:
 - the small leaves and phyllodes (lea-like structures) of wattles such as Blackwood and Silver Wattle
 - the medium-sized leaves of Lilly Pilly and Southern Sassafras
 - the deeply lobed leaves of Silky Oak
 - the wider, broad leaves of Kurrajong and non-native species such as maples, oaks and elms.

Go to 11

3. What type of bark does the tree have?



Stringybark eucalypt with coarse, loose fibrous bark

- Examples include Messmate and Red Stringybark.

Go to 4



Sheds large ribbons or sheets of bark annually

- Strips or ribbons of bark are caught and held in the tree.
- Examples include many smooth or gum-barked eucalypts such as Manna Gum and Mountain Grey Gum.

Go to 8



Does not have stringybark or ribbons of bark

- Examples include iron bark, some gum-bark species, box bark and peppermint bark eucalypts.

Go to 5

4. NOT FIREWISE



- Trees with this type of bark are extremely flammable.
- This type of bark acts as a ladder carrying fire into the canopy of the tree and produces masses of embers.

For more information, see *Section 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

5. What is the height of the lowest branch?



Low Branches are less than 2 metres above the ground.

Go to 6



Good separation At least 2 metres between ground and branches.

Go to 20

6. LESS FIREWISE



- Trees must be under-pruned up to 2 metres if possible and dead branches and fronds removed to ensure a more firewise characteristic

Go to 11

7. Does it shed large amounts of leaves or needles?



Yes The conifer sheds large amounts of leaves or needles. For example, Monterey Pine.

Go to 8



No The conifer or conifer-like tree does not shed large quantities of leaves or needles. Examples may include native Cypress Pine, she-oak and Cherry Ballart.

Go to 9

8. LESS FIREWISE



- Pine needles need to be periodically removed from roofs, other plants and the ground near structures.
- Eucalypt bark and foliage should also be routinely removed from the tree and the ground.

Go to 9

9. What is the height of the lowest branch or frond?



Low Branches or fronds are less than 2 metres above the ground.

Go to 10



Good separation At least 2 metres between ground and branches.

Go to 11

10. LESS FIREWISE



- Trees must be under-pruned to a height of 2 metres if possible and dead branches and fronds removed to ensure a more firewise characteristic.

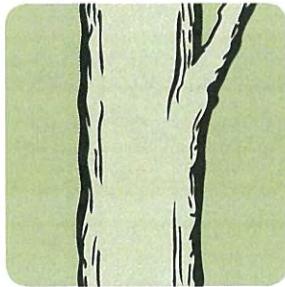
Go to 11

11. Does it have papery or loose bark?



Yes Trunk has papery bark or loose fibrous bark.
For example tea-trees and most paper barks.

Go to 12



No Trunk does not have papery bark or loose fibrous bark.

Go to 20

12. LESS FIREWISE



- Papery bark and fibres may act as ladder fuels.
- Requires appropriate placement in your garden.

Go to 20

13. What is the plant's texture?



Fine texture

- Texture is used to describe the overall appearance of the plant from a distance.
- From a distance of about 3 metres it is not easy to distinguish individual leaves or branches on plants with a fine texture.
- Examples include diosma and some paper barks with thin, narrow leaves. The fineness of foliage (the surface area-to-volume-ratio) is a very important determinant of flammability.

Go to 14



Medium texture

- This category includes many azalea and holly species as well as the natives Sarsaparilla and Hairpin Banksia.

Go to 15



Coarse texture

- It is easy to distinguish each individual leaf or branch from a distance of about 3 metres.
- Examples include hydrangea, cotoneaster, hazel pomaderris and blanket leaf.

Go to 15

14. LESS FIREWISE



- Plants with a fine texture have a higher surface-area-to-volume ratio and tend to dry out more readily than medium- and coarse-textured plants. This makes them generally more flammable.
- Require appropriate placement and routine pruning.

Go to 15

15. How dense is the plant?



Very dense

- So dense that it is very difficult to place a hand in the plant and touch the main stem. These plants have dense branches.
- Examples include shrubby grevilleas and junipers.

Go to 16



Moderately dense

- Sufficiently dense to not be able to see through the plant, but reasonably easy to place a hand into the plant and touch the main stem.
- Examples include some lavenders, rosemary and some correas.

Go to 20



Sparsely dense

- May have open branching patterns, making it easy to see through the plant.
- Examples include many wattles, rhododendrons and some hydrangeas.

Go to 20

16. LESS FIREWISE



- Dense plants have a larger amount of fuel packed closely together, which encourages the spread of flames within the plant.
- Require appropriate placement and routine pruning.

Go to 20

17. NOT FIREWISE

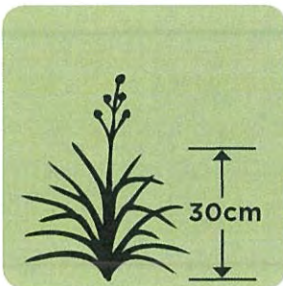


- Vines are extremely flammable as they typically add fuel directly to a structure. As such, they act as ladder fuels bridging gaps between surface fuels and canopy fuels.

For more information, see *Section 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

18. Is it a grass greater than 30 centimetres tall?



Yes Grass is greater than 30 centimetres tall (for example grass in the Family Poaceae or Gramineae).

Go to 19

No Short grasses and all other herbaceous plants or grass-like plants.

Go to 20



19. NOT FIREWISE



- Regardless of how many **LESS FIREWISE** results you may get, tall grasses are extremely flammable because they readily dry out and rapidly carry fire.

For more information, see *Section 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

20. Does the plant retain dead leaves or twigs?



Yes Plant retains dead leaves or twigs mixed with the living leaves.

- Retention of dead leaves or twigs increases the flammability of a plant. Fine fuels readily dry out and increase the fuel available within the plant for fire.

Go to 21



No Plant does not usually retain dead leaves or twigs, except when shedding leaves.

Go to 22

21. NOT FIREWISE



- Regardless of how many **LESS FIREWISE** results you receive for this plant, plants that retain dead foliage throughout the year are extremely flammable.
- Dead foliage has very low leaf moisture content and is therefore highly susceptible to ignition.

For more information: see *Section 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

22. Are the leaves waxy or oily?



Yes Leaves have a waxy coating or numerous oil glands dotted on the leaves.

- The leaves of plants containing significant amounts of oils and waxes will often have a strong scent when crushed. The presence of these chemicals often contributes to plant flammability.
- Plants with waxy leaves are often grey, silver or whitish and the waxy 'bloom' can be scraped off the leaf with a fingernail. For example, Wax Myrtle and gallberry.
- Plants in the families Myrtaceae, Rutaceae, Lamiaceae and Pinaceae are examples of plants with numerous oil glands. [Go to 23](#)



No Leaves do not have a waxy coating or numerous oil glands.

[Go to 24](#)

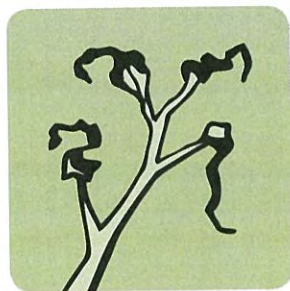
23. LESS FIREWISE



- Plants with large amounts of oils and waxes are more flammable than those without these chemicals.
- Require appropriate placement and routine pruning

[Go to 24](#)

24. Is the species seriously susceptible to disease, insects or pests?



Yes Species is known to be seriously susceptible to disease or insect pests.

- Plants seriously susceptible to disease are likely to become stressed and have less vigorous growth.
- When this happens, there is a lower foliage moisture content and a greater number of dead leaves are retained. This in turn makes the plant more flammable. For example, elm trees.

Go to 25



No Species is not known to be particularly susceptible to disease or insect pests.

Go to 26

25. LESS FIREWISE



- Routine monitoring and appropriate treatment for the disease or pest is recommended.

Go to 26

26. Is the plant deciduous or evergreen?



Deciduous Plants drop all leaves once a year and the new leaves usually have higher moisture content than evergreen plants.

Go to 29



Evergreen Plants retain leaves for several years.

Go to 27

27. Are the leaves soft, thick or fleshy?



Yes Plant leaves are soft, thick, succulent or fleshy.

- These types of leaves often have a higher moisture content than hard, thin and needle-like leaves, making them less flammable.
- Moisture can often be seen on the exposed edge of torn leaves. Examples include cactus, agave, some myoporums such as Creeping Myoporum, many Lilies, some saltbush species and geraniums.

Go to 29



No Plant leaves are not obviously succulent; they may have various shapes and vary in thickness.

Go to 28




28. LESS FIREWISE



- Require appropriate placement and routine pruning.

Go to 29

29. END

How many LESS FIREWISE ratings did your plant score?	Then your plant is:	What does this mean?
None	FIREWISE	<ul style="list-style-type: none"> ➤ Flammability = Low ➤ Where to plant: These plants can be used in a garden as they are not known to be particularly flammable.
 or 	MODERATELY FIREWISE	<ul style="list-style-type: none"> ➤ Flammability = Moderate ➤ Where to plant: These plants can be used in a garden but they need regular maintenance to keep them in a less flammable condition.
 or more	AT-RISK FIREWISE	<ul style="list-style-type: none"> ➤ Flammability = High ➤ Where to plant: Avoid using these plants in a garden. If you are on a large property, they may be planted outside the defensible space.
Was your plant NOT FIREWISE?	NOT FIREWISE	<ul style="list-style-type: none"> ➤ Flammability = Extreme ➤ Where to plant: These plants should not be planted in a garden or used when landscaping for bushfire.

WHAT TO DO NEXT

- It is important to consider the role that plant selection plays in enhancing defensible space.
- If the plant is 'Firewise' or 'Moderately Firewise', locate it according to the design principles as outlined in Section 4. Remember, the location and arrangement of plants has a significant effect on reducing the bushfire risk within your garden, but during summer as soil dries out, the moisture content of plants will decrease and their flammability will increase.
- If the plant is 'At Risk' or 'Not Firewise' it should not be planted within the defensible space. For further information, see *Section 3: Rules for vegetation clearance around existing homes* or *Section 5: Choosing suitable plants*.
- You can also book a free Home Bushfire Advice Service visit where a member of CFA will assess your property and provide a range of options to assist you to develop your Bushfire Survival Plan. Go to cfa.vic.gov.au/hbas for information and bookings.

RECORD SHEET

➤ Use this sheet to record the plant name and how many 'Less Firewise' or 'Not Firewise' results the plant receives as you work through the Plant Selection Key.

Plant name	NOT FIREWISE Circle the questions that had a Not Firewise outcome	LESS FIREWISE Circle the questions that had a Less Firewise outcome	Firewise Rating	Flammability
			NOT FIREWISE (any Not Firewise results)	Extreme
			AT-RISK FIREWISE (3 or more Less Firewise results)	High
			MODERATELY FIREWISE (1 or 2 Less Firewise results)	Moderate
			FIREWISE (no Less Firewise results)	Low
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		

FURTHER RESOURCES

CFA

cfa.vic.gov.au

Fire Ready Kit

On the Land: Agricultural Fire Management Guidelines

A guide to retrofit your home for better protection from a bushfire

Fire Service Guidelines:

- *Land Use Planning 0002: Requirements for Water Supply and Access in a Bushfire Management Overlay*
- *Land Use Planning 0003: Assessing Vegetation in a Bushfire Management Overlay*

OTHER

dpcd.vic.gov.au/planning/bushfire

Fact Sheet: Planning and Building for Bushfire Protection

Advisory Note 39: Amendment VC83 Bushfire Protection Vegetation Exemptions

Advisory Note 40: Amendment VC83 Bushfire Protection Bushfire Planning Provisions

Practice Note 64: Local Planning for Bushfire Protection

Practice Note 65: Bushfire Management Overlay and Bushfire Protection: Planning Requirements

planningschemes.dpcd.vic.gov.au

Clause 13.05 Bushfire

Clause 44.06 Bushfire Management Overlay

Clause 52.17 Native vegetation

Clause 52.43 Interim Measures for Bushfire Protection

Clause 52.47 Bushfire Protection: Planning Requirements

Clause 52.48 Bushfire Protection: Exemptions

Planning for Bushfire in Victoria (CFA and DPCD, forthcoming)

Department of Sustainability and Environment

dse.vic.gov.au

land.vic.gov.au

Department of Primary Industries

dpi.vic.gov.au

Municipal Association of Victoria

Council details can be found at mav.asn.au/about-local-government/council-details

Ramsay, C and Rudolph, L, 2003 *Landscape and Building Design for Bushfire Areas*, CSIRO, Melbourne.

Standards Australia AS 3959-2009: Construction of Buildings in Bushfire-prone Areas

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Bushfire Survival Plan

PREPARE. ACT. SURVIVE.

Tomorrow's Queensland: strong, green, smart, healthy and fair

Department of Community Safety





You must **PREPARE** ■ **ACT** ■ **SURVIVE** ■

Your main priority is to ensure that you and your family are safe. During a bushfire you and your family's survival and safety depend on your preparations, and the decisions you make.

The lives of you and your family are more important than any building.

Whether your plan is to leave early or stay, you must prepare your home and property to increase their level of resilience and your chances of survival.

Bushfires in Queensland

The fire season in Queensland normally commences in the far north of the state in July and progresses through to southern areas as spring approaches. The fire season can extend through to February in southern and far south-western Queensland. These time frames can vary significantly from year to year, depending on the fuel loads, long-term climate and short-term weather conditions in each area.

There are four key considerations for dealing with bushfire:

- The safety of you and your family.
- The resilience of your property.
- The protection of irreplaceable valuables and important documents.
- The maintenance of adequate levels of insurance.

This document will provide you with information about the things you need to consider to prepare yourself and your home for the bushfire season, and how to make your own personal Bushfire Survival Plan.

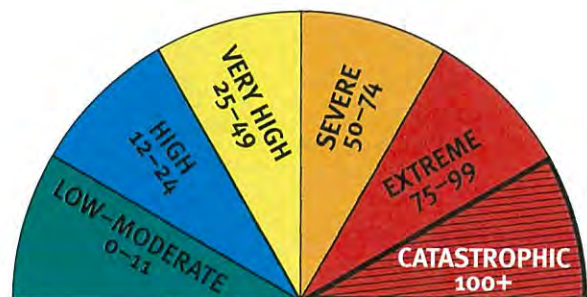
It is your responsibility to prepare yourself, your family and your home for the threat of bushfire.

Understand your risk

The first step in planning to survive a bushfire is to understand your own level of risk. By understanding your own level of risk you will be able to make informed decisions that are right for you and your family. Included with this Bushfire Survival Plan is a self-assessment tool that will enable you to assess the risk level associated with your property. If you are still unsure of your level of risk or require assistance contact your local fire station for more information. To book a Bushfire Safety presentation call 1300 369 003.

Fire danger ratings

The increased frequency of extreme bushfires in Australia in the last 10 years and the recent experience of the Black Saturday fires in Victoria have encouraged fire services throughout Australia to introduce new levels of Fire Danger Rating (FDR). A lift-out chart of the FDR system is contained within this document. Display it in a prominent place in your home or keep it with your Bushfire Survival Plan.



Catastrophic fire danger rating

The highest level is catastrophic. On a day of catastrophic FDR leaving early is the only option to ensure your survival. You must relocate early to a safer location, hours or the day before a fire occurs. Under no circumstances will it be safe to stay with your property.

Extreme fire danger rating

The second highest level is extreme. Should a fire occur in your area on a day of extreme FDR leaving early will always be the only option. Staying can only be considered for homes that:

- Have been designed and constructed specifically to address the threat of bushfire.
- Have been maintained to those levels and are currently well prepared.
- Can be actively defended by people with the skills, knowledge and confidence to implement a well-rehearsed Bushfire Survival Plan.

On days of catastrophic or extreme FDR:

- Fires are likely to be uncontrollable, unpredictable and very fast moving with highly aggressive flames extending high above tree tops and buildings.
- Thousands of embers may be violently blown into and around homes causing other fires to start rapidly and spread quickly up to 20 kilometres ahead of the main fire.
- Fire can threaten suddenly, without warning, and the heat and wind will make it difficult to see, hear and breathe as the fire approaches.
- People in the path of such fires will almost certainly be injured or die and a significant number of homes and businesses will be destroyed or damaged.
- Even well-prepared and constructed homes will not be safe.
- Expect power, water and phone networks to fail as severe winds bring down trees, power lines and blow roofs off buildings well ahead of the fire.

It is vital that you understand on these days that your survival will depend solely on how well you have prepared and how decisively you act.

Leaving late can be
a deadly option.
If you are in any doubt,
make the decision to
LEAVE EARLY.

What will you do?

At all times you need to **PREPARE.ACT.SURVIVE.**

When the fire danger rating is 'catastrophic' leaving early is the safest option.

When the fire danger rating is lower than 'catastrophic', one of the most important decisions you need to make is whether you will leave early or stay with a well prepared property. This decision is the basis of your Bushfire Survival Plan.

The following questions may help you make the right decision for whether you will leave early or stay:

- Do you need to consider family members who are young, elderly or infirm?
- Are you physically and emotionally prepared to stay with your property?
- Do you have the knowledge, skills, and confidence to stay with your property?
- Is your home adequately constructed, maintained and prepared to withstand the impact of a fire? In other words, is your home prepared to withstand the impact of a bushfire?
- Do you have well-maintained resources and equipment to fight fire, and do you know how to use them?
- Do you have appropriate protective clothing to fight a fire?
- What will you do if a rapid onset fire leaves you with no time to leave? Where will you shelter?



Leave early

If you plan to leave early then you must leave your home well before a bushfire threatens and travelling by road becomes hazardous. Your leave early preparations include:

Step 1: Preparation – your property should be well prepared for bushfire even if you intend to leave early.

Step 2: What you will do – make your Bushfire Survival Plan in accordance with your decision to leave early.

Step 3: Make a contingency plan – the FDR, the preparedness of your home, a change in household circumstances, a change in your physical preparedness or unexpected visitors are some things that may require you to reconsider your Bushfire Survival Plan.

Planning to stay

Planning is critical to successfully staying with your home may involve the risk of psychological trauma, injury or death.

Step 1: Preparation – your property must be able to withstand the impact of bushfire and well prepared to shelter you and your family.

Step 2: What you will do – make your Bushfire Survival Plan in accordance with your decision to stay.

Step 3: Make a contingency plan – the FDR, the preparedness of your home, a change in household circumstances, a change in your physical preparedness or unexpected visitors are some things that may require you to reconsider your Bushfire Survival Plan.

In making your decision to stay, here are a few things you need to consider.

- Is your property able to withstand the impact of a bushfire?
- Are you physically and emotionally prepared to stay with your property?
- Do you have well-maintained resources and equipment and do you know how to use them?
- Do you have appropriate protective clothing?
- Will your bushfire survival plan need to be different for weekdays, weekends or if someone is sick at home?
- Do you have a contingency plan?

Preparing your Bushfire Survival Plan

Preparation is the key to survival. Being involved in a fire will be one of the most traumatic experiences of your life.

- Prepare yourself – you need to be both mentally and physically prepared to carry out your Bushfire Survival Plan.
- Prepare your Bushfire Survival Plan.
- Prepare your Bushfire Survival Kit.
- Prepare your Bushfire Relocation Kit.
- Prepare your property.

When writing your plan you need to consider:

- Have you made the right choice: to leave early or stay?
- Have you discussed your choice with your family, friends and neighbours?
- Who will take charge and lead other family members by carefully communicating the various tasks set out in the plan?
- If you have chosen to stay what will you do to protect your property when the fire arrives?
- What will you put in your Bushfire Survival Kit and where will you store it?
- Do your friends, family and neighbours know the details of your plan?

- What will you do if your Bushfire Survival Plan fails?
- Do you have an alternative option or contingency plan if your plan fails?
- Do you have a Neighbourhood Safer Place (NSP) you can go to as a last resort? For more information on NSPs see www.ruralfire.qld.gov.au.
- Is it safe to travel there?

If your decision is to leave early, you must include the following information or action items in your Bushfire Survival Plan:

- Monitor media outlets – radio, TV, mobile phone and internet for bushfire alerts.
- When will you leave?
- What will be your trigger for action?
- Will your plan be different for weekdays, weekends, or if someone is at home sick or injured?
- What will you take with you (Relocation Kit)?
- Where will you and your family go when you leave early?
- What route will you take to get there?
- What will you do with your pets?
- What will you do if there are consecutive or multiple **'catastrophic'** or extreme fire danger days?
- Will you go into work on days when the FDR is in the upper levels?
- Will you send your children to school when the FDR is in the upper levels?
- Will all members of your household leave early?
- What will you do to prepare your property?
- What is your contingency plan in the event that it is unsafe to leave?

If your decision is to stay you must include the following information or actions items in your Bushfire Survival Plan:

- Monitor media outlets – Radio, TV, mobile phone and internet.
- Locate your Bushfire Survival Kit.
- Put on protective clothing.
- Remain hydrated by drinking lots of water.

- Move any stock to fully grazed paddocks.
- Move cars to a safe location.
- Remove garden furniture, doormats and other items.
- Close windows and doors and shut blinds.
- Take down curtains and move furniture away from windows.
- Seal gaps under doors and window screens with wet towels.
- Place pets inside, restrain them, and provide water.
- Block downpipes and fill gutters with water.
- Wet down the sides of buildings facing the approaching fire front.
- Wet down decks and verandas.
- Wet down fine fuels close to buildings.
- Turn on sprinklers in garden before bushfire arrives.
- Fill containers with water; bath, sinks, buckets, wheelie bins, etc.
- Have ladders ready for roof space access (inside) and against roof (outside).
- Have generator or petrol pump ready.
- Start checking and patrolling for embers outside.

When the fire front arrives:

- Take all fire fighting equipment inside such as hoses and pumps as they may melt during the fire.
- Go inside and shelter away from the fire front.
- Patrol the inside of your home, including the ceiling space, for embers or small fires that may start.
- Drink lots of water.
- Check family and pets.

After the fire front has passed:

- Wear protective equipment.
- Go outside once it is safe.
- Check for small spot fires and burning embers:
 - inside roof space
 - under floor boards
 - under house space
 - on veranda and decks

- on window ledges and door sills
- in roof lines and gutters
- garden beds and mulch
- wood heaps
- outdoor furniture
- sheds and carports
- Continue to drink lots of water.
- Stay at your property until the surrounding area is clear of fire.
- Monitor media outlets – radio, TV, mobile phone and internet.

You need to be both mentally and physically prepared to carry out your Bushfire Survival Plan

There may be other actions to include, depending on your individual property and the level of bushfire risk you are exposed to.

Include the whole family in creating your Bushfire Survival Plan. You and your family should be aware of the actions you will take at the various FDR levels and it is important to ensure this is incorporated into your Bushfire Survival Plan. The FDR for your area can be found on roadside signs and by visiting www.ruralfire.qld.gov.au and following the FDR link.

It is important that your Bushfire Survival Plan does not rely solely on receiving an alert.

Once you have completed your Bushfire Survival Plan, practise it regularly to ensure everyone involved knows exactly what to do in the event of a fire.

Preparing your Bushfire Survival Kit

It is essential that you have a Bushfire Survival Kit if your choice is to stay with your property. This kit will ensure you and your family have the important equipment you need to stay. For a comprehensive list of equipment needed in a Bushfire Survival Kit see page 14.

Preparing your Bushfire Relocation Kit

It is equally important to have a relocation kit if your choice is to leave early. This kit will ensure you and your family have important items and equipment required to relocate for the time needed. For a comprehensive list of items and equipment needed in a Bushfire Relocation Kit see page 15.

Making a contingency plan

No matter whether your decision is to leave early, well before a bush fire threatens or to stay you should still have a contingency plan as part of your Bushfire Survival Plan. There are many scenarios to consider, such as what you will do if a rapid onset fire starts in your local area making roads impassable or travel particularly dangerous. You should have other options if road travel is not safe.

- Is your house well prepared?
- Can it provide you with protection from radiant heat?
- Have you identified a safer location such as an NSP?

Sheltering in a well-prepared property is far safer than being out in the open or in a vehicle

Preparing your property

An unprepared property is not only at risk itself, but may also present an increased danger for your neighbours and their homes.

Planning is absolutely critical to safely staying with your home. Staying home involves the risk of psychological trauma, injury and death.

There are a number of measures you can take to prepare your home and property for bushfire. These include several preparations you must take annually prior to the bushfire season.

Your pre-season property preparations should include:

- Displaying a prominent house number.
- Ensuring there is adequate access for fire trucks to your property – 4 metres wide by 4 metres high with a turn-around area. Reduce vegetation loads along the access path.
- Mowing your grass regularly.
- Removing excess ground fuels and combustible material (long dry grass, dead leaves and branches).
- Clearing of leaves, twigs, bark and other debris from the roof and gutters.
- Purchasing and testing the effectiveness of gutter plugs.
- Trimming low-lying branches 2 metres from the ground surrounding your home.
- Enclosing open areas under your decks and floors.
- Installing fine steel wire mesh screens on all windows, doors, vents and weep holes.
- Pointing LPG cylinder relief valves away from the house.
- Conducting maintenance checks on pumps, generators and water systems.
- Checking that you have sufficient personal protective clothing and equipment.
- Relocating flammable items away from your home including woodpiles, paper, boxes, crates, hanging baskets and garden furniture.
- Sealing all gaps in external roof and wall cladding.
- Checking that the first aid kit is fully stocked.

Bushfire Alerts

If you receive an emergency warning about a bushfire or other emergency, take notice as it could save your life.

There are three types of alert messages to help you make the right safety choices:

Bushfire Advice Message – a fire has started – general information to keep you up to date.

Bushfire Watch and Act Message – represents a heightened level of threat. Conditions are changing, a fire is approaching; lives may come under threat. Take appropriate action.

Bushfire Emergency Warning – is the highest level message advising of impending danger. It may be preceded with the Standard Emergency Warning Signal (SEWS).

An Emergency Warning means there is a threat to lives and protective action is required immediately.

When a bushfire strikes

You have made your decision to **PREPARE.ACT.SURVIVE.** You have prepared your property before the fire season. You have made your Bushfire Survival Plan. You have practised your Bushfire Survival Plan.

A bushfire is threatening? What do you do?

- Know the FDR for any given day.
- Regularly check the FDR on the Rural Fire Services website at www.ruralfire.qld.gov.au.
- Monitor your media outlets for warnings on bushfire activity.
- Seek out information if you have to, and do not assume that you will receive a warning.
- Leave early or stay according to your Bushfire Survival Plan.
- Act decisively in accordance with your Bushfire Survival Plan.
- Do not adopt the 'wait and see' option.

Travelling in your vehicle near a bushfire

Sheltering inside a vehicle is a high-risk strategy that can result in death. Whilst sheltering inside a vehicle offers you a slightly higher chance of survival than being caught in the open, having a leave early or stay strategy is a much safer option.

You should never take a journey into areas where the fire danger is catastrophic or extreme. You should consider postponing or finding alternative routes if necessary. If you can smell or see smoke in the distance it is best to u-turn and drive away from the danger.

If you are caught in smoke or flames while on the road:

- Turn on the vehicle's headlights and hazard warning lights.
- If you need to shelter in your vehicle drive your car into a bare, clear area well away from surrounding trees, leaving lights on. Position vehicle to prevent side impact from advancing fire front.
- Close all windows and vents.
- Leave the engine running and turn off the air conditioning system.
- Cover your entire body with woollen or cotton blankets to protect from radiant heat.
- Take shelter below the window level.
- Drink water frequently and stay in the vehicle until the fire front has passed.
- Once the fire front has passed exit the vehicle to inspect the damage and ensure other passengers are safe.

Neighbourhood Safer Places

A Neighbourhood Safer Place (NSP) is a place of last resort for people during a bushfire. An NSP may form part of a back-up plan when:

- Your Bushfire Survival Plan has failed.
- Your plan was to stay but the extent of the fire means that your home cannot withstand the impact of the fire and therefore your home is not a safe place to shelter.
- The fire has escalated to an extreme or catastrophic level and relocation is the safest option.

An NSP is an identified building or open space within the community that can provide a level of protection from the immediate life-threatening effects of a bushfire. NSPs still entail some risk, both in moving to them and while sheltering in them and cannot be considered completely safe.

They are a place of *last resort* in bushfire emergencies only. The following limitations of NSPs need to be considered within your Bushfire Survival Plan:

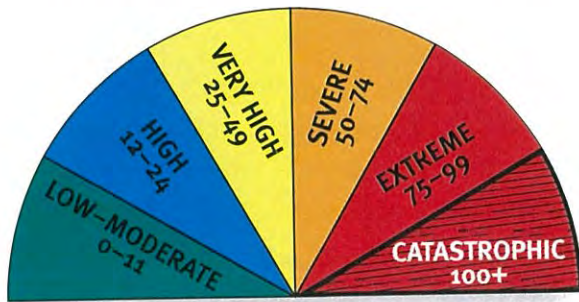
- NSPs do not cater for pets.
- Firefighters may not be present as they will be fighting the main fire front elsewhere.
- NSPs do not provide meals or amenities.
- They may not provide shelter from the elements, particularly flying embers.

If you are a person with special needs you should give consideration to what assistance you may require at an NSP.

Although QFRS cannot guarantee an immediate presence during a bushfire, every effort will be made to provide support as soon as resources are available.

If an NSP is part of your contingency plan it should not require extended travel through fire-affected areas to get there.

FIRE DANGER RATING



The Fire Danger Rating (FDR) is an early indicator of potential danger and should act as your first trigger for action. The higher the rating the greater the need for you to act.

The FDR is an assessment of the potential fire behaviour, the difficulty of suppressing a fire, and the potential impact on the community should a bushfire occur on a given day.

A Fire Danger Index (FDI) of 'low-moderate' means that fire will burn slowly and that it will be easily controlled, whereas a FDI in excess of 'catastrophic 100+' means that fire will burn so fast and so hot that it will be uncontrollable.

CATASTROPHIC 100+

A fire with a rating of 'catastrophic' may be uncontrollable, unpredictable and fast moving. The flames will be higher than roof tops. Many people will be injured and many homes and businesses will be destroyed.

During a 'catastrophic' fire, well-prepared and constructed homes will not be safe. Leaving is the only option for your survival.

EXTREME 75-99

A fire with an 'extreme' rating may be uncontrollable, unpredictable and fast moving. The flames will be higher than roof tops. During an 'extreme' fire, people will be injured and homes and businesses will be destroyed.

During an 'extreme' fire, well-prepared and well-constructed homes may not be safe. Leaving is the only option for your survival.

SEVERE 50-74

A fire with a 'severe' rating may be uncontrollable and move quickly, with flames that may be higher than roof tops. A 'severe' fire may cause injuries and some homes or businesses will be destroyed.

During a fire with a 'severe' rating, leaving is the safest option for your survival. Use your home as a place of safety only if it is well-prepared and well-constructed.

VERY HIGH 25-49

A fire with a 'very high' danger rating is a fire that can be difficult to control with flames that may burn into the tree tops. During a fire of this type some homes and businesses may be damaged or destroyed.

During a fire with a 'very high' danger rating, you should use your home as a place of safety only if it is well prepared and well-constructed.

HIGH 12-24

A fire with a 'high' danger rating is a fire that can be controlled where loss of life is unlikely and damage to property will be limited.

During a fire with a 'high' danger rating, you should know where to get more information and monitor the situation for any changes.

LOW-MODERATE 0-11

A fire with a 'low to moderate' rating can be easily controlled and pose little/or no risk to life or property.

During a fire with a 'low to moderate' rating, you should know where to get more information and monitor the situation for any changes.

BUSHFIRE SURVIVAL PLAN

Complete your personalised Bushfire Survival Plan lift-out.

Personal details:

Important phone numbers: **000** (Fire, Police and Ambulance)

Family: _____ Family: _____ Family: _____

Work: _____ Friends: _____ Friends: _____

School: _____

Important contact details – name and phone number:

Insurer: _____ Policy Number: _____ Phone: _____

Electricity: _____ Phone: _____

Water: _____ Phone: _____

Gas: _____ Phone: _____

Phone Company: _____ Phone: _____

Council: _____ Phone: _____

Leave early:

List all names and contact phone numbers of household members who have decided to leave early then complete Section 1.

Names: _____

Phone: _____

Stay:

List all names and contact phone numbers of household members who have decided to stay, then complete Section 2.

Names: _____

Phone: _____

Leave early – Section 1

Pull this Bushfire Survival Plan lift-out from this document and keep in a safe place.

Leaving early will always be the safest option for you and your family. It is extremely important for you to prepare a detailed leave early plan to ensure everyone understands what to do and when. Use the boxes below to list tasks to do.

When to go – Think of different triggers that will cause you and your family to leave early. Think about what you will do if you have sent the children to school that day. Think about whether or not you will have to travel from work into the fire zone.

Where to go – Identify one or more safer locations. Consider putting on personal protective clothing before you leave home.

How to get there – What roads will you take to your destination? Have an alternative route if your first choice is impassable.

What to take – Make a list of your most valuable items (e.g. insurance papers, electronic records, photo albums, passports, birth certificates and other important documents).

Stay – Section 2

Anyone who is not going to leave early must be involved in completing this stay and defend plan to ensure they know what to do. Every stay plan will be different depending on your circumstances. Use the boxes below to list tasks to do.

Before the fire approaches – Start getting yourself and your property ready for a bushfire.

As the fire approaches – Prepare for ember attack on or near your home.
Remember to put on personal protective clothing.

As the fire front arrives – Stay safe by monitoring the fire from inside your home.

After the fire has passed – Patrol your property and extinguish any spot fires or burning embers.
You may need to keep this up for several hours.

Everyone must have a contingency plan

Have a contingency plan – what will you do if you can't activate your Bushfire Survival Plan? Remember that leaving late can lead to loss of lives.

Know where your nearest NSP is and how to get there.

ACTIVATING YOUR BUSHFIRE SURVIVAL PLAN

Once you have prepared your Bushfire Survival Plan and completed your preparations, it is absolutely essential that you regularly practise and review your plan. This will make sure you and your family are well organised in the event of a bushfire. If a bushfire threatens the health and safety of you, your family, home or property, you should follow these steps:

Step 1 – Activate your Bushfire Survival Plan

Someone must take charge and lead other family members through this emotional experience by carefully communicating the various tasks set out in the plan. Know who is going to leave early and who is going to stay.

Step 2 – Put on your personal protective clothing

Every member of the family must change into their personal protective clothing, including long pants, long-sleeve-shirt and closed-in shoes.

Step 3A – Pack your vehicle and leave early

If your plan is to leave early, pack all valuables in your vehicle (see Relocation Kit) and relocate to your designated safer location. Give yourself enough time to get you and your family to safety. Don't return home until it is safe to do so.

Step 3B – Implement your strategy to stay and defend

If your plan is to stay ensure you have all the items in the Bushfire Survival Kit ready to go. This can be a dangerous option and you should be physically and mentally prepared.

OR

Step 4 – Keep informed of bushfire activity

Listen to the radio, television, internet, firefighters and/or police for information on the fire in your local area. Bushfire is dynamic and unpredictable so you need to be prepared for the unexpected. Warnings are not guaranteed so do whatever is necessary to ensure you remain safe.

BUSHFIRE SURVIVAL KIT

You need to have a Bushfire Survival Kit stored in an area of the house that is safe and easy to access. It should contain:

- protective clothing
- mop
- gloves
- torch
- hoses
- shovel
- towels
- buckets
- safety goggles
- ladder
- medications
- bottled drinking water
- fire extinguishers
- battery operated radio
- spare batteries
- smoke mask
- woollen blankets
- first aid kit
- knapsack sprayer
- protective clothing for the whole family.



RELOCATION KIT

Write a list of all items your family will need before, during and after your relocation. The list below shows items that you might like to put in your relocation kit.

- protective clothing for the whole family
- battery operated radio and spare batteries
- safety goggles
- mobile phone and battery charger
- medications
- wallet or purse and money
- clothing (two sets of clothes for each family member)
- identity information (passports, birth certificates)
- bottled water (enough for each relocated family member)
- family and friends' phone numbers
- items of high importance (e.g. family photos, valuables, important documents)
- blankets (natural fibres)
- children's toys



BUSHFIRE RISK SELF-ASSESSMENT CHECKLIST



This basic self-assessment checklist is designed to give you a greater understanding of the bushfire risk level relevant to your property. Information provided in this assessment will assist you when completing your Bushfire Survival Plan.

Address:

Postcode:

Property Owner/Property Name:

ACCESS/EGRESS

Road/Street/Driveway

PLEASE ✓ APPROPRIATE BOX

Clear of overhanging vegetation	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Unrestricted gate access	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Clear of overhead power lines	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Able to reverse in	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Turning/passing areas	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Heavy vehicle access on cattle grid/bridge	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Alternative way out	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Two wheel drive access	Yes <input type="checkbox"/>	No <input type="checkbox"/>

STRUCTURE/S

Exterior walls – non-combustible	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Roof ridge capping sealed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Eaves enclosed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Roofing gutters and valleys clear of leaf litter and fine fuels	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Underfloor enclosed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Vents screened	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Windows – non-combustible finishing	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Deck/veranda non-combustible	Yes <input type="checkbox"/>	No <input type="checkbox"/>

WATER SUPPLY

Reticulated water supply	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Tank supply with QFRS access – 50mm male camlock fitting so fire fighters can use water if needed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
QFRS accessible external open water supply (dam/pool)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Firefighting pump and hose connected to water supply	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Other considerations

There are a range of other things to be considered regardless of your decision to leave early or stay:

- Firefighting equipment such as pumps, hoses and sprinkler systems should be tested regularly and maintained in maximum operational working condition.
- Firefighters may need access to your property during a bushfire so it is in your best interests to allow enough space for fire trucks (4 metres wide by 4 metres high).
- Your pets, livestock and other animals require proper care and attention during fires. Consider food, medication, transportation and sleeping arrangements for your animals.

Myths versus Reality

Myths	Reality
There will always be a fire truck available to fight a bushfire threatening my home.	Firefighters may be required to fight many fronts of a large fire. Fire trucks and firefighters are finite resources so it is important they are deployed in an appropriate manner to best manage the fire.
I know the back streets in town like the back of my hand so it is OK for me to leave at the last minute.	If your decision in your Bushfire Survival Plan is to leave early, then you should leave well before the fire front reaches your property. Irrespective of your local area knowledge you must stick to your plan and leave early. Leaving late can be fatal.
Someone from an emergency service will knock on my door when it is time to leave.	Emergency services personnel may not be available to alert the community by door-knocking and encouraging you to leave. You need to monitor the bushfire alerts by listening to the radio, watching TV or checking the rural fire website. You need to be ready to leave early if your life or the people in your care are at risk.
My house will not burn down because there is more than 50 metres between my home and nearby bushland.	Most houses which burn down during bushfires have been attacked by flying embers. Under certain conditions embers can cause ignitions up to 20kms in front of the main fire. A combination of your level of preparation and your home's construction will determine the survivability of your home.
I only have to clean my gutters and mow my lawns to prepare my property for bushfire.	Fire requires fuel, heat and oxygen to occur. This means that flames or embers do not necessarily rely solely on your gutters and lawns for fuel. They might utilise overhanging trees, woodpiles, old building materials under the deck or chemicals in the garden shed to sustain them. Take the time to properly prepare your whole property, which includes yourself, your house and your land.

Hints on Building Design Approaches to Limit BAL-Compliance Costs

Certain building design approaches can effectively decrease construction costs associated with meeting the provisions of AS3959-2009. Some of these approaches include:

- slab on ground construction
- brick / masonry / concrete veneer as opposed to timber cladding
- consideration of the location of windows and window design, avoiding floor-to-ceiling glazing and raising windows at least 400mm off the ground and away from any adjoining timber structures such as decking
- consideration of more simple designs which avoid numerous roof valleys and avoiding re-entrant corners around the building
- consideration of door locations and door types, some types more affordably meet AS3959-2009 than others (i.e. consider avoiding bi-fold doors)
- stainless steel security screening to doors and windows and aluminium roller shutters (shutters may not be essential but may be more affordable than specified glazing requirements)
- avoid timber framing to windows and doors where applicable, which require selected timbers to a bushfire resistant density
- avoid entry sidelights
- avoid unnecessary skylights and certain roof ventilation systems (i.e. whirlybirds) to avoid additional need for ember guarding
- select non-combustible material for garage doors and frames as opposed to timber materials which must be of bushfire-resisting density
- consider the need for timber decking and / or other timber structures which may be located adjoining or affixed to the main dwelling and which would require bushfire resisting timber for construction.

Informed building design can substantially decrease costs associated with ember and radiant heat protection construction methodologies. Purchasers are strongly recommended to consult their builder and private certifier with respect to these opportunities in advance of dwelling design selection to maximise the opportunity for construction savings.