

BUSH FIRE ASSESSMENT REPORT

New Class 1a development

8440 New England Highway, Muswellbrook, NSW

Lot 302 / DP 1295800

Reference No#: 241684



Bush Fire Certificate

Certificate issued under 4.14(1)(b) of the *Environmental Planning & Assessment Act, 1979*

This Certificate has been issued by a person accredited by Fire Protection Association Australia (FPA Australia) under the Bush Fire Planning and Design (BPAD) Accreditation Scheme and who is recognised by the NSW Rural Fire Service as a qualified consultant in bushfire risk assessment within the meaning of section 4.14(1)(b) of the *Environmental Planning and Assessment Act 1979* (NSW).

Property Details and Description of Works				
Address Details	Unit no	Street no	Street name	Lot/Sec/DP
		8440	New England Highway	Lot 302 / DP 1295800
	Suburb	State		Postcode
	Muswellbrook	NSW		2333
Local Government Area	Muswellbrook			
BCA class of the building	Class 1a			
Description of the proposal	New residential dwelling			
Development Application Reference	N/A			

Bush Fire Assessment Report	
A detailed Bush Fire Assessment Report is attached, which includes the relevant submission requirements set out in <i>Appendix 2 of Planning for Bush Fire Protection 2019</i> together with recommendations as to how the relevant specifications and requirements are to be achieved.	<div>YES <input checked="" type="checkbox"/></div> <div>NO <input type="checkbox"/></div>
Report Reference No#	241684
Report Date	14 th April 2024

BPAD Certification		
Duncan Scott-Lawson	I hereby certify, in accordance with Section 4.14(1)(b) of the <i>Environmental Planning and Assessment Act 1979</i> that: <ul style="list-style-type: none"> I am a person recognised by the NSW Rural Fire Service as a qualified consultant in bush fire risk assessment; and the development conforms to the relevant specifications and requirements of <i>Planning for Bush Fire Protection 2019</i> in accordance with section 4.14(1)(b) of the <i>Environmental Planning and Assessment Act 1979</i> (NSW). 	
Bushfire and Environmental Management Consultancy Pty Ltd ABN: 606 409 656 44		
BPAD Accreditation Number # 47789 	Signature 	Date 14th April 2024

Disclaimer

Please note that every effort has been made to ensure that information provided in this report is accurate. It should be noted that the information is for the client for the specific purpose for which it is supplied, that is to support a DA application. This report is strictly limited to the purpose including the facts and matters stated within it and is not to be used, directly or indirectly, for any other application, purpose, use or matter.

Due consideration has been given to site conditions and to appropriate legislation and documentation available at the time of preparation of the report. As these elements are liable to change over time, the report should be considered current at the time of preparation only. Should further information become available regarding the conditions at the site, BEMC reserves the right to review the report in the context of the additional information. BEMC has made no allowance to update this report and has not considered events occurring after the time its assessment was conducted.

Bushfire and Environmental Management Consultancy (BEMC) Pty Ltd will not be liable in respect of any losses arising out of any event or events beyond our reasonable control. Samantha Jennings or Duncan Scott-Lawson or will not be liable in respect of any business losses, including without limitation, loss of or damage to profits, income, revenue, use, production, anticipated savings, business, contracts, commercial opportunities, or goodwill. Samantha Jennings or Duncan Scott-Lawson will not be liable to you in respect of any special, indirect, or consequential loss or damage.

Apart from fair dealing for the purposes of private study, research, criticism, or review as permitted under the Copyright Act, no part of this report, its attachments or appendices may be reproduced by any process without the written consent of BEMC Pty Ltd. All enquiries should be directed to BEMC Pty Ltd.

Title	Bush Fire Assessment Report			
Description	Residential Development – Class 1a 8440 New England Highway, Muswellbrook, NSW - Lot 302 / DP 1295800			
Created By	Duncan Scott-Lawson – BPAD 47789 T: +61 408 667 137 E: duncan@emconsultancy.com.au			
Prepared For	Reggie Mikellides reggie@wildgroup.com.au 0427 865 875			
Version Number	Modified By	Modifications Made	Date Modified	Status
1	SJ	Draft	10/04/2024	Draft
2	DSL	Final	14/04/2024	Completed

TABLE OF CONTENTS

1	Executive Summary and Recommendations	4
2	Introduction	9
2.1	Description of proposed development	9
2.2	Objectives of Assessment.....	10
2.3	Specific Objectives of Residential Infill Developments	10
3	Bush Fire Risk Strategic Study	11
4	Bush fire Hazard Assessment.....	14
4.1	Forest Fire Danger Index	14
4.2	Assessment Methodology.....	14
4.3	Vegetation Assessment.....	14
4.3.1	Vegetation exclusions, and downgrades	15
4.3.2	Predominant Vegetation Classification.....	15
4.4	Separation Assessment	15
4.5	Slope Assessment.....	16
4.5.1	Effective and Site Slope Assessment.....	16
4.6	Shielding	17
4.7	Wildfire Growth.....	17
5	Bushfire Assessment and Performance Measures.	18
5.1	Better bush fire Outcomes Section 7.8 of PBP.....	18
6	Conclusion and Recommendations.....	25
7	References	28
8	APPENDIX 1 Site Layout	30
9	APPENDIX 2 Plates (Photographs)	31
10	APPENDIX 3 Biodiversity Map	34
11	APPENDIX 4 Bush fire Protection Measures.....	35

TABLES

Table 1 Description of Proposed development	10
Table 2 Bush fire risk strategic study	11
Table 3 Outcomes for the property with respect to Bush fire Hazard Assessment (Method 1 PBP 2019)	17
Table 4 Planning for bush fire protection compliance (PBP 2019) Chapter 7 - Infill residential developments on bush fire prone lands.	18

FIGURES

Figure 1 Property Location of 8440 New England Highway, Muswellbrook, NSW - Lot 302 / DP 1295800 (Mecone Mosaic, 2024)	7
Figure 2 Bush fire Assessment	8
Figure 3 Vegetation in and around the site (Extract from the SEED Portal)	15
Figure 4 LiDAR 1m DEMS slope analysis	16

PLATES

Plate 1 (P1) Access along private property	31
Plate 2 (P2) Access along private property	31
Plate 3 (P3) Example of APZ	32
Plate 4 (P4) Vegetation that creates the greatest bushfire threat	32
Plate 5 (P5) Existing shed and proposed building knock-down/replacement	33

Abbreviations and Acronyms

APZ	Asset Protection Zone
AS/NZS 1221:1997	Australian Standard – Fire hose reels
AS1596:2014	Australian Standard – The storage and handling of LP Gas
AS2419:2021	Australian Standard – Fire hydrant installations
AS2441:2005	Australian Standard – Fire hose reels installation
AS3745:2010	Australian Standard – Planning for emergencies in facilities
BAL	Bush fire Attack Level
BCA	Building Code of Australia
BFAR	Bush Fire Assessment Report
BFRSS	Bush Fire Risk Strategic Study
BPA	Bush fire Prone Area (Also Bush fire Prone Land)
BPL Map	Bush fire Prone Land Map
BPMs	Bush fire Protection Measures
BV	Biodiversity Values
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
FFDI	Forest Fire Danger Index
GFDI	Grass Fire Danger Index
ha	Hectare
HOC	Heat Of Combustion
IPA	Inner Protection Area
kJ/kg	Kilo Joules per Kilo gram
LAT	Large Air Tanker
LGA	Local Government Area
NCC	National Construction Code
OPA	Outer Protection Area
PBP	Planning for Bush fire Protection
RF Act	<i>Rural Fires Act 1997</i>
RF Regs	<i>Rural Fires Regulations 2013</i>
RHG	Restricted Head Growth
SEED	Sharing and Enabling Environmental Data in NSW
SFR	Short Fire Run

1 EXECUTIVE SUMMARY AND RECOMMENDATIONS

BEMC Pty Ltd was engaged by Reggie Mikellides to complete a Bush Fire Assessment on the proposed Class 1a residential development at 8440 New England Highway, Muswellbrook, NSW - Lot 30 / DP 815308 (**Figure 1, page 1**). The proposed development includes a new residential dwelling.

The intent of this report is to assess the bushfire landscape risk, support the NSW governments position to provide new and affordable housing while reducing process and assess the proposal applying Method 1 assessment pathway from PBP 2019 to prepare this Bush Fire Assessment Report (BFAR).

Based upon the assessment, perusal of the site plan prepared (**Appendix 1, page 31**), and a site visit, it is recommended that development consent be granted subject to the following conditions to comply with PBP 2019:

Recommendation 1 - Asset Protection Zones

The vegetation within the site currently complies with APZ standards and no vegetation management is required to comply.

At the commencement of building works and in perpetuity the property around the proposed development shall be maintained as an inner protection area (IPA) as outlined within Appendix 4 of Planning for Bush Fire Protection 2019 and the NSW RFS document Standards for Asset Protection Zones to a distance of:

- 33 metres on the northern elevation,
- 43 metres on the eastern elevation,
- 33 metres on the western elevation, and
- 37 metres on the southern elevation.

Recommendation 2 - Landscaping

A Landscaping plan is required to illustrate:

- Landscape species are reflected in the landscaping plan to ensure tree canopy cover is less than 15% (IPA), and less than 30% (OPA) at maturity and trees do not touch or overhang buildings.
- Fencing and gates within BAL 29 areas or higher, and within 6m of the occupied dwelling shall be non-combustible.
- A minimum 1-metre-wide area (or to the property boundary where the setbacks are less than 1 metre), suitable for pedestrian traffic, must be provided around the immediate curtilage of the building.
- Planting is limited in the immediate vicinity of the building.
- Planting does not provide a continuous canopy to the building (i.e., trees or shrubs are isolated or located in small clusters).
- Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies.
- Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown.
- Avoid planting of deciduous species that may increase fuel at surface/ ground level (i.e., leaf litter).
- Avoid climbing species to walls and pergolas.
- Locate combustible materials such as woodchips/mulch, flammable fuel stores away from the building.

- Locate combustible structures such as garden sheds, pergolas, and materials such as timber garden furniture away from the building, and
- Low flammability vegetation species are used.

Recommendation 3 - Construction Standards

New construction must comply with section 3 and section 6 (BAL 19) Australian Standard AS3959-2018 Construction of buildings in bush fire-prone areas or NASH Standard National Standard Steel Framed Construction in Bushfire Areas – 2021 as appropriate and section 7.5 of Planning for Bush Fire Protection 2019.

Recommendation 4 - Access

Access to the property and development site is noted on **Figure 2, page 8** of this report and in the site plan provided in **Appendix 1, page 31**.

Internal roads shall comply with following requirements of Table 7.4a of Planning for Bush Fire Protection 2019:

- Private property access shall be two-wheel drive, all weather roads,
- The capacity of private property access of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating,
- Category 1 fire appliance to within 4m of the static water supply,
- Minimum carriageway width of 4m,
- In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay,
- A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, and
- Property access must provide a suitable turning area in accordance with Appendix 3,
- Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress,
- The minimum distance between inner and outer curves is 6m,
- The crossfall is not more than 10°,
- Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads.

Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. the gradients applicable to public roads also apply to community style development property access roads in addition to the above.

Recommendation 5 - Water Supply

20,000L static water supply is provided for firefighting purposes in areas where reticulated water is not available need to meet the following specifications:

- All above-ground water service pipes external to the building are metal, including and up to any taps,
- A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65mm Storz outlet with a ball valve is fitted to the outlet,
- Ball valve and pipes are adequate for water flow and are metal,
- Supply pipes from tank to ball valve have the same bore size to ensure flow volume,
- Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank,
- A hardened ground surface for truck access is supplied within 4m,

- Above-ground tanks are manufactured from concrete or metal,
- Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959),
- Unobstructed access can always be provided,
- Static Water Supplies (SWS) are clearly marked with SWS signage place at the front gate and in location that guide responding fire agencies to the location of the water supply on site (Refer to Appendix),
- Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters,
- All exposed water pipes external to the building are metal, including any fittings,

Water pumps and fire hose reels are not required for compliance with PBP 2019, although if provided shall:

- Where pumps are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm (internal diameter), and

Fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels and installed in accordance with AS 2441:2005 Installation of fire hose reels.

Recommendation 6 - Electricity services

Where possible electricity should be placed underground. If overhead power supply is provided, lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

Recommendation 7 - Gas services

Any reticulated or bottled gas shall be installed and maintained in accordance with the below requirements as outlined in Table 7.4a of PBP:

- Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used.
- All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side.
- Connections to and from gas cylinders are metal.
- Polymer-sheathed flexible gas supply lines are not used; and
- Above-ground gas service pipes are metal, including and up to any outlets.

Finally, the implementation of the adopted measures and recommendations forwarded within this report comply with Planning for Bush fire Protection (2019) and will contribute to the amelioration of the potential impact of any bush fire upon the development, but they do not and cannot guarantee that the area will not be affected by bush fire at some time.

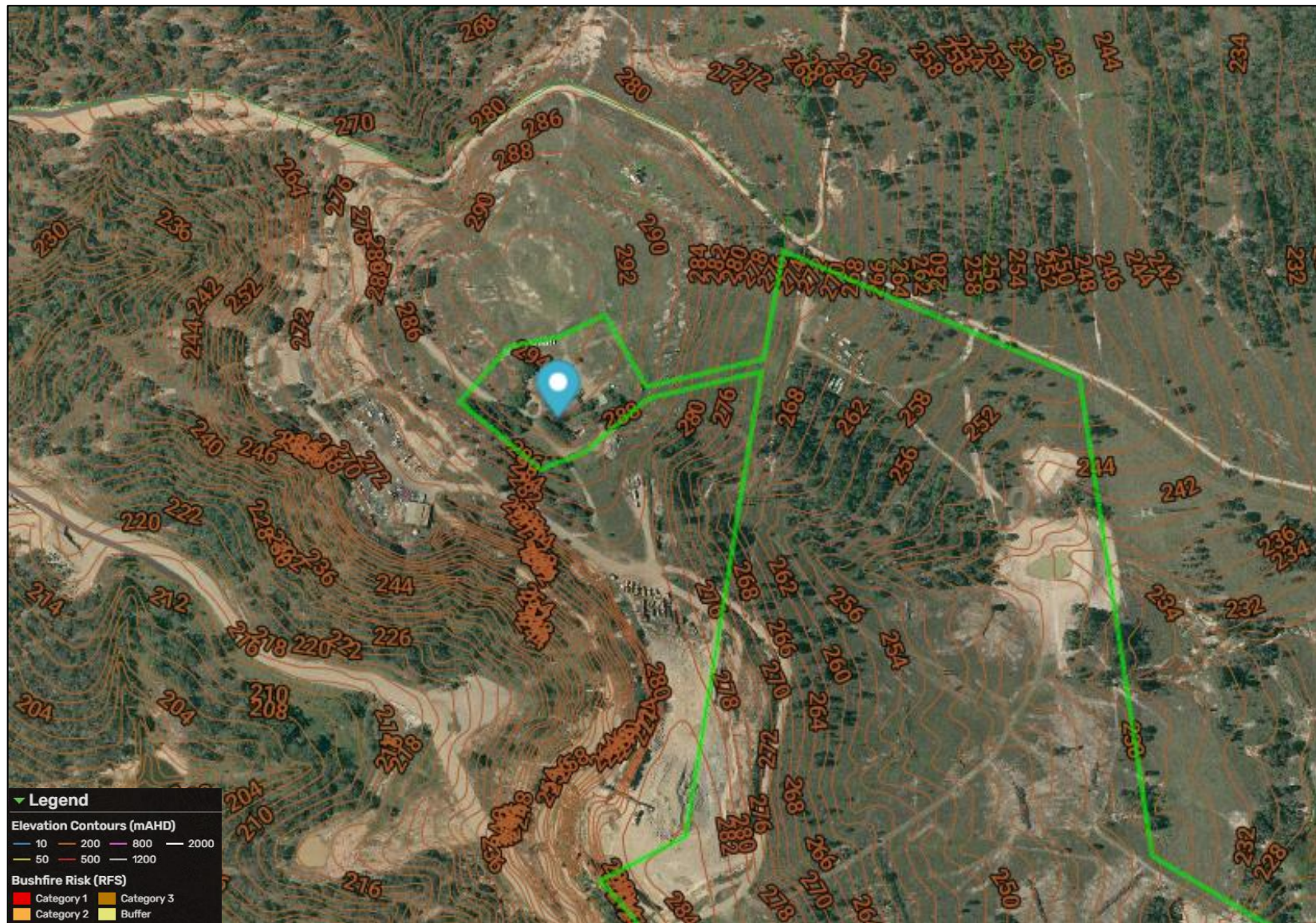


Figure 1 Property Location of 8440 New England Highway, Muswellbrook, NSW - Lot 302 / DP 1295800 (Mecone Mosaic, 2024)

Figure 2 Bushfire Assessment

-  Vehicle Water
 -  Separation
 -  Fire Run
 -  Photo Point
 -  Category 1 Access
 -  Unobstructed water access
 -  2m Contours
 -  Asset Protection Zone
 -  Existing Class 10 building
 -  Proposed Development
 -  100m Slope analysis
 -  140m Assessment area
 -  Unmanaged grasslands
 -  Woodlands
- Nearmap Reprojection



2 INTRODUCTION

BEMC Pty Ltd was engaged by Reggie Mikellides to complete a Bush Fire Assessment Report (BFAR) to inform early planning accompany a Development Application for residential development located at 8440 New England Highway, Muswellbrook, NSW - Lot 302 / DP 1295800 (**Figure 1, page 7**).

It is clear from the investigation and assessment of the property that the site is located within Bush fire Prone Land.

The identification of bush fire prone lands (BPL Map) in NSW is required under section 10.3 of the Environment Planning and Assessment Act 1979 (EP&A Act). Section 4.14 of the EP&A Act requires developments to comply with NSW Rural Fire Service, Planning for Bush fire Protection (PBP 2019) if any part of a development site is affected by a bush fire hazard as indicated within the BPL Map.

This report considers and assesses the bush fire construction and planning requirements to determine compliance with the performance criteria in NSW Rural Fire Service Planning for Bush fire Protection 2019 (PBP 2019). This report applies the methodology in Appendix 1 of the PBP 2019 and provides the required information in consideration of A2.2 of PBP 2019.

This development falls within bush fire affected land within the Muswellbrook Council bush fire prone land map which triggers development assessment provisions under 4.14 of the EP&A Act and compliance with PBP 2019. The consent authority may consult with the RFS under section 4.15 of the EP&A Act for development in bush fire prone lands.

The proposed development is classified as a Class 1a building in accordance with Building Code of Australia (BCA). The EP&A Regulation requires a Certifying Authority, prior to issuing a construction certificate or complying development certificate, to be satisfied that the relevant requirements of the BCA will be met. The BCA calls-up AS3959:2018 Construction of buildings in bush fire prone land (AS3959:2018). Residential buildings classified as Class 1a located on bush fire prone land, must comply with the BCA and the construction requirements in PBP 2019.

2.1 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development includes a main dwelling. As a result, the required objectives of Residential Infill Development have been considered in this assessment.

The Site Plan provided in **Appendix 1, page 31**.

The intent of the proposal is supporting the NSW governments position to provide new and affordable housing where acceptable risk can be achieved.

Table 1 Description of Proposed development

Boundaries	Rural landscape in all directions.
Topography	Downslope in all directions.
Type of development	Class 1a - New residential dwelling.
Roof construction	TBA
External wall construction	TBA
Landscaping plan provided	No
Bush fire Prone Land	Yes – Muswellbrook – FFDI – 100

The proposed location of the development is provided in **Figure 1, page 7** with further development details provided in **Appendix 1, page 31**.

2.2 OBJECTIVES OF ASSESSMENT

To assess the proposed development in consideration of s4.14 of the EP&A Act 1979, PBP 2019 and AS 3959:2018 to enable council to make a determination.

This report assesses whether the development meets the six objectives listed in section 1.1 of PBP 2019, which provide for the protection of human life and minimize impacts on property as follows:

1. Afford buildings and their occupants protection from exposure to a bush fire.
2. Provide for a defendable space to be located around buildings.
3. Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings.
4. Ensure appropriate operation access and egress for emergency services personnel and residents is available.
5. Provide for ongoing management and maintenance of Bush fire Protection Measures (BPMs); and
6. Ensure the utility services are adequate to meet the needs of firefighters.

2.3 SPECIFIC OBJECTIVES OF RESIDENTIAL INFILL DEVELOPMENTS

The aims and objectives listed in section 1.1 of PBP 2019 remain applicable to residential infill development, however further consideration has been given to this development to ensure BPMs are fully incorporated at the design stage of the development. The specific objectives of residential infill developments outlined in section 7.3 of PBP 2019 are:

- Provide a defendable space to enable unimpeded access for firefighting around the building.
- Provide better bush fire outcomes on a redevelopment site than currently exists, commensurate with the scale of works proposed.
- Design and construct buildings commensurate with the bush fire risk.
- Provide access, services, and landscaping to aid firefighting operations.
- Not impose an increased bush fire management and maintenance responsibility on adjoining landowners.
- Increase the level of bush fire protection to existing dwellings based on the scale of the proposed work and level of potential risk.

3 BUSH FIRE RISK STRATEGIC STUDY

Planning for Bushfire Protection (2019) is based on the worst-case scenarios for each of the bush fire behaviour elements of fire weather, vegetation, slope and assumes no human intervention. All development shall be assessed on an individual basis as broad-brush approaches of documents such as PBP 2019 may not be applicable in every instance.

A Bush Fire Risk Strategic Study (BFRSS) was prepared to inform the context of the Bush Fire Assessment Report (BFAR). The level of information gathered and analysis within the BFRSS depends upon the nature and scale of the development. The BFRSS provides a broad-brush approach to determine landscape wildfire risk in considerations of vegetation continuity, distribution, and proximity to development; human intervention; access and evacuation. This enables an assessment the *actual* bushfire risk, determine if strict adherence to PBP 2019 is warranted, and if a proposed development is appropriate in the bush fire hazard context.

Table 2 Bush fire risk strategic study

ELEMENT	Low Threat		Moderate Threat		High Threat		Extreme Threat	
Adjoining Lands	The proposed development and changing land use will have positive impacts on the ability of adjoining landowners to implement Bush fire Protection Measures		The proposed development and changing land use do not impact on the ability of adjoining landowners to implement Bush fire Protection Measures	✓	The proposed development and changing land use will impact on the ability of adjoining landowners to implement Bush fire Protection Measures		The proposed development will significantly impact on the wildfire risk profile of adjoining lands.	
Surrounding infrastructure	The proposed development does not significantly impact on community water, electricity, or gas services.		The proposed development is associated with community water, electricity, or gas services but will not have significant impact.	✓	The proposed development impact on community water, electricity, or gas services.		The wildfire risk profile of significant infrastructure will increase due to this development.	
Emergency services	The proposed development does not significantly impact on the ability of emergency services to plan, prepare, respond, or recover prior, during or after a bush fire event.		The proposed development is located within 30-minute flight from a Large Air Tanker (LAT) airbase and within 30-minutes of multiple fire response units.	✓	The proposed development is located more than 30-minute flight from a Large Air Tanker (LAT) airbase and only 1 or 2 fire response units within 30-minutes.		It is unlikely emergency services will respond to wildfire in this location during extreme and catastrophic events.	

ELEMENT	Low Threat		Moderate Threat		High Threat		Extreme Threat	
Access	Good, multiple route evacuation is possible and connects with the public road network in a direction away from the wildfire threat to shelter location.		More than one access or egress routes is provided from the property to a safer location which then can access the public road network with multiple access/egress routes o shelter location.		One access or egress routes is provided, which is <200m from the property to a safer location.		Only one access or egress route with no nearby safe location.	✓
Emergency egress	Seamless integration with existing settlement - no effect on evacuation.		Short bushland pinch points that may restrict access temporarily or carry fire across roads. Unlikely impact on evacuation.		Pinch points that are likely to restrict access along evacuation routes for short periods (15-30mins) and carry fire across roads.		Large areas of bushland or multiple pinch points along evacuation routes that could block evacuation routes for an extended time.	✓
Vegetation continuity	Forested vegetation beyond 140m from the site is scattered with low continuity due to built development.		Forested vegetation beyond 140m from the site is scattered and isolated, forming a dominate fast moving grassland or open woodland fire event.		Patches of forested vegetation associated riparian and isolated ridgelines beyond 140m from the site may result in localised forest fire event.		Continuous forested areas within mountainous terrain beyond 140m from the site will result in broadscale landscape emergency management operations.	✓
Vegetation connectiveness	Forested vegetation corridors beyond 140m are restricted and do not enable landscape fire to enter and move through the site by a continuous fire path.		Forested vegetation corridors beyond 140m from the site exist, although grasslands >100m provide separations between forested vegetation restricting the fire head progression of landscape fire.		Forested vegetation corridors beyond 140m from the site exist, although grasslands <100m provide separations between forested vegetation restricting the fire head progression of landscape fire.	✓	Forested vegetation corridors beyond 140m from the site provide for passage of landscape fire to enter and move through the site.	
Vegetation Location	Wildfire within forests can only approach from one direction surrounded by a suburban, township or urban area managed in a minimum fuel condition.		Wildfire within forests can only approach from two directions and the site is within a suburban, township or urban area managed in a minimum fuel condition.		Wildfire within forests can approach from several directions although gaps within forested vegetation or are present.	✓	Wildfire within forests can approach from several directions and have hours or days to grow and develop before impacting and/or site is surrounded by unmanaged vegetation.	
Separation	Hazard separation between forested hazard and buildings of greater than 100m.		Hazard separation between forested hazard and buildings of 50-100m		Hazard separation between forested hazard and buildings of 30-50m		Hazard separation between forested hazard and buildings of <30m	✓

ELEMENT	Low Threat		Moderate Threat		High Threat		Extreme Threat	
Vegetation flammability	Within the dominated fire direction, the fire fuel is restricted to surface, partially managed and separated through land use practises.		Within the dominated fire direction, the fire fuel is highly aerated, with significant separations (>50m) between these patches with partially managed vegetation between.		Within the dominated fire direction, the fire fuel is highly aerated, with <50m between these patches with partially managed vegetation between	✓	Within the dominated fire direction, the fire fuel is highly aerated, continuous continuity vertically and horizontally with flammable species.	
Wildfire Behaviour	Extreme Wildfire behaviour at the site is not possible given the broader landscape.		Extreme Wildfire behaviour at the site is unlikely given the broader landscape.		Extreme Wildfire behaviour at the site is likely given the broader landscape.	✓	Extreme Wildfire behaviour at the site is very likely given the broader landscape.	
Overall Threat Rating:					Wildfire provides HIGH threat to this proposal	✓		

Where a **high** threat is determined strict compliance with PBP 2019 is warranted. In these cases, meeting the broad aims and objectives and the specific objectives of rural residential infill and increased residential developments of PBP 2019 through providing separation between the wildfire threat and building, strict application of bushfire construction measures with access and water supplies to facilitate emergency management is required.

4 BUSH FIRE HAZARD ASSESSMENT

This section details the site assessment methodology in Appendix 1 of PBP2019. It provides a detailed analysis of the vegetation, slope, exclusions, vegetation downgrades and shielding elements to provide the required Bush fire Protection Measures.

4.1 FOREST FIRE DANGER INDEX

This assessment utilises Muswellbrook Council area with a FFDI 100.

4.2 ASSESSMENT METHODOLOGY

The assessment of the vegetation, slope and other bush fire characteristics within and surrounding the site has been carried out with the aid of the following:

- Nearmap, sixmap aerial photograph interpretation.
- Kogan 6*25 laser distance finder.
- Photo theodolite application supported by contour and LiDAR DEMs terrain profiles.
- Sharing and Enabling NSW Environmental Data (SEED Portal)
- Reference to regional vegetation community mapping, and
- Site assessment in April 2024.

4.3 VEGETATION ASSESSMENT

In accordance with PBP 2019, an assessment of the vegetation over 140m in all directions from the building was undertaken. Consideration is provided to any clearing, re-vegetation or landscaping likely to occur to obtain the worst-case scenario and derived maximum fuel loads.

Vegetation that may be considered a bush fire hazard was identified and classification based on available fuel loads for sub-formations are provided through vegetation fuel monitoring project administered by the University of Wollongong, University of Melbourne and CSIRO Ecosystems Science and Bush fire Dynamics and Applications. The results of this research are commonly referred to as the '*NSW Comprehensive Fuel Loads*'.

An arborist and/or a biodiversity report has not been provided to inform the vegetation assessment.

There are no stream order watercourses within the 140m assessment area in accordance with the Water Management Act 2000 (WM Act).

No vegetation within the 140m Assessment has been identified within the Biodiversity Values (BV) Map provided in **Appendix 3, page 35**.

The area is not identified within the Areas of Regional Koala Significance (ARKS).

SEED Portal (State Vegetation Type Mapping) and where available regional vegetation community mapping has been analysed to determine the vegetation in and around the development, which is illustrated in **Figure 3, page 15**.

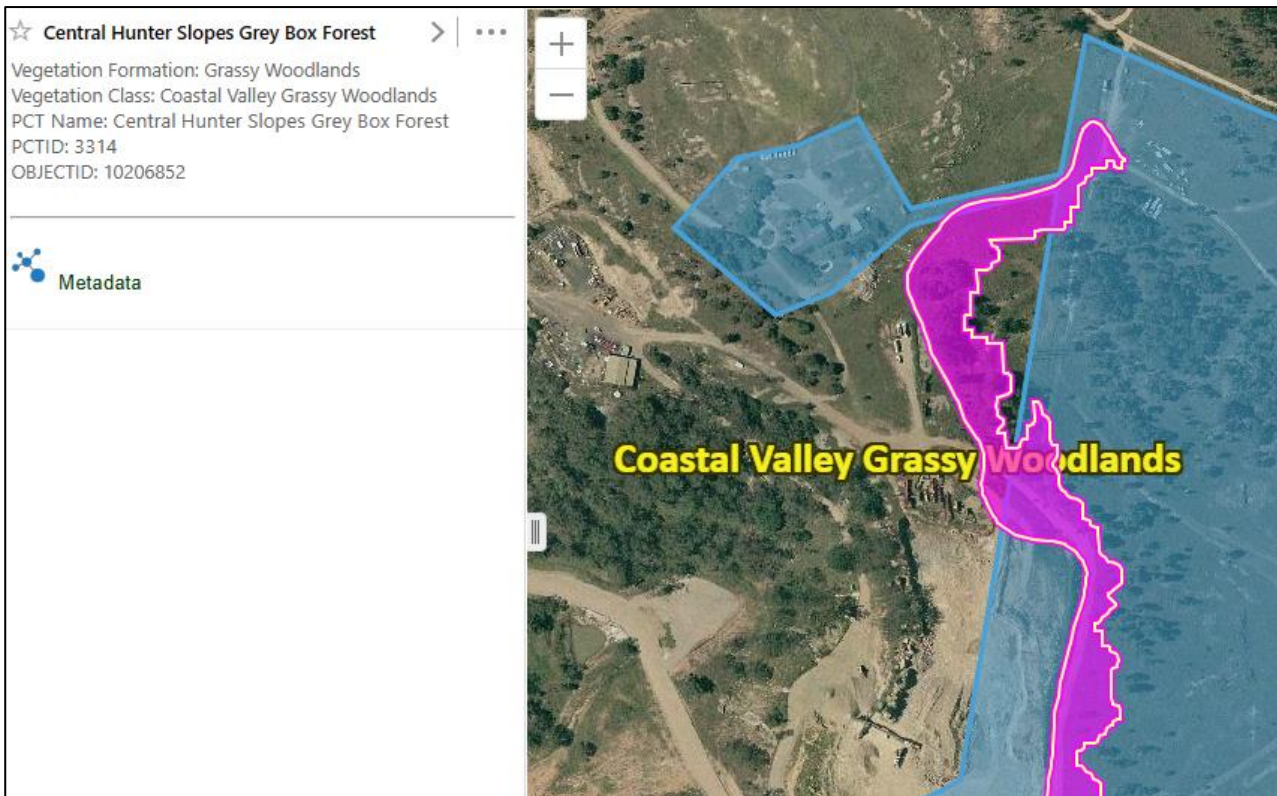


Figure 3 Vegetation in and around the site (Extract from the SEED Portal)

4.3.1 Vegetation exclusions, and downgrades

Section A1.11 of PBP 2019 provides for vegetation to be downgraded to remnant bushland, with fire behaviour compatible with *Rainforests*. A1.11.1 provides a simplified approach with this delegation being applied to vegetation <1ha and <50m fire run. A1.11.2 applies Short Fire Sun (further discussed in section 4.7 of this report).

The vegetation to the south-east of the site is heavily disturbance, high grazing, pressure and partially cleared. Beyond the 140m assessment area the timber becomes increasing scattered into unmanaged grassland. The vegetation to the south-east has been classified as woodlands for tis reason.

4.3.2 Predominant Vegetation Classification

Vegetation in and around the site is classified as PCTID: 3314 *Central Hunter Slopes Grey Box Forest*, which is *Coastal Valley Grassy Woodlands* in accordance with the '*NSW Comprehensive Fuel Loads*'. In this case, the simplified analysis has been performed, hence the vegetation has been classified as *Woodlands* in accordance with *PBP 2019*.

4.4 SEPARATION ASSESSMENT

The separation between the proposed building envelope and the classifiable vegetation that creates bush fire threat is one of the significant BPMs to reduce the risk of bush fire impacting on the development. The land within the separation must conform to the standards of an Asset Protection Zone (APZ) to be accepted within the separation areas.

The separations between the classifiable vegetation and the proposed dwellings are provided in **Table 3, page 17**, illustrated in **Figure 2, page 8**.

4.5 SLOPE ASSESSMENT

This section details the site assessment methodology in Appendix 1 of PBP2019 to assess the effective slope (under classified vegetation) and site slope (slope between the vegetation and proposed development) within 100m of the proposed building envelope.

The effective and site slopes used within this assessment are provided in **Table 3, page 17**, illustrated in **Figure 2, page 8**.

4.5.1 Effective and Site Slope Assessment

The slope of the land under the classified vegetation has a direct influence on the rate of fire spread, the intensity of the fire and the ultimate level of radiant heat flux.

The effective slope is the slope of the ground under the hazard (vegetation). The slope between the vegetation and the proposed building envelope is the site slope. When identifying the effective and site slopes, it may be found that there are a variety of slopes covering different distances. The effective slope is the slope under the vegetation which will most significantly influence the bush fire behaviour for each aspect.

The topography of the site and surrounds has been assessed to identify the maximum slope present under the classified vegetation (hazard). Slope data has been calculated from a 1m LiDAR Digital Elevation Model (DEM). The source data sets have been captured to standards that are generally consistent with the Australian ICSM LiDAR Acquisition Specifications with require a fundamental vertical accuracy of at least 0.30m (95% confidence) and horizontal accuracy of at least 0.80m (95% confidence). The slope arrows indicated in **Figure 4** represent the slope calculated across the length of the arrow utilising LiDAR data within ERSI software. These values help determine the vegetation that poses a bush fire threat and significantly influences fire behaviour.

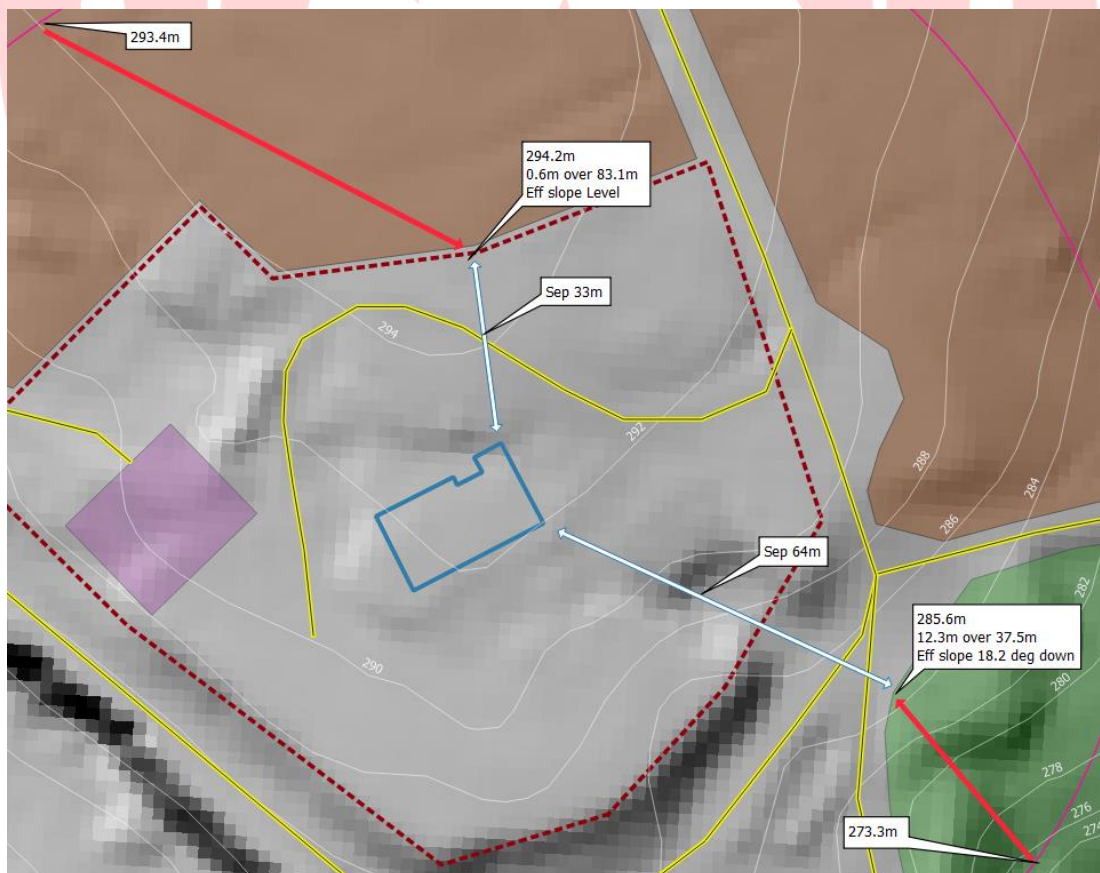


Figure 4 LiDAR 1m DEMS slope analysis

4.6 SHIELDING

Where an elevation is shielded from direct radiant heat arising from bush fire attack, then the construction requirements for that elevation can be reduced to the next lower BAL rating. An elevation is deemed to be not exposed to the source of bush fire attack if all the straight lines between that elevation and the source of bush fire attack are obstructed by another part of the building.

The shielding of an elevation shall apply to all the elements of the wall but shall not apply to subfloors or roofs. The construction requirements for a shielded elevation shall not be less than that required for BAL-12.5 unless the building has been assessed as being BAL-LOW. The reduced construction requirements do not apply where any elevation is BAL-FZ.

4.7 WILDFIRE GROWTH

An analysis of the size and shape of the classifiable vegetation in and around the site has determined no Short Fire Run (SFR) or Restricted Head Growth (RHG) considerations within this assessment.

Outcomes of the Bushfire Attack Level assessment implementing Method 1 PBP 2019 are outlined in **Table 3, page 17**.

Table 3 Outcomes for the property with respect to Bush fire Hazard Assessment (Method 1 PBP 2019)

Elements	Method (unit)	Fire Run 1	Fire Run 2
Vegetation	NSW Comprehensive Fuel Loads	Woodlands	Unmanage grasslands
Provided separation	Site -Laser finder (m)	64m	33m
Effective slope	Site visit – Theodolite (°)	15-20 deg down	Level
Fire Danger Index (FFDI)	Council Area	100	100
OUTPUTS - Table A1.12.2 of PBP 2019			
	BAL FZ	<24m	<8m
	Separation to Achieve BAL 40	24 - <32m	8 - <10m
	Separation to Achieve BAL 29	32 - < 44m	10 - < 15m
	Separation to Achieve BAL 19	44 - < 59m	15 - < 22m
	Separation to Achieve BAL 12.5	59 - < 100m	22 - < 100m
	Bush fire Attack Level (BAL)	BAL 12.5	BAL 12.5

5 BUSHFIRE ASSESSMENT AND PERFORMANCE MEASURES.

This section assesses Bushfire Performance Measures (BPMs) for the proposed development at 8440 New England Highway, Muswellbrook, NSW - Lot 302 / DP 1295800 in consideration of the acceptable solutions required for each performance criteria within PBP 2019. Outcomes are outlined in **Table 4**, below. Where acceptable solutions are not met details of the performance-based solution are provided.

5.1 BETTER BUSH FIRE OUTCOMES SECTION 7.8 OF PBP

New works are required to comply with the National Construction Code (NCC). Consideration should be given to whether strict compliance with the NCC is the best outcome for the property or whether a more balanced holistic outcome that addresses the entire development is more appropriate.

This report does not apply better Bush fire outcomes for the proposed development at 8440 New England Highway, Muswellbrook, NSW - Lot 302 / DP 1295800 in accordance with Section 7.8 of PBP.

Table 4 Planning for bush fire protection compliance (PBP 2019) Chapter 7 - Infill residential developments on bush fire prone lands.

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTION	COMPLIANCE for 8440 New England Highway, Muswellbrook, NSW - Lot 302 / DP 1295800
APZs	APZs are provided commensurate with the construction of the building and defensible space is provided.	<ul style="list-style-type: none"> An APZ is provided in accordance with Tables A1.12.2 or A1.12.4 in Appendix 1 of PBP 2019. 	COMPLIES - ACCEPTABLE SOLUTION A >32m APZ is provided in accordance with Table A1.12.2.
	APZs are managed and maintained to prevent the spread of a fire towards the building.	<ul style="list-style-type: none"> APZs are managed in accordance with the requirements of 'Asset protection zone standards' of Appendix 4 of PBP 2019. 	MADE CONDITION OF CONSENT At the commencement of building works and in perpetuity the property around the proposed development shall be maintained as an inner protection area (IPA) as outlined within Appendix 4 of Planning for Bush Fire Protection 2019 and the NSW RFS document Standards for asset protection zones to a distance of: <ul style="list-style-type: none"> • 33 metres on the northern elevation • 43 metres on the eastern elevation • 33 metres on the western elevation • 37 metres on the southern elevation

	The APZ is provided in perpetuity APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	<ul style="list-style-type: none"> • APZs are wholly within the boundaries of the development site. • APZ are located on lands with a slope less than 18 degrees. 	COMPLIES - ACCEPTABLE SOLUTION The APZ on this site is wholly within the site boundaries and is not located on land >18 degrees slope.
CONSTRUCTION STANDARDS	The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.	<ul style="list-style-type: none"> • BAL is determined in accordance with tables A1.12.5 to A1.12.7. • Construction provided in accordance with the Building Code of Australia and as modified by table 7.5. 	MADE CONDITION OF CONSENT Due to the building >200m from a public road, construction level has been upgraded by 1 BAL. Construction material schedules have not been provided to be assessed. New construction must comply with section 3 and section 6 (BAL 19) Australian Standard AS3959-2018 Construction of buildings in bush fire-prone areas or NASH Standard National Standard Steel Framed Construction in Bushfire Areas – 2021 as appropriate and section 7.5 of Planning for Bush Fire Protection 2019.
	Proposed fences and gates are designed to minimise the spread of bush fire.	<ul style="list-style-type: none"> • Fencing and gates are constructed in accordance with section 7.6. 	REFER TO LANDSCAPING COMPLIANCE REQUIREMENTS
	Proposed Class 10a buildings are designed to minimise the spread of bush fire.	<ul style="list-style-type: none"> • Class 10a buildings are constructed in accordance with section 8.3.2. 	N/A The proposal has not identified the construction of any class 10 buildings with 6m of the occupied dwelling.
ELECTRICITY	Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	<ul style="list-style-type: none"> • Where practicable, electrical transmission lines are underground; and • Where overhead, electrical transmission lines are proposed as follows: <ul style="list-style-type: none"> ○ Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and ○ No part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines. 	COMPLIES - ACCEPTABLE SOLUTION Were possible electricity should be placed underground. If overhead power supply is provided, lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

GAS	<p>Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.</p>	<ul style="list-style-type: none"> • Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used. • All fixed gas cylinders are kept clear of all flammable materials to 10m and shielded on the hazard side. • Connections to and from gas cylinders are metal. • Polymer-sheathed flexible gas supply lines are not used; and • Above-ground gas service pipes are metal, including and up to any outlets 	<p>MADE CONDITION OF CONSENT</p> <p>Any reticulated or bottled gas shall be installed and maintained in accordance with the below requirements as outlined in Table 7.4a of PBP:</p> <ul style="list-style-type: none"> • Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used. • All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side. • Connections to and from gas cylinders are metal. • Polymer-sheathed flexible gas supply lines are not used; and • Above-ground gas service pipes are metal, including and up to any outlets.
LANDSCAPING	<p>Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.</p>	<ul style="list-style-type: none"> • Compliance with the NSW RFS 'Asset Protection Zone standards' (see Appendix 4 of PBP 2019). • A clear area of low-cut lawn or pavement is maintained adjacent to the house. • Fencing is constructed in accordance with Section 7.6 • Trees and shrubs are planted such that: <ul style="list-style-type: none"> • the branches will not overhang the roof. • the tree canopy is not continuous. • any proposed windbreak is located on the elevation from which fires are likely to approach. 	<p>MADE CONDITION OF CONSENT</p> <p>A Landscaping plan is required to illustrate:</p> <ul style="list-style-type: none"> • Landscape species are reflected in the landscaping plan to ensure tree canopy cover is less than 15% (IPA), and less than 30% (OPA) at maturity and trees do no touch or overhang buildings. • Fencing and gates within BAL 29 areas or higher, and within 6m of the occupied dwelling shall be non-combustible. • A minimum 1-metre-wide area (or to the property boundary where the setbacks are less than 1 metre), suitable for pedestrian traffic, must be provided around the immediate curtilage of the building. • 1.5m separation is provided between the building-to-shrub/garden vegetative fuels with a smooth ground surface within this separation immediately adjacent to buildings. • No flammable rough ground surfaces (bark/mulch gardens beds) within 6m of the building, stairs or decks.

			<ul style="list-style-type: none"> • Planting does not provide a continuous canopy to the building (i.e., trees or shrubs are isolated or located in small clusters). • Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies. • Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown. • Avoid planting of deciduous species that may increase fuel at surface/ ground level (i.e., leaf litter); • Avoid climbing species to walls and pergolas. • Locate combustible materials such as woodchips/mulch, flammable fuel stores away from the building. • Locate combustible structures such as garden sheds, pergolas, and materials such as timber garden furniture away from the building, and • Low flammability vegetation species are used.
ACCESS REQUIREMENTS	Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	<ul style="list-style-type: none"> • Property access roads are two-wheel drive, all weather roads. 	MADE CONDITION OF CONSENT Private property access shall be two-wheel drive, all weather roads.
	The capacity of access roads is adequate for firefighting vehicles.	<ul style="list-style-type: none"> • The capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating. 	MADE CONDITION OF CONSENT The capacity of private property access of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.
	There is appropriate access to water supply.	<ul style="list-style-type: none"> • There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available. 	MADE CONDITION OF CONSENT Category 1 fire appliance to within 4m of the static water supply.

ACCESS REQUIREMENTS	<p>Firefighting vehicles can access the dwelling and exit safely.</p> <ul style="list-style-type: none"> • At least one alternative property access road is provided for individual dwellings or groups of dwellings that are located more than 200m from a public through road. • There are no specific access requirements that apply in areas where firefighting can occur directly from the hydrant in accordance with AS 2419. In circumstances where this cannot occur, the following requirements apply: <ul style="list-style-type: none"> • Minimum carriageway width of 4m; • In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay • A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, and • Property access must provide a suitable turning area in accordance with Appendix 3, and • Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress • The minimum distance between inner and outer curves is 6m, and • The crossfall is not more than 10°, and • Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads, and • A development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. 	<p>PERFORMANCE SOLUTION</p> <p>The dwelling is located >200m from a public through road and is therefore considered isolated. Isolated developments are vulnerable as access can be restricted during a fire event, and occupants may not be able to evacuate and forced to seek shelter. The most common shelter will be the residential home, which in this case will be upgraded by one BAL level to BAL 19 as a performance solution to mitigate bush fire risk to acceptable levels.</p> <p>MADE CONDITION OF CONSENT</p> <ul style="list-style-type: none"> • Minimum carriageway width of 4m; • In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay. • A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches. • Property access must provide a suitable turning area in accordance with Appendix 3 of PBP. • Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. • The minimum distance between inner and outer curves is 6m. • The crossfall is not more than 10°. • Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads. <p><i>Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. the gradients applicable to public roads also apply to community style development property access roads in addition to the above.</i></p>
---------------------	--	--

WATER SUPPLIES	Water supply is provided for firefighting purposes	<ul style="list-style-type: none"> • Reticulated water is to be provided to the development, where available a static water supply is provided where no reticulated water is available. 	COMPLIES - ACCEPTABLE SOLUTION Static water supplied for firefighting purposes.
	A water supplies are located at regular intervals the water supply is accessible and reliable for firefighting operations	<ul style="list-style-type: none"> • Fire hydrant spacing, design and sizing comply with the Australian Standard AS 2419.1:2021, • Hydrants are not located within any road carriageway, and • Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter road 	N/A Static water supply provided.
	Flows and pressure are appropriate	<ul style="list-style-type: none"> • Fire hydrant flows and pressures comply with Table 2.2 of AS 2419.1:2021 	N/A This report has not tested or determined if the fire hydrant flow and pressures to comply with Table 2.2 of AS 2419.1:2017
	The integrity of the water supply is maintained	<ul style="list-style-type: none"> • All above-ground water service pipes external to the building are metal, including and up to any taps. 	MADE CONDITION OF CONSENT All above-ground water service pipes external to the building are metal, including and up to any taps.
	A static water supply is provided for firefighting purposes in areas where reticulated water is not available	<ul style="list-style-type: none"> • Where no reticulated water supply is available water for firefighting purposes is provided in accordance with table 5.3d, and • A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65mm Storz outlet with a ball valve is fitted to the outlet, and • Ball valve and pipes are adequate for water flow and are metal, and • Supply pipes from tank to ball valve have the same bore size to ensure flow volume, and • Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank, and • A hardened ground surface for truck access is supplied within 4m, and • Above-ground tanks are manufactured from concrete or metal, and 	COMPLIES - ACCEPTABLE SOLUTION A 20,000L static water supply shall be provided for firefighting purposes with the following provisions. <ul style="list-style-type: none"> • A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; a 65mm Storz outlet with a ball valve is fitted to the outlet. • Ball valve and pipes are adequate for water flow and are metal. Supply pipes from tank to ball valve have the same bore size to ensure flow volume. <ul style="list-style-type: none"> • Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank. • A hardened ground surface for truck access is supplied within 4m of the access hole. • Above-ground tanks are manufactured from concrete or metal.

	<ul style="list-style-type: none"> • Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959), and • Unobstructed access can be provided at all times, and • Underground tanks are clearly marked, and • Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters, and • All exposed water pipes external to the building are metal, including any fittings, and • Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm (internal diameter), and • Fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels, and installed in accordance with AS 2441:2005 Installation of fire hose reels 	<ul style="list-style-type: none"> • Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959). • Unobstructed access is always provided. • Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; and • Underground tanks are clearly marked. • All exposed water pipes external to the building are metal, including any fittings. • Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump and are shielded against bush fire attack, any hose and reel for firefighting connected to the pump shall be 19mm internal diameter. • Where fire hose reels are provided, they are constructed in accordance with AS/NZS 1221:1997 Fire hose reels and installed in accordance with the relevant clauses of AS 2441:2017 Installation of fire hose reels.
--	---	---

6 CONCLUSION AND RECOMMENDATIONS

It is clear from this investigation and assessment that the site is located within Bush fire Prone Land. An assessment in accordance with Appendix 1 of PBP2019 has been undertaken. This BFAR found the classifiable vegetation of *Grassy woodlands* as described by PBP 2019 level to the south-east of the site creates a bush fire threat.

In accordance with the provisions of PBP 2019, the recommendations outlined within this assessment will reduce the risk of damage and/or harm in the event of a bush fire event to acceptable levels. Compliance with the below recommendations can be achieved or practically implemented without substantial change to the proposed layout or construction methodology. It is recommended that development consent be granted subject to the following conditions:

Asset Protection Zones

The vegetation within the site currently complies with APZ standards and no vegetation management is required to comply.

At the commencement of building works and in perpetuity the property around the proposed development shall be maintained as an inner protection area (IPA) as outlined within Appendix 4 of Planning for Bush Fire Protection 2019 and the NSW RFS document Standards for Asset Protection Zones to a distance of:

- 33 metres on the northern elevation,
- 43 metres on the eastern elevation,
- 33 metres on the western elevation, and
- 37 metres on the southern elevation.

Landscaping

A Landscaping plan is required to illustrate:

- Landscape species are reflected in the landscaping plan to ensure tree canopy cover is less than 15% (IPA), and less than 30% (OPA) at maturity and trees do not touch or overhang buildings.
- Fencing and gates within BAL 29 areas or higher, and within 6m of the occupied dwelling shall be non-combustible.
- A minimum 1-metre-wide area (or to the property boundary where the setbacks are less than 1 metre), suitable for pedestrian traffic, must be provided around the immediate curtilage of the building.
- Planting is limited in the immediate vicinity of the building.
- Planting does not provide a continuous canopy to the building (i.e., trees or shrubs are isolated or located in small clusters).
- Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies.
- Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown.
- Avoid planting of deciduous species that may increase fuel at surface/ ground level (i.e., leaf litter).
- Avoid climbing species to walls and pergolas.
- Locate combustible materials such as woodchips/mulch, flammable fuel stores away from the building.

- Locate combustible structures such as garden sheds, pergolas, and materials such as timber garden furniture away from the building, and
- Low flammability vegetation species are used.

Construction Standards

New construction must comply with section 3 and section 6 (BAL 19) Australian Standard AS3959-2018 Construction of buildings in bush fire-prone areas or NASH Standard National Standard Steel Framed Construction in Bushfire Areas – 2021 as appropriate and section 7.5 of Planning for Bush Fire Protection 2019.

Construction and site layout plans

It is recommended that a page within the construction and site layout plans is dedicated to Bushfire Construction standards together with the landscaping plan to ensure bushfire requirements are clearly understood and applied throughout the project and beyond.

Access

Access to the property and development site is noted on **Figure 2, page 8** of this report and in the site plan provided in **Appendix 1, page 35**.

Internal roads shall comply with following requirements of Table 7.4a of Planning for Bush Fire Protection 2019:

- Private property access shall be two-wheel drive, all weather roads,
- The capacity of private property access of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating,
- Category 1 fire appliance to within 4m of the static water supply,
- Minimum carriageway width of 4m,
- In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay,
- A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, and
- Property access must provide a suitable turning area in accordance with Appendix 3,
- Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress,
- The minimum distance between inner and outer curves is 6m,
- The crossfall is not more than 10°,
- Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads.

Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. the gradients applicable to public roads also apply to community style development property access roads in addition to the above.

Water Supply

20,000L static water supply is provided for firefighting purposes in areas where reticulated water is not available need to meet the following specifications:

- All above-ground water service pipes external to the building are metal, including and up to any taps,
- A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65mm Storz outlet with a ball valve is fitted to the outlet,
- Ball valve and pipes are adequate for water flow and are metal,

- Supply pipes from tank to ball valve have the same bore size to ensure flow volume,
- Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank,
- A hardened ground surface for truck access is supplied within 4m,
- Above-ground tanks are manufactured from concrete or metal,
- Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959),
- Unobstructed access can always be provided,
- Static Water Supplies (SWS) are clearly marked with SWS signage place at the front gate and in location that guide responding fire agencies to the location of the water supply on site (Refer to Appendix),
- Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters,
- All exposed water pipes external to the building are metal, including any fittings,

Water pumps and fire hose reels are not required for compliance with PBP 2019, although if provided shall:

- Where pumps are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm (internal diameter), and

Fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels and installed in accordance with AS 2441:2005 Installation of fire hose reels.

Electricity services

Where possible electricity should be placed underground. If overhead power supply is provided, lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

Gas services

Any reticulated or bottled gas shall be installed and maintained in accordance with the below requirements as outlined in Table 7.4a of PBP:

- Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used.
- All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side.
- Connections to and from gas cylinders are metal.
- Polymer-sheathed flexible gas supply lines are not used; and
- Above-ground gas service pipes are metal, including and up to any outlets.

Emergency Management

There are no performance criteria requirements for this type of development within PBP 2019.

7 REFERENCES

- Australian Building Codes Board (2010), *Building Code of Australia, Class 1 and Class 10 Buildings*, Housing Provisions Volume 2.
- Biodiversity Conservation Act (2016), accessed online: <https://legislation.nsw.gov.au/view/html/inforce/current/act-2016-063>
- Clarke, H., Lucas, C., Smith, P., 2012. *Changes in Australian fire weather between 1973 and 2010*, International Journal of Climatology. DOI: 10.1002/joc.3480
- Councils of Standards Australia (2018), *AS 3959:2018: Construction of Buildings in Bushfire-prone Areas*. SAI Global
- Councils of Standards Australia (2002), *AS 1596:2002: Storage and handling of LPG Gas*. SAI Global
- Councils of Standards Australia (2017), *AS 2419:2017: Fire hydrant installations System design, installation and commissioning*. SAI Global
- Elevation Foundation Spatial Data (ELVIS), ANZLIC licence committee on survey and mapping. Accessed online: <https://elevation.fsd.org.au/>
- Environmental Assessment Legislation Amendment Act (2002). Accessed online: <https://www.legislation.nsw.gov.au/#/view/act/1979/203>
- Environmental Planning & Assessment Amendment (Planning for Bush Fire Protection) Regulation 2007, accessed online: <https://www.legislation.nsw.gov.au/regulations/2014-285.pdf>
- Grumstrup, T.P., McAllister, S.S., Finney, M.A. 2017. Qualitative Flow Visualization of Flame Attachment on Slopes. 10th U. S. National Combustion Meeting Organized by the Eastern States Section of the Combustion Institute April 23-26, College Park, Maryland.
- Hedayati F., Stansell C., Gorham D.J., Quarles S.L., 2018. Near-Building Non-combustible Zone. (Insurance Institute for Business & Home Safety). Available at https://ibhs.org/wp-content/uploads/member_docs/Near-Building_Noncombustible_Zone_Report_IBHS.pdf
- Keith, D.A. 2004. Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT. Department of Environment and Conservation NSW, Hurstville, NSW, Australia.
- Lucas, C. 2010. *On developing a historical fire weather data-set for Australia*. Australian Meteorological and Oceanographic Journal. 60.1-14
- Minimum Vegetation Clearances for Power Lines, ISSC3 - NSW Resources and Energy - NSW Government Accessed online: <https://www.resourcesandenergy.nsw.gov.au/energy-supply-industry/pipelines-electricity-gas-networks/electricity-networks/safety/ISSC3-guideline-for-managing-vegetation-near-power-lines.pdf>
- NSW Rural Fire Service (2018). *Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners*, NSW Rural Fire Service.
- NSW Rural Fire Service (2005). *Standards for Asset Protection Zones*. NSW Rural Fire Service, Sydney.
- NSW Rural Fire Service (2019). *Comprehensive vegetation Fuel Loads, Fact sheet V8*, NSW Rural Fire Service. Sydney
- NSW Rural Fire Service (2022). *NSW RFS Fire Trail Standards. Version 2*, NSW Rural Fire Service, Sydney
- NSW Rural Fire Service, *Best Practise Guidelines – Dwelling upgrades*, Accessed online: https://www.rfs.nsw.gov.au/data/assets/pdf_file/0018/4365/Building-Best-Practice-Guide.pdf

Quarles, S.L., Christine Standohar-Alfano. C., Hedayati, F., Gorham, D. J., 2023. Factors influencing ember accumulation near a building. *International Journal of Wildland Fire* 32(3) 380-387 <https://doi.org/10.1071/WF22132>

Rural Fires Act (1997), Accessed online: <https://www.legislation.nsw.gov.au/#/view/act/1997/65>

Rural Fires Amendment Regulation (2007), accessed online:
http://www.austlii.edu.au/au/legis/nsw/num_reg/rfafsar20072007109593.pdf

Rural Fires Regulation (2013), accessed online: <https://www.legislation.nsw.gov.au/#/view/regulation/2013/488>

The Central Resource for Sharing and Enabling Environmental Data in NSW (SEED Portal) NSW Government State Vegetation Type Map (SVTM)- Current Release C1.1.M1.1 (December 2022) accessed online :
<https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map>

Water Management Act (2000), accessed online: <https://legislation.nsw.gov.au/view/html/inforce/current/act-2000-092>

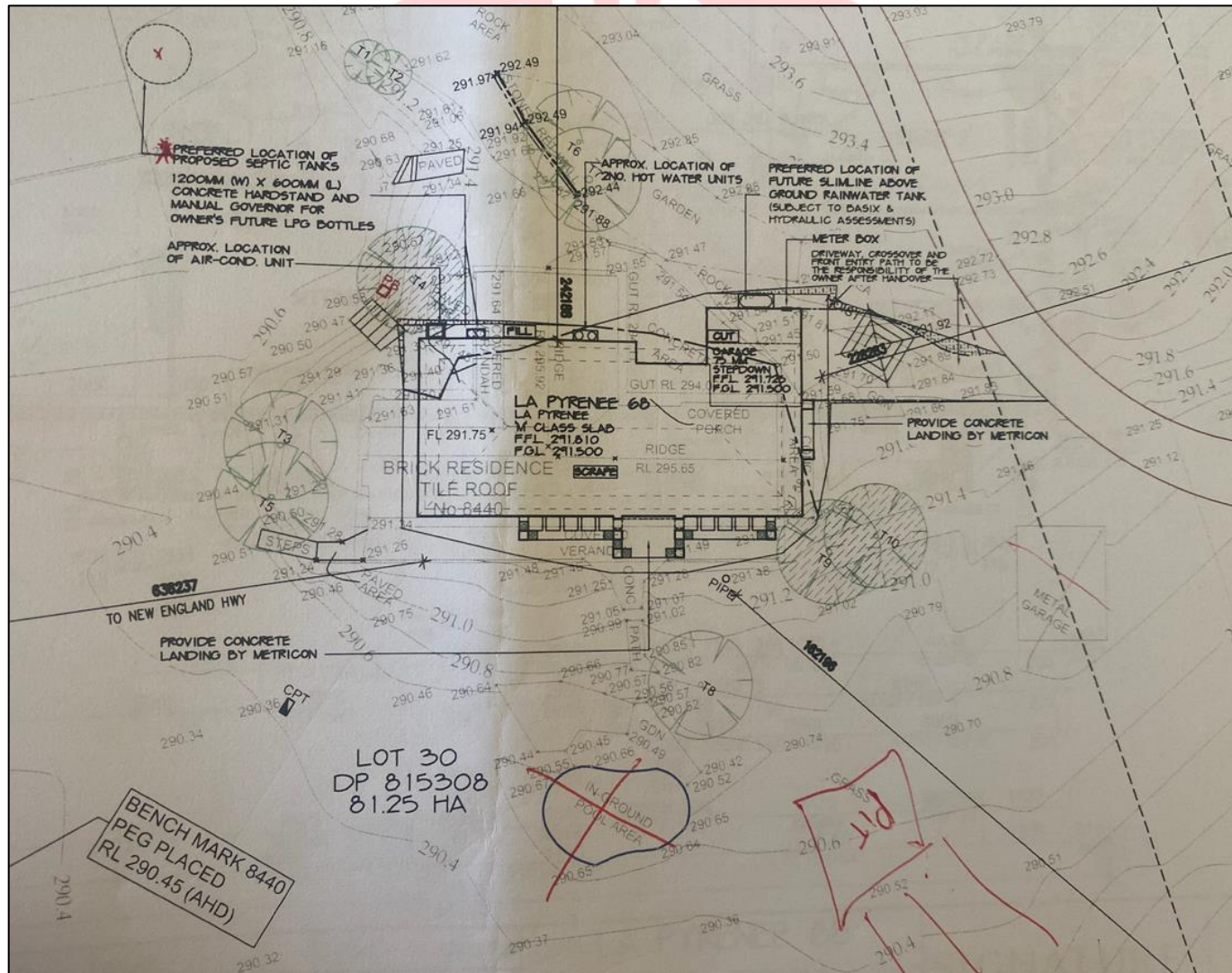
Water Management (General) Regulation (2018), accessed online:
<https://legislation.nsw.gov.au/view/html/inforce/current/act-2000-092>

Western Australian Government, (2017) The WAPC's Guidelines for Planning in Bushfire Prone Areas (Guidelines),
[https://www.planning.wa.gov.au/dop/pub/pdf/Bushfire Guidelines Version 1.2 Aug2017.pdf](https://www.planning.wa.gov.au/dop/pub/pdf/Bushfire%20Guidelines%20Version%201.2%20Aug2017.pdf)

CASE LAW

Easter Developments Pty Ltd against Shoalhaven City Council [2023] NSWLEC 1671

8 APPENDIX 1 SITE LAYOUT



9 APPENDIX 2 PLATES (PHOTOGRAPHS)

Plates 1 –5 depict the elements in and around the site that are considered within the bush fire hazard assessment. The classified vegetation, separations, effective and site slope are identified in **Table 3, page 18** and displayed in **Figure 2, page 8**.



Plate 1 (P1) Access along private property



Plate 2 (P2) Access along private property



Plate 3 (P3) *Example of APZ*



Plate 4 (P4) *Vegetation that creates the greatest bushfire threat*



Plate 5 (P5) Existing shed and proposed building knock-down/replacement

10 APPENDIX 3 BIODIVERSITY MAP

Biodiversity Values Map and Threshold Tool

The Biodiversity Values (BV) Map and Threshold Tool identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing.

The map forms part of the Biodiversity Offsets Scheme threshold, which is one of the factors for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal. You can use the Threshold Tool in the map viewer to generate a BV Threshold Report for your nominated area. The report will calculate results for your proposed development footprint and determine whether or not you will need to engage an accredited assessor to prepare a Biodiversity Development Assessment Report (BDAR) for your development.


This report can be used as evidence for development applications submitted to councils, native vegetation clearing not requiring development consent in urban areas and areas zoned for environmental conservation under State Environmental Planning Policy (Biodiversity and Conservation) 2021 - Chapter 2 vegetation in non-rural areas.

What's new?

For more information about the latest updates to the Biodiversity Values Map and Threshold Tool go to the updates section on the [Biodiversity Values Map webpage](#).

Map Review: Landholders can request a review of the BV Map where they consider there is an error in the mapping on their property. For more information about the map review process and an application form for a review go to the [Biodiversity Values Map Review webpage](#).

If you need help using this map tool see our [Biodiversity Values Map and Threshold Tool User Guide](#) or contact the [Map Review Team](mailto:map.review@environment.nsw.gov.au) at map.review@environment.nsw.gov.au or on 1800 001 490.



No vegetation of biodiversity value identified within 140m

11 APPENDIX 4 BUSH FIRE PROTECTION MEASURES

The following information on building survivability and the application of Bushfire Protection Measures should be considered continually for the life of the development. These measures facilitate meeting the aims and objectives of PBP 2019 and mitigating bushfire risk and are provided to inform the client.

Why do buildings burn during bush fires?

Research has been undertaken over the last decades to analyse and determine the elements that determine the survivability of a building during a bush fire event. As the research is validated, these elements are incorporated into planning documentation that guides construction in bush fire prone areas, such as Australian Standard 3959 and NSW RFS Planning for Bushfire Protection.

Research has illustrated that there are three ways a bush fire impacts a building:

1. Direct flame contact,
2. Radiant heat from the bush fire, and
3. Embers generated by the bush fire.

Most people expect direct flame contact to be the biggest risk to homes in a bush fire, but this is not the case. Over 80% of house loss during bush fires occurs because of ember attack; the burning firebrands of bark, leaves and twigs with winds drive away from the main fire front. They find weaknesses in houses such as gaps, cracks to combustible construction materials and can quickly lead to ignition of the building.

Significantly, vegetation that is established adjacent to the building and within the Asset Protection Zone following the construction of the building, which provides fuel for burning embers to ignite and increase the ignitability of the building. It is critical that the Asset Protection Zone are maintained throughout the life of the property, so that wildfire is not encouraged closer to the building.

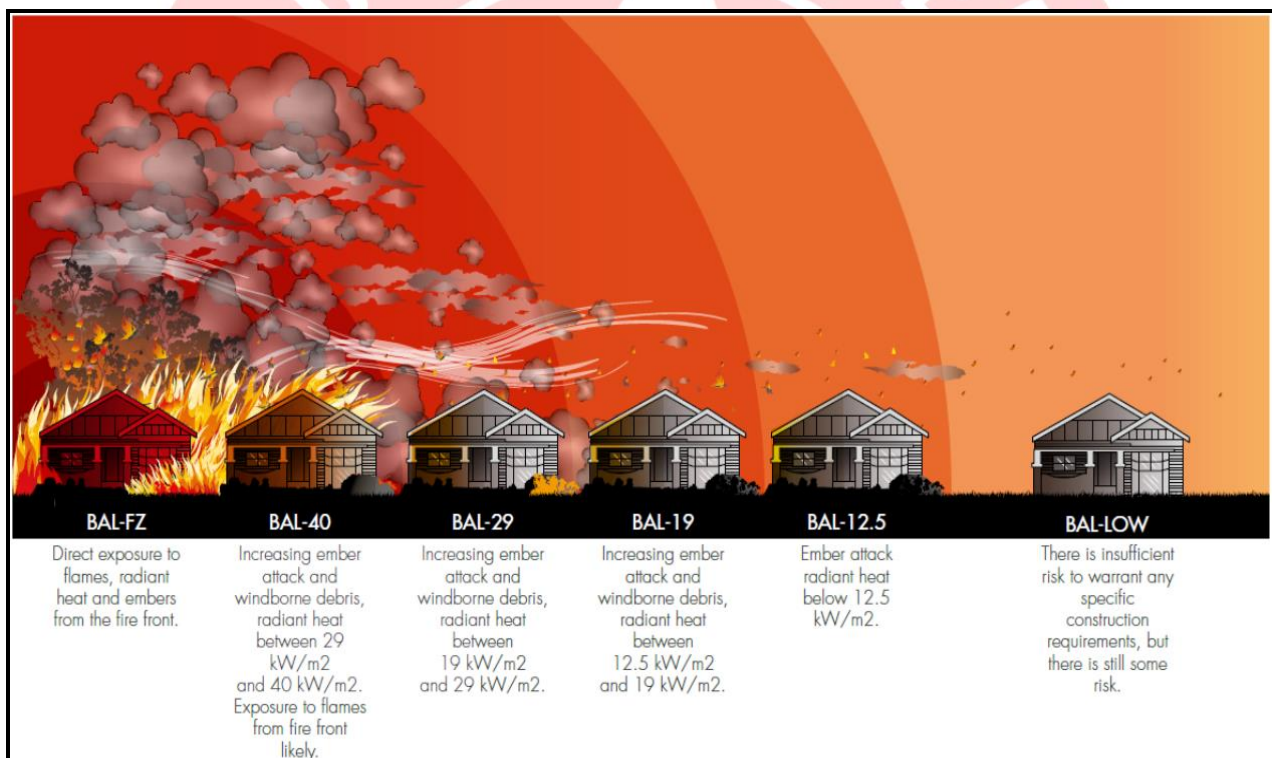
The research has illustrated the separation between the bushfire threat and building; and the construction standards of the building are the principal elements to building survivability. It is critical that:

1. Any future alterations and additions to the building are undertaken with materials that comply with the relevant BAL of the building.
2. The separations between the building and bush fire threat (known as the Asset Protection Zones (APZ)) are maintained to low flammability. This means restricted gardens and combustible elements, such as timber landscaping and furnishings. It is critical to maintain 'fire hygiene' around the building.

Australia Standard 3959 Construction of buildings in Bush fire prone areas and Bush fire Attack Level (BAL)

Bush fire Attack Level (BAL) ratings refer to the fire intensity your house is likely to be subjected to in a bush fire, expressed in terms of radiant heat. The BAL assessment forms the construction component of the bush fire assessment process. The other component is the Bush fire planning, which includes Asset Protection Zones (APZ), separation to provide defensible spaces, access, water, electricity, gas, landscaping and emergency management.

Furthermore, the measures contained in the *Australian Standard 3959 Construction of buildings in Bushfire Prone Areas* for each BAL construction level are not for fire resistance. The building will burn. The construction standards are aimed at slowing the ignition and fire spread of the building to provide adequate time to enable occupants to shelter within the building as the bushfire front passes. The degree of vegetation management within the APZ, the unpredictable nature of behaviour of fire, and extreme weather conditions make building adjacent to vegetation very dangerous.



Relationship between fire behaviour and BAL (WA Guidelines for Planning in Bush fire Prone Areas, 2017)

Design and Siting

The design and siting of a building can be of critical importance during bush fire attack event. The appropriate design and siting can reduce the impact of bush fire attack mechanisms of direct flame, radiant heat, ember attack, smoke, and wind.

BCA P2.3.1 indicates that the class 1 buildings should be protected from other building fires and provides a minimum 900mm separation between the boundary and dwelling. Consideration should be given to increasing the side-set back to 6m to neighbouring buildings to limit the potential of building-to-building fires. If this separation is not possible, upgrading the elevation facing the adjacent building to BAL40 standards, reducing glazing-to-glazing construction between buildings and other fire protection measures such as sprinklers should be considered when the residential developments are designed.

Key principles to consider when designing and siting a new development include the following:

- Avoid building on ridges, saddles and build on level ground wherever possible.
- Utilise cut-in benches, rather than elevating the building when building on sloping land.
- Avoid raised floors and protect the sub-floor areas by enclosing or screening.
- Provide an appropriate shelter room that is located on the lowest or non-bush fire hazard side of the building, near building exits and provides the occupant views of the outside environment.
- Reduce bulk of building, limit re-entrant corners, and incorporate simplified roof that are able to self-clean of debris.
- No gutters on second or consecutive storeys of building and avoid box gutters.
- If gutters are installed, incorporate gutter guards with a flammability index more than 5 when tested to AS1530.2, or aluminium, bronze, or stainless steel with maximum aperture of 5mm.
- Limit glazing elements on the sides of the building exposed to the bush fire threat and use shutters to protect glazing elements.
- Carparking provided in a location that does not interfere with escape routes.
- Position development so any gas supplies and overhead electricity are positioned not to impede egress to and from the site.
- Class 10a buildings (such as shed, carport, and garages) should be a minimum of 6m away from any other building. Consider the storage of hazardous materials (petrol, kerosene, alcohol, LPG, natural gas, acetylene, vehicle, machinery etc.) within Class 10a buildings when siting in proximity to Class 1a occupied building and escape routes.
- Provide unobstructed access around the entire building supported by a minimum 1.5m wide concreted path to the external wall.

Asset Protection Zones

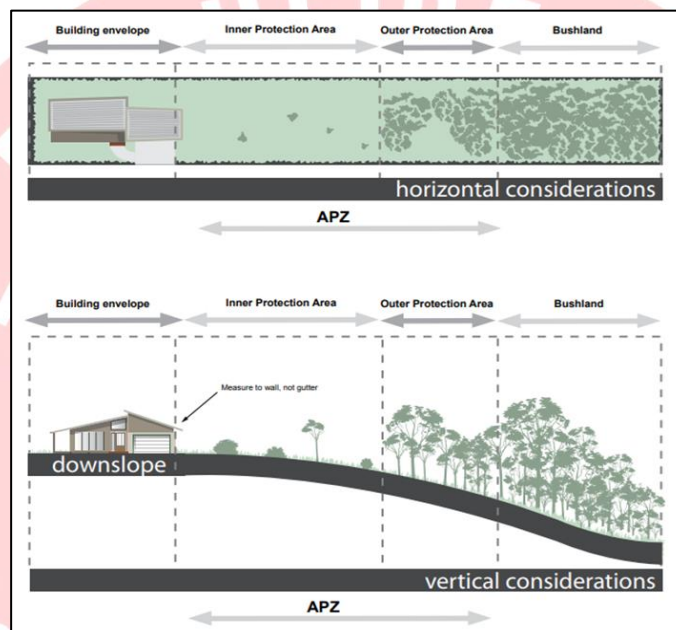
An APZ is an area surrounding a development that is managed to reduce the bushfire hazard to an acceptable level to mitigate the risk to life and property. The required width of the APZ varies with slope and the type of hazard. An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance to the below standards should be undertaken on an annual basis, in advance of the fire season, as a minimum.

For a complete guide to APZs and landscaping, download the NSW RFS document Standards for Asset Protection Zones at www.rfs.nsw.gov.au/resources/publications.

An APZ can consist of both an Inner Protection Area (IPA) and an Outer Protection Area (OPA) as indicated below. An APZ can include the following:

Footpaths	Driveways
Lawns	Unattached non-combustible garages as long as suitably separated
Discontinuous gardens	Open space / parkland
Swimming pools	Car parking

Isolated areas of shrub and timbered vegetation are generally not a bush fire hazard as they are not large enough to produce fire of an intensity that will threaten dwellings. These areas include narrow strips of vegetation along road corridors.



Components of an APZ (Figure A4.1 - PBP 2019)

Any areas that are designated Asset Protection Zones, should be delineated by rural fencing, signposted or bollards (whatever is practical in the circumstances) to ensure vegetation creep does not occur and further landowners and ground management are aware that the area is to be maintained for Bush fire protection purposes. Examples are provided below:



Inner Protection Area (IPA)

The IPA extends from the edge of the OPA to the development. The IPA is the area closest to the asset and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and be a defensible space. The intent of an IPA is to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fire fuel. This area also allows airborne embers to fall safely without igniting further outbreaks and provides a safer firefighting position and is operationally important for implementation of clear fire control lines.

In practical terms the IPA is typically the curtilage around the dwelling, consisting of a mown lawn and well-maintained gardens. When establishing and maintaining an IPA the following requirements apply:

- Vegetation within the IPA should be kept to a minimum level. Litter fuels (leaves and vegetation debris) within the IPA should be continually removed and kept below 1cm in height and be discontinuous. There is minimal fine fuel at ground level which could be set alight by a bushfire.
- Canopy cover should be less than 15% (at maturity). Trees (at maturity) should not touch or overhang the building and should be separated by 2 to 5m.
- Lower limbs of canopy trees should be removed up to a height of 2m above ground.
- Preference should be given to smooth barked and evergreen trees.
- Large discontinuities or gaps in the shrub vegetation shall be established to slow down or break the progress of fire towards buildings.
- Shrubs should not be located under trees and not form more than 10% ground cover
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- Grasses should be kept mown (as a guide grass should be kept to no more than 100mm in height), and
- Woodpiles, wooden sheds, combustible material storage areas, large areas / quantities of garden mulch, stacked flammable building materials etc. are not permitted in the IPA.

Outer Protection Area (OPA)

An OPA is located between the IPA and the unmanaged vegetation. Vegetation within the OPA can be managed to a more moderate level. The reduction of fuel in this area substantially decreases the intensity of an approaching fire and restricts the pathways to crown fuels, reducing the level of direct flame, radiant heat and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation.

In practical terms the OPA is an area where there is maintenance of the understorey and some separation in the canopy. When establishing and maintaining an OPA the following requirements apply:

- Tree canopy cover should be less than 30%, canopies should be separated by 2 to 5m
- Shrubs should not form a continuous canopy and form no more than 20% of ground cover
- Grasses should be kept to no more than 100mm in height with leaf and other debris should be mown, slashed or mulched.

Furthermore, the edge of the APZ should be clearly delineated to ensure vegetation creep does not occur over time, reducing the separation between the bushfire hazard and building.

Gardens and vegetation within the APZ

All vegetation will burn under the right conditions.

In choosing plants for landscaping consideration should be given to plants that possess properties, which help to protect buildings. If the plants themselves can be prevented from ignition, they can improve the defence of buildings by:

- Filtering out wind-driven burning debris and embers.
- Acting as a barrier against radiation and flame, and
- Reducing wind forces.

Consequently, landscaping with vegetation of the site should consider the following:

- Meet the specifications of an Inner Protection Area (IPA) detailed in PBP 2019.
- Priority given to retaining or planting species which have a low flammability and high moisture content.
- Priority given to retaining or planting species which do not drop much litter in the bushfire season, and which do not drop litter that persists as ground fuel in the bush fire season, and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.
- Avoid gardens within 10m of the exterior building envelop.
- Trees and shrubs within 40m are not continuous, but instead arranged as discrete patches separated by a ground layer with low fuel hazard, such as mown grass.
- Position courtyards, gardens, and grassed areas in locations that facilitate the protection of the building.
- Install pebble/rock garden beds avoiding the use of mulch and wood chip.

Consideration should be given to vegetation fuel loads present on site. Careful thought must be given to the type and physical location of any proposed site landscaping.

Inappropriately selected and positioned vegetation has the potential to ‘replace’ any previously removed fuel load.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered. The below list of well know ground fire-retardant plants is intended as a guide only, check with your local council for information more specific to your area.

<i>Lomandra longifolia</i>	<i>Dampiera</i>
<i>Lomandra hystrix</i>	<i>Scaevola aemula</i>
<i>Anigozanthos</i> hybrids	<i>Succulents (most)</i>
<i>Agapanthus orientalis</i>	<i>Carpobrotus (Pigface)</i>
<i>Liriope muscari</i>	<i>Cotyledon</i>
<i>Carpobrotus glaucescens</i>	<i>Ajuga australis</i>

<i>Casuarina glauca</i>	<i>Myoporum</i>
<i>Ajuga</i>	<i>Nepeta</i> (catmint)
<i>Brachyscome</i>	<i>Mesembryanthemum</i>

Strategically positioned elevated vegetation (fire-retardant tree and shrub species) can act as 'windbreaks' and 'ember filter', reducing wind velocities and suppressing the density of embers attacking a building. It is critical that this vegetation is:

- On flat ground place >30m from the building (ideally 40m forming the outer perimeter of the IPA).
- >20m separation from the hazardous vegetation.
- Located on the side of the bush fire hazard.
- No gardens of shrubs under the trees.
- Shrub patches no greater than 10m².

The below list of well know fire-retardant trees and shrubs is intended as a guide only, check with your local council for information more specific to your area:

<i>Melia azederach</i> (Cape Lilac)	<i>Citrus trees</i>
<i>Brachychiton acerifolius</i> (Flame tree)	<i>Loquat</i>
<i>Magnolia grandiflora</i>	<i>Arbutus Quercus</i> (only the deciduous oak)
<i>Pyrus</i> (most ornamental pears)	<i>Feijoa</i>
<i>Magnolia Little Gem</i>	<i>Gleditzia</i>
<i>Ulmus chinensis</i> (Chinese Elm)	<i>Ficus</i> (all including edible)
<i>Acacia howitii</i>	<i>Aloe</i> (all)
<i>Cercis</i> (Judus Tree)	<i>Correa</i>
<i>Acmena smithii</i> (Lilypilly)	<i>Acacia iteaphyla</i>
<i>Prunus</i> (all including ornamental)	<i>Scaevola crassifolia</i>
<i>Cupaniopsis anacardiopsis</i> (Tuckeroo)	<i>Viburnum tinus</i>
<i>Malus</i> (apple trees)	<i>Atriplex</i> (saltbush)
<i>Eleocarpus</i>	<i>Escallonia</i>
<i>Mullberry</i>	<i>Maireana</i> (Cottonbush)
<i>Eremophila</i> (Emu bush)	<i>Leucophyta brownii</i>
<i>Melaleuca nodosa</i>	<i>Plectranthus</i>
<i>Syzygium</i> (lilypilly)	<i>Santolina</i>
<i>Photinia</i>	<i>Coprosma</i>
<i>Rhagodia</i> (saltbush)	<i>Strelitzia</i>
<i>Acacia Cyclops</i>	<i>Senna</i> (Silver Cassia)

Recent post-fire research from the 2019/20 bushfire season suggests greenness factor (the extent to which plants are actively growing) had an impact on building survivability to a bushfire, indicating that maintained green grasses and landscape watering features are beneficial during a bushfire.

It is essential that any vegetation and landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

Landscaping features within the APZ

A combination of hard (materials) and soft (design) landscaping will benefit the survivability of a building during a bushfire event. The type, quantity and condition of fuel has a very important effect on bushfire behaviour in proximity to a building. Poorly located vegetation that burns readily may expose a house to increased levels of radiant heat and flame contact.

- 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.
- Remove other flammable objects from around the house. These include sheds, caravans, outdoor furniture, barbeques, gas bottles, wood piles and organic mulch.
- Avoid flammable mulches within the APZ. Alternatives include gravel, scoria, pebbles, shells or recycled crushed bricks.
- Use non-combustible, moveable containers and pots that can be relocated in the summer.
- Restrict the use of door mats and place firewood stacks >10m from building.
- Restrict the use of timber and use materials such as brick, earth, stone, concrete and galvanised iron
- Metal screens can help to shield your house from radiant heat, direct flame contact and ember attack.
- An intensive area of planting centred on a contoured garden mound provide an effective screening.
- Fencing in BAL 29 or within 6m of a building should be of non-combustible materials.
- Establish a path immediately around the external wall of the building. Do not place garden beds adjacent to the external fabric of the building and under windows.
- Clumping shrubs and trees so they do not form a continuous canopy and are separated by areas of low fuel (maintained green grass lawn).

Further information can be found here - [Landscaping for bushfires](#)

Access Requirements

In the event of a serious bushfire threat to the proposed development, it will be essential to ensure that adequate ingress/ egress and the provision of defensible space are afforded in the development/building design.

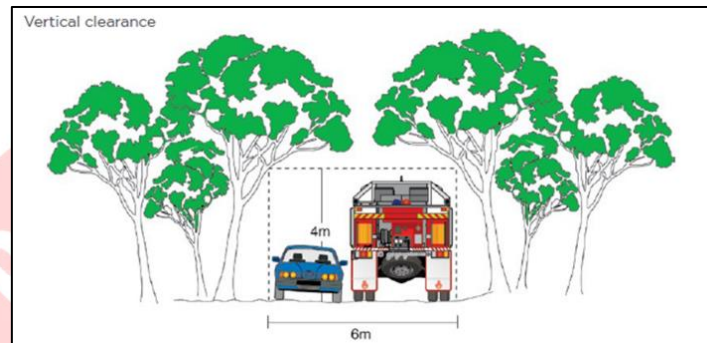
Local Area Traffic Management (LATM)

The objective of LATM is to attain an acceptable level of speed, volume, and composition of traffic within a local area and reduce the number of road accidents. This is achieved by modifying the street environment through the installation of various traffic control devices. LATM devices by their nature are designed to restrict and or impede the movement of traffic, especially large vehicles, which conflicts with the intent for access required by the NSW RFS and may significantly increase response times for emergency services.

Where LATM devices are provided they are to be designed so that they do not impede fire vehicle access.

Vertical clearance

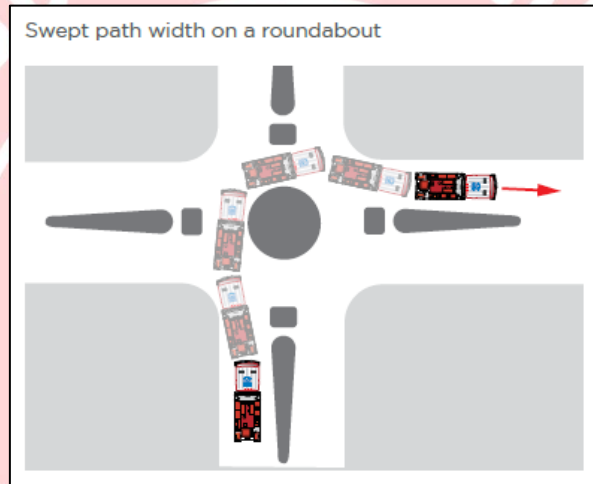
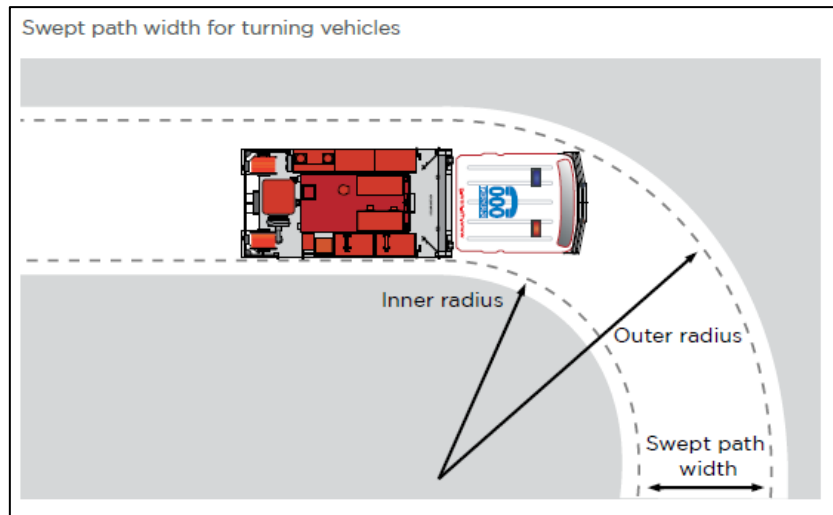
An unobstructed clearance height of 4 metres should be maintained above all access ways including clearance from building construction, archways, gateways/doorways, and overhanging structures (e.g., ducts, pipes, sprinklers, walkways, signs and beams). This also applies to vegetation overhanging roads and fire trails.



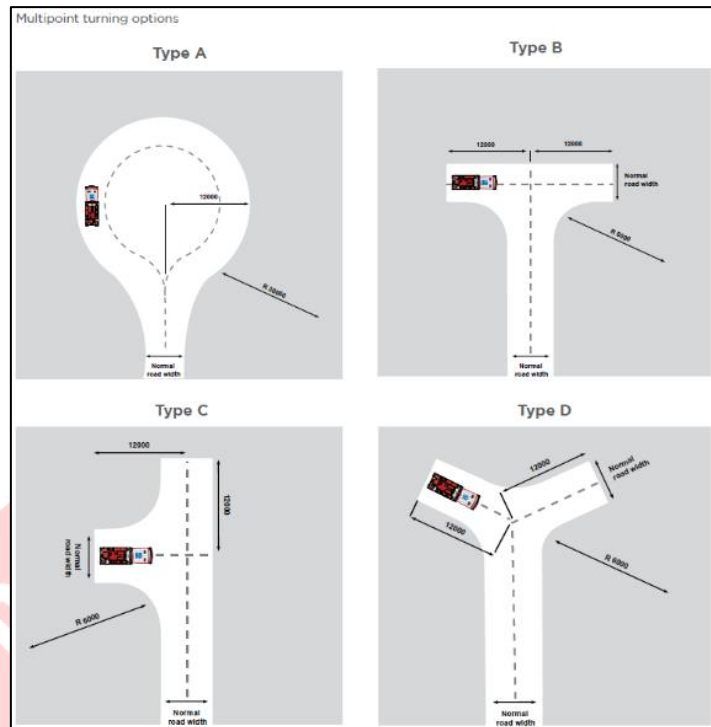
Vehicle Turning Requirements

Fire crews must have rapid access and egress for vehicles, therefore curved carriageways should be constructed using the minimum swept path. The below diagrams from PBP2019 provide indication of the requirements to be achieved.

Minimum curve radius (inside edge (m))	Swept path (m) wide
<40	4.0
40 - 69	3.0
70 - 100	2.7
>100	2.5



Where a turning head is proposed the NSW RFS requires that dead ends having a length greater than 20 metres should be provided with a turning head area which avoids multipoint turns.



Passing Bays

The construction of passing bays, where required, shall be 20m in length, provide a minimum trafficable width at the passing point of 6m.



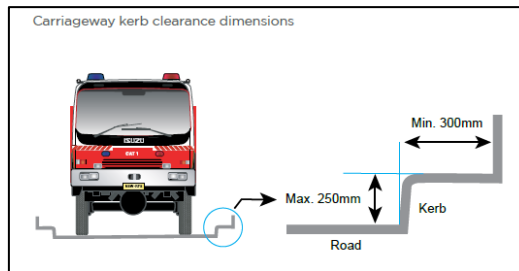
Parking

Parking can create a pinch point within the road reserve. The location of parking should be carefully considered to ensure fire appliance access is unimpeded. Hydrants should be located clear of any parking areas to ensure that access is always available.



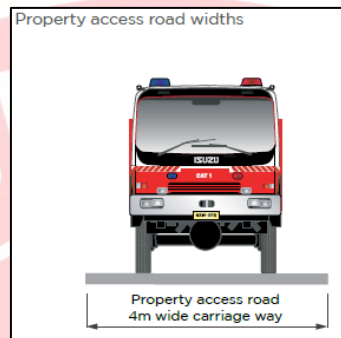
Kerb Dimensions

All kerbs constructed around access lanes should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang.



Road Types

Property access is required to be 4m wide all-weather road. Can be sealed or unsealed.



Water Supply

The intent of water measures is to provide adequate services of water for the protection of dwellings during and after the passage of a bush fire.

Where reticulated water supply is not provided, a static water supply for fire-fighting purposes should be above-ground, accessible, clearly marked and manufactured from concrete or metal. If raised, the tank stand should be made from non-combustible material. These static water supplies (tanks) should be positioned on the non-hazard side of the building and have 65mm Storz outlet with a ball valve fitted to the outlet within the IPA. If not appropriate, they should be appropriately shielded to protect the tank and fire fighters accessing the water. Category 1 fire appliances should be able to access within 4 m of static water supply with a hardened ground surface to support this access.

All exposed water pipes, valves, taps and fittings should be metal and the supply line from tank to ball valve have the same bore size.

Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump and are shielded against bush fire attack. Any hose and reel for firefighting connected to the pump shall be 19mm (internal diameter), and fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels and installed in accordance with AS 2441:2005 Installation of fire hose reels.

Where static water supply is provided the following signage should be installed at the front gate and at a location that is clearly visible (assume smoke) to approaching emergency services to guide them to the static water supply.

STATIC WATER SUPPLY (SWS) PROGRAM

During bush fires, firefighters often have difficulty accessing water to protect lives and property, with mains supply often not adequate during major bush fires.

The Static Water Supply (SWS) program aims to identify properties with sources of water that can be used for firefighting purposes.

Static water supplies include:

- > Swimming pools
- > Dams
- > Creeks
- > Rainwater tanks

If your house or property has a water source, such as a swimming pool, tank or dam, you can assist firefighters by prominently displaying a SWS plate at your property boundary so that it is readily visible from the road.

! SWS signs are provided free of charge.

Being a part of the SWS program may assist fire fighters to protect you and your neighbours' properties should a fire threaten.

If you have a pool, tank or dam with at least 3,000 litre capacity and wish to participate in the SWS Program, please contact your nearest NSW RFS Fire Control Centre.

NSW RURAL FIRE SERVICE

SWS

For more information on what you can do to prepare for bush fire this season:

- NSW Rural Fire Service Website
www.rfs.nsw.gov.au
www.myfireplan.com.au
- Your nearest NSW RFS Fire Control Centre:
- Bush Fire Information Line
1800 NSW RFS (1800 679 737)

NSW **NEW SOUTH WALES** **NSW RURAL FIRE SERVICE** **FIRE & RESCUE** **PREPARE ACT SURVIVE** **NSW RURAL FIRE SERVICE**

Electricity, Gas supplies and Hazardous materials

The intent of electricity, gas and hazardous material measures is to locate these utilities and materials so as not to contribute to the risk of fire to a building.

Electricity

Location of electricity services should limit the possibility of igniting the surrounding bush land or the fabric of buildings. Where practicable, electrical transmission lines are underground. If overhead, electrical transmission lines are installed with short pole spacing (30m), unless crossing gullies, gorges, or riparian areas, then no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

For further information visit <https://www.electricalsafety.com.au/>

Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS/NZS 1596:2014. All fixed gas cylinders are kept clear of all flammable materials to 10m and shielded on the hazard side. All above-ground pipes and connections to and from gas cylinders are metal, and polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not permitted. Furthermore, if gas cylinders need to be kept close to the building, safety valves are directed

away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion. Gas utilities should be positioned to not impede fire fighters accessing water supplies while undertaking suppression operations.

Hazardous Materials

Hazardous materials are any materials that can fuel the fire, such as leaf litter, grass, garden mulch and woodpiles. They can also be made up of solid combustibles or flammable liquids and gases such as petrol, kerosene, alcohol, LPG, natural gas, and acetylene. Vehicle, machinery, and other mechanical equipment that utilise fuels for operations can also be considered hazardous. The incorrect design and placement of carport and garages in residential developments could propagate fire towards the residential dwelling. Any liquids or fuels that are considered hazardous should be positioned away from the dominant bush fire threat. If located in a building/structure, it should be a minimum of 6m away from any other building. Vegetation surrounding these locations shall be maintained to IPA standards and the construction standards shall minimise the impact of ember attack to ignite the structure.

Construction Requirements

Groundwork and Sub-structure construction phase

During the ground phase potential ignition sources of the subject development may include hot works, incorrect disposal of cigarette butts and hot exhausts from vehicles, electrical failures, and sparks from metal contact.

Groundwork and Sub-structure construction phase fire management plan should be developed. Preparation of the site should include mitigating fire ignition sources. This should include vegetation management such as slashing and mowing long grasses in and around the development site, car parking and access tracks. This is especially important during summer months where Rates of Spread of fire can significantly increase due to the prevailing weather condition.

Handheld fire extinguishers should be carried on each vehicle and on site for quick access and suppression of fires.

Where neither reticulated water nor an existing static water supply is available during the construction phase, a temporary 10,000 litre Static Water Supply within proximity of the development site shall be provided before the commencement of any construction works. This temporary supply will allow for the replenishment of attending fire services which will facilitate the rapid suppression of any potential ignitions. The temporary supply may be removed when the prescribed fire-fighting water supply is installed.

Ongoing Operations

Routine inspections of bush fire safety systems and equipment generally occur annually and are supported by a Bushfire Plan. Ideally these inspections should occur moving out of the colder months in preparation for the bushfire season. The most common types of inspections that are required are surface, near surface (grasses and debris) and elevated (shrub) fire fuel level accumulation in APZs, canopy separation reequipments in APZs, and maintaining building fire hygiene such as cleaning gutters and down pipes.

Developing and annually reviewing a bushfire plan, no matter how big or small the development, is critical to the ongoing maintenance of the Bushfire Protection Measures identified within this report.

Construction Standards

Australian Standard 3959 "Construction of buildings in bushfire-prone areas" provides for six (6) levels of building construction these being BAL - Low, BAL - 12.5, BAL - 19, BAL - 29, BAL - 40 and BAL - FZ. The Australian Standard 3959 specifies construction standards for buildings within various Bushfire Attack Levels as determined by the Planning for Bushfire Protection – 2019 document.

Retrofitting

Any future alterations, extension to structures, even if they are complying, should consider the appropriate bushfire construction standards at that time. Homes built prior to August 2002 were not required to be built to meet bush fire construction standards. Constructions in Bush fire prone lands after August 2002 required bush fire construction standards, which have also changed over time.

The current construction standards are based on your Bush fire Attack Level (BAL). Evidence from large wildfire events over the last 20 years illustrate that house ignition is concentrated within 100m from the vegetation, although it can occur kilometres from the burning vegetation under worst case scenarios. Developments outside the bush fire prone area (100m from the vegetation) will benefit from increasing construction standards to withstand ember-attack to protect the building during a bush fire event.

When undertaking alterations and additions to a dwelling in Bush fire prone land only the new construction is required to conform with the current requirements, although this only partially protects your home.

Research has illustrated that ember-attack from the wildfire is the principal mechanism that ignites homes. The most vulnerable elements are timber decks, Eave fascia boards, gutters timber window frames and timber stairs. Furthermore, house-to-house fires occur following the ignition of a neighbouring property. Appropriate amount of effort should be placed to ensure that vegetation and landscaping should be maintained to reduce the likelihood of ember attack igniting fire fuels near the house, and separation between neighbouring houses is achieved to reduce house-to-house fires. The use of non-combustible fencing and appropriately positioned windows can go a long way to reducing the risk of house-to-house fires.

While retrofitting identifies available construction protection methods as per *AS3959 – Construction of buildings in Bushfire Prone Area*, **it should be clearly understood that such building enhancements are complementary to good site preparation and vegetation management in the context of the bushfire survival plan.**

Routine maintenance is an important part of bushfire protection for your home, out-buildings and garden. For example, if a window/door metal shutter is fitted, it needs to work at the time of a bushfire threat just like your fire equipment needs to be ready to go.

Each retrofitting measure is a step towards making your home safer against the impact of embers and radiant heat in the event of a bushfire. If you want your home to be comparable to the construction requirements under AS 3959, then *ALL* the works associated with a particular BAL category will need to be undertaken.

Some of the basic retrofitting that can be undertaken:

- Enclose existing sub floors with suitable materials or construct the floor and structure with non-combustible materials

- Cover, seal, overlap, back or butt-joint all joints in the external surface material of walls to prevent gaps greater than 2mm.
- Seal vents, weepholes, breathers and openings with metal screens of aperture <2mm.
- Replace flammable external walls with non-combustible materials.
- Apply sarking-type material (flammability index >5) over the outer face of the building frame prior to re-fixing of any external cladding.
- Screen all windows and doors with metal screens of aperture <2mm and metal frames.
- Establish weather strips, draught excluders or draught seals around doors and panel lift garage doors.
- Garage roller doors could have guide tracks with a maximum gap area of 3mm and be fitted with a nylon brush in contact with the door.
- Above-ground, exposed water, gutter downpipes and gas supply pipes should be metal.
- incorporate gutter guards with a flammability index more than 5 when tested to AS1530.2, or aluminium, bronze, or stainless steel with maximum aperture of 5mm.
- Only use Bushfire resisting timber as specified in AS 3959 Appendix F.

Further information can be found at [Guide-retrofit-your-home-for-better-bushfire-protection](#).

Construction in Flame Zones

Flame zone is defined as 'radiant heat received by the proposed building exceeds 40kW/m² or calculated by the point of potential flame contact, whichever occurs first'.

BAL FZ development applications should be referred to the NSW RFS. To satisfy the performance requirement the following applies:

1. Buildings subject to BAL FZ must comply with specific conditions of development consent for construction at this level.
2. The requirements above as modified by the development consent following consultation with the RFS under Section 4.14 of the Environmental Planning and Assessment Act 1979; or
3. The requirements of (a) as modified by development consent with a bush fire safety authority under Section 100b of the Rural Fires Act 1997 for the purposes of integrated development

Although Section 9 of AS3959 2009 is excluded in NSW, it nonetheless should be used as a basis for assessment of compliance for construction in the flame zone.

For developments in the flame zone (as determined above), systems complying with AS3959 Section 9 will be considered, except that there is to be no flaming of the specimen unless:

1. The situation is infill development and specifically alterations and additions,
2. The outcome as the result of the alterations and additions is positive regarding bush fire safety (i.e., a better outcome is achieved),
3. The applicants are referred to the link that has the Bush Fire Survival Plan and engaged in the bush fire issues associated with their situation, and
4. The flaming is not considered to add to the existing overall bush fire risk of the development.

Materials that allow flaming can be problematic in flame zone and are not generally supported by the NSW RFS.

Construction elements of the building with 10m of the bushfire hazard are generally required to conform with AS1530.8.2.

An integrated approach to the construction standards, design, and type of hazardous industry in Flame Zones will provide the best outcome to establish a development that will sustain bush fire attack.

Electric Vehicles (EVs)

EVs are an ever-growing part of the transport environment with government aims of EV vehicles dominating throughout the 2030's. There are a variety of different technologies, battery types, and chemistries in vehicles, e-scooter and e-bikes creating complexity on the risk of 'thermal runaway'.

Thermal runaway is an unstable chemical process that begins when heat generated within a battery exceeds the amount of heat that is dissipated to its surroundings, which can lead to the battery catch fire. EV batteries tend to put out toxic fumes resulting in suppression difficulties.

Although the chances of batteries catching fire is relatively small <0.1%, approximately 1/3rd of fires occur during charging. the location of residential parking of Plug-in Hybrid Electric Vehicles (PHEVs) vehicles should be considered when planning inconsideration of occupied buildings and extinguishment requirements.

Having a smoke/heat alarm, a F-500 (class A, B and F) Lithium-Ion Battery fire extinguisher in an open-air charging station (unenclosed building) that is location >6m from any building or flammable vegetation will significantly mitigate risk of a EV fire spreading.

Further information can be obtained at: <https://www.evfiresafe.com/>

Bushfire Emergency / Survival Plan

No matter how big or small the development is within a bush fire prone area, a bush fire plan is critical to preparing the property in the event of a bush fire. To ensure appropriate measures are taken, the worst-case scenario bush fire behaviour should be used to determine the course of action.

There is extreme noise, smoke, heat, and wind during the passing of a bush fire front under worst-case conditions. Vision, hearing, breathing, and communication are significantly affected during this period.

State bush fire authorities have established kits to help residential and small property owners to develop appropriate plans to plan and prepare for bush fire events. In NSW Bush fire survival Plans can be accessed from <https://www.rfs.nsw.gov.au/plan-and-prepare/bush-fire-survival-plan>.

The principal elements of the Bush fire survival Plans are:

- Know your risk.
- Know and understand the bush fire alert levels.
- Access to 'Fires Near Me' app.
- Knowledge of Local radio, local ABC/emergency broadcaster frequency, and TV.
- Prepare yourself, your home and your family.
- Leave early or prepare to stay.
 - If leaving, when to leave, where will you go, how will I get there, what will I take, who will you call, what is your back-up plan.
 - If you stay, do you have all the equipment you need, what are the signal to start defending the dwelling, what to do before, during and after the passing of the fire front, do all members of the household know what to do, check your equipment, develop action checklist, what is your back-up plan.
- Discuss all elements with your family and neighbours.

Furthermore, knowledge of escape routes (generally the public road system around your dwelling), refuges and location of any nearby Neighborhood Safer Places is critical knowledge prior to a bush fire event.

A bushfire emergency management and evacuation plans are prepared consistent with Australian Standard AS 3745:2010 Planning for emergencies in facilities. State agencies also have developed guidelines to facilitate the development of the documents and other Australian Standards are relevant for different development type. Bushfire emergency management and evacuation plans should be complemented with a Bushfire Management Plan (BMP).



A simple 4 step process can be undertaken to develop a basic bushfire emergency survival plan:

DISCUSS

STEP 1

DISCUSS WHAT TO DO IF A BUSH FIRE THREATENS YOUR HOME

Many households find that having a discussion over dinner works best as everybody is together and focussed.

[Download the Step 1 discussion guide \(PDF, 985.3 KB\).](#)



PREPARE

STEP 2

PREPARE YOUR HOME AND GET IT READY FOR BUSH FIRE SEASON

There are simple things you can do around your home to prepare it for a bush fire, like keeping the grass low and having a cleared area around your home.

[Download the Step 2 checklist \(PDF, 595.5 KB\).](#)



KNOW

STEP 3

KNOW THE BUSH FIRE ALERT LEVELS

If there is a fire in your area you will find its alert level on the NSW RFS website and in the 'Fires Near Me' app. You need to keep track of the alert level so you know what you should do.

[Download Step 3 \(PDF, 166.1 KB\).](#)



KEEP

STEP 4

KEEP ALL THE BUSH FIRE INFORMATION NUMBERS, WEBSITES AND THE SMARTPHONE APP

In a bush fire, it's important that you stay up to date on conditions in your area.

[Download Step 4 \(PDF, 219.1 KB\).](#)



Bushfire Management Plan

No matter how big or small the development is within a bushfire prone area, a bushfire plan is critical to preparing the property in the event of a bushfire. To ensure appropriate measures are taken, the worst-case scenario bushfire behaviour should be used to determine the course of action.

State bushfire authorities have established kits to help residential and small property owners to develop appropriate plans to plan and prepare for bushfire events. These can be accessed by contacting your local fire authority.

For larger development such as industrial, commercial and developments that accommodate vulnerable people, more comprehensive emergency management requirements and procedures should be developed.

At a minimum, the Bushfire Management Plan should illustrate the Bushfire Protection Measures (location and type of hazard (vegetation), defensible space, access, water, and construction standards) that will be implemented as part of the development to reduce the risk from bushfire to an acceptable level and should be clearly displayed within the property to ensure current occupants are aware of the bush fire risk.

Furthermore, the BMP can provide information that assists in wildfire suppression operations, such as:

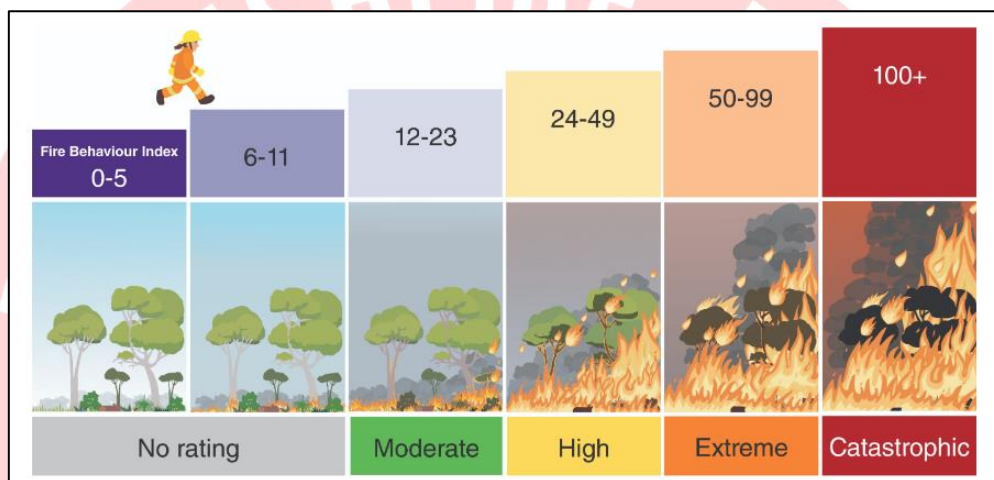
- 24/7 emergency contact details including alternative telephone contact.
- Location of site infrastructure and assets.
- Fire-fighting water supply plan.
- Site access and neighbour/ internal road plan.
- Identification of built, natural and cultural assets in and around the site.
- Emergency escape routes, refuges, and location of any nearby Neighbourhood Safer Places.
- Location of Fire Management Zone, specifically Asset Protection Zones.
- Location of hazards (Physical, Chemical and Electrical) that will impact on fire-fighting operations and procedures to manage identified hazards during fire-fighting operations.
- Aviation assets (helipads and aviation water supplies) and risks (powerlines).
- Fire history in and around the site, and
- Schedule of on-ground works and review and updating schedule.

Updated Australian Fire Danger Rating System

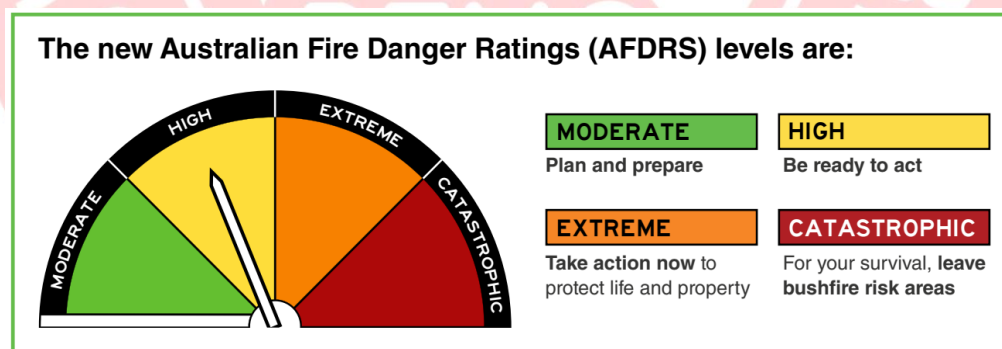
The principal objective of the new Australian Fire Danger Rating System (AFDRS) is to implement a more accurate and nationally consistent system that will enable improved decision-making by response agencies and industry and provoke the desired community response to messaging in order to improve public safety. More information at <https://www.rfs.nsw.gov.au/news-and-media/newfdr> and eLearning at <https://www.afac.com.au/initiative/afdrs/afdrs-training>.

The AFDRS uses the latest scientific understanding about weather, fuel and how fire behaves in different types of vegetation to improve the reliability of fire danger forecasts. This strengthens the ability of those working in emergency services to be better prepared, make improved decisions, and provide better advice to the community.

It is aimed at a simplified, action-oriented Fire Danger Rating System.



Accessed from AFAC: <https://www.afac.com.au/initiative/afdrs/afdrs-faqs>



Accessed from AFAC: <https://www.afac.com.au/initiative/afdrs/afdrs-faqs>

MODERATE: *Plan and Prepare* - Have a plan and be ready to act if a fire starts.

HIGH: *Be ready to act* - Be alert for fires in your area and be ready to leave or be ready to defend.

EXTREME: *Take action* - Act before a fire starts.

CATASTROPHIC: *Leave high risk areas* - Protect your life, leave early.