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Bushfire Management Report

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referred to in Council's Decision Notice dated

31 August 2026

This plan is subject to conditions of Approval Number

RAL/2026/2586 & MCUC/2026/2587



Assessment Manager



Project No:	R6009
Address	10 Widderick Road, Crows Nest QLD 4355
Lot Plan	Lot 1 RP15463 and Lot 181 CSH1741
BAL Rating	BAL – 12.5

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Address	10 Widderick Road, Crows Nest, QLD 4355
Project No.	R6009
Client	Julia Petts

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PROJECT TEAM

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Report expiry

Please note that the bushfire hazard assessment and BAL rating provided in this report are valid for a period of 12 months from the date of issuance. It is recommended that a qualified professional be consulted to verify the accuracy of the assessment if this report is more than 12 months old. Should any discrepancies be identified or an update deemed necessary, a new report must be obtained.

Disclaimer

This report has been prepared based on information provided by the client and is intended solely for the client's exclusive use for the specified purpose. Any inaccuracies or changes to the report or development application shall require revision.

While every effort has been made to provide accurate and reliable recommendations, no guarantee can be given that desired outcomes will be achieved during extreme bushfire conditions. Such conditions may result in unpredictable fire behaviour and pose significant risks to life, property, and the environment. Any statements, opinions, or advice expressed in this report are made in good faith, based on the best information and judgment available at the time.

Max Bushfire Protection Consulting and its employees accept no liability whatsoever (whether due to negligence, lack of care, or otherwise) for any loss or damage arising from reliance on any representations, statements, or advice contained in this report. Furthermore, legislative requirements may impact vegetation clearing activities, and clients are strongly advised to consult relevant authorities to ensure compliance with applicable local, state, and federal laws.

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Executive summary

An assessment of the vegetation on and surrounding 10 Widderick Road, Crows Nest, QLD (Lot 1 RP15463 and Lot 181 CSH1741 hereafter referred to as ‘the site’) was undertaken to assist in the development of a bushfire management plan for the purpose of ensuring that a proposed boundary realignment (2 into 2) on the site meet the requirements of the Toowoomba Regional Council Planning Scheme (2012 Version 28) Bushfire Hazard Overlay Code, the State Planning Policy – Bushfire (July 2017), and the Australian Standard, “Construction of buildings in bushfire-prone areas” (AS 3959-2018). This management plan provides recommendations for a number of measures that will assist in ensuring the safety of life and property and mitigating the impacts of bushfire.

Consideration of bushfire hazard assessment is triggered through development located in an area mapped by the Toowoomba Regional Planning Scheme (TRPS) (2012 Version 28) Bushfire Hazard Overlay.

Bushfire

The site is identified by the Toowoomba Regional Council Planning Scheme Bushfire Hazard Overlay mapping as being located within an area of **Medium** fire risk. The SPP Interactive Mapping System Natural Hazards and Risk Resilience Mapping identified that the site contains areas of ‘Very High’, ‘High’ and ‘Medium Fire Risk’, and ‘Potential Impact Buffer’. The bushfire hazard is due to the presence of native vegetation on the site and in the surrounding landscape.

Mitigation measures

The implementation of the following measures will assist in mitigating the bushfire threat to an acceptable level for future residents and assets on the site. Mitigation of bushfire risks is predominantly proposed to be achieved through use of a building envelope, sensitive building design and construction, with adequate separation from adjacent areas of potentially hazardous vegetation achieved through layout design.

Construction of buildings

Careful design of new buildings should be undertaken, taking into consideration site characteristics and relevant building standards including the Australian Standard for Construction of buildings in bushfire-prone areas (AS3959-2018) and the Building Code of Australia. Bushfire Attack Levels (BALs) in the order of BAL-12.5 are identified for the building location envelope on Lot B (Appendix 2 Calculation of bushfire hazard), dependent on the final location of a dwelling, extent of vegetation management undertaken, and separation distances achieved and maintained.

A **Bushfire Attack Level (BAL) of 12.5** has been identified for the site of the proposed dwelling on the basis that a minimum separation distance of greater than **31 metres** exists between the dwelling and potentially hazardous understorey vegetation to the north.

A number of construction measures are required to minimise the risk of bushfire impact on buildings. Key areas include:

- Roof to be fully sarked, **or**
- Foil-backed insulation blankets (anticon) be installed over battens under roof sheeting,
- Vents and weepholes in walls and eave linings to be screened,
- Cladding to be of bushfire resisting material for walls that are less than 400mm from the ground, decks, awnings, and other horizontal surfaces,

- Openable parts of windows to be screened with corrosion resistant metal mesh with a maximum aperture of 2mm, and
- Decking to be of bushfire-resistant or non-combustible material.

Where a garage, carport, or similar structure is not attached to the building covered by this report and it is located closer than 6 metres, it will be required to comply with the construction requirements of this report.

Access and egress

Access to the site is via Andrews Road which is located on the eastern boundary and is of sealed all-weather construction, and Widderick Road which is on the southern boundary and is of gravel all-weather construction. Adequate access is constructed and maintained to enable efficient, practical access to buildings and water supply for emergency services appliances.

Vegetation management

Vegetated areas of the site are largely classified as Category X (non-remnant) vegetation, with a limited area (<2,000 square metres) of regulated vegetation mapped as Regional Ecosystem (RE) 12.9-10.17. The field assessment identified that vegetation on the site and nearby areas does not align with this RE. Dominant tree species present were identified as *Eucalyptus tereticornis* and *E. crebra*. The site contains a grassy understorey, whilst mapped vegetation to the north contains a shrubby to grassy understorey composed of native and exotic species.

Water supply

The TRPS (2012 Version 28) Bushfire Hazard Overlay Code requires that the development be provided with a reliable water supply for fire-fighting purposes that is safely located and freely accessible. This can be achieved by connection to a reticulated water supply or provision of a dedicated on-site water storage system that permanently holds a minimum of 10,000 litres (e.g., dam, swimming pool or water tank) for firefighting purposes at the time of constructing a dwelling. A Council maintained reticulated water supply main is located in Andrews Road on the eastern boundary of the site.

Prepare, act, survive

It is important that residents are well prepared during times of high fire danger and have well made plans that can be readily enacted in a time of bushfire emergency. The key message being: Prepare, Act and Survive.

Maintenance of bushfire mitigation measures

This bushfire management plan has been prepared on the basis that bushfire mitigation measures identified are implemented and maintained into the foreseeable future. Failure to maintain these measures may contribute to the dwelling being exposed to a higher level of bushfire threat and attack.

1.0 Introduction

Max BP was engaged by Julia Petts and Stephen Prokop to prepare a Bushfire Management Report for a proposed boundary realignment (2 into 2) at 10 Widderick Road, Crows Nest, formally described as Lots 181 CSH1741 and 1 RP15463.

This bushfire assessment and report have been prepared in accordance with the requirements of the Toowoomba Regional Council Planning Scheme (2012 Version 28) Bushfire Hazard Overlay Code, and the SPP (2017) Natural hazards, risk and resilience (Bushfire). A summary of site details is provided in Table 1.

Table 1: Summary of site details

Widderick Road, Crows Nest	
Address	10 Widderick Road, Crows Nest
Lot on Plan	181 CSH1741 & 1 RP15463
Area	7.013 hectares
Local Government Area	Toowoomba Regional Council
Planning Scheme/Local Plan	Toowoomba Regional Planning Scheme (TRPS) 2012 Version 28
Overlays mapped for site	Environmental Significance Bushfire Hazard Agricultural land Water resource catchment
Vegetation Management Act 1999 (VMA 1999)	Category X Category B
Area Classification/Zone	Rural
Proposed Landuse	Rural

The site is located on approximately 7.013 hectares of land that is currently zoned as Rural under the TRPS (2012 Version 28). The site is located on the south-western outskirts of the township of Crows Nest. It is bounded by Widderick Road to the south, and Andrews Road to the east (Figure 1). Rural properties are located to the north, west and south of the site, with Low Density Residential and Limited development (Constrained land) to the east. The boundary realignment (2 into 2 lots) will result in 2 lots with areas of approximately 0.46 and 6.55 hectares (Figure 2). The site falls from west to east, and north to the south and southeast with underlying slopes in the order of 9% or 5 degrees (Figure 3).

The following photographs provide an overview of the condition of the site at the time of site assessment.



Photo 1: View to the north from the site of the proposed building envelope on Lot B.



Photo 2: View to the east over the site of the proposed building envelope on Lot B.



Photo 3: View to the south from the site of the proposed building envelope on Lot B.



Photo 4: View to the west from the site of the proposed building envelope on Lot B.



Photo 5: View of vegetation to the north of proposed Lot B.



Photo 6: Fuel loads on the site are managed by cattle grazing

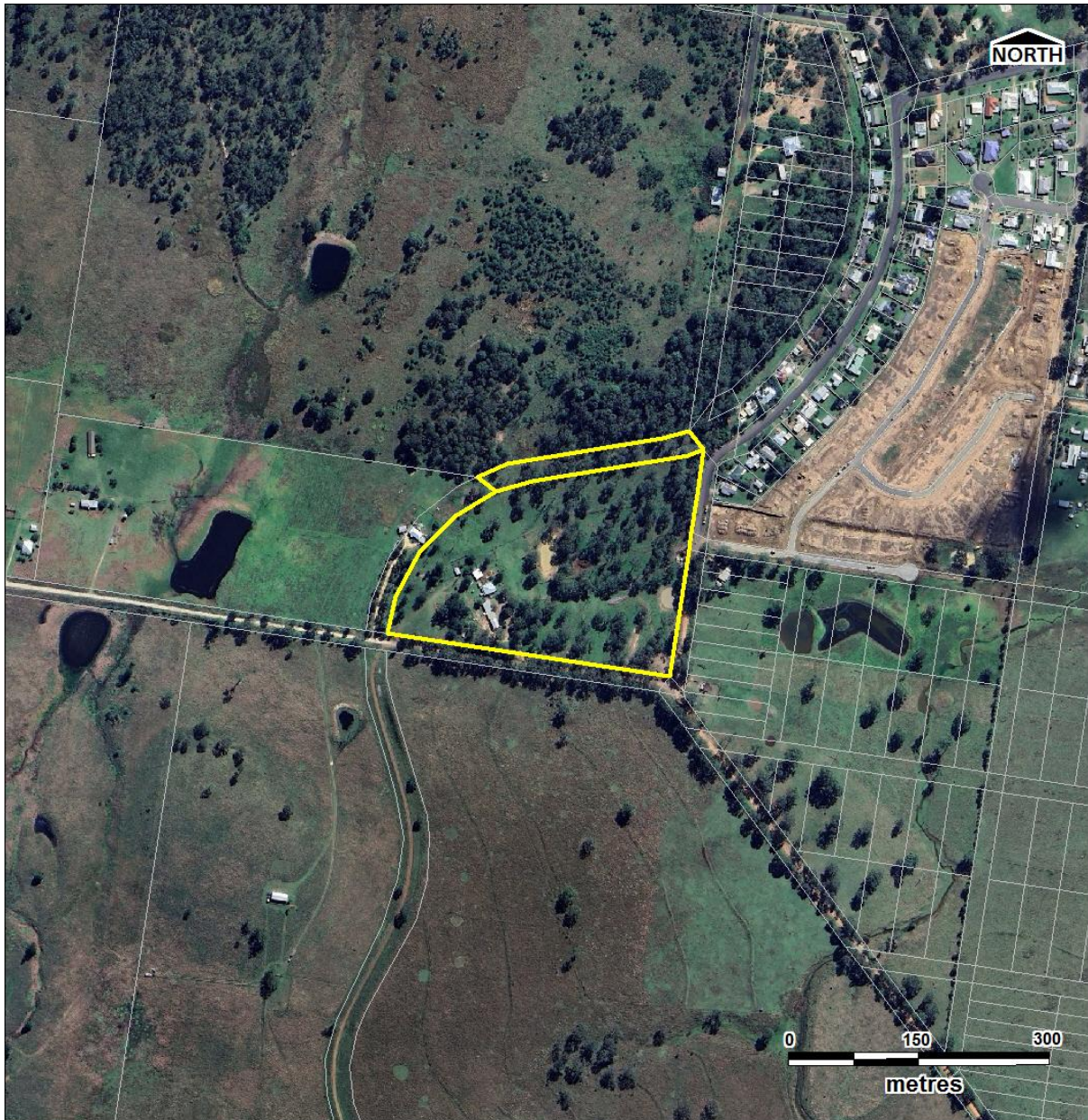


Figure 1: Aerial view providing landscape context for the site which is highlighted with a yellow border. Imagery sourced from Google Earth that was captured on 23 April 2025.

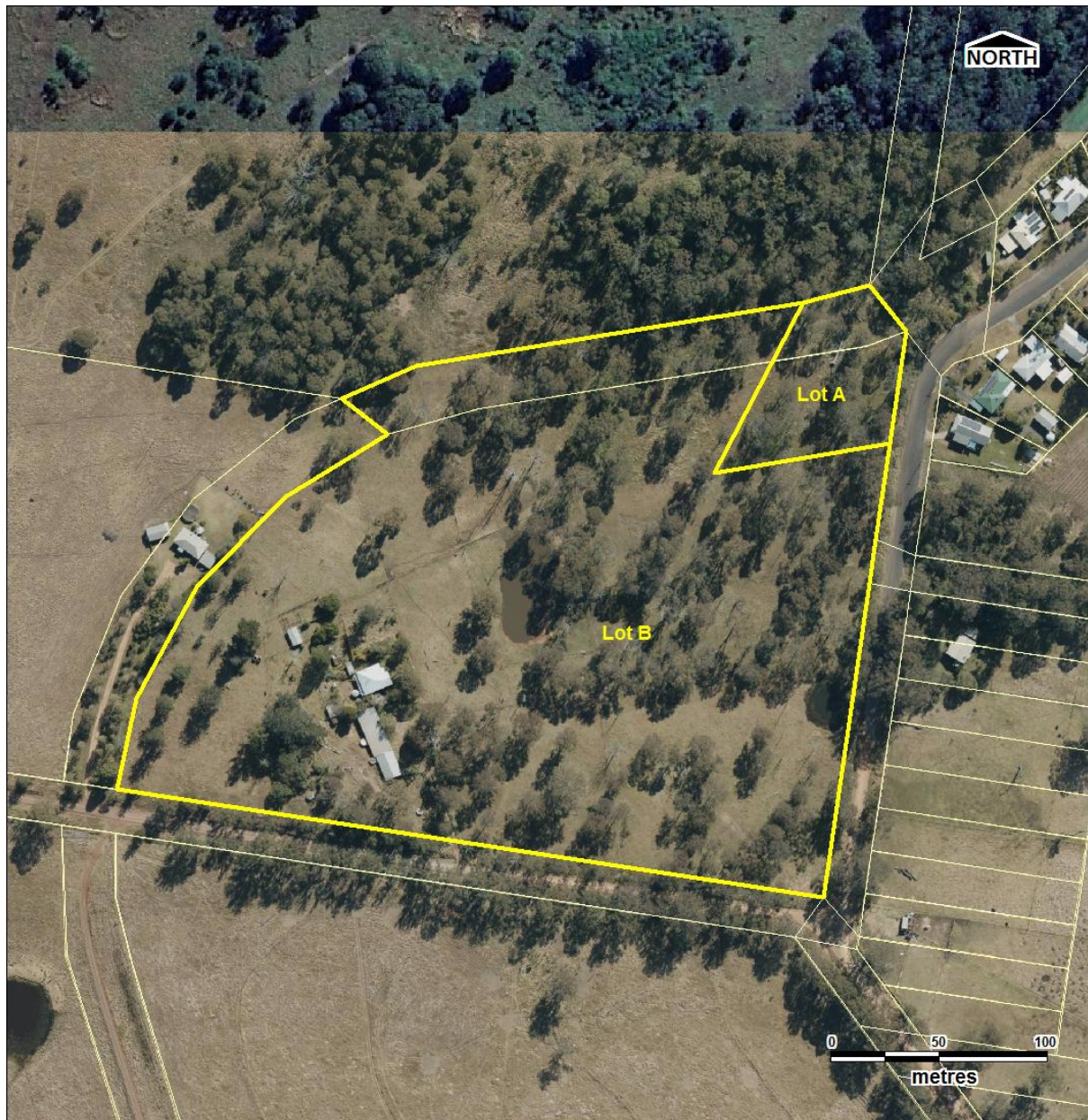


Figure 2: Aerial view of the proposed boundary realignment. Imagery sourced from Queensland Globe that was accessed on 2 March 2026.

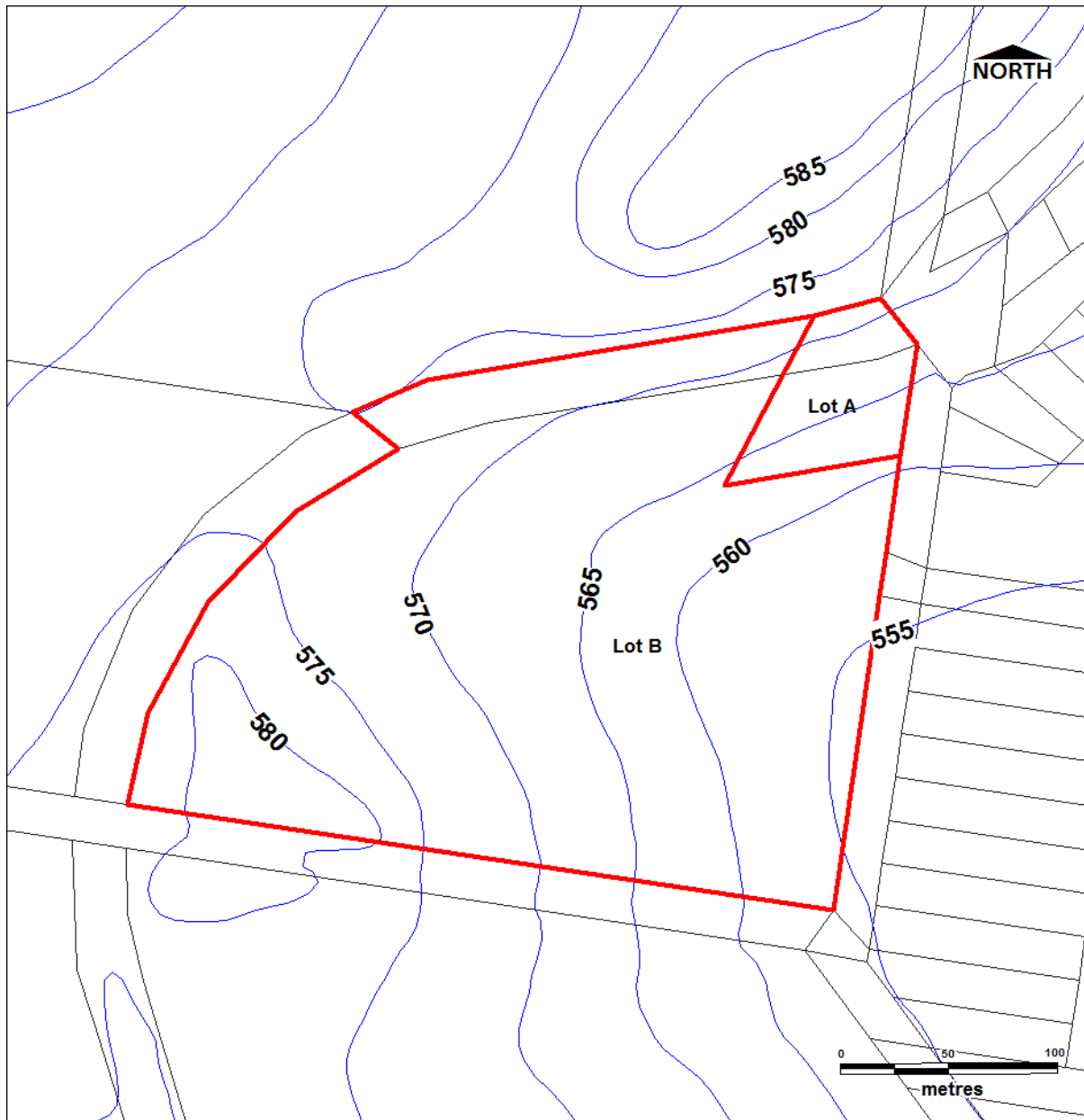


Figure 3: Topography for the site with contour intervals of 5 metres.

3.0 Vegetation

3.2 Vegetation details

An assessment of the vegetation on Lot 1 RP15463 and Lot 181 CSH1741 was undertaken to assist in the development of a fire plan for the purpose of ensuring that a Reconfiguration of a Lot (RaL) can be safely undertaken and that future residents of building are not impacted by the adverse effects of bushfire. Additionally, the assessment also identified bushfire risk that a future dwelling on Lot B could be exposed to. The current Vegetation Management Supporting Map indicates that a very limited area of regulated vegetation (less than 2,000 square metres) is present on the site. A larger area of regulated vegetation is located to the immediate north of the site. The extent of mapped remnant vegetation in the area and its conservation status is shown in Figure 4, with Table 2 providing a description of the Regional Ecosystem 12.9-10.17. The site assessment identified that vegetation structure present was an open eucalypt woodland with a grazed grassy understorey. Native vegetation to the north of the site comprised a similar species composition for overstorey trees with a shrubby to grassy understorey comprising native and exotic plant species.

Tree species identified on the site were *Eucalyptus tereticornis* (Forest red gum) and *E. crebra* (Narrow leaf ironbark) with measured heights in the order of 18 to 20 metres.

Table 2: Regional Ecosystem vegetation description

Regional ecosystem:	12.12.16	Conservation status	Least concern
Description	Open forest to woodland complex generally with a variety of stringybarks, grey gums, ironbarks and in some areas spotted gum. Canopy trees include <i>Eucalyptus siderophloia</i> , <i>E. propinqua</i> or <i>E. major</i> , <i>E. acmenoides</i> or <i>E. portuensis</i> , <i>E. carnea</i> and/or <i>E. microcorys</i> and/or <i>Corymbia citriodora</i> subsp. <i>variegata</i> . Other species that may be present locally include <i>Corymbia intermedia</i> , <i>C. trachyphloia</i> , <i>Eucalyptus tereticornis</i> , <i>E. biturbinata</i> , <i>E. moluccana</i> , <i>E. longirostrata</i> , <i>E. fibrosa</i> subsp. <i>fibrosa</i> and <i>Angophora leiocarpa</i> . <i>Lophostemon confertus</i> or Whipstick <i>Lophostemon confertus</i> often present in gullies and as a sub-canopy or understorey tree. Mixed understorey of grasses, shrubs and ferns. Hills and ranges of Cainozoic and Mesozoic sediments		

The information above was sourced from the Queensland Herbarium (2024) Regional Ecosystem Description Database (REDD). Version 13.1 May 2024) (DESI: Brisbane)

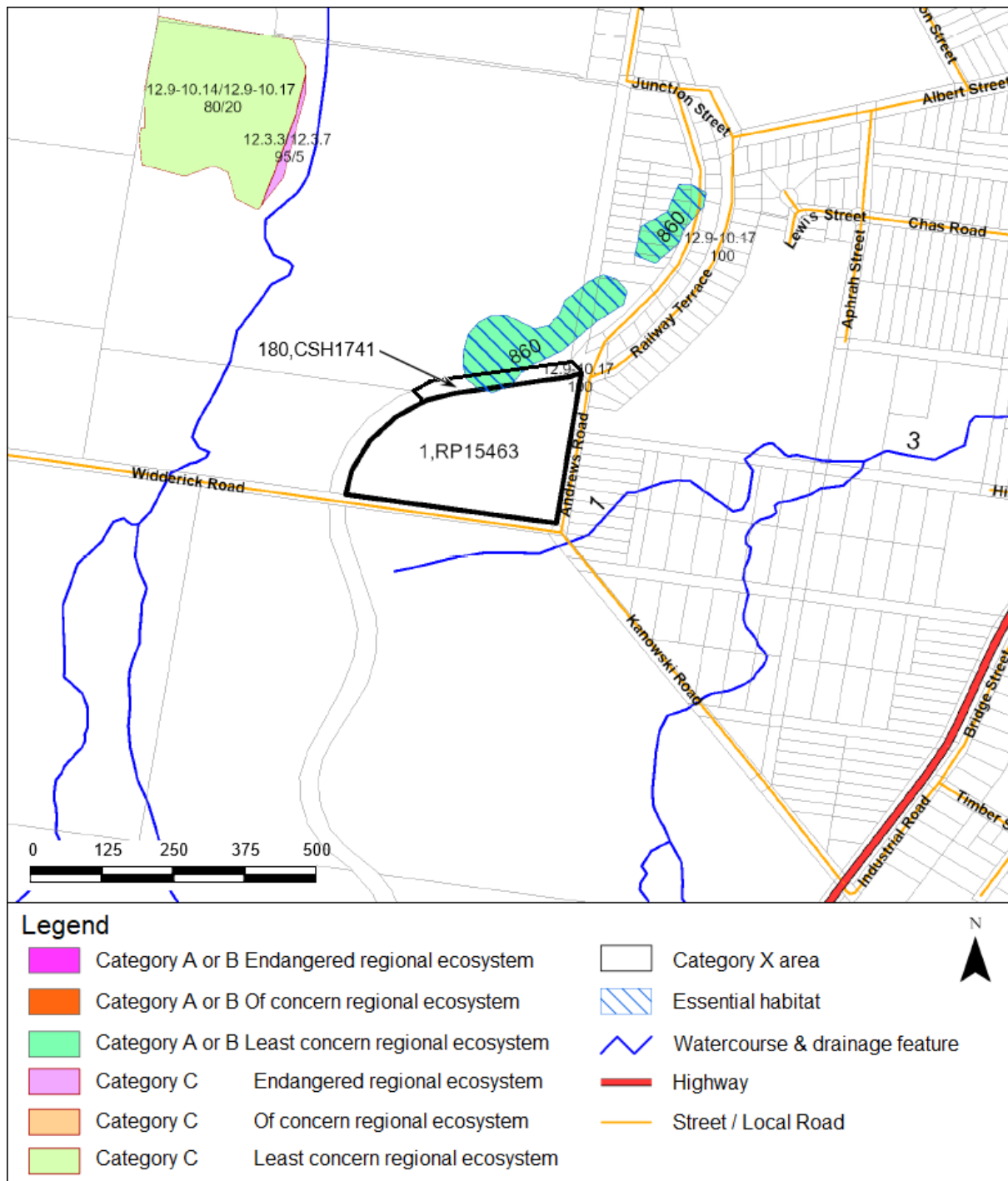


Figure 4: Extent of mapped remnant vegetation within the vicinity of 10 Widderrick Road, Crows Nest as identified on the Vegetation Management Supporting Map accessed from the Department of Resources website.

4.0 Bushfire and vegetation

4.1 Overview

The Queensland State-wide mapping methodology was used to identify Bushfire Prone Areas on and surrounding the site. This methodology scales bushfire hazard based on the Potential Fire-line Intensity of a severe bushfire and can be used to predict the radiation profile of areas adjacent to potentially hazardous vegetation. The Potential Fire-line Intensity is a useful indicator of the level of safety afforded for resident egress and firefighter access.

The Potential Fire-line Intensity is calculated using 3 key factors operating at a landscape level, these being Potential Fuel Load (tonnes / hectare), Maximum Landscape Slope (degrees) and Fire Weather Severity (Forest Fire Danger Index). Figure 5 illustrates the variables used to determine the Potential Fire-line Intensity.



Figure 5: Variables used to determine Potential Fire-line Intensity. (Redrawn from Leonard et al 2013)

Potential Fuel Load represent the approximate mass (measured in tonnes/ha) of combustible fuel material that would typically accumulate if vegetation is not regularly burnt or subject to fuel reduction practices. Potential fuel loads vary according to the type of vegetation present and management of it. Fuel: its availability, arrangement, size, amount and moisture content contribute to the speed and intensity of a bushfire. The type of vegetation present determines the flammability of the fuel, with the finer and drier the fuel, the more easily it will burn. Fuel loads in general are related to the quantities of fine fuels available to burn. The primary components of fuel loads are the fine fuels; that is; flammable materials that are less than 6 mm in diameter such as leaves, twigs and bark principally on or near the ground.

Slope or steepness of land (described as Landscape Slope) is a major determinant of fire behaviour, controlling fire spread, the rate of fuel consumption and thus Potential Fire-line Intensity.

Fire behaviour is influenced by a range of weather variables including recent precipitation, current wind speed, relative humidity, and temperature. Due to the complexity of these influences, they are commonly combined into a single weather index that can be used to estimate potential fire behaviour. The McArthur (1973) Forest Fire Danger Index (FFDI) is the best known, most widely used and thoroughly tested fire weather index adopted by fire agencies throughout Australia.

4.2 Bushfire hazard mapping

The bushfire hazard for the site and surrounds as identified by the Queensland Government SPP Interactive Mapping System using the Statewide mapping methodology is shown in Figure 6. The SPP mapping indicates that the site contains areas of Very High, High and Medium Potential Bushfire Intensity and Potential Impact Buffer. The site assessment identified that the bushfire hazard is significantly less than what is mapped for the site.

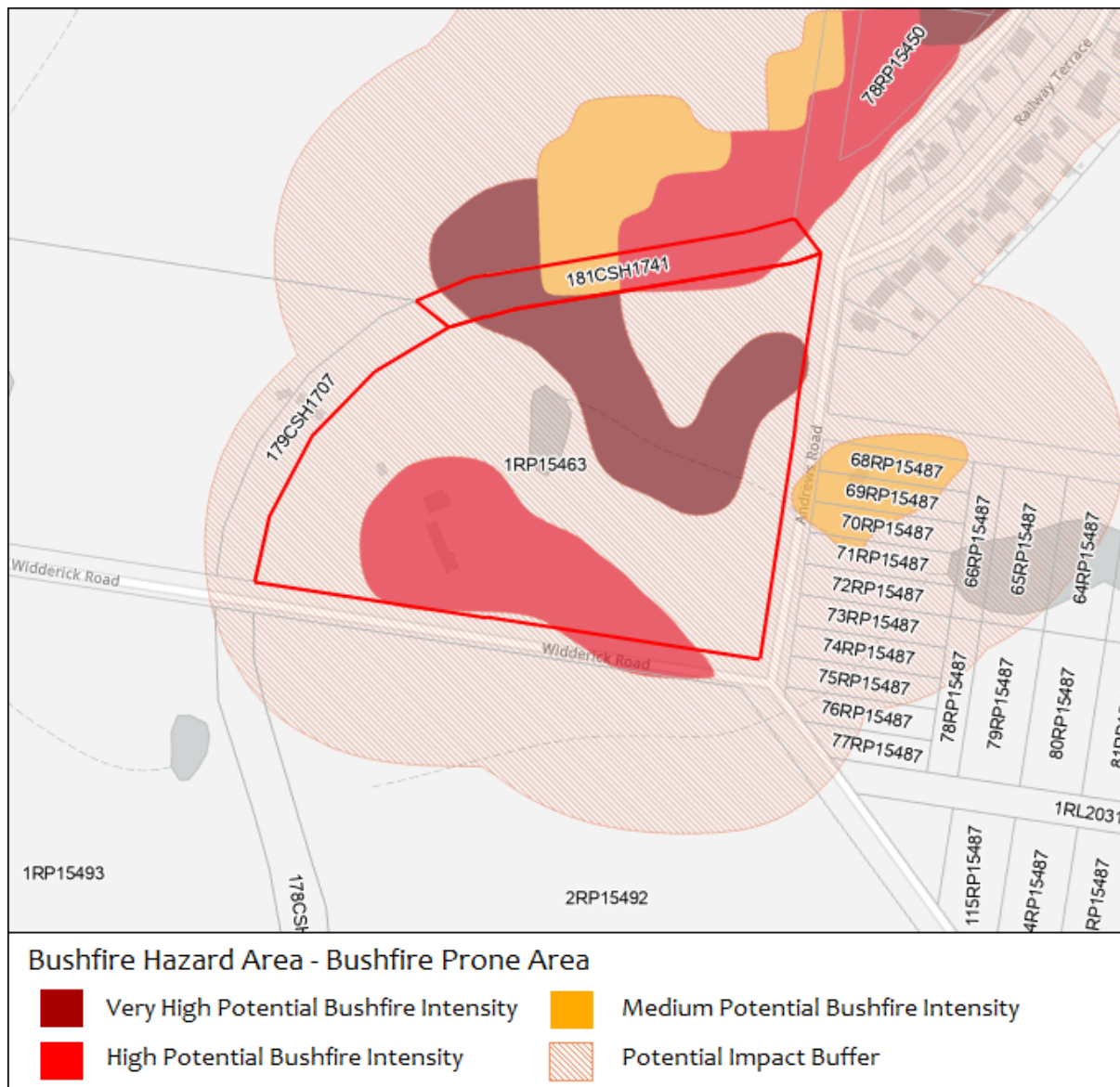


Figure 6: Bushfire Hazard for 10 Widderick Road, Crows Nest as identified by the Queensland Government SPP Interactive Mapping System accessed on 3 March 2026.

The site is identified by the Toowoomba Regional Council Planning Scheme Bushfire Hazard Overlay mapping as containing areas of 'Medium Fire Risk' and 'Low Fire Risk'. The bushfire hazard is due to the presence of native vegetation on the property and in the surrounding landscape. The bushfire risk category for the property and immediate surrounding area is shown in Figure 7. Bushfires in the area have the potential to generate quantities of embers that could impact on the building even though the fire does not necessarily reach it.

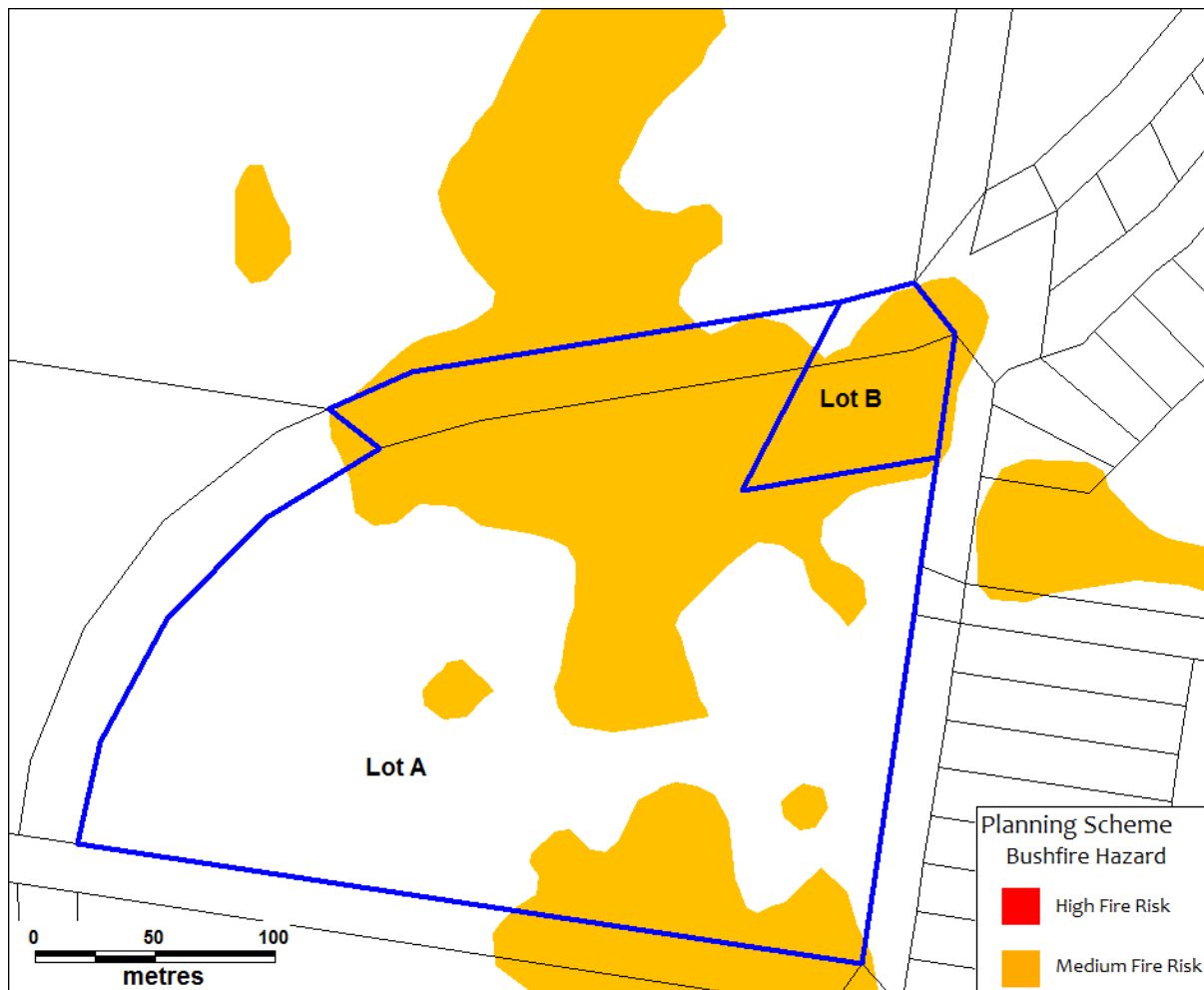


Figure 7: Bushfire Hazard for 10 Widderick Road, Crows Nest as identified by the Toowoomba Regional Council Planning Scheme bushfire hazard overlay mapping.

4.3 Fire brigade

The site is contained within the Crows Nest Rural Fire Brigade district. The closest fire brigade equipped to fight structural fires is the Crows Nest Fire Rescue Station (auxiliary) located at 28 Creek Street, Crows Nest approximately 2 kilometres by road to the northeast of the site

4.4 Fire run

The length of fire run influences the area in which a fire has to develop and reach its potential maximum intensity for the conditions prevailing at the time. It is important to assess the length of fire run to determine the potential scale and intensity of fires that may occur in the area. Fire runs less than 1 kilometre in length are generally considered to pose a lesser risk than those with a longer run. Fire runs may be modified by natural features such as creeks, rock formation and vegetation types and be influenced by weather and fuel conditions.

Due to historical land management practices and the developed nature of the surrounding landscape, limited fire runs are present. A fire run of approximately 300 metres is identified to the northeast of proposed Lot B from the proposed development with a second fire run of approximately 150 metres from the northwest. These fire runs are limited in their extent and do not pose a significant threat to the proposed development. Figure 8 shows the location of potential fire runs and the areas of the development that could be impacted on by a bushfire.



Figure 8: Potential fire runs identified for the site. Imagery sourced from Google Earth that was captured on 23 April 2025.

4.5 Vegetation Hazard Classes

The new methodology for State-wide mapping of bushfire prone areas in Queensland identifies Potential Fuel Loads that are assigned to vegetation categories (Vegetation Hazard Classes) formed by amalgamating land use and vegetation types with a moderately consistent fuel load and structure. The Potential Fuel Load assigned to each Vegetation Hazard Class (VHC) is generally representative of the higher fuel load expected for the typical vegetation types, landscape, and site conditions within each Vegetation Hazard Class. This Potential Fuel Load of each Vegetation Hazard Class would approximate the 80th percentile fuel load of the “long unburnt condition” for the class (generally greater than 10 years without burning). A field assessment was conducted to confirm the vegetation hazard classes (VHCs) present within and surrounding the site and the level of exposure to bushfire risk. The mapped VHCs for the site are shown in Figure 9.

The Queensland State Government has introduced a State-wide mapping methodology to identify Bushfire Prone Areas. This methodology was developed by the CSIRO Climate Adaptation Flagship and scales bushfire hazard based on the Potential Fire-line Intensity of a severe bushfire. It is used to predict the radiation profile of areas adjacent to potentially hazardous vegetation. A key component of the methodology is the allocation of Vegetation Hazard Classes (VHC) which are used to estimate Potential Fuel Loads. These fuel loads were derived from a combination of expert appraisals and field measurements using the upper range of fuel loads for each fuel element (i.e., surface, near surface, elevated and bark). A “long unburnt condition” of generally greater than 10 years without burning was used for estimating fuel loads.

The dominant VHCs mapped for the site and immediate adjoining areas by the State-wide mapping methodology were VHC 8.1 *Wet eucalypt tall open forest*, VHC 9.2 *Moist to dry eucalypt woodland on coastal lowlands and ranges*, VHC 39.2 *Low to moderate tree cover in built-up areas*, VHC 40.4 *Continuous low grass or tree cover*, and VHC 42.6 *Nil to very low vegetation cover* (Figure 9).

A detailed site assessment was undertaken to prepare a representative vegetation hazard class map in relation to the site. The hazard assessment was undertaken in accordance with the guidelines specified in *Bushfire Resilient Communities* (QFES 2019) Sections 5.3.1 and 5.4.2. This included the development footprint and all land within 150 metres of the development footprint. Based on detailed field assessment, a site-based vegetation hazard class map has been produced to accurately determine potential bushfire hazards and resulting building requirements for the site.

Vegetation on the site aligned with aligned with VHC 39.2, and VHC 40.4. Areas of VHC 41.4 *Discontinuous low grass or tree cover* and VHC 9.2 *Moist to dry eucalypt woodland on coastal lowlands and ranges* were also present on nearby lands. The ground truthed VHCs for the site and surrounds are shown in Figure 10. Table 3 provides a summary of the mapped and ground truthed VHCs and potential fuel loads.

Table 3: Vegetation Hazard Class and Potential Fuel Loads

Vegetation Hazard Class (VHC)	Surface and near surface Fuel Load (t/ha)	Total Fuel Load (t/ha)	Prone type ¹	Fuel continuity ²
8.1 Wet eucalypt tall open forest	31.0	35	1	1
9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges	14.9	17.2	1	1
39.2 Low to moderate tree cover in built-up areas	5	8	3	2
40.4 Continuous low grass or tree cover	4.5	5	2	1
41.4 Discontinuous low grass or tree cover	2.5	3.0	3	2
42.6 Nil to very low vegetation cover	2	2	3	2

Fuel load data sources from Bushfire Resilient Communities Technical Reference Guide October 2019

Note 1: Prone type: 1= Bushfire prone, 2 = Grass fire prone, 3 = Low hazard

Note 2: Fuel continuity: 1= Continuous, 2 = Discontinuous

The identification of VHCs determines the extent to which the vegetation contributes to prevailing bushfire hazard. All VHCs are identified as being one of three prone types **Error! Bookmark not defined.**, with prone types being a categorical indicator of the capacity of a VHC to support a

significant bushfire. VHCs are also given a binary indicator of fuel continuity. Continuous fuel vegetation generally has a consistent distribution of fuel. Discontinuous fuel types include non-hazardous vegetation or land uses.

VHC 39.2, 41.4 and 42.6 are considered non-bushfire prone VHCs under Bushfire Resilient Communities (2019) and BAL calculations using the SPP APZ calculator involving these VHCs results in a radiant heat flux of 0 kW/m^2 (BAL-Low). VHC 40.4, while listed as a grass fire prone VHC with a continuous fuel load under Bushfire Resilient Communities (2019), is considered a non-hazardous VHC due to low fuels loads of 5 t/ha or less and calculations using the SPP APZ calculator involving this VHC results in a radiant heat flux of 0 kW/m^2 (BAL-Low).

Post development, proposed Lot B is located within an area of VHC 39.2, which has been assessed as having Potential Bushfire Hazard Class of 'Low hazard'.

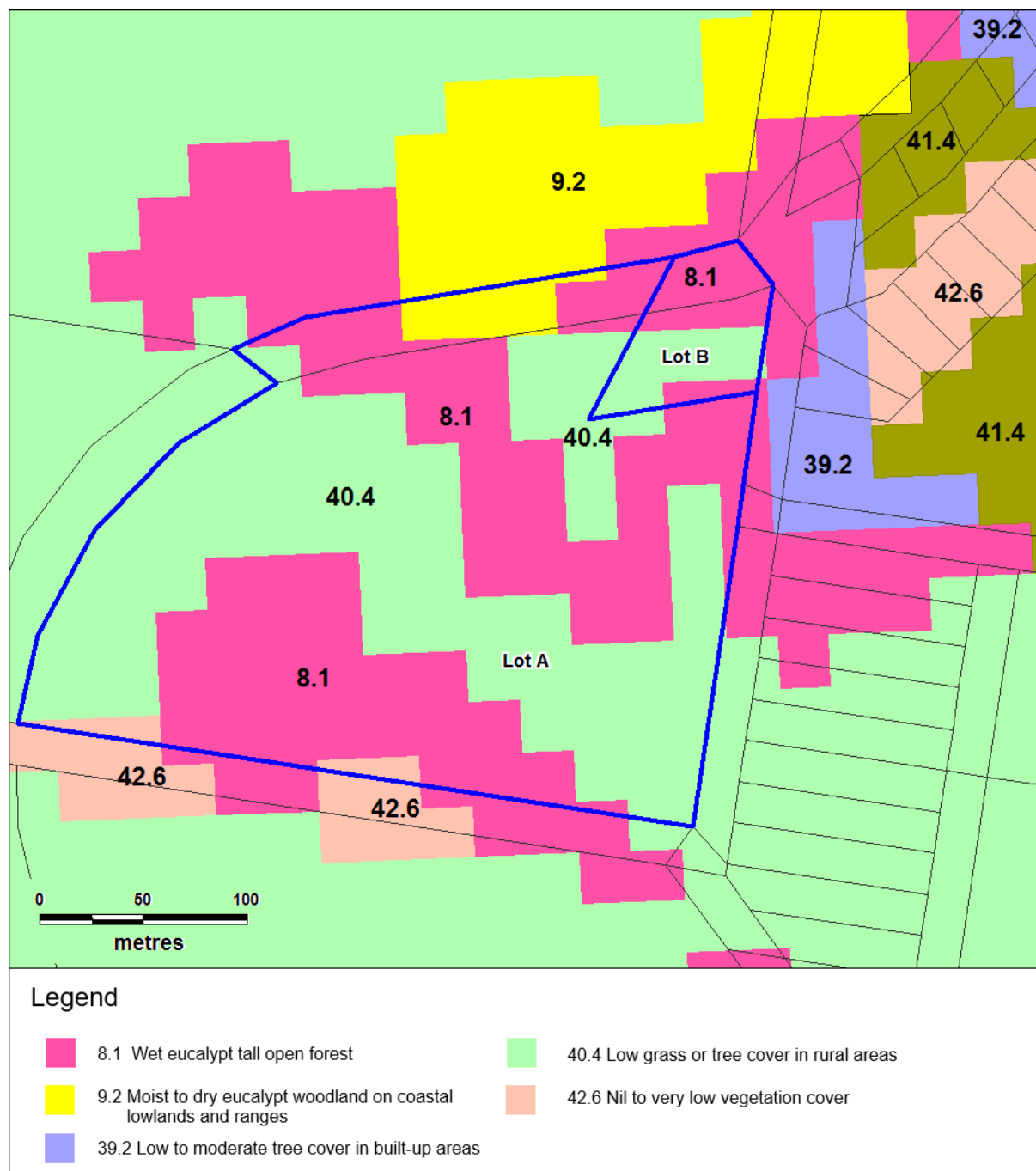


Figure 9: Mapped VHC for the site and immediate surrounding areas.

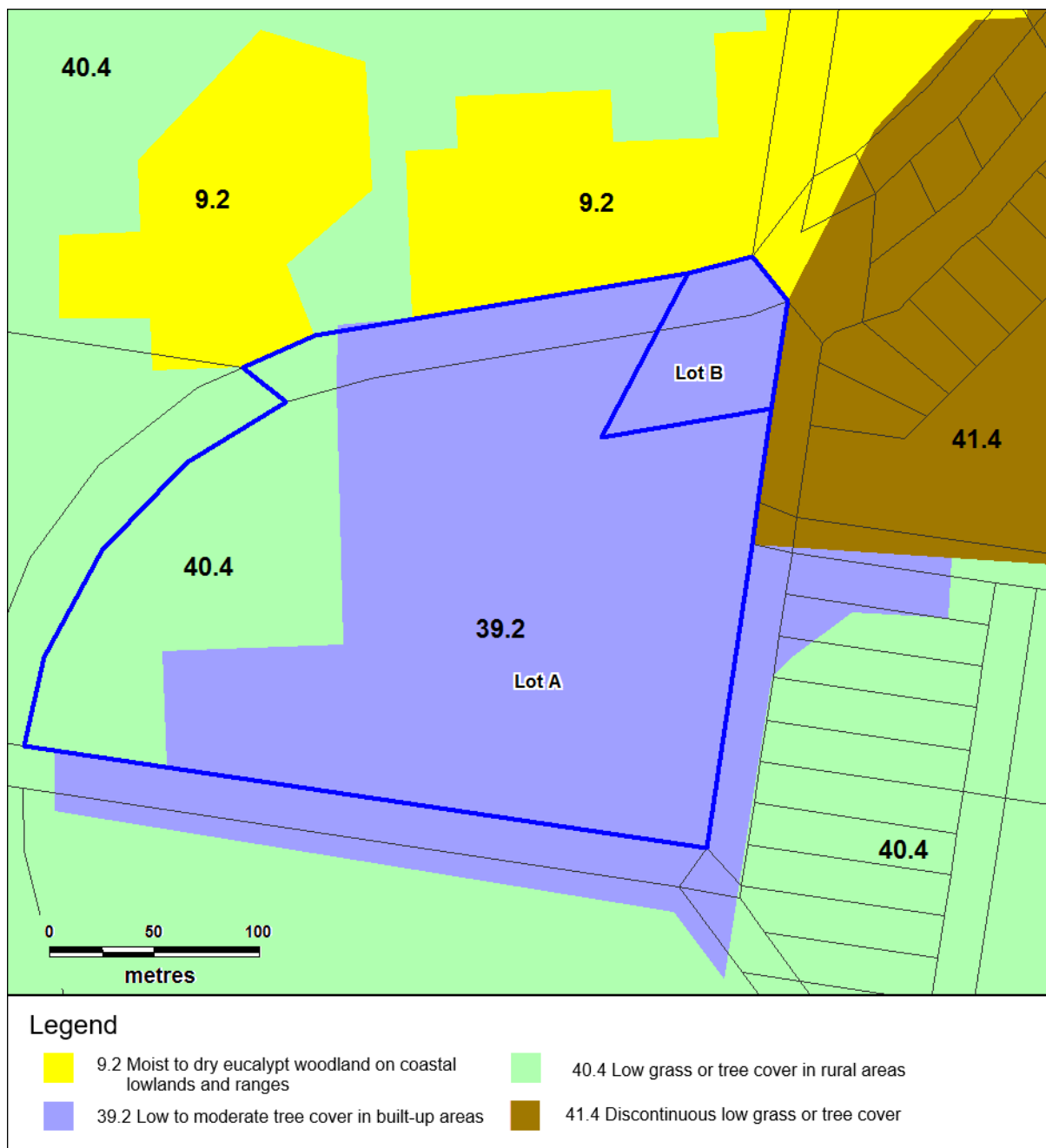


Figure 10: Ground-truthed VHC for the site and immediate surrounding areas.

An aerial image of the site and ground-truthed VHCs is presented in Figure 11.

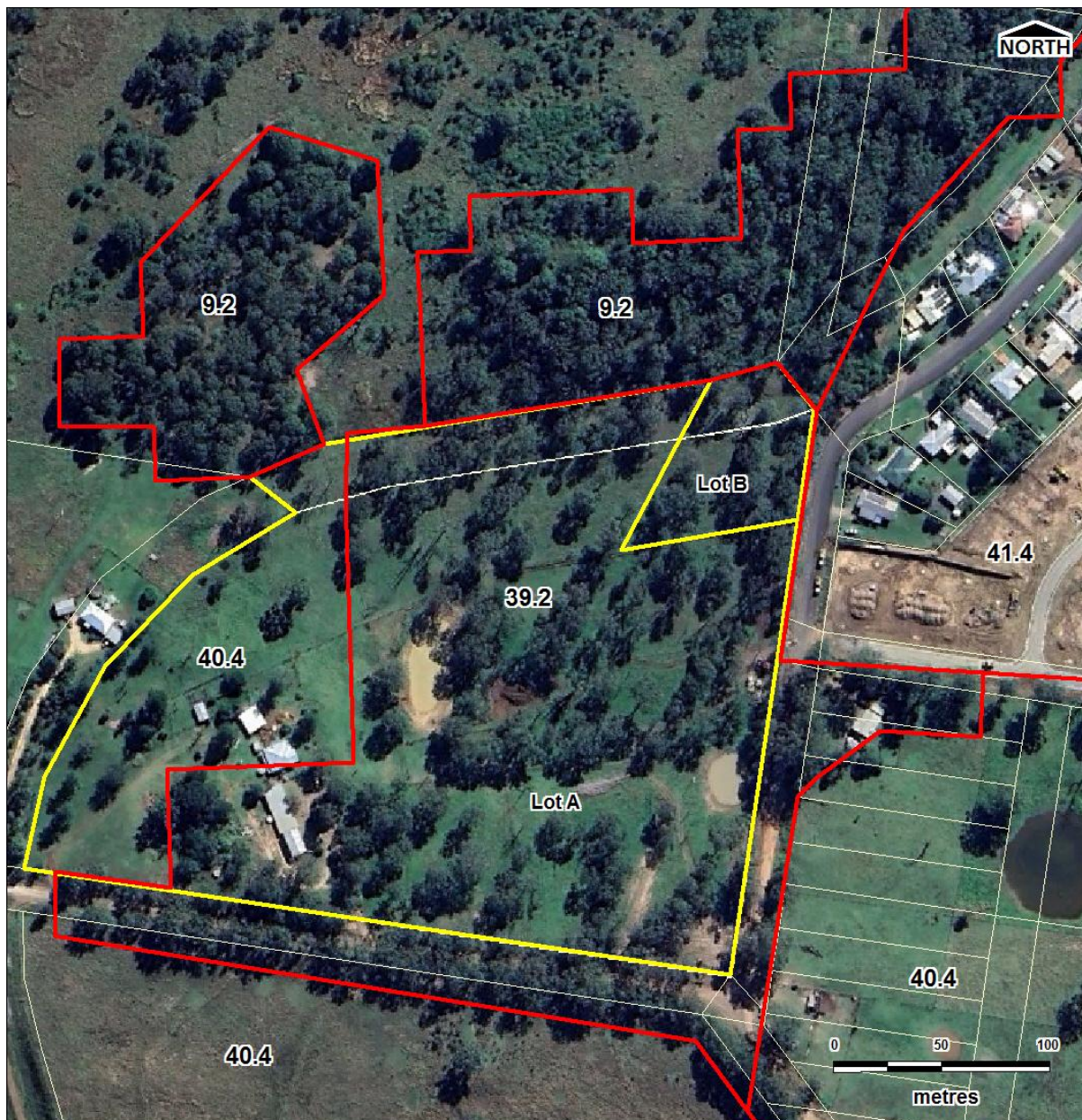


Figure 11: Aerial view of the site and ground-truthed VHCs. Imagery sourced from Google Earth that was captured on 23 April 2025.

4.6 Potential Bushfire Hazard Classes

A ‘fit for purpose’ approach was undertaken to identify the bushfire risk present using the statewide mapping methodology in conjunction with local-scale vegetation and slope maps. The location of ground-truthed VHCs on the site and in the surrounding landscape in conjunction with the underlying slope of land was utilised to develop Potential Bushfire Hazard Classes. The Potential Fireline Intensity calculator was used to calculate the Potential Fireline Intensity (kW/m) to which a Potential Bushfire Hazard Class was attributed. The maximum slope in any direction was used for each area of identified ground-truthed VHC. Potentially hazardous vegetation is located level with and upslope of the proposed development. The Forest Fire Danger Index (or FFDI) was identified by the Bushfire Resilient Communities mapping website as 60. Table 4 provides the various site attributes used to calculate the Potential Bushfire Hazard Class at representative locations around the site. Table 5 provides the correlation between Potential Fireline Intensity and Potential Bushfire Hazard Class.

Table 4: Attributes used to calculate the Potential Bushfire Hazard Class

Vegetation Hazard Class (VHC)	Potential Fuel Load (t/ha)	Potential Fire Weather Severity (FFDI)	Slope under hazardous vegetation (deg)	Potential Fireline Intensity (kW/m)	Potential Bushfire Hazard Class
9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges	17.2	60	0	11,005	Medium
39.2 Low to moderate tree cover in built-up areas	8	60	5	3,362	Low
40.4 Low grass or tree cover	5	60	1	1079	Low
41.4 Discontinuous low grass or tree cover	2	60	1	998	Low

Table 5: Potential Bushfire Hazard Classes

Potential Bushfire Intensity Class	Potential Fire-line Intensity
1. Very high (potential intensity)	40,000+kW/m
2. High (potential intensity)	20,000 – 40,000kW/m
3. Medium (potential intensity)	4,000 – 20,000kW/m
4. Low hazard (potential impact buffer)	<4,000kW/m

Figure 12 identifies the Potential Bushfire Hazard for the site and immediate surrounding areas based on the site assessment as detailed above in Tables 4 and 5. Areas assessed as Low hazard within a 100 metre radius of vegetation mapped as comprising Medium Potential Intensity or higher were classified as ‘Potential Impact Buffer’.

The location of vegetation in relation to the site is a key attribute to be considered when mapping bushfire hazards. In this situation, most of the potentially hazardous vegetation is located downslope of the development footprint.

Additional details on the Bushfire Attack Level (BAL) that the site may be exposed to is provided in Appendix 4 Explanation of Bushfire Attack Levels.

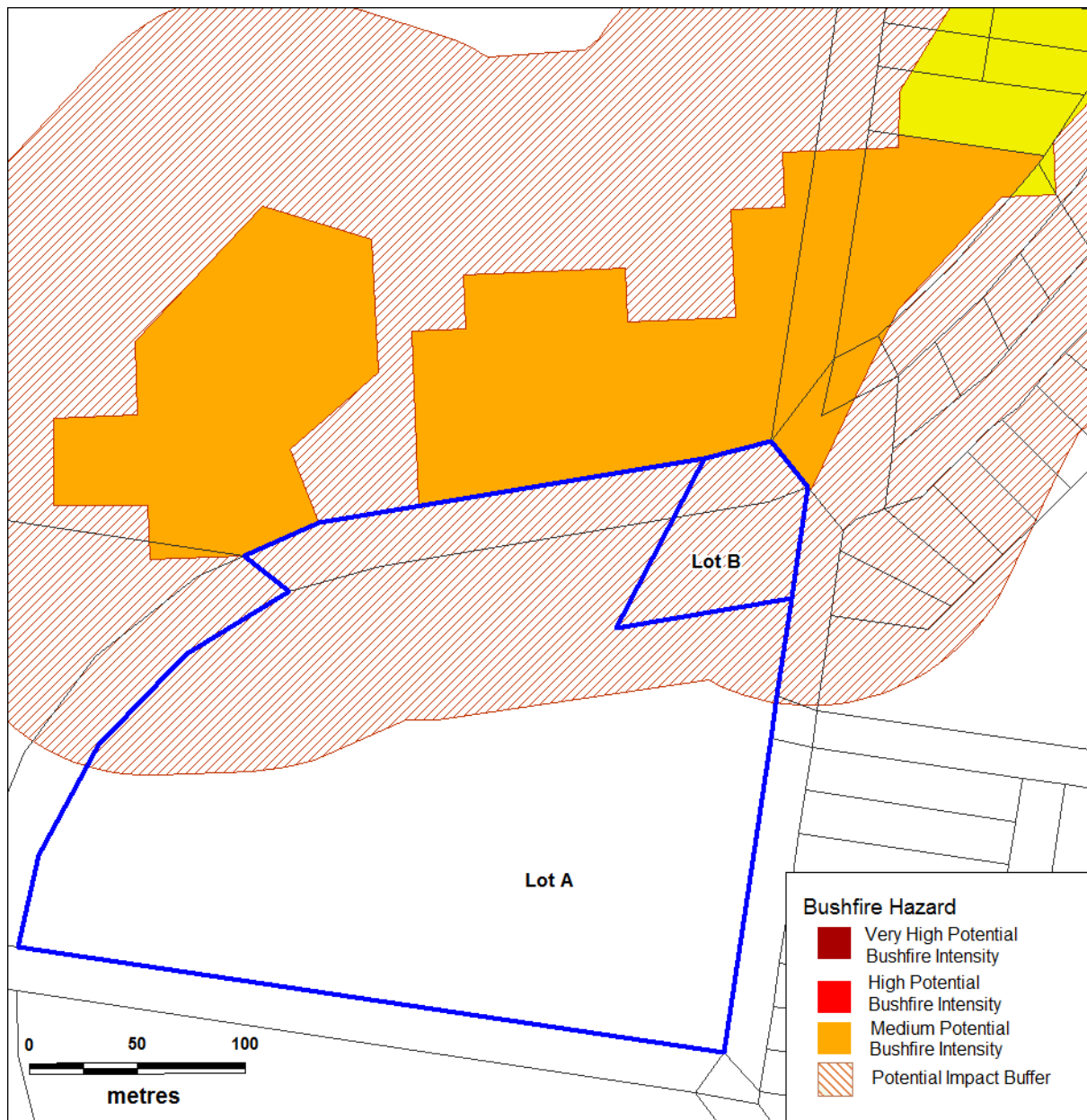


Figure 12: Potential Bushfire Hazard calculated for the site.

4.7 Determination of Bushfire Attack Level (BAL)

The Bushfire Attack Level (BAL) that is likely to be experienced by a building in the event of a bushfire is determined by the type of vegetation present, its distance from the building and the slope of the site. Vegetation within the immediate area of the BLE was assessed as comprising Vegetation Hazard Class (VHC) 9.2 *Moist to dry eucalypt woodland on coastal lowlands and ranges* to the north, and VHC 39.2 *Low to moderate tree cover in built-up areas* further to the north to the west and south, and VHC 41.4 *Discontinuous low grass or tree cover* to the east.

Table 6 provides details of the BAL calculations utilising the SPP APZ width calculator in relation to potentially hazardous vegetation in the area surrounding the BLE on Lot B.

Table 6: QFES SPP Bushfire APZ Calculator values for the areas within a 100-metre radius of the BLE.

Step	Variable description	North	East	South	West
1	Method of assessment	SPP APZ width calculator			
2	Fire Danger Index (FDI) for site utilizing BRC mapping website	60	60	60	60
3	Vegetation Hazard Class	9.2	41.4	39.2	39.2
4	Location of vegetation (Upslope or Downslope)	Upslope	Downslope	Downslope	Upslope
5	Effective slope under hazardous vegetation	5.0	5.0	5.0	2.0
6	Distance of site from hazardous vegetation (m)	31	20	20	31
7	Radiant heat flux kW/m ²	9534	0	0	0
8	Determination of BAL using SPP APZ width calculator	BAL-12.5	BAL-12.5	BAL-12.5	BAL-12.5
9	Appropriate construction methods – See	Appendix 3	Appendix 3	Appendix 3	Appendix 3

Appendix 2 Calculation of Bushfire Attack level contains additional information on the methodologies used to calculate the potential BAL that a dwelling located within the BLE on Lot B could be exposed to, Appendix 3 provides a summary of AS3959-2018 construction requirements and Appendix 4 has an explanation of BALs.

5.0 Mitigating Potential Bushfire Impact

A number of actions should be implemented to mitigate the potential impacts of bushfire on the development. This suite of bushfire protection measures, when implemented in an integrated manner can achieve a better outcome for the site than when used individually and in isolation from other measures. This suite of potential measures is illustrated in Figure 13.

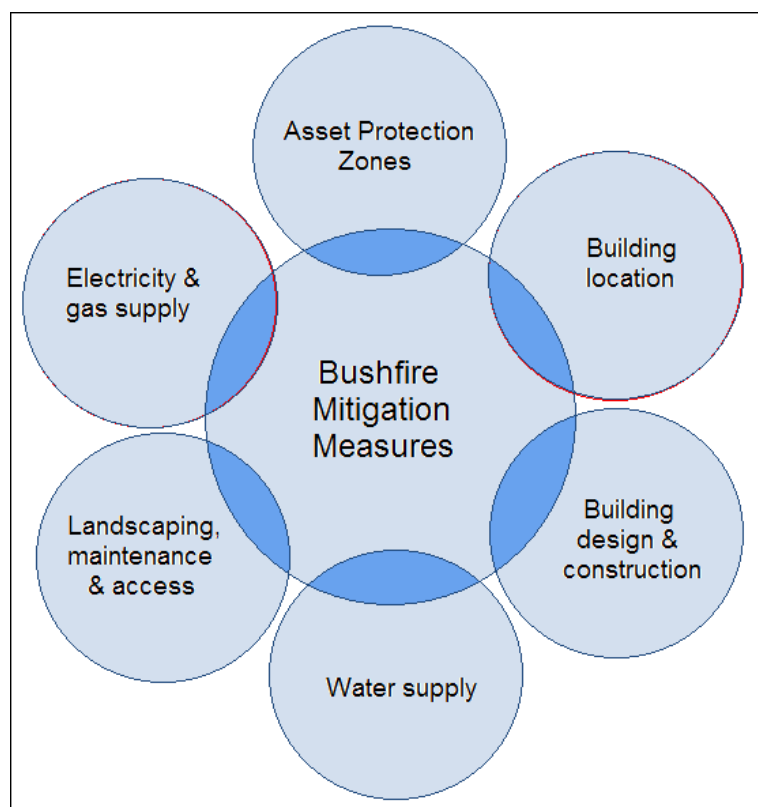


Figure 13: Bushfire protection measures in combination. (Redrawn from Planning for Bush Fire Protection 2019).

5.1 Building location and separation

The location of buildings and their relationship with vegetation in the immediate surrounding area is critical for maximising their survival in the event of a bushfire. A BLE has been identified for Lot B on the site to ensure that a potential dwelling achieves minimum separation distances from hazardous vegetation to enable a BAL of 12.5 to be achieved (Appendix 2 Calculation of bushfire hazard). Building issues can be adequately addressed during the design and construction phase with compliance to the National Construction Code and the Australian Standard for construction of buildings in bushfire-prone areas (AS3959-2018).

Vegetation upslope of the identified BLE is identified as VHC 9.2. In general, a separation distance of greater than 31 metres can be achieved from potentially hazardous upslope vegetation which results in a BAL of 12.5 being achieved when utilising the QFES SPP Bushfire APZ Calculator.

5.2 Asset Protection Zones

The establishment of an Asset Protection Zone (APZ) is an effective mechanism for reducing bushfire hazards that a building may be exposed to. An APZ is a fuel-reduced area surrounding a built asset or structure. Potential bushfire fuels should be minimised within an APZ, so that the vegetation within it does not provide a path for the transfer of fire to the asset either from the

ground level or through the tree canopy. An APZ, if designed correctly, implemented, and maintained regularly, will reduce the risk of:

- (a) direct flame contact on the asset;
- (b) damage to the built asset from intense radiant heat; and
- (c) ember attack.

The APZ is located between the asset and the bushfire hazard and consists of an Inner Protection Area (IPA) and an Outer Protection Area (OPA). 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. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous. The OPA is located between the IPA and the unmanaged vegetation. Vegetation within the OPA can be managed to a more moderate level with the reduction of fuel in this area substantially decreasing the intensity of an approaching fire. It also assists restricting the pathways to crown fuels; reducing the level of direct flame, radiant heat and ember attack on the IPA and built assets. Figure 14 provides a visual representation of a building, separation from areas of potentially hazardous vegetation and the creation of an APZ.

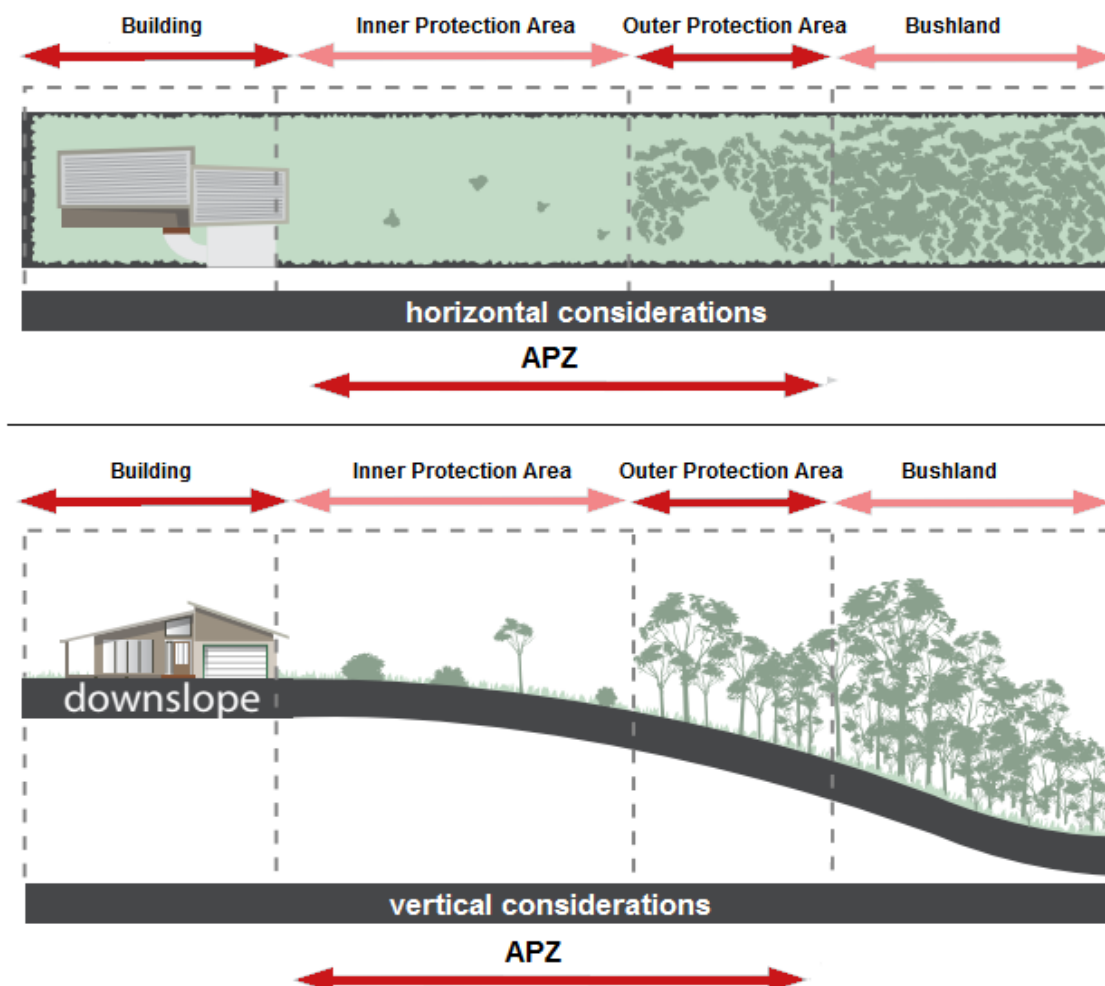


Figure 14: Building envelopes and their relationship to potentially hazardous vegetation. (Planning for Bushfire Protection 2017)

Additional details on creating and managing an APZ are provided in Appendix 5 Living in a Bushfire Prone Area.

5.3 Building design and construction

Careful design of new buildings in areas of mapped bushfire hazard needs to be undertaken; which includes consideration of site characteristics. Buildings should be constructed to meet the requirements of the relevant building standards and Council bylaws prevailing at the time to enable a building to be designed and constructed according to the site conditions. This includes the Building Code of Australia (BCA 2019) and the Australian Standard for “Construction of buildings in bushfire-prone areas (AS3959 – 2018).

A Bushfire Attack Level (BAL) in the order of 12.5 is identified for a dwelling on Lot B on the basis that a minimum separation distance of 31 metres is achieved between the dwelling and potentially hazardous upslope vegetation.

Appendix 2 Calculation of bushfire hazard contains information on the potential Bushfire Attack Levels that could be experienced on the site with Appendix 4 providing an explanation of BAL’s present.

5.4 Access and egress

Unhindered access and egress is required to the site to enable ready access by emergency services in a time of need. Both Lots are provided with constructed access to Mdina Drive on the north-eastern boundary of the site which is of sealed all-weather construction. Constructed access is provided to the BLE on Lot 21. Site access has an overall average slope in the order of 14% with civil engineer designed drawings for the driveway showing slopes on some portions of being up to 16%. The driveway has been constructed in accordance with the engineering drawings.

5.5 Vegetation management

Vegetation on the site comprises landscaped and maintained grounds around the existing dwelling on Lot A. Vegetation on the site consists of scattered mature eucalypt trees having a height in the order of 18 to 20 metres with a grassy understorey that is maintained by grazing by domestic animals and mowing. These management measures ensure that the site is maintained in a low fuel load state. A BLE is identified for Lot B which contains an area suitable for the construction of a dwelling that is well-separated from areas of unmanaged and potentially upslope hazardous vegetation. Ongoing vegetation management and control of woody weeds (such as lantana) on the site will prevent the potential for hazardous fuel loads to accumulate.

5.6 Firebreaks and fire trails

No firebreaks or fire trails are proposed due to good access being provided by Andrews Road to the east and Widderick Road to the south. Constructed access is to be provided the BLE on Lot B with an existing internal driveway on Lot A which is serviceable by emergency vehicles. Vegetation is managed on the site, and on adjacent properties which limits the potential for a destructive wildfire to impact the site.

5.7 Water supply

The Toowoomba Regional Council Planning Scheme Bushfire Hazard Overlay code requires that an adequate water supply is provided for fire-fighting purposes. This can be achieved by connection to a reticulated water supply with sufficient pressure and flow rates for fire-fighting purposes. Alternatively, a static water supply (tank/s) is to be provided at the time of constructing a dwelling on Lot B that:

- (a) contains a minimum volume of 10,000 litres; and
- (b) is either below ground level or constructed of non-flammable construction; and
- (c) (e) Is provided with rural fire brigade tank fittings; and
- (d) allows a medium rigid vehicle (15 tonne fire appliance) safe and clear access within 6 metres of the tank.

5.8 Landscaping

The design, management and maintenance of the landscape in the immediate vicinity of buildings are fundamental to the chances of survival of both people and buildings in a bushfire event. Vegetation provides the major fuel element in a bushfire. All vegetation, regardless of how succulent or green it is will eventually burn, provided the fire has sufficient intensity. Contrary to common belief, the area around the building does not need to be totally devoid of vegetation, and in fact some trees in this area can serve a valuable role in trapping embers before they impact on the asset. It is important however that:

- (a) There are substantial gaps (of at least 2 - 5m) between the canopies of any trees in this area;
- (b) There are no continuous fuels linked horizontally or vertically. (Smooth barked trees provide a lesser fuel ladder to the canopy than rough barked or ribbon barked species);
- (c) Tree canopies do not overhang the roof;
- (d) Surface and near surface fuels are kept to a minimum. This includes lawns to be kept short (less than 10 cm in height) and removal of accumulated leaf and bark litter; and
- (e) Avoidance of flammable mulches on garden beds such as woodchip or straw within 10 metres of dwellings.

Additional guidelines for landscaping in fire prone areas are provided in Appendix 6.

5.9 Prepare, Act, Survive

It is important that residents are well prepared during times of high fire danger and have well made plans that can be readily enacted in a time of bushfire emergency. This includes having plans in place to guide actions on days of extreme and catastrophic, identifying safe refuge areas and planning to either 'stay' or 'go'. The key message being; Prepare, Act and Survive. The Queensland Fire and Emergency Services have information readily available to assist people living in bushfire prone areas to develop their own plans. Details can be downloaded from:

www.ruralfire.qld.gov.au/BushFire_Safety/Pages/default.aspx

5.10 Maintenance of bushfire mitigation measures

This fire report has been prepared on the basis that bushfire mitigation measures identified are implemented and maintained into the foreseeable future. Failure to maintain these measures may contribute to the development being exposed to a higher level of bushfire threat and attack.

6.0 Planning requirements

The Queensland Government's State Planning Policy (SPP) for Natural Hazards (Bushfire) contains development assessment requirements that developments in bushfire prone areas are required to address. Likewise, the TRPS (2012 Version 28) Bushfire hazard overlay code contains provisions to protect the safety of people and property in bushfire risk areas. The Code proposes Performance outcomes and Acceptable outcomes which have been addressed through Proposed Solutions.

A summary of compliance with SPP and TRC Bushfire hazard overlay code is presented in Table.

Table7: Summary of compliance to the Queensland SPP and TRC Bushfire hazard overlay code

Issue	Compliance		Reference to proposed solution		
	SPP	TRC Bushfire Hazard Overlay Code	QLD SPP Table 8	TRC Table 9	TRC Table 10
Risk mitigation	✓	✓	PS1	PS2.1, PS2.2	
Water access	✓	✓	PS1 (3), PS2 (1-2), PS3 (3), PS4 (2)	PS1	PS3.1-3
Access and Egress	✓	✓	PS1 (4), PS2 (2)		PS6.1-4
Vegetation management	✓	✓	PS1 (1), PS2 (3), PS3 (1-3)		PS5.1
Asset Protection Zones	✓	✓	PS1 (1) PS3 (2)	PS3.1	PS5.1
Location of buildings	✓	✓	PS1 (1)	PS3.1	PS5.1
Building design & construction	✓	✓	PS1 (2)	PS2.2, PS3.1	PS5.1
Hazardous materials	✓	✓	PS4		PS4.1
Community infrastructure	N/A	N/A	N/A	N/A	N/A

6.1 State Planning Policy - Bushfire

The State Planning Policy (July 2017) provides a comprehensive set of principles which underpin Queensland's planning system to guide local government and the state government in land use planning and development assessment. The State's interest in relation to natural hazards is: "The risks associated with natural hazards are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards". The State Planning Policy (July 2017) development assessment requirements have been addressed in Table 8.

Table 8: State Planning Policy development assessment requirements (Natural hazards, risk and resilience - Bushfire)

Assessment Benchmark	Development Assessment Requirement	Proposed Solution
Applicable development	A development application for a material change of use, reconfiguration of a lot or operational works on premises in any of the following: 1. bushfire prone areas 2. flood hazard areas 3. landslide hazard areas 4. storm tide inundation areas 5. erosion prone area.	Development is the Reconfiguration of a Lot (RaL) being a 2 into 2 lot development with areas of approximately 0.46 and 6.55 hectares. The site is identified as bushfire prone under the SPP Interactive Mapping System. Areas of mapped Very High, High, and Medium potential bushfire intensity and Potential Impact Buffer are mapped for the site.
3	Bushfire, flood, landslide, storm tide inundation, and erosion prone areas outside the coastal management district: Development other than that assessed against (1) above, avoids natural hazard areas, or where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level.	PS1. The is located within an area of mapped bushfire hazard by the Queensland Government Development Assessment Mapping System Natural Hazards Risk and Resilience mapping (Bushfire). The Toowoomba Regional Council Bushfire Hazard Overlay Code mapping identifies the development footprint as containing limited areas of Medium bushfire hazard. A site assessment was conducted to confirm the presence of mapped VHC classes and the level of potential bushfire hazard present. A Bushfire Management Plan was prepared that identifies measures to mitigate the risks to people and property to an acceptable level. Included in the hazard assessment were identification of vegetation hazard class (VHC) present and the calculation of Bushfire Attack Levels. Mitigation measures identified include: 1. Buildings to comply with relevant standards of building construction including the BCA and AS3959-2018. A BAL of 12.5 is identified for the BLE on Lot B; 2. Provision of an adequate water supply that can be readily accessed for fire-fighting purposes; and 3. Adequate ingress and egress to the site. Provided the measures identified in the bushfire management plan are implemented and maintained, the bushfire risk to people, property and infrastructure can be kept to an acceptable level.
4	All natural hazard areas: Development supports and does not hinder disaster management response or recovery capacity and of capabilities.	PS2. Development is a RaL, being a 2 into 2 lot development with areas of approximately 0.46 and 6.55 hectares within an area mapped by the Queensland Government Development Assessment Mapping System as comprising bushfire prone. The development actively assists and supports disaster management capacity and capabilities by:

Assessment Benchmark	Development Assessment Requirement	Proposed Solution
		1. Providing ready access to a water supply suitable for fire-fighting purposes. This can be achieved by connection to a reticulated water supply or provision of a dedicated on-site water storage system that permanently holds a minimum of 10,000 litres for each lot for fire fighting purposes; and 2. Managing potentially hazardous fuel loads on the site.
5	All natural hazard areas: Development directly, indirectly and cumulatively avoids an increase in the severity of the natural hazard and the potential for damage on the site or to other properties	PS3. The development takes into consideration topography, location of existing vegetation and potential natural hazards. Vegetation on the site comprises was assessed to be VHC 39.2 <i>Low to moderate tree cover in built-up areas</i>. Mitigation measures identified include: 1. Maintenance of vegetation (including understorey) on the site to prevent the accumulation of hazardous fuel loads; 2. Ongoing management of woody environmental and highly flammable weeds on the site such as lantana in the vicinity of dwellings; 3. Landscaping near buildings to consist of plants that have low flammability.
6	All natural hazard areas: Risks to public safety and the environment from the location of hazardous materials and the release of these materials as a result of a natural hazard are avoided.	PS4. Development is a Ral - 2 into 2 lots. It does not involve the location or use of hazardous materials on the site. In this situation there is no potential for the release of these materials as a result of a natural hazard event.
7	All natural hazard areas: The natural processes and the protective function of landforms and the vegetation that can mitigate risks associated with the natural hazard are maintained or enhanced.	PS5 The development seeks to maintain and enhance the protective function of landforms and vegetation present on the site by: 1. Ongoing and effective management of environmental weeds on the site; 2. Retaining the natural landform by minimising the extent of major earthworks required; and 3. Ensuring that any landscape plantings are compatible with the natural environment and do not contribute to an elevated bushfire hazard. Incorporation of these measures in the development will enable natural processes and functions to continue and aid in the mitigation of risks associated with potential natural hazards.

6.2 Toowoomba Regional Council Planning Scheme - Bushfire

The Toowoomba Regional Planning Scheme (TRPS) (2012 Version 28) contains a Bushfire hazard overlay code.

1. The purpose of this code is to protect the safety of people and property in bushfire risk areas.
2. The purpose of the code will be achieved through the following overall outcomes:
 - a. development does not increase the exposure of people and property to an unacceptable bushfire hazard risk;
 - b. development located in a bushfire risk area is designed to mitigate the bushfire risk through siting, design and management measures;
 - c. development provides access and evacuation routes for both private and emergency service vehicles which are appropriate to the nature of the development and the level of bushfire risk;
 - d. development for essential community infrastructure is able to function effectively during and immediately after a bushfire event;
 - e. public health and safety and the environment are not put at risk by development involving the manufacture and/or storage of hazardous goods in a bushfire hazard area;
 - f. the reconfiguration of land appropriately responds to bushfire hazard having regard to the appropriate siting of future development and access for evacuation; and
 - g. development provides access to an adequate water supply for firefighting purposes.

This code identifies performance outcomes and acceptable outcomes. Where appropriate, this Code has been applied to the development and outcomes proposed to comply with the accepted development and assessment benchmarks. Tables 9 and 10 provide responses to the Bushfire hazard overlay code.

Table 9: Bushfire Hazard Overlay Code –requirements for accepted development and assessment benchmarks for assessable development

Performance outcomes	Acceptable Outcomes	Proposed solutions
PO1 Development is provided with an adequate water supply for fire-fighting purposes that is safely located and freely accessible.	AO1.1 Development within a water supply area involving the creation of a new lot/s or involving proposed and existing buildings with a combined gross floor area greater than 50m ² , is connected to Council's reticulated water supply system It will be readily available at all times for fire fighting vehicles and a water supply outlet located within the road reserve is within 40m of the following: 1. All of the land; or 2. A building envelope designated on each lot; or	PS1.1 Lot B is to be provided with ready access to Council's reticulated water supply so as to provide a reliable fire-fighting water source (for both structural and bush fires) in compliance with AO 1.1. A Council maintained reticulated water supply is located on the eastern boundary of Lot B in Andrews Road.

Performance outcomes	Acceptable Outcomes	Proposed solutions
	3. The centre of each lot, excluding access handles (where no building envelope is designated); and 4. All existing and proposed buildings And Fire hydrants are designed and installed in accordance with Queensland Fire and Emergency Services Fire Hydrant and Vehicle Access Guidelines, unless otherwise specified by the relevant water entity. AO1.2 Development outside a water supply area involving proposed or existing buildings with a combined gross floor area greater than 50m², are provided with a dedicated on site water storage system that permanently holds a minimum of 10,000 litres (e.g. dam, swimming pool or water tank) for fire fighting purposes. AO1.3 A water tank is provided within 10m of each building (other than a class 10 building) which: - Is either below ground level or of non-flammable construction; - Has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: 10,000 litres for residential buildings; - For industrial, commercial and other buildings: a volume specified in AS2304- 2011; - Includes shielding of tanks and pumps in accordance with AS2304-2011; - Includes a hardstand area allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank; - Is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50mm ball valve and male camlock coupling and, if underground, an access hole of	PS1.2 Not applicable. Development is located within a reticulated water supply area. PS1.3 If a future dwelling on Lot B is not connected to the reticulated water supply, then a dedicated water supply for fire-fighting purposes is to be provided in accordance with AO1.3.

Performance outcomes	Acceptable Outcomes	Proposed solutions
	200mm (minimum) to accommodate suction lines); and f. Is clearly identified by directional signage at the street frontage	
PO2 Development provides for the safety of people and people by avoiding areas of High or Medium bushfire risk.	AO2.1 Development is located on land that is not subject to High or Medium bushfire hazard. OR AO2.2 Where development is located in a High or Medium bushfire hazard area (except for single dwellings on existing lots), it complies with a Bushfire Management Plan for the premises.	PS2.1 The site is mapped by Council as containing areas of Medium bushfire hazard. Mapping by the Queensland Government identified areas of bushfire hazard on the site. PS2.2 A bushfire Management Plan has been prepared for the site which identifies the standard of building required, emergency fire-fighting water supplies and ingress and egress requirements. New buildings on Lot B to be constructed are to comply with current relevant building standards. This includes the Building Code of Australia (Parts 1 and 2) and AS3959-2018.
PO3 Development provides for the safety of people and property by mitigating the bushfire risk through the siting of buildings.	AO3.1 Buildings and structures: - are sited in locations of lowest hazard within the lot; and - achieve setbacks from hazardous vegetation of 1.5 times the predominant mature canopy tree height or 10 metres, whichever is the greater; and - are 10 metres from any retained vegetation strips or small areas of vegetation; and - are sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard.	PS3.1 - Suitable areas are available on proposed Lot B that enable future buildings to be located in areas of least hazard. A BLE has been identified that allows a potential dwelling on the lot to be exposed to a BAL of 12.5; and - The BLE on Lot B achieves achieve setbacks from potentially hazardous vegetation of 1.5 times the predominant mature canopy tree height (18 to 20 metres); and - Are greater than 10 metres from any retained vegetation strips or small areas of vegetation; and - Elements least susceptible to fire such as tennis courts or swimming pools should be located closest to the bushfire hazard. Appendix 2 Calculation of bushfire hazard provides additional information on the level of bushfire hazard posed to buildings and the methodology used to calculate it. A site-specific bushfire report should be prepared to guide the construction of new dwellings taking into account location of buildings and prevailing building requirements.

Table 10: Bushfire Hazard Overlay Code - assessment benchmarks for assessable development

Performance Outcomes	Acceptable Outcomes	Proposed Solutions
For all Development		
PO1 Community infrastructure is only located in a bushfire medium and high risk area where the function and role of the infrastructure necessitates its location in the area and there are no suitable alternative sites in a low bushfire hazard area.	No acceptable outcome is nominated.	PO1. Not applicable Development is a RaL being 2 into 2 lots. No community facilities proposed.
PO2 Community infrastructure is able to function effectively during and immediately after bushfire events.	AO2.1 The community infrastructure is located on land that is not subject to High or Medium bushfire risk; or Note for AO2.1: A site-specific bushfire hazard assessment is necessary to demonstrate that although the proposed development site is within bushfire hazard area, the bushfire hazard is low on that site. Note for AO2.1: A site-specific bushfire hazard assessment is necessary to demonstrate that although the proposed development site is within bushfire hazard area, the bushfire hazard is low on that site. AO2.2 The community infrastructure will not involve any new building work other than a minor extension (<20 m² Gross Floor Area) to an existing building; or AO2.3 The community infrastructure development is located within a bushfire hazard area (as identified in the Bushfire Hazard Overlay Maps) but is designed to function effectively during and immediately after bushfire events.	PO2.1 Not applicable. PO2.2 Not applicable. PO2.3 Not applicable.

Performance Outcomes	Acceptable Outcomes	Proposed Solutions
	Note for AO2.3: The development application must include and comply with a comprehensive Bushfire Management Plan.	
Water Supply		
PO3 Development is provided with an adequate water supply for fire fighting purposes that is safely located and freely accessible.	AO3.1 Development within a water supply area involving the creation of a new lot/s or involving proposed and existing buildings with a combined gross floor area greater than 50m ² , is connected to Council's reticulated water supply system. It will be readily available at all times for fire fighting vehicles and a water supply outlet located within the road reserve is within 40m ² of the following: a. All of the land; or b. A building envelope designated on each lot; or c. The centre of each lot, excluding access handles (where no building envelope is designated); and d. All existing and proposed buildings And Fire hydrants are designed and installed in accordance with Queensland Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines, unless otherwise specified by the relevant water entity. AO3.2 Development outside a water supply area involving proposed or existing buildings with a combined gross floor area greater than 50m ² , are provided with a dedicated on site water storage system that permanently holds a minimum of 10,000 litres (e.g. dam, swimming pool or water tank) for fire fighting purposes.	PS3.1 Lot B to be provided with ready access to Council's reticulated water supply so as to provide a reliable fire-fighting water source (for both structural and bush fires) in compliance with AO3.1.
		PS3.2 Not applicable.
	AO3.3 A water tank is provided within 10m of each building (other than a class 10 building) which:	PS3.3 If Lot B is not connected to a reticulated water supply, then a dedicated fire-fighting water supply is to be provided

Performance Outcomes	Acceptable Outcomes	Proposed Solutions
	a. Is either below ground level or of non-flammable construction; b. Has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: i. 10,00 litres for residential buildings; ii. (For industrial, commercial; and other buildings, a volume specified in AS2304-2011 c. Includes shielding of tanks and pumps in accordance with AS2304-2011 d. Includes a hardstand area allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank e. Is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines); and f. Is clearly identified by directional signage at the street frontage	in accordance with the requirements of AO3.3.
Hazardous Materials		
PO4 Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on the manufacture or storage of hazardous materials in bulk.	AO4.1 Development complies with a Bushfire Management Plan for the premises. Note: 'Hazardous materials in bulk' is defined in Section 9, Glossary of the SPP Guideline. Where the assessment manager has not previously approved a Bushfire Management Plan (see Note 1.7 above), the development proponent will be expected to prepare such a plan to the satisfaction of the assessment manager. See Appendix 8 for more	PS4.1 Development is to comply with this bushfire management plan. The proposed land use does not include the storage of bulk quantities of hazardous materials.

Performance Outcomes	Acceptable Outcomes	Proposed Solutions
	information on bushfire management plans.	
Reconfiguring a lot and Material Change of Use		
PO5 Lot design and the siting of buildings provide safe sites for habitable and non-habitable buildings.	AO5.1 All development enables buildings and structures to achieve setbacks from hazardous vegetation that are: a. sited within the area of lowest hazard within the lot; and b. provide for adequate setbacks from hazardous vegetation; and c. 1.5 times the predominant mature canopy tree height or 10m, whichever is the greater; and d. 10m from any retained vegetation strips or small areas of vegetation; and e. sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard.	PS5.1 Development is a RaL being 2 into 2 lots. The proposed lot layout configuration enables buildings and structures to be sited within areas that: a. Comprise areas of reduced bushfire hazard; b. Achieve adequate setbacks from potentially hazardous vegetation of greater than 31 metres are achieved. Lot B is located within an area of identified Bushfire Potential Impact Buffer; c. The BLE on Lot B achieves achieve setbacks from potentially hazardous vegetation of 1.5 times the predominant mature canopy tree height (18 to 20 metres). The Australian Standard AS3959-2018 allows for the construction of buildings closer to vegetation than this provided that they are built to a higher standard; and d. Greater than 10m from any retained vegetation strips or small areas of vegetation; and e. Are sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard. Construction of new structures is to comply with AS3959-2018 and the BCA. Appendix 2 Calculation of bushfire hazard provides additional information on the level of bushfire hazard posed to buildings and the methodology used to calculate it
PO6 For development that will result in multiple buildings or lots, roads and access are designed to mitigate against bushfire hazard by ensuring adequate access for: a. fire fighting and other	AO6.1 The road design is capable of providing access for fire fighting and other emergency vehicles, in accordance with the standards identified in SC6.2 PSP No. 2 – Engineering Standards – Roads and Drainage Infrastructure. AO6.2 The lot layout ensures that all roads are through roads.	PS6.1 Not applicable No new roads are proposed. PS6.2 Not applicable PS6.3

Performance Outcomes	Acceptable Outcomes	Proposed Solutions
emergency vehicles; and b. the evacuation of people in the event of an emergency.	AO6.3 The lot layout does not include long narrow lots, long access ways or rear lots. AO6.4 The road has a maximum gradient of 1 in 8 (12.5%).	The development does not result in long narrow lots. PS6.4 Proposed access to the BLE on Lot B will have a have a gradient that does not exceed 12.5%.
PO7 For development that will result in multiple buildings or lots, fire breaks are provided that: a. adequately and effectively separate the development site from surrounding vegetation to mitigate against bushfire hazard; b. have sufficient width to enable continuous access for fire fighting and other emergency vehicles, residents and equipment; and c. are in secure tenure and are maintained.	AO7.1 The development incorporates a fire break provided by a perimeter road that: - separates the boundary of the lots and the adjacent bushland; - has a minimum cleared width of 20m; - has a formed road width of 6m; and - is constructed to an all weather standard. AO7.2 The development includes fire breaks which are located as close as possible to the boundaries of the lot(s) and the adjoining bushfire hazard and the fire breaks have: - a minimum cleared width of 6m; - a minimum formed width of 4m; - a maximum gradient of 1 in 8 (12.5%); - are constructed and maintained to prevent erosion, provide adequate drainage and provide continuous access for fire fighting vehicles; - provide passing bays and turning areas for fire-fighting appliances; and - are either located on public land, or within an access easement that is granted in favour of the Toowoomba Regional Council and the Queensland Fire and Rescue Service. AO7.3 Vehicular access is provided along and at each end of	PS7.1-4 Development is a RaL comprising 2 into 2 lots. Due to the nature of the development, the presence of existing roads and limited areas of potential bushfire hazard, no firebreaks and fire management lines are proposed.

Performance Outcomes	Acceptable Outcomes	Proposed Solutions
	the fire break to existing fire maintenance trails or roads. AO7.4 The development includes sufficient cleared breaks of 6m minimum width in retained bushland within the development (e.g. creek corridors and retained vegetation) to allow burning of sections and access for bushfire response.	

7.0 Conclusion

The bushfire assessment of the site identified that in general hazards are relatively low with a Bushfire Attack Level (BAL) of 12.5 identified for a potential dwelling located within the identified BLE on Lot B. The bushfire risk to built assets can be effectively managed at the design and construction phase through the application of the National Construction Code and the Australian Standard Construction of buildings in bushfire-prone areas (AS3959-2018) and ongoing vegetation maintenance.

7.1 Recommendations

The following recommendations are made for the proposed development with reference to the bushfire management requirements of the site:

- That buildings are designed and constructed to meet the requirements of the relevant building standards prevailing at the time. This includes AS3959 – 2018, the BCA and relevant Council bylaws and building regulations.
- That vegetation be managed on the site to minimise the accumulation of hazardous fuel loads and to control understory woody and highly flammable weeds such as lantana.
- That any landscaping works utilise plant species and design principles suitable for bushfire prone areas and in accordance with Appendix 6.
- That Lot B be provided with access to a reticulated water supply having sufficient pressure for fire-fighting purposes or that a minimum dedicated water supply of 10,000 litres be provided at the time of constructing a dwelling.
- That bushfire mitigation measures identified in this bushfire management report are implemented and maintained.

8.0 References

Australian Standard; 2018. Construction of Buildings in Bushfire-prone Areas (AS3959–2018). Sydney.

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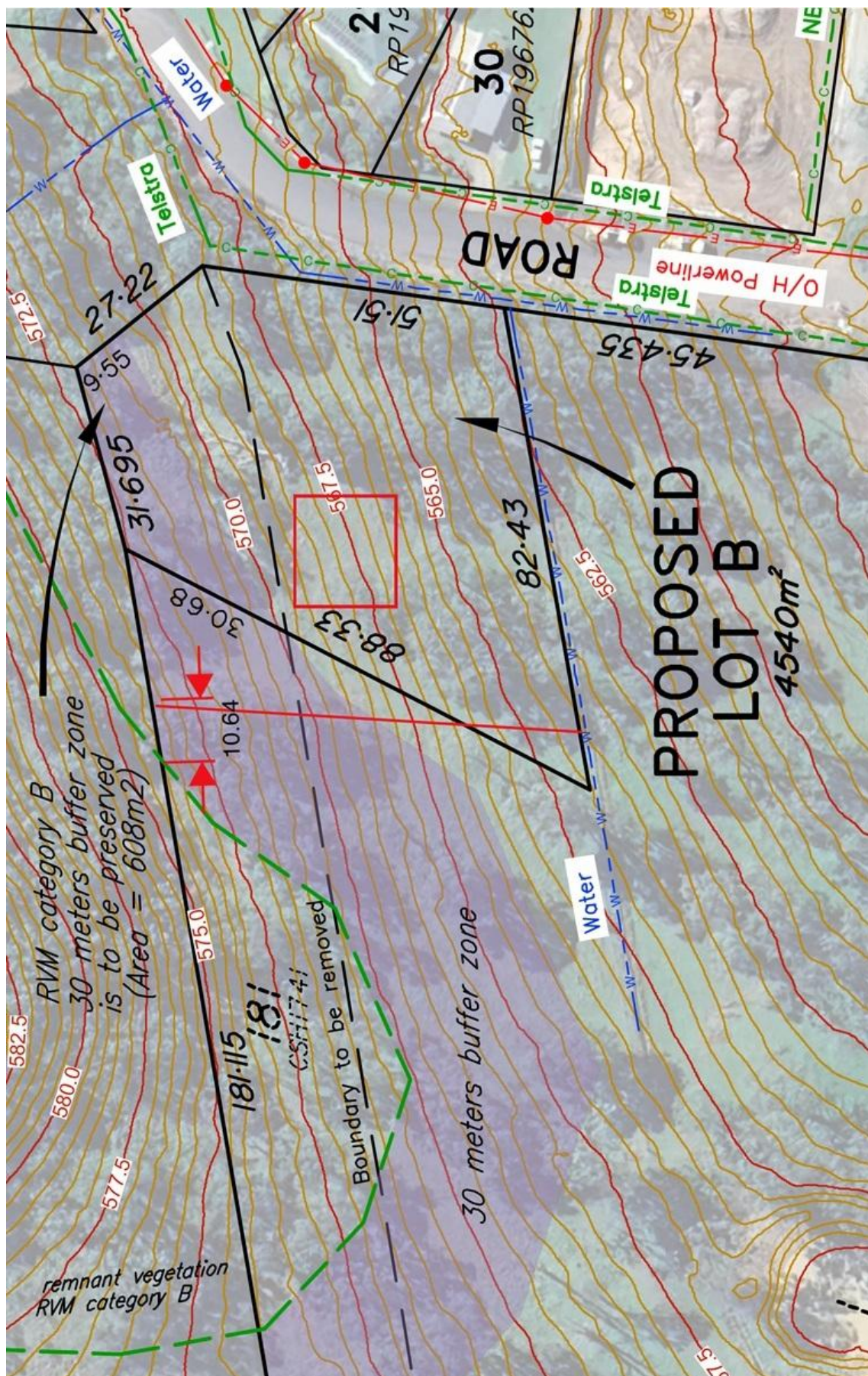
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Appendix 1: Site plan



Appendix 2: Calculation of Bushfire Hazard

In accordance with SPP guidance material (Bushfire Resilient Communities (QFES 2019)) the vegetation hazard class (VHC) mapping was reviewed and modified to accurately represent the on-ground matters through a field assessment.

Vegetation hazard class and 80th percentile potential fuel load inputs from QFES (2019) were utilised to determine the radiant heat exposure using the QFES SPP Asset Protection Zone Width Calculator.

Determination of Bushfire Attack Level – SPP APZ Calculator

The bushfire hazard that buildings could potentially be exposed to was calculated using the QFES SPP Asset Protection Zone Width Calculator and fuel loads consistent with the post-development VHCs as set out in SPP technical reference guide 'Bushfire Resilient Communities' (2019). AS 3959-2018 identifies the level of construction required for the purpose of ensuring that a building is constructed to withstand a potential bushfire attack. This Standard is primarily concerned with improving the ability of buildings in designated bushfire-prone areas to better withstand attack from bushfire, thus giving a measure of protection to the building occupants (until the fire front passes) as well as to the building itself. AS3959-2018 requires that vegetation be assessed within 100 metres of a building when determining the Bushfire Attack Level.

Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire' (2019) requires that bushfire hazard is to be assessed within 150m of the development footprint.

Climatic conditions and Forest Fire Danger Index

The McArthur Forest Fire Danger Index (or FFDI) is the most common proxy of fire weather severity in Australia and is used for bushfire hazard assessments, emergency management and in regulations such as the Australian Standard 3959–2018 Construction of buildings in bushfire-prone areas.

Unlike Queensland's adoption of AS 3959–2018 (Method 1) that uses a single FFDI value for all of Queensland (40), the estimate of fire weather severity used as an input to identifying the SPP bushfire prone areas in Queensland recognises that weather conditions vary across the state.

Spatially explicit 5% annual exceedance probability (AEP) fire weather event FFDI values for Queensland have been estimated from a gridded (83 kilometre, three-hourly resolution) prediction of FFDI from long-term spatial weather products produced by the Australian Bureau of Meteorology (BoM). The adopted FFDI values reflect a 5% AEP weather event. Adopted FWS (i.e., 5% AEP fire weather event FFDI) values for Queensland vary from 50 in Southeast Queensland and Cape York bioregions to 130 in the south-western parts of the state.

A FFDI of 60 was identified for the site using the Bushfire Resilient Communities website. A BAL map was prepared for Lot B and the BLE. Figure 15 illustrates the location and extent of the BLE on Lot B, Figure 16 illustrates the BALs present in relation to the BLE, with Table 11 providing details of the BAL calculations that a dwelling located within the BLE on Lot B could potentially be exposed to.

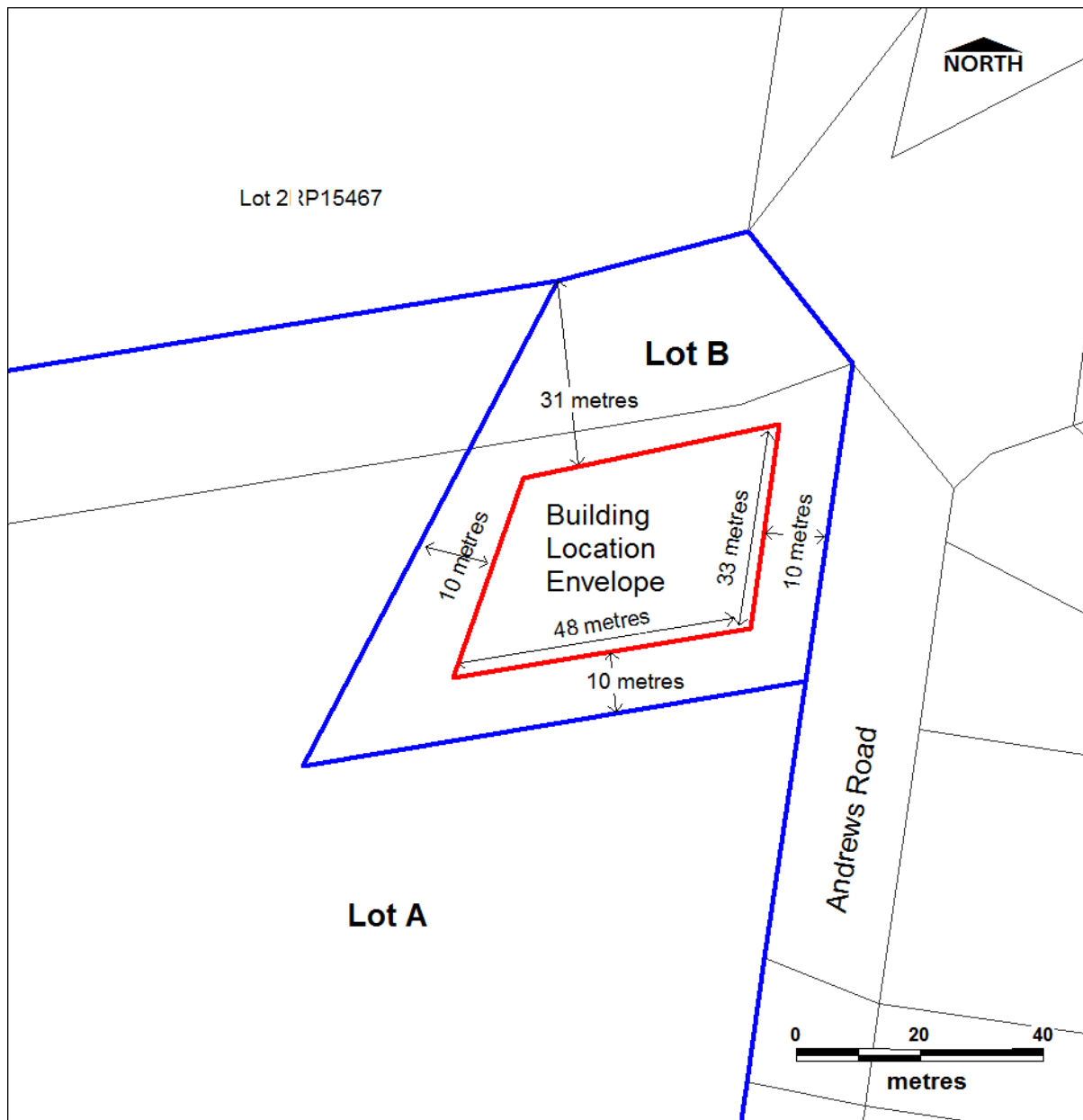


Figure 15: Building Location Envelope (BLE) identified for Lot B with dimensions

Table 11: QFES SPP Bushfire APZ Calculator values for the areas within a 100-metre radius of the dwelling.

SPP Bushfire Asset Protection Zone Width Calculator						
Variable description	Variable	Units	Value			
Input Values						
			North	East	South	West
Fire weather severity	FDI		60	60	60	60
Vegetation Hazard Class	VHC	-	9.2	41.4	39.2	39.2
Remnant status	-	-	Remnant	Non-remnant	Non-remnant	Non-remnant
Slope type (Upslope or Downslope)	ST	-	Upslope	Downslope	Downslope	Upslope
Effective slope under hazardous vegetation	eSlope	degrees	5.0	5.0	5.0	2.0
Slope between site and hazardous vegetation	θ	degrees	5.0	5.0	5.0	2.0
Distance of site from hazardous vegetation	d	m	>31m	>10m	>10m	>10m
Output Values						
Surface fuel load	-	t/ha	11.40	0.50	2.00	2.00
Near surface fuel load	-	t/ha	3.50	2.00	3.00	3.00
Bark fuel load	-	t/ha	1.30	0.50	2.00	2.00
Elevated fuel load	-	t/ha	1.00	0.00	1.00	1.00
Total overall fuel load	W	t/ha	17.20	3.00	8.00	8.00
Total surface fuel load	w	t/ha	14.90	0.50	2.00	2.00
Potential fireline intensity	I	kW/m	9534	0	0	0
Radiant heat flux	q	kW/m²	12.23	0.00	0.00	0.00
Bushfire Attack Level (AS 3959-2018)	BAL	-	BAL-12.5	BAL-12.5	BAL-12.5	BAL-12.5

***Note:** This fire report has been prepared on the basis that a minimum separation distance of **31 metres** exists between the dwelling and the edge of hazardous understory upslope vegetation.

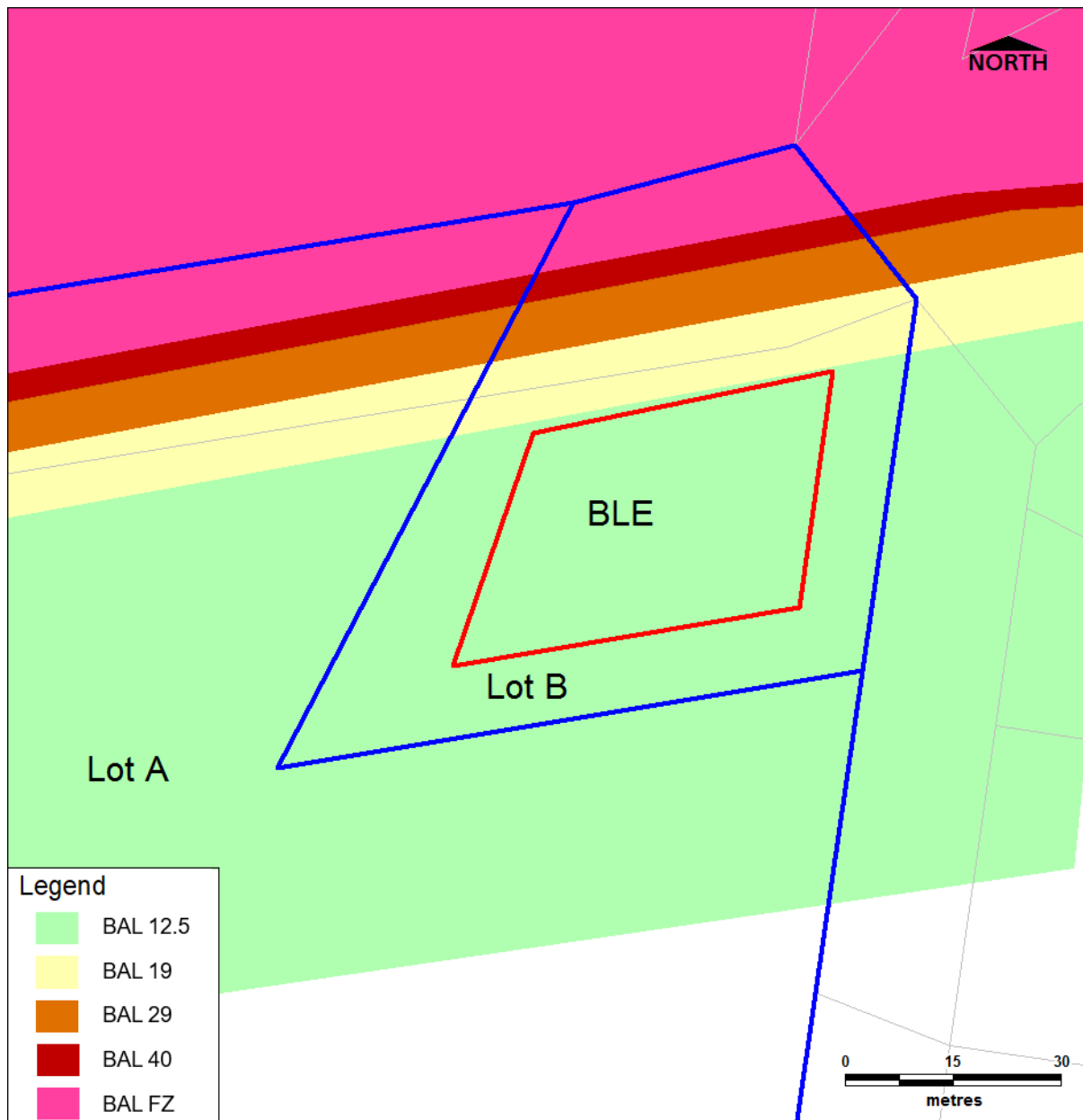


Figure 16: BAL map and BLE for Lot B

Appendix 3: Summary of AS3959-2018 BAL 12.5 construction requirements

Note: this is a summary of some portions of the standard - the building designer, builder and subcontractors should refer to AS3959-2018 in full prior to construction.

Subfloor supports

The Standard does not provide construction requirements for sub-floor supports where the sub-floor is enclosed in accordance with wall that conforms to the requirements for walls listed below or is enclosed with corrosion resistant steel, bronze or aluminium mesh with a maximum aperture of 2 mm.

Floors

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

Unenclosed subfloor space

The standard does not provide construction requirements for bearers, joists and floors that are greater than 400mm above finished ground level

External walls

External walls that are less than 400mm from the ground, decks, carport roofs and similar elements should be:

- (a) made of non-combustible materials (e.g. full masonry, brick veneer etc.) with a minimum thickness of 90 mm,
- (b) timber logs with a density of 680 kg/m³ and a minimum nominal thickness of 90mm; or
- (c) cladding that is fixed externally to a timber or metal frame and is:
 - (i) non-combustible; or
 - (ii) fibre cement a minimum of 6mm thick; or
 - (iii) bushfire-resisting timber.

Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed.

Vents and weepholes

Vents and weepholes in external walls are to be screened with corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture of 2 mm.

External glazed elements, assemblies and doors

Screens for windows and doors

Where fitted, screens for windows and doors shall have mesh or perforated sheet made of corrosion-resistant steel, bronze or aluminium with a maximum aperture of 2 mm.

Windows

Frame material for windows less than 400 mm from the ground, decks, carport roofs and awnings, window frames are to be made from bushfire-resisting timber, metal or metal-reinforced uPVC.

Where glazing is less than 400mm from the ground, decks, carport roofs and awnings, glazing shall be Grade A safety glass with a minimum 4 mm thickness.

The openable portions of windows shall be screened with a mesh with a max aperture of 2 mm made of corrosion resistant steel, bronze or aluminium.

Doors - side hung external doors, panel fold & sliding doors

Doors- shall be completely protected externally by a screen with a mesh with a max aperture of 2mm made of corrosion resistant steel, bronze or aluminium, **OR**

Door panel material shall be:

- (a) non-combustible; or
- (b) solid timber, laminated timber or reconstituted timber, having a minimum thickness of 35 mm for the first 400 mm above the threshold;
- (c) hollow core, solid timber, laminated timber or reconstituted timber with a non-combustible kickplate on the outside for the first 400 mm above the threshold; or
- (d) protected externally by a metal screen with a maximum aperture of 2 mm; or
- (e) fully framed glazed door panels with framing made from metal or bushfire resisting timber.

There is no requirement to screen the openable part of a door at this level.

Garage doors

The lower portion (within 400 mm of the ground) of vehicle access doors shall be made from:

- (i) non-combustible material; or
- (ii) bushfire-resisting timber; or
- (iii) fibre-cement sheet, a minimum of 6 mm in thickness; or
- (iv) a combination of any of items (i), (ii) or (iii) above.

All vehicle access doors to be protected with suitable weather strips, draught excluders, draught seals or brushes.

Roofs

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

- (a) roof tiles, roof sheets and roof covering accessories shall be non-combustible,
- (b) the roof/wall and roof/roof junction shall be sealed, or otherwise protected to prevent openings greater than 2mm,
- (c) roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a max aperture of 2mm made of corrosion resistant steel, bronze or aluminium.

Tiled roofs shall be fully sarked.

Sheet roofs shall:

- (a) be fully sarked with sarking, except that foil backed insulation blankets may be installed over battens; **OR**
- (b) have any gaps sealed at the fascia, or wall line, hips and ridges by:
 - (i) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium (this may include gutter guard), or
 - (ii) mineral wool, or

- (iii) other non-combustible material, or
- (iv) -a combination of any of the above.

Roof penetrations

The following apply to roof penetrations:

- (a) roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors, shall be adequately sealed at the roof to prevent gaps greater than 3 mm.
- (b) openings in vented roof lights, roof ventilators or vent pipes shall be fitted with ember guards made from a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.
- (c) glazed elements in roof lights and skylights may be of polymer provided a grade safety glass diffuser, complying with AS 1288, is installed under the glazing.

Eaves linings, fascias and gables

The following apply to eaves linings, fascias and gables:

- (a) gables shall comply with requirements for walls.
- (b) eaves ventilation openings are to be fitted with ember guards and be made of corrosion resistant steel, bronze or aluminium.

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

Gutters and downpipes

The Standard does not provide material requirements for gutters and downpipes, with the exception of box gutters.

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

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

Verandahs, decks, steps, ramps and landings

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

Decking, stair treads and trafficable surfaces of ramps and landings less than 300 mm (measured horizontally at deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck are to be made from:

- (a) of non-combustible material; or
- (b) of bushfire-resisting timber; or
- (c) a combination of items (a) and (b) above.

Water and gas supply pipes

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

Appendix 4: Bushfire Attack Levels explained

				
BAL-12.5	BAL-19	BAL-29	BAL-40	BAL-FZ
The risk is considered to be LOW	The risk is considered to be MODERATE	The risk is considered to be HIGH.	The risk is considered to be VERY HIGH.	The risk is considered to be EXTREME.
There is a risk of ember attack. The construction elements are expected to be exposed to a heat flux not greater than 12.5 kW/m ² .	There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m ² .	There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m ² .	There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux not greater than 40 kW/m ² .	There is an extremely high risk of ember attack and burning debris ignited by windborne embers, and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux greater than 40 kW/m ² .

Images sourced from Planning Practice Note 65 September 2014 Victoria State Government

Appendix 5: Living in a Bushfire Prone area

A bushfire can ignite fuel and spread in three ways:

- Embers and burning debris carried by wind,
- Heat radiation from fire, and
- Direct flame contact

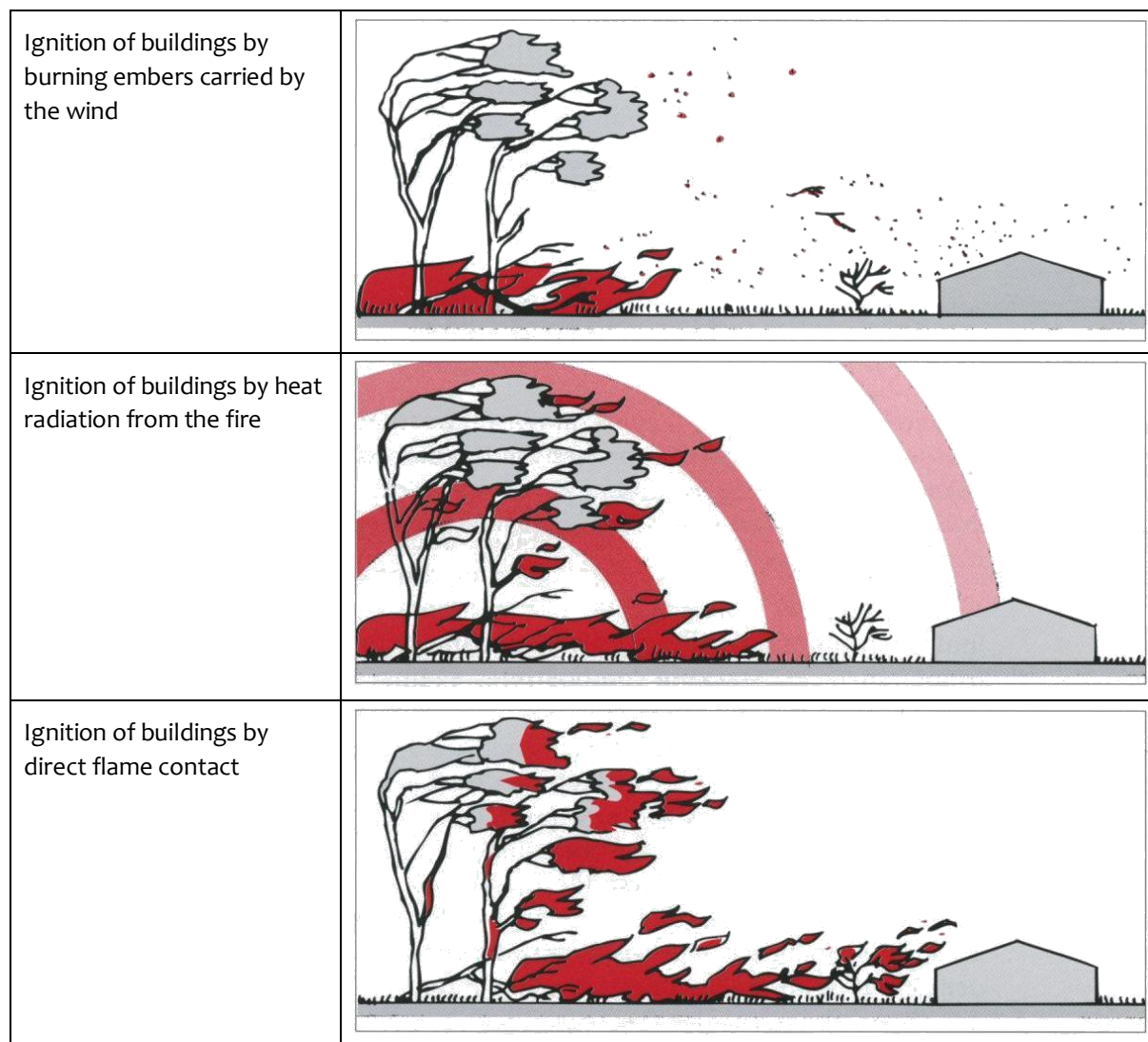


Figure 17: The three main elements of bushfire, which threaten life and property. (Ramsay & Rudolf 2003)

Overall, the intention of bush fire protection measures should be to prevent flame contact to a structure, reduce radiant heat to below the ignition thresholds for various elements of a building, to minimise the potential for wind driven embers to cause ignition and reduce the effects of smoke on residents and fire-fighters.

Asset Protection Zones

The most immediate form of defense for an asset is a well-designed Asset Protection Zone (APZ). This zone serves to protect the asset from flames and radiant heat. It improves the chances of the asset surviving the passing of the fire front, providing a safe refuge for occupants during this period and providing a relatively "defendable space" for firefighting activity.

Whilst research shows that ember attack ultimately claims more vacant houses than radiant heat or flames, if a house is occupied, ember attack can be relatively easily dealt with.

The consequence of leaving a house unattended is that there will probably be nobody there to prevent the small fires which initially start, from gradually taking hold of various parts of the structure. This process can occur over a significant period of time, usually simply with embers which fly about and settle, and start smoldering. The hot windy conditions associated with the fire help fan the smoldering clumps of fuel and bring many small fires to life. These are usually easy fires to extinguish if there is someone there with the equipment and water to put them out. In their absence, often some time, even hours after the initial fire front, the house succumbs to small fires which have grown to larger ones.

Over 90% of houses burnt down in bushfires are attributable to ember attack, and the vast majority of these are unattended at the time. In the 1984 study of the Ash Wednesday Fires around Mt Macedon, the survival rate amongst the 450 houses was 82% where they were occupied and 90% where the occupants were active, able bodied defenders, while only 30% of houses survived without someone to patrol them (Wilson & Ferguson, 1984).

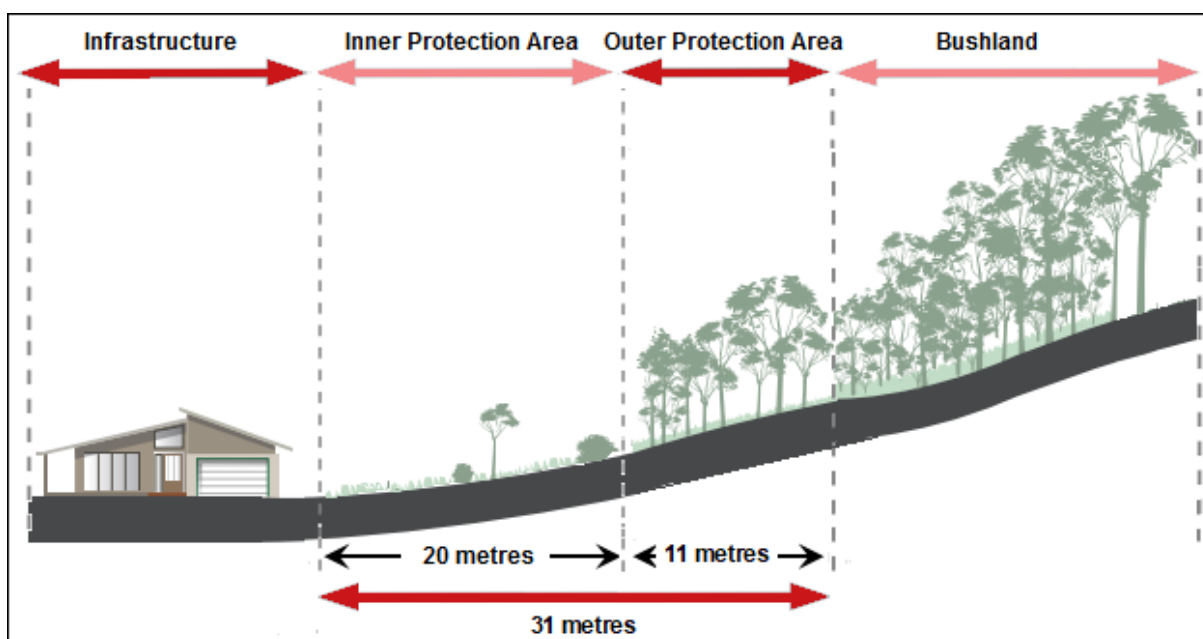


Figure 18: Recommended asset protection zone for the area to the north of the BLE. (Adapted from Planning for Bushfire Protection 2019)

Outer Protection Area (OPA) is effectively the fuel-reduced outer protection area which serves to deprive attacking fire of fuel and reduce the intensity of the fire front. Removal of mid layer fuels prevents flames from transferring from ground fuels to the canopy where destructive potential is greatest. The OPA will also help shield a building from radiant heat, minimize the rate of spread and also intercept burning embers carried by the wind. Understory fuel levels in the OPA should be kept below 8t/ha.

Inner Protection Area (IPA) refers to the area between the fuel reduced zone and the asset, and its design may serve to considerably reduce risks posed to the asset. Contrary to common belief, this area does not need to be devoid of vegetation, and in fact some trees in this area can serve a valuable role in trapping embers before they impact on the asset. It is important however that:

- There are substantial gaps (or at least 2 - 5m) between the canopies of any trees in this area.
- There are no continuous fuels linked horizontally or vertically. Smooth barked trees provide a lesser fuel ladder to the canopy than rough barked or ribbon barked species.
- Tree canopies do not overhang the roof.
- Surface and near surface fuels are kept to a minimum. This includes lawns (to be kept short) leaf litter and garden mulches.
- Plants with a higher tolerance to fire should be utilised closest to the house and are maintained in a healthy moisture state throughout the fire season.

Asset Protection Zones act as a buffer zone between a dwelling and the hazard. The primary purpose of an Asset Protection Zone is to ensure that a progressive reduction of bushfire fuels occurs between the bushfire hazard and any habitable structures.

Asset Protection Zones should be in place for dwellings adjoining a bushfire hazard area, whether it is a single building, a group of isolated buildings or an urban subdivision.

Various amenities can contribute to the Asset Protection Zone, provided they are not combustible or otherwise add to radiant heat levels. Such amenities include driveways, tennis courts, swimming pools or fire trails, each adding to the distance from the hazard.

Radiant heat barriers such as non-combustible walls or water tanks can help shield assets from radiant heat, thereby complementing the APZ, and in some cases reducing the requirement for distance from the hazard, to a degree.

The required distances for Asset Protection Zones are dependent on the vegetation type (hazard), the slope of the site and whether the hazard is upslope or downslope from the asset.

Appendix 6: Landscaping in Fire Prone Areas

The design, management and maintenance of the landscape in the immediate vicinity of buildings are fundamental to the chances of survival of both people and buildings in a bushfire event. Vegetation provides the major fuel element in a bushfire. All vegetation, regardless of how succulent or green it is will eventually burn, provided the fire has sufficient intensity. Table 12 identifies the attributes of plants that may influence fire behaviour.

Table 12: Characteristics of low flammability species and effect on performance in bushfire situations

Plant attribute	Effect	Design measures
Foliage moisture content	Leaves with higher moisture content retard ignition and slow the rate of combustion	Select species with high leaf moisture content (e.g. rainforest species, succulents and semi-succulents)
Foliage volatile oil content	Foliage with higher volatile oil content ignite more readily and enhance ignition of surrounding vegetation, even though volatile oils themselves do not contribute significantly to total radiant heat	Select species with lower volatile oil content
Foliage mineral content	Foliage with higher mineral content tend to be less flammable (e.g. Amyema spp mistletoes)	Species selection should favour species with higher leaf mineral content
Leaf fineness	The ratio of area-to-volume of leaves is one of the main factors affecting ease of ignition and intensity of burning. Finer leaves (greater area to volume ratio) tend to ignite and burn more easily than broader leaves	Species selection should favour broad-leafed species
Density of foliage and continuity of plant form	Species with continuous, denser foliage can act as a barrier to wind-borne embers and radiant heat; however, increased density can increase flammability. Species with open branching and low foliage density are less effective as a barrier, though can be less flammable	Select species on a case-by-case basis
Height of lowest foliage	Shrub and tree species with persistent low height foliage are more likely to be ignited by surface fires, allowing the spread of fires into the canopy above	Species selection should favour species which can be maintained or pruned to reduce persistent, near-ground foliage
Size of plant (volume and spread)	The effect of plant size varies according to volume or spread.	Species selection should ensure plant size (volume and spread)

	Species with a greater spread tend to be more effective as a barrier to the diffusion of radiant heat than narrower trees with the same volume. Species with a greater volume can result in increased ember attack, radiation and flame if ignited. For example, narrow columnar trees are less effective as a barrier than wider trees with the same overall volume	does not increase ignition likelihood
Dead foliage on plant	Persistent dead leaves and woody twigs increase flammability	Species selection should favour species which have a low volume of persistent dead leaves and woody material or can be maintained or pruned to reduce persistent, dead leaves and woody material
Bark texture	Loose, flaky, stringy, papery or ribbon-like bark contribute to ladder fuels which: - can contribute to destructive crown fires - act as a potential source of flame, radiant heat and ember attack	Avoid species with persistent loose, flaky, stringy, papery or ribbon-like bark. Species selection should favour smoothbarked and tightly-held bark species
Potential available surface fuel	The availability of surface fuel is a function of volume (quantity) and fineness. The fireline intensity increases in proportion to available fine fuel quantity. Fine fuel includes dead fallen material such as leaves, bark, twigs and branches up to 6mm in diameter (forest) and grass greater than 5cm in height (grasslands). Coarse fuel ignites less readily but may burn for longer	Species selection should favour species which do not contribute significantly to persistent, fine ground fuel

The characteristics of low flammability species and effect on performance in bushfire situations was sourced from the publication *Bushfire Resilient Communities, Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'*

To assist building survival in a bushfire event, it is important that a fuel-reduced zone is maintained around it. This can be achieved by keeping all vegetation away from the building or by using low flammability plantings to help shield the building from radiant heat. Trees and shrubs that drop litter should not be planted or retained close to buildings where they can contribute to the accumulation of flammable material.

Ongoing maintenance of vegetation should be undertaken in the area surrounding the site to prevent hazardous fuel loads from occurring. These actions include:

- Pruning lower branches of trees to provide a minimum vertical 2 metre high fire break;
- Removal of loose bark, dead twigs, leaves;
- Regular mowing of lawns;
- Keeping other grassed areas to less than 100mm in height;
- Use of non-flammable mulches such as river pebbles or stones on garden beds near buildings; and
- Avoidance of flammable mulches on garden beds such as woodchip or straw.