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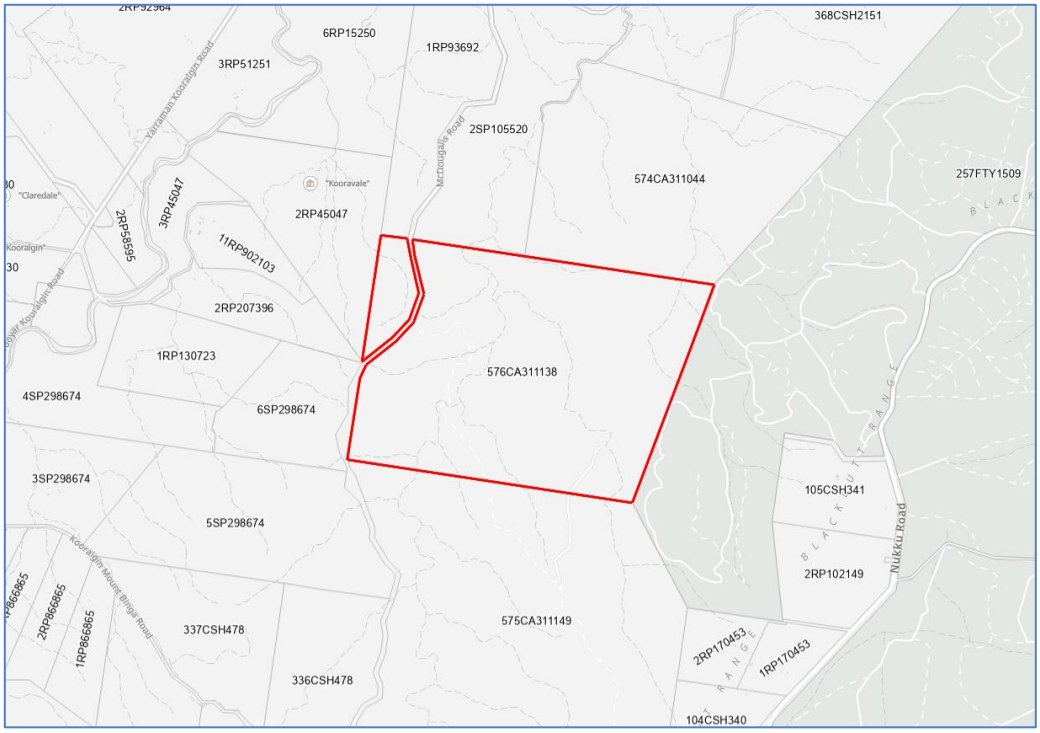
# Bushfire Hazard Assessment

# Bushfire Management Report




| | |
|---|---|
| Project No: | B5671 |
| Address: | 781 McDougalls Rd Gilla QLD 4314 |
| Lot Plan: | Lot 576 CA311138 |
| Local Government Area: | Toowoomba Regional Council |
| Proposed Development: | Reconfiguring a lot (one (1) lot into five(5) lots) |
| Maximum Radiant Heat Flux: | Less than 29 kW/m$^2$ |

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| Document History | | | | |
|---|---|---|---|---|
| **Version** | **Description** | **Date** | **Author** | **Approved by** |
| 1.0 | Report - Draft | 10/12/2025 | HL | HL |
| 2.0 | Report - Final | 16/12/2025 | HL | HL |

## Report Expiry

Please be aware that the bushfire hazard assessment and BAL rating provided in this report are valid for 12 months from the date of issuance. It is advisable to consult with a qualified professional to confirm the accuracy of the assessment if this report is more than 12 months old. If any discrepancies are identified or if an update is necessary, a new report should be obtained.

## Copyright Statement



## 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 stated purpose for which it was provided. Any inaccuracies or amendments to the report or development application will require revision. Please note that, despite our best efforts, there is no guarantee that desirable outcomes are achievable during extreme bushfire weather episodes, which may result in unpredictable bushfire behavior and detrimental consequences to life, property, and the environment. Any representation, statement, opinion, or advice expressed or implied in this report is made in good faith.

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Legislation may impact vegetation clearing activities. It is strongly recommended that clients contact the relevant agencies to determine if their proposed vegetation clearing activity complies with local, state, and federal laws.

## Practitioner Declaration

| | |
|---|---|
| **Name:**<br>**Position:** | **Henry (Hongxi) Liang**<br>**Senior Bushfire Consultant** |
| I hereby certify that I have undertaken the assessment of the above-mentioned site and determined the Bushfire Attack Level stated above in accordance with the requirements of AS 3959:2018 and/or the Bushfire Resilient Communities - Technical Reference Guide published by Queensland Fire and Emergency Services.<br>I hereby declare that I am a suitably qualified bushfire consultant, holding AQF Level 8 qualifications and tertiary degrees below:<br>▪ Graduate Certificate in Bushfire Protection<br>▪ Master of Business Administration<br>▪ Bachelor in Engineering | |
| Signature: |  |
| Email: service@maxbp.com.au<br>Mobile: 0432898282 | **Max Bushfire Protection Consulting**<br>ABN: 81 671 088 887 |

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## Acronyms and Abbreviations

| | |
|---|---|
| APZ | Asset Protection Zone |
| AEP | Annual Exceedance Probability |
| AS 3959:2018 | Australian Standard 3959:2018 Construction of Buildings in Bushfire-Prone Areas (This Standard incorporates Amendment No. 1 (June 2019) and Amendment No. 2 (December 2020)) |
| BCA | Building Code of Australia |
| BPA | Bushfire Prone Area |
| BMP | Bushfire Management Plan |
| BVG | Broad Vegetation Group |
| FDI | Fire Danger Index |
| FFDI | Forest Fire Danger Index |
| FWS | Fire Weather Severity |
| IMS | Interactive Mapping System |
| LMP | Landscape Management Plan |
| MCU | Material Change of Use |
| NCC | National Construction Code |
| QFES | Queensland Fire and Emergency Services |
| RH | Relative Humidity |
| RAL/ROL | Reconfigure A Lot/Reconfiguration of Lot |
| SPP | State Planning Policy 2017 |
| SPP map input data | Statewide Map of Bushfire Prone Areas Input Data E.G. FFDI (5% AEP), Maximum Landscape and Vegetation Hazard Class |
| VHC | Vegetation Hazard Class |
| VMP | Vegetation Management Plan |

# Executive Summary

| | |
|---|---|
| Project No: | **B5671** |
| Type of bushfire assessment: | Site-specific bushfire hazard assessment<br>Bushfire attack level assessment<br>Bushfire management plan |
| Location: | 781 McDougalls Rd Gilla QLD 4314<br>Lot 576 CA311138 |
| Site area: | 4,585,090 sqm |
| Local Government Area: | Toowoomba Regional Council |
| Client(s): | WJ & DJ Stevenson<br>C/- Reel Planning |
| Proposed Development: | Reconfiguring a lot (one (1) lot into five(5) lots) |
| Site plan by: | The Client(s) |
| Asset Protection Zone: | Designed APZ as Bushfire Management Area |
| Maximum Radiant Heat Flux: | No more than 29 kW/m$^2$ |

# 1. Introduction

## 1.1 Purpose

Max Bushfire Protection Consulting was engaged by the client(s) to conduct a site-specific bushfire hazard assessment for the proposed development on the subject site.

The objective of this report is to assess the potential bushfire hazard and related risks concerning the proposed development, aligning with several regulatory frameworks such as the Queensland State Government State Planning Policy - Part E (SPP 2017), the Bushfire Resilient Communities Technical Reference Guide (QFES, 2019), the local council planning scheme - bushfire hazard overlay code, and the Australian Standard – Construction in Bushfire Prone Areas (AS 3959:2018). These guidelines delineate the State and Council's concerns regarding bushfire hazard within the context of evaluating development applications.

The development shall be carried out on the lot referred to as the 'Subject Site,' and the dwelling shall be situated within the proposed building location envelope.

## 1.2 Subject site

- Site Address: 781 McDougalls Rd Gilla QLD 4314
- Lot Plan: Lot 576 CA311138
- Site Area: 4,585,090 sqm

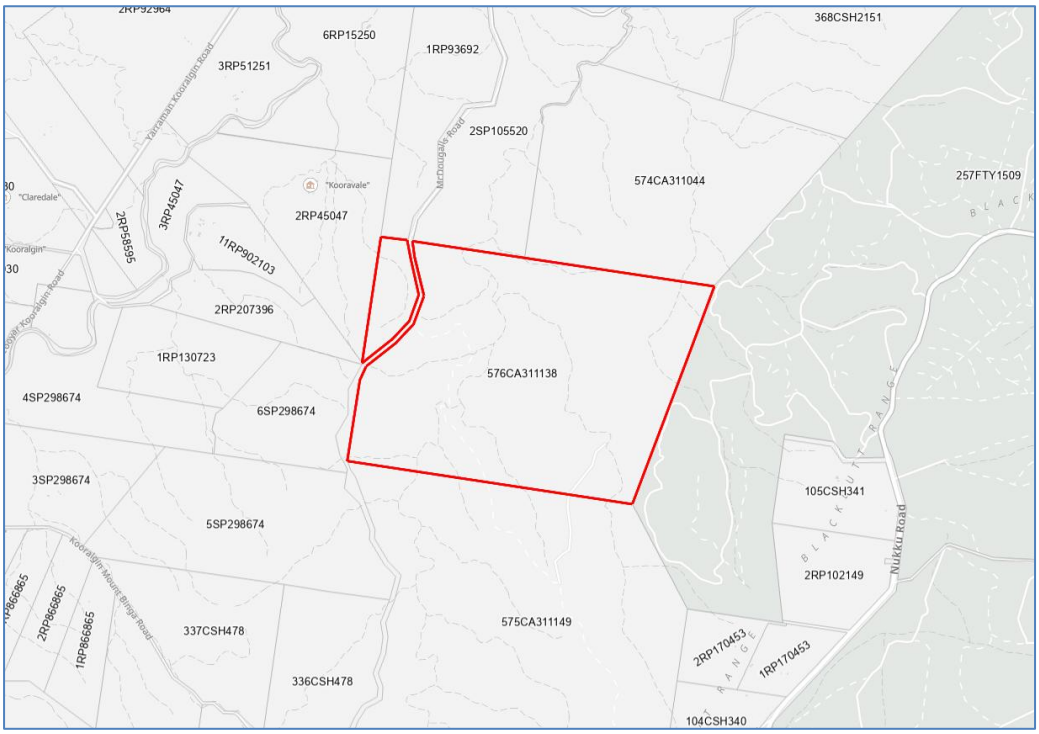



Figure 1-1: Subject Site

## 1.3 The proposed development

The proposed development seeks a Development Permit for Reconfiguring a Lot, involving the subdivision of one (1) lot into five (5) lots. The proposed Lot 1 to Lot 4 each have an area ranging between approximately 105 Ha and 110 Ha, while Lot 5 has an area of approximately 27.78 ha.

## 1.4 Bushfire Prone Land

The Council's designation of land as "bushfire prone" carries two primary consequences:

- It mandates the formulation of a Bushfire Management Plan that conforms to the specifications delineated in the Planning Scheme. This includes strict adherence to the Bushfire Overlay Code stipulated within the planning scheme.
- It activates the application of the Building Code of Australia (BCA) and the National Construction Code (NCC), necessitating compliance with their performance objectives pertaining to bushfire mitigation. Furthermore, adherence to AS 3959:2018, which governs the construction of buildings in bushfire-prone regions, is imperative.

## 1.5 Scope and objectives

The scope and objectives of this assessment are to:

- Identify bushfire-related risk factors linked to the positioning of the development footprint. This includes the probable direction of bushfire attack, hazard ratings associated with existing and proposed vegetation on and around the subject site, and planning separation from potential hazards.
- Recommend suitable protective measures to alleviate the risk posed by the assessed BAL in alignment with the State Planning Policy (SPP 2017), AS 3959:2018, and the Bushfire Hazard Overlay Code of the Council Planning Scheme.
- Prepare a comprehensive site-specific bushfire management plan and conduct an assessment of compliance with the Bushfire Hazard Overlay Code to illustrate how adherence can be attained.

# 2. Assessment Methodology

## 2.1 Desktop Assessment and Legislative

A desktop assessment and legislative review was conducted to identify overlay mapping and requirements under the SPP 2017 and Toowoomba Regional Council planning scheme. The review included:

- Planning Act 2016 (Planning Act)
  - Planning Regulation 2017 (Planning Regulation)
  - State Planning Policy (SPP 2017) mapping
  - State Assessment and Referral Agency (SARA) mapping (Department of Infrastructure, Local Government and Planning)
- Toowoomba Regional Council Planning Scheme
  - Bushfire Hazard Overlay Code
  - Planning Scheme interactive mapping
- Queensland FIRE and Emergency Services
  - Catalyst interactive mapping
- Building Act 1975 (Building Act)
- National Construction Code 2022: Building Code of Australia (NCC 2022)
- AS 3959:2018 Construction of Buildings in Bushfire-Prone Areas

## 2.2 Bushfire Hazard Assessment

A site-specific bushfire hazard assessment aims to identify and understand the bushfire hazards on the site. The site's vegetation and terrain characteristics were surveyed using a complete site examination, aerial photography, accessible databases, and relevant mapping. The site-specific assessment included:

- Recording the structure, composition, and condition of vegetation communities located in the development footprint and all land within 100m of the development footprint, extending to 150m-300m where necessary.
- Assessing site slope and effective slope.
- Determining the aspect of the site.
- Identifying waterway and wetland features within the assessment area.
- Calculating potential fire line intensity and Radiant Heat Flux.

Utilizing the recorded outcomes of the field survey, a Bushfire Hazard Assessment and subsequent BAL review were conducted in accordance with the Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest ‘Natural Hazards, Risk and Resilience – Bushfire’ (QFES 2019), which was prepared by the Queensland Fire and Emergency Services to provide technical guidance for the SPP 2017 guidance material. The method involves a quantitative assessment of the vegetation communities, fuel loads, slope, and other relevant factors.

## 2.3 Bushfire Attack Level Assessment

The determination of the site-specific Bushfire Attack Level (BAL) for the development footprint and classified vegetation was undertaken in accordance with the Bushfire Resilient Communities – SPP Technical Reference Guide and AS 3959:2018. This includes the identification of the following input values:

- FFDI (5% AEP fire weather event)
- Vegetation hazard class, surface and overall fuel load
- Site slope, effective slope, and whether the effective slope is upslope or downslope of the development
- Distance of the development footprint from classified vegetation

Radiant heat exposure was calculated using the Bushfire Asset Protection Zone calculator provided by the Sustainable Development Unit of Queensland Fire and Emergency Services and/or the AS 3959:2018 Method 2 Calculator.

AS 3959:2018 defines the Bushfire Attack Level as a method for measuring the severity of a building's potential exposure to ember attack, radiant heat, and direct flame contact, using increments of radiant heat expressed in kilowatts per square meter. This method serves as the basis for establishing construction requirements to improve the protection of building elements from bushfire attack. Consequently, the assessment results and accompanying BAL construction requirements only apply to proposed buildings or structures, not the entire development area.

# 3. Legislative Context

The following key legislation, policies and guidelines are relevant to the preparation of bushfire assessment:

- State Planning Policy (July 2017, QLD)
- National Construction Code 2022
- AS 3959:2018 Construction of Buildings in Bushfire-Prone Areas
- Local Council Planning Scheme
- Planning Act 2016 (Planning Act) and Building Act 1975 (Building Act)

## 3.1 State Planning Policy (July 2017)

Supporting the Planning Act 2016 (Planning Act) (Qld), the purpose of the SPP is to guide State and Local government in land-use planning and development by defining the Queensland Government's polices about matters of state interest, to which there are 17 state interests arranged under five broad themes:

- liveable communities and housing
- Economic growth
- Environment and heritage
- Safety and resilience to hazards
- Infrastructure

The SPP Interactive Mapping System includes bushfire hazard area (bushfire prone area) mapping based on the methodologies outlined in Leonard et al. (2014). Under the safety and resilience to hazards theme, the state's interest is to ensure that natural hazards are properly considered in all levels of the planning system. This includes the avoidance of natural hazard areas or the mitigation of risks to an acceptable or tolerable level. The SPP is supported by the SPP – State Interest Guideline – Natural Hazards, Risk and Resilience (April 2016), Technical Manual – Evaluation Report: Bushfire Hazards (April 2016), and Technical Manual – A 'Fit for Purpose' Approach in Undertaking Natural Hazard Studies and Risk Assessments (April 2016) by the Department of Infrastructure, Local Government and Planning. These documents identify the outcomes sought by the state and their application when planning development within a bushfire hazard area (bushfire prone area).

## 3.2 National Construction Code 2022: Building Code of Australia

The National Construction Code 2022: Building Code of Australia (NCC 2022) sets out technical requirements for the design and construction of buildings and other structures in Australia (The Australian Building Codes Board). NCC 2022 defines ten core building classes, along with various subclasses. It mandates that buildings constructed within designated bushfire prone areas must be designed and constructed to minimize the risk of ignition from bushfires.

## 3.3 AS 3959:2018 Construction of Buildings in Bushfire-Prone Area

Where development is proposed in designated bushfire prone areas, AS 3959:2018 provides construction requirements designed to enhance resistance against bushfire attack. These construction specifications are determined by specific heat flux exposure thresholds and are categorized into six Bushfire Attack Levels (BAL):

| Bushfire Attack Level (BAL) | Radiant Heat Exposure (AS3959:2018) | Description of Predicted Bushfire Attack and Levels of exposures |
|---|---|---|
| BAL – Low | Insignificant | Minimal attack from radiant heat and flame due to the distance of the building from the vegetation, although some attack by burning debris is possible. There is insufficient threat to warrant specific construction requirements |
| BAL - 12.5 | 0 to 12.5kW/m$^2$ | Attack by burning debris is significant with radiant heat (not greater than 12.5kW/m$^2$). Radiant heat is unlikely to threaten building elements (such as unscreened glass). Specific construction requirements for ember protection and accumulation of debris are warranted. |
| BAL - 19 | 12.5 to 19kW/m$^2$ | Attack by burning debris is significant with radiant heat flux (not greater than 19kW/m$^2$) threatening some building elements (such as screened glass). Specific construction requirements for embers and radiant heat are warranted. |
| BAL – 29 | 19 to 29kW/m$^2$ | Attack by burning debris is significant and radiant heat flux (not greater than 29kW/m$^2$) threatens building integrity. Specific construction requirements for ember and higher levels of radiant heat are warranted. Some flame contact is possible. |
| BAL – 40 | 29 to 40kW/m$^2$ | Radiant heat flux and potential flame contact could threaten building integrity. |
| BAL - FZ | 40kW/m$^2$ plus<br>(Flame Contact) | Significant radiant heat and significantly higher likelihood of flame contact from the fire front will threaten building integrity and result in significant risk to residents. |

Table 1: AS3959:2018 Using BAL to determine construction requirements

## 3.4 Toowoomba Regional Council Planning Scheme

The Bushfire Hazard Overlay, under the Council's Planning Scheme reflects SPP State and Local level interests by identifying designated bushfire prone areas. Where assessable development is proposed on land mapped as containing bushfire hazard areas, a site-specific bushfire hazard assessment prepared in accordance with the planning scheme is required.

# 4. Bushfire Hazard Assessment

Several factors determine the likelihood and severity of bushfires in a landscape. Key factors include the type of vegetation and the amount of available fuel. Other considerations are topography and land use patterns around potentially hazardous vegetation. Additionally, connectivity between vegetation communities can influence the development and persistence of bushfires.

## 4.1 Current Bushfire Hazard Mapping

A review of the Bushfire Hazard Overlay Mapping indicates that the site contains bushfire hazard areas, as shown in Figure 4-1.

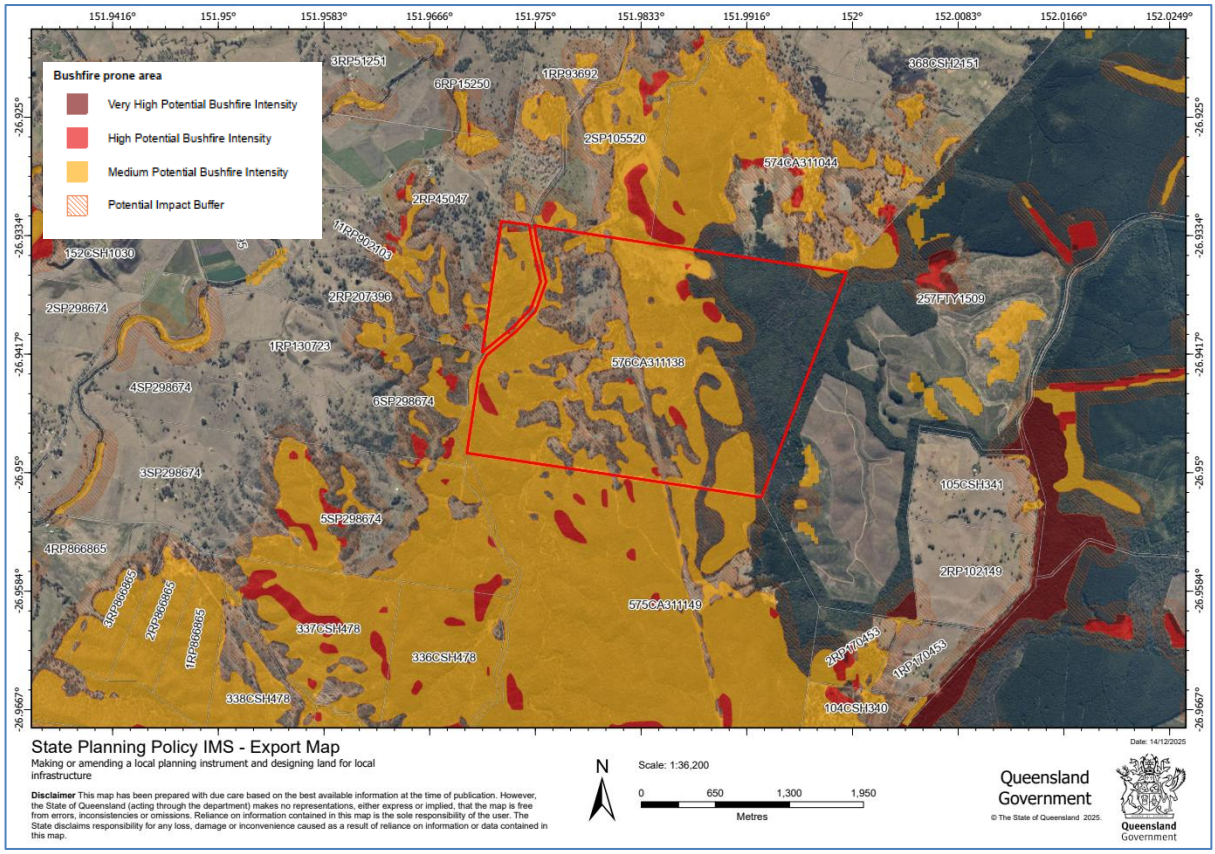



Figure 4-1: Bushfire Hazard Overlay Mapping

## 4.2 Local FFDI

The fire season in Queensland typically begins in the far north in July, advancing southward by spring and occasionally lasting until February in southern and far south-western regions. These timeframes vary annually due to fuel loads, long-term climate patterns, and short-term weather conditions, differing from other Australian states. In the far north and the northwest, warm, dry winters and springs, with dead grasses and dry fuels, heighten bushfire risks. In the south, the greatest danger follows dry winters and springs, with severe conditions arising when low-pressure

systems bring strong, hot, dry westerly winds to coastal areas. The season ends with the arrival of moist conditions, often influenced by tropical cyclones near the coast.

The Forest Fire Danger Index (FFDI) evaluates the likelihood of fire ignition, its propagation rate, intensity, and the difficulties encountered during suppression, amalgamating factors like air temperature, relative humidity, wind speed, and drought effects. This assessment is accessible through state mappings, revealing an annual exceedance probability FFDI of 57 at a 5% probability level for the subject site. Fire Danger Ratings (FDR) are determined by forecasted weather conditions, particularly the FFDI, offering insight into the level of bushfire threat on a given day. This FFDI corresponds to a high FDR, indicating hot, dry, and windy conditions. Under such circumstances, the ignition and spread of fires may present significant challenges for containment, especially in areas with extensive bushland vegetation.

## 4.3 Fire History

Fire history information from QFES reveals that between 2010 and 2024, there were recorded fires within a 2-kilometer radius of the location in 2018, 2012, 2022 and 2023. Both the historical fire data and observations of fire scars suggest that it has been a substantial amount of time since the site was last exposed to a large-scale fire event. However, it is important to note that while this information does not guarantee the site will remain free from future fires, the likelihood of such events occurring appears to be decreasing due to the surrounding residential and commercial land development patterns.

## 4.4 Site-Specific Hazard Assessment

This Site-Specific Bushfire Hazard Assessment draws upon several key references and sources, including:

- Vegetation Hazard Classification and Potential Fire-line Intensity for Queensland, as outlined in "A new methodology for state-wide mapping of bushfire-prone areas in Queensland" by CSIRO, Australia (2014).
- The Bushfire Resilient Communities Technical Reference Guide (QFES, 2019).
- The Bushfire Attack Level (BAL), Building setback requirements, and Construction Standards as specified in the Australian Standard AS3959:2018 Construction of buildings in bushfire-prone areas.
- Bushfire Risk Mitigation Measures aligned with current industry best-practice assessment methodologies and compliance with Council's Planning Scheme.

This assessment will utilize factors such as vegetation composition and extent, slope, and industry-standard fuel load calculations to determine the potential bushfire hazard affecting the proposed development. Furthermore, this Bushfire Management

Plan (BMP) will ensure compliance with the Council's Bushfire Overlay Code in relation to the proposed development.

The assessment involved an analysis of the site and its immediate 100 m radius surroundings to determine the typical bushfire risk characteristics. It included the application of Vegetation Hazard Classifications to vegetation located within 100 m of the site. Where necessary, it was expanded to cover an additional area ranging from 150 to 300 m.

According to AS3959:2018, the following vegetation shall be excluded from a BAL assessment, which is considered as low threat vegetation and/or non-vegetation areas:

- Vegetation of any type that is more than 100m from the site.
- Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.
- Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other or of other areas of vegetation being classified vegetation.
- Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.
- Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.
- Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks.

The assessment also takes into account the small and or isolated patches and corridor filtering process of Bushfire Resilient Communities:

- Sub-hectare areas of continuous fuel (i.e. surrounded by either no fuel or non-continuous fuel) those are further than 100 metres from any other continuous fuel greater than two hectares.
- Downgrade the effective fuel load of continuous vegetation patches measuring (a) 1 to 2 hectares (by 66 per cent), and (b) 2-3 hectares patches (by 50 per cent) if the patch is surrounded by either non-continuous fuel or a low-hazard vegetation or land use type, and if the patch is further than 100 metres from any other continuous-fuel vegetation patch greater than two hectares.

- Remove narrow corridors and areas of continuous fuel < 50 m in width that are not sufficiently wide to support a fully developed flame front.
- Small fragments are removed because of the varied quality of the vegetation mapping inputs.

It is noted that the client is actively undertaking vegetation management activities on the site, including the removal of invasive weeds, thinning of overgrown vegetation, and general landscape and property maintenance.

### 4.4.1 Ground Truthed VHC

The locations of site assessment plots are shown on Figure 4-2. Table 2 presents a summary of observations and the features of site assessment points.

| Lot | Mapped VHC | Ground Truthed VHC |
|---|---|---|
| Lot 1 | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite |
| Lot 2 | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite |
| Lot 3 | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite |
| Lot 4 | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite | RE 12.11.14<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite |
| Lot 5 | RE 12.9-10.7<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite | RE 12.9-10.7<br>VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite |

Table2: Ground truthed VHC

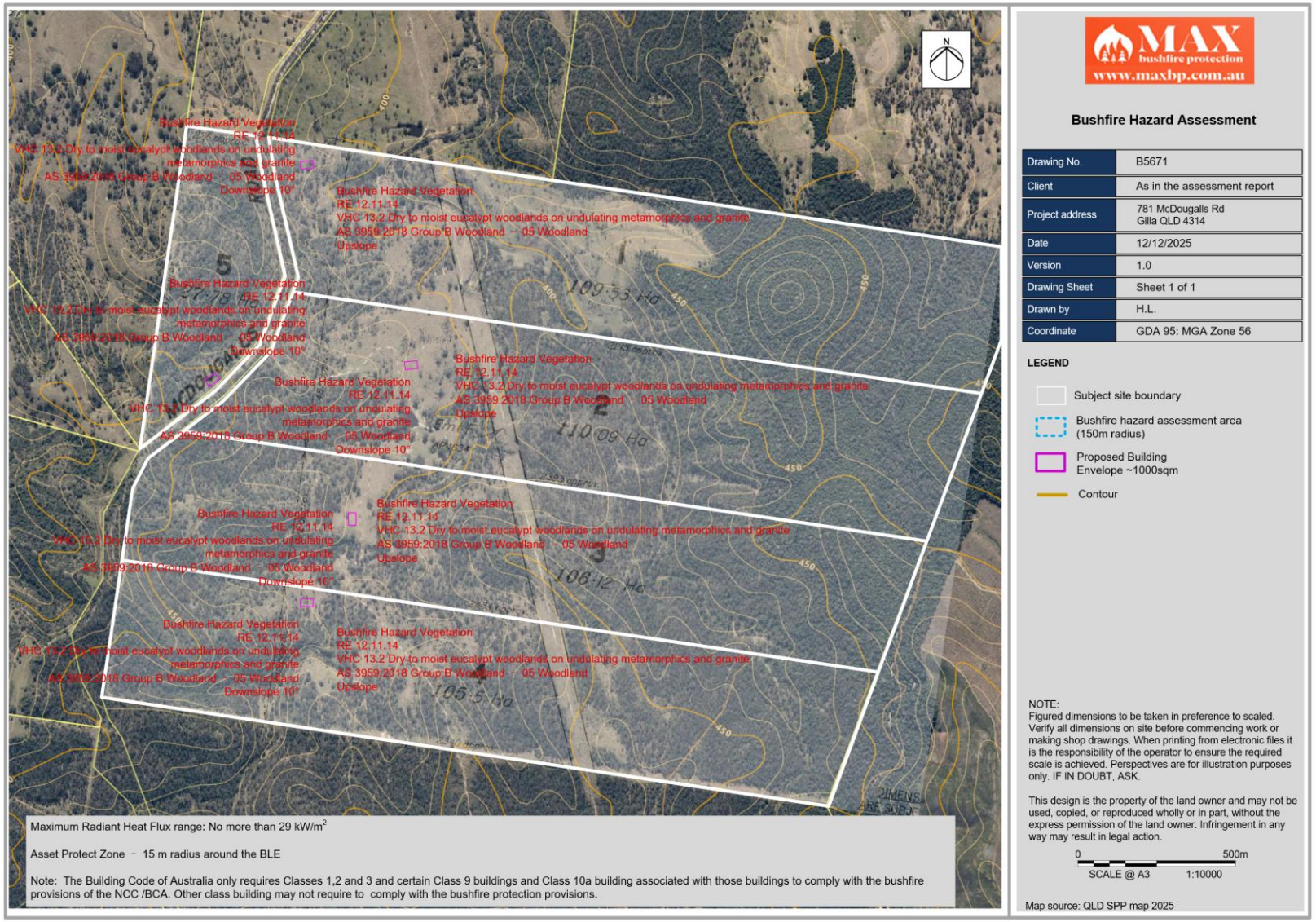



Figure 4-2: Ground truthed VHC and local Bushfire Prone Area map

- **Classified vegetation surround BLE of Lot 1 – Lot 4**

The proposed building envelopes on Lot 1, Lot 2, Lot 3 and Lot 4 are all located within existing cleared areas, with similar site conditions. Surround classified vegetation is characterised by VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite. This vegetation patch may contain RE 12.11.14 Eucalyptus crebra, E. tereticornis, Corymbia intermedia woodland on metamorphics +/- interbedded volcanics.

Trees 10 – 25m in height with a canopy providing 10 – 30% foliage cover, typically dominated by eucalypts. The understorey includes grasses, herbs, and scattered shrubs, with some areas supporting a grassy ground layer. Elevated fuel may occur as young trees. A diverse range of weeds and invasive plant species, including weedy grasses and Lantana, is widespread across the area, occurring under conditions varying from sparse to moderately dense. The predominant tree canopy reaches a height of approximately 18m.

Unmanaged vegetation, such as unmanaged grassland and grassy woodland, characterised by overgrowth typically exceeding 10cm in height, dense ground cover, and the accumulation of dry or dead vegetation due to the absence of mowing, slashing, or grazing would contribute to a build-up of fine fuels that are easily ignitable and capable of sustaining rapid fire spread under dry and windy conditions, thereby posing a potential bushfire risk.

The site topography generally rises from north to south. At the building envelope , the land beneath the hazard vegetation slopes downward toward the south at approximately 10 degrees, while the terrain rises upslope toward the north.

- **Classified vegetation surround BLE of Lot 5**

The proposed building envelope on Lot 5 is located along the western side of McDougalls Road, within an area of relatively denser vegetation. Surround classified vegetation is also characterised by VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite. This vegetation patch may contain RE 12.9-10.7 Eucalyptus crebra +/- E. tereticornis, Corymbia tessellaris, Angophora spp. and E. melanophloia woodland on sedimentary rocks. Limited regular maintenance activities have been carried out in this area.

Trees 10 – 25m in height with a canopy providing 10 – 30% foliage cover, typically dominated by eucalypts. The understorey includes grasses, herbs, and scattered shrubs, with some areas supporting a grassy ground layer. Elevated fuel may occur as young trees. A diverse range of weeds and invasive plant species, including weedy grasses and Lantana, is widespread across the area, occurring under conditions varying from sparse to moderately dense. The predominant tree canopy reaches a height of approximately 18m.

### 4.4.2 Classified vegetation fuel load

The potential fuel load of the bushfire hazard vegetation patch is determined as following:

| | |
|---|---|
| Vegetation context | VHC 13.2 with RE 12.11.14 or RE 12.9-10.7 |
| Vegetation structure | Woodland |
| AS3959:2018 Classification of vegetation | Group B Woodland – Woodland 05 |
| Surface fuel load | 9.4 t/ha |
| Near-surface fuel load | 3.4 t/ha |
| Elevated fuel load | 0.6 t/ha |
| Bark fuel load | 1.0 t/ha |
| Total fuel load | 14.4 t/ha |

Table 3: Potential fuel load

### 4.4.3 Vegetation Conditions within the proposed development

Within the proposed development area and the designed Asset Protection Zone, vegetation conditions will be consistently maintained in a low-fuel state, aligning with the characteristics of VHC 40.4 Continuous low grass or tree cover.

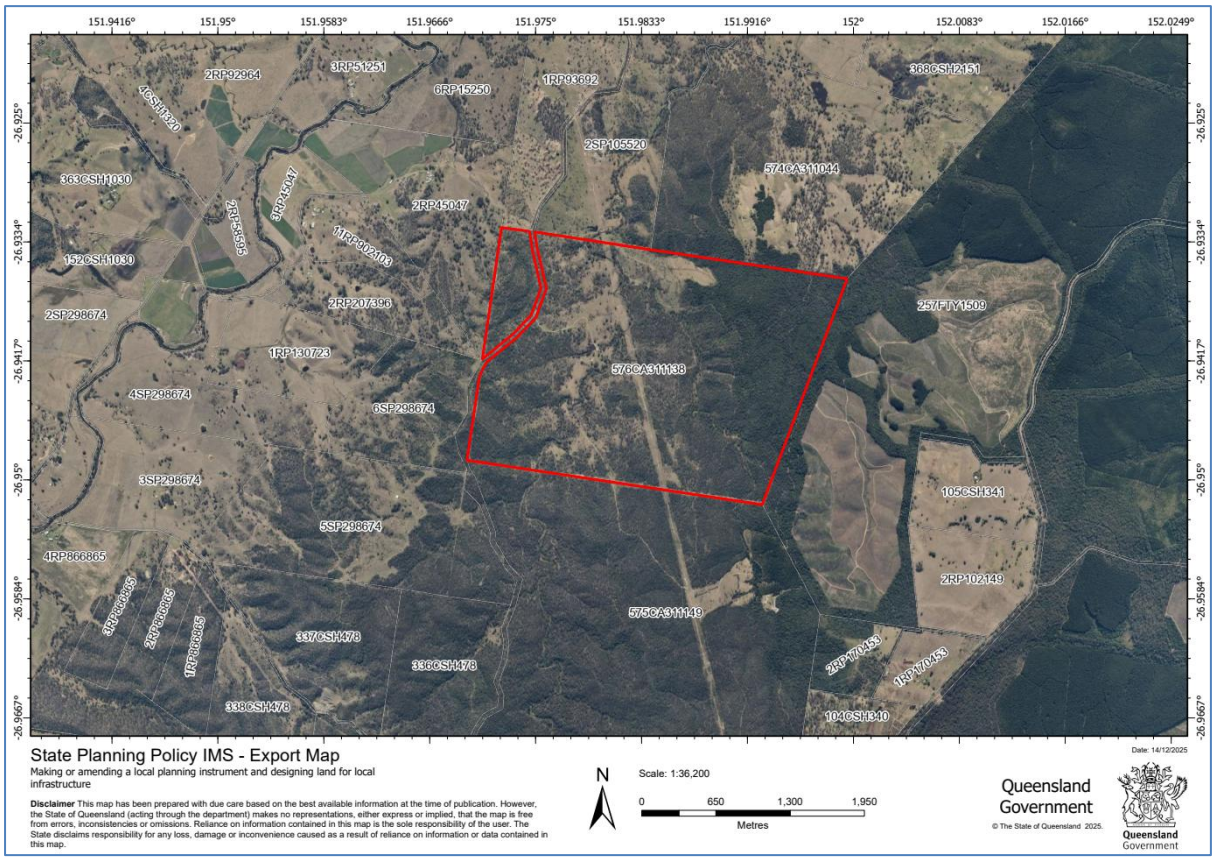



Figure 4-3: Aerial view providing landscape context for the site (Sourced from QLD SPP mapping, captured 09/2025)

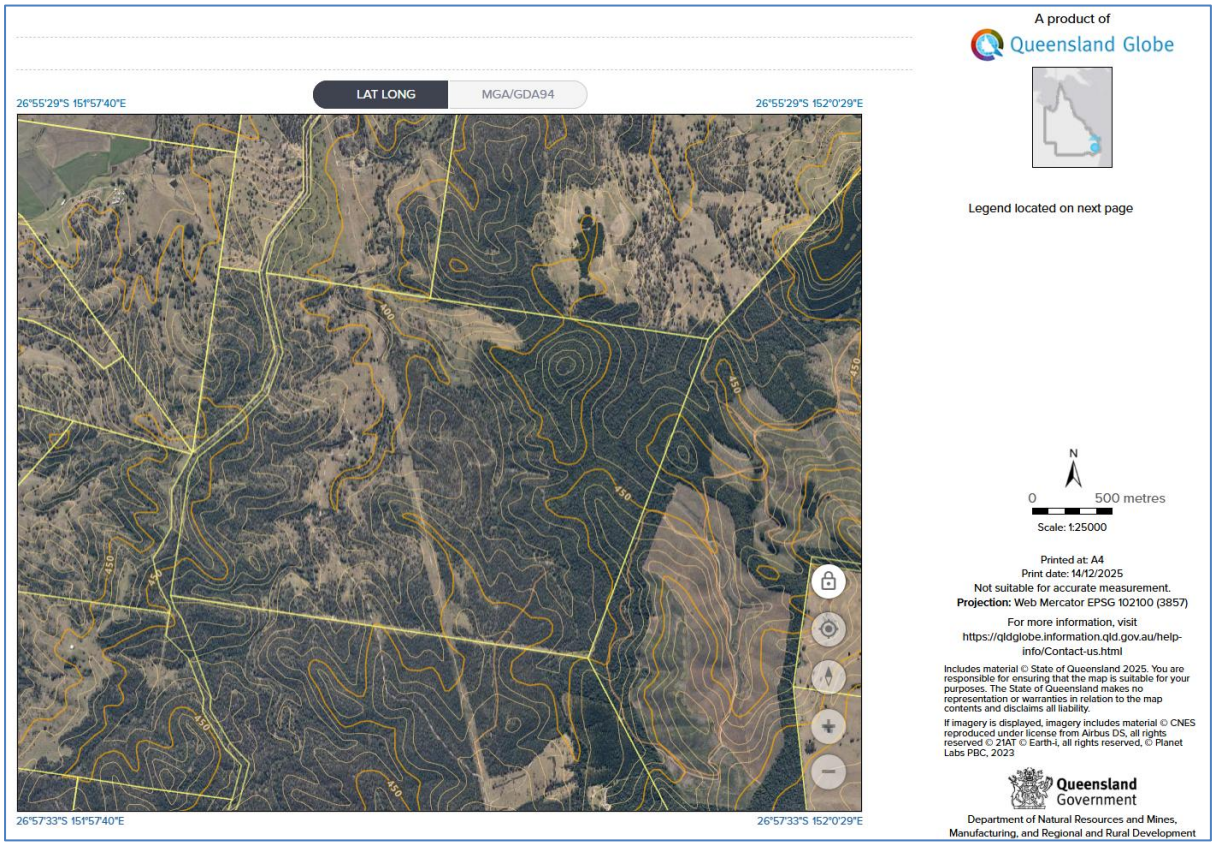



Figure 4-4: 1m interval contour map (Sourced from Queensland Globe mapping, captured 09/2025)

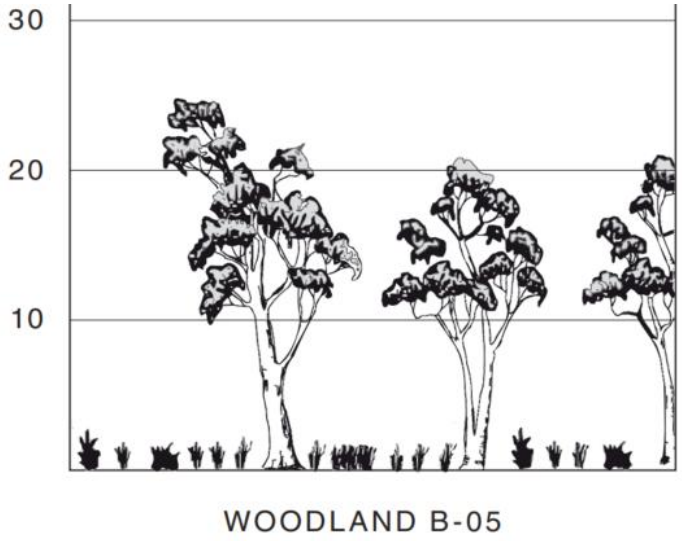



Figure 4-5: AS 3959:2018 Classification of vegetation – Woodland B-05

## Regional ecosystem details for 12.11.14

| | |
|---|---|
| Regional ecosystem | 12.11.14 |
| Vegetation Management Act class | Of concern |
| Wetlands | Not a Wetland |
| Biodiversity status | Of concern |
| Subregion | 7, 5, 6, 10, 3, (2), (4), (11.18) |
| Estimated extent[1] | Pre-clearing 124000 ha; Remnant 2021 32000 ha |
| Short description | Eucalyptus crebra, E. tereticornis, Corymbia intermedia woodland on metamorphics +/- interbedded volcanics |
| Structure code | Woodland |
| Description | Eucalyptus crebra, E. tereticornis, Corymbia intermedia grassy woodland. Other species including Eucalyptus melanophloia, Corymbia clarksoniana, C. erythrophloia, C. tessellaris, E. siderophloia, Angophora spp. May be present in low densities or in patches. Mid-layer generally sparse but can include low trees such as Vachellia bidwillii, Capparis spp., Dodonaea triquetra, Alphitonia excelsa and Xanthorrhoea spp. Occurs on mid and lower slopes on Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Not a Wetland. (BVG1M: 13c). |
| Fire management guidelines | SEASON: Summer to late-autumn. INTENSITY: Low. INTERVAL: 3-6 years. INTERVAL_MIN: 3. INTERVAL_MAX: 6. STRATEGY: Aim to burn 40-60% of any given area. Spot ignition in cooler or moister periods encourages mosaics. ISSUES: The substrate is typically nutrient rich and grassy. Control of weeds (e.g., Lantana camara) with fire might be required. Maintain ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. |


Figure 4-6: Ecological Condition Profile of RE 12.11.14

## Regional ecosystem details for 12.9-10.7

| | |
|---|---|
| Regional ecosystem | 12.9-10.7 |
| Vegetation Management Act class | Of concern |
| Wetlands | Not a Wetland |
| Biodiversity status | Of concern |
| Subregion | 2, 5, 6, (8), (7), (1), (11.31), (3), (10), (11.22), (4), (9) |
| Estimated extent[1] | Pre-clearing 245000 ha; Remnant 2021 40000 ha |
| Short description | Eucalyptus crebra +/- E. tereticornis, Corymbia tessellaris, Angophora spp. and E. melanophloia woodland on sedimentary rocks |
| Structure code | Woodland |
| Description | Eucalyptus crebra +/- E. tereticornis, Corymbia tessellaris, Angophora leiocarpa, E. melanophloia woodland. Occurs on Cainozoic and Mesozoic sediments. Not a Wetland. (BVG1M: 13c).<br><br>Vegetation communities in this regional ecosystem include: 12.9-10.7a: Eucalyptus siderophloia, Corymbia intermedia +/- E. tereticornis and Lophostemon confertus open forest. Occurs on Cainozoic and Mesozoic sediments in near coastal areas. Not a Wetland. (BVG1M: 12a). |
| Fire management guidelines | SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. INTERVAL_MIN: 4. INTERVAL_MAX: 25. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. Variability in season and fire intensity is important. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds (e.g., lantana Lantana camara, balloon cotton bush Gomphocarpus physocarpus, sensitive weed Mimosa pudica and fireweed Senecio madagascariensis) with fire might be required. |


**Condition class 1**
**Reference condition, mature and minimal disturbance**
- Tree canopy cover: > 40%; Tree height: > 20 m
- Tree sub-canopy cover: > 8%; Tree sub-canopy height: > 10 m
- Native shrub cover: 3-5%
- Large trees: > 2 eucalypts > 40 cm DBH
- Coarse Woody Debris: 25-35 m total length
- Species richness: Trees ≥ 3; Shrubs ≥ 5; Grass ≥ 8; Forbs and other ≥ 26
- Ground cover: Perennial grass cover 60-80%; Organic litter cover > 20%
- Non-native plant species: < 2% cover
- Regeneration: > 2 tree species in regeneration phase


**Condition class 2**
**Mature, some disturbance e.g. fire, grazing**
- Tree canopy cover: 30-40%; Tree height: 15-20 m
- Tree sub-canopy cover: 5-8%; Tree sub-canopy height: 5-10 m
- Native shrub cover: 3-5%
- Large trees: 1-2 eucalypts > 40 cm DBH
- Coarse Woody Debris: 10-25 m total length
- Species richness: Trees 1-2; Shrubs 3-4; Grass 4-7; Forbs and other 15-25
- Ground cover: Perennial grass cover 40-60%; Organic litter cover 10-20%
- Non-native plant species: 2-15% cover.
- Regeneration: 1-2 tree species in regeneration phase


**Condition class 3**
**Advanced regrowth or moderate disturbance e.g. grazing, clearing**
- Tree canopy cover: 20-30%; Tree height: 10-15 m
- Tree sub-canopy cover: 5-8%; Tree sub-canopy height: 5-10 m
- Native shrub cover: 3-5% or > 30%
- Large trees: ≤ 1 eucalypt > 40 cm DBH
- Coarse Woody Debris: 10-25 m or > 90 m total length
- Species richness: Trees 1-2; Shrubs < 3; Grass < 4; Forbs and other 5-15
- Ground cover: Perennial grass cover 20-40% or > 90%; Organic litter cover 10-20%
- Non-native plant species: 15-25% cover
- Regeneration: 0-1 trees species in regeneration phase

Figure 4-7: Ecological Condition Profile of RE 12.9-10.7

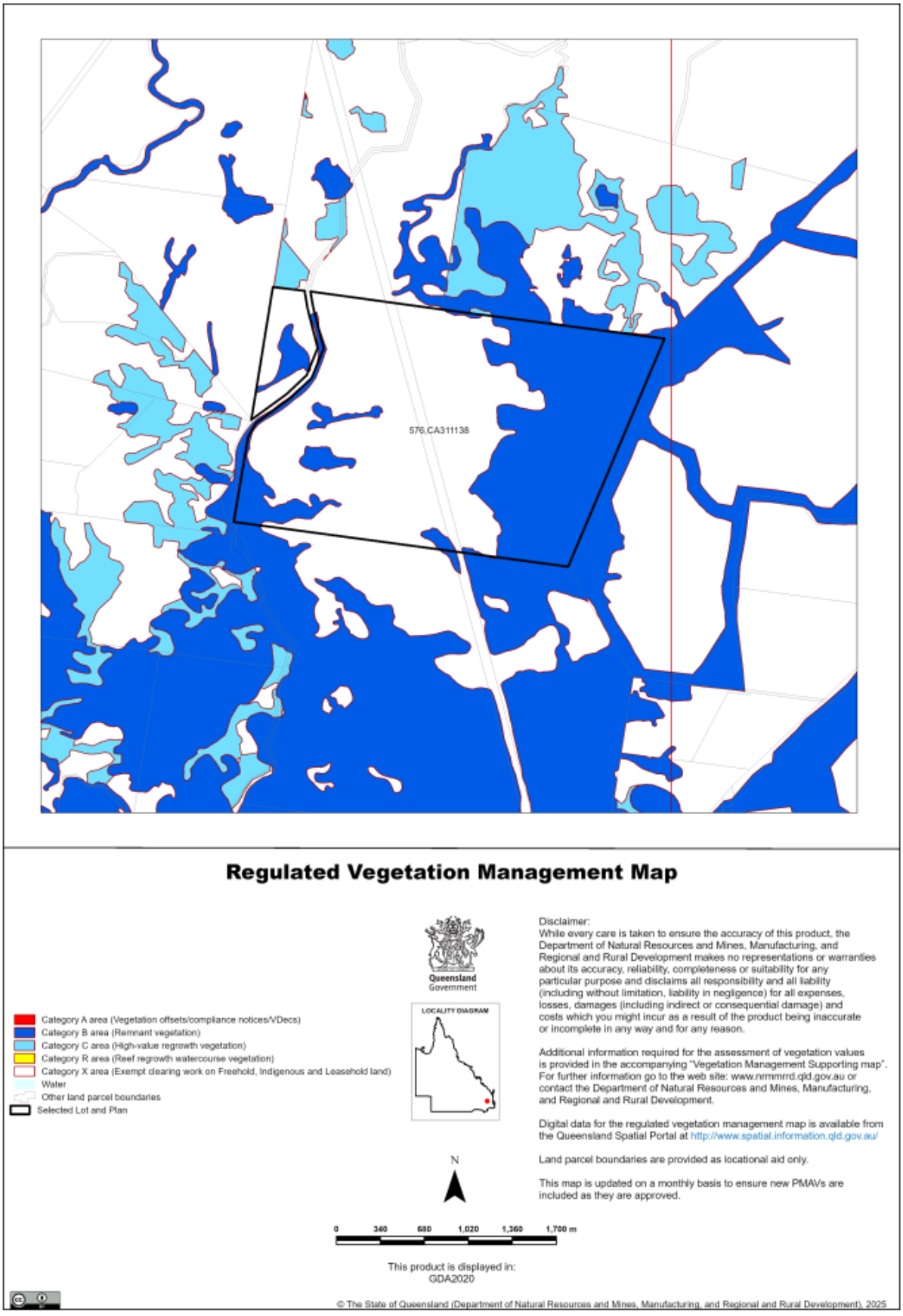



Figure 4-8: Regulated vegetation management map (sourced from Vegetation management report, Department of Resources, 2025)

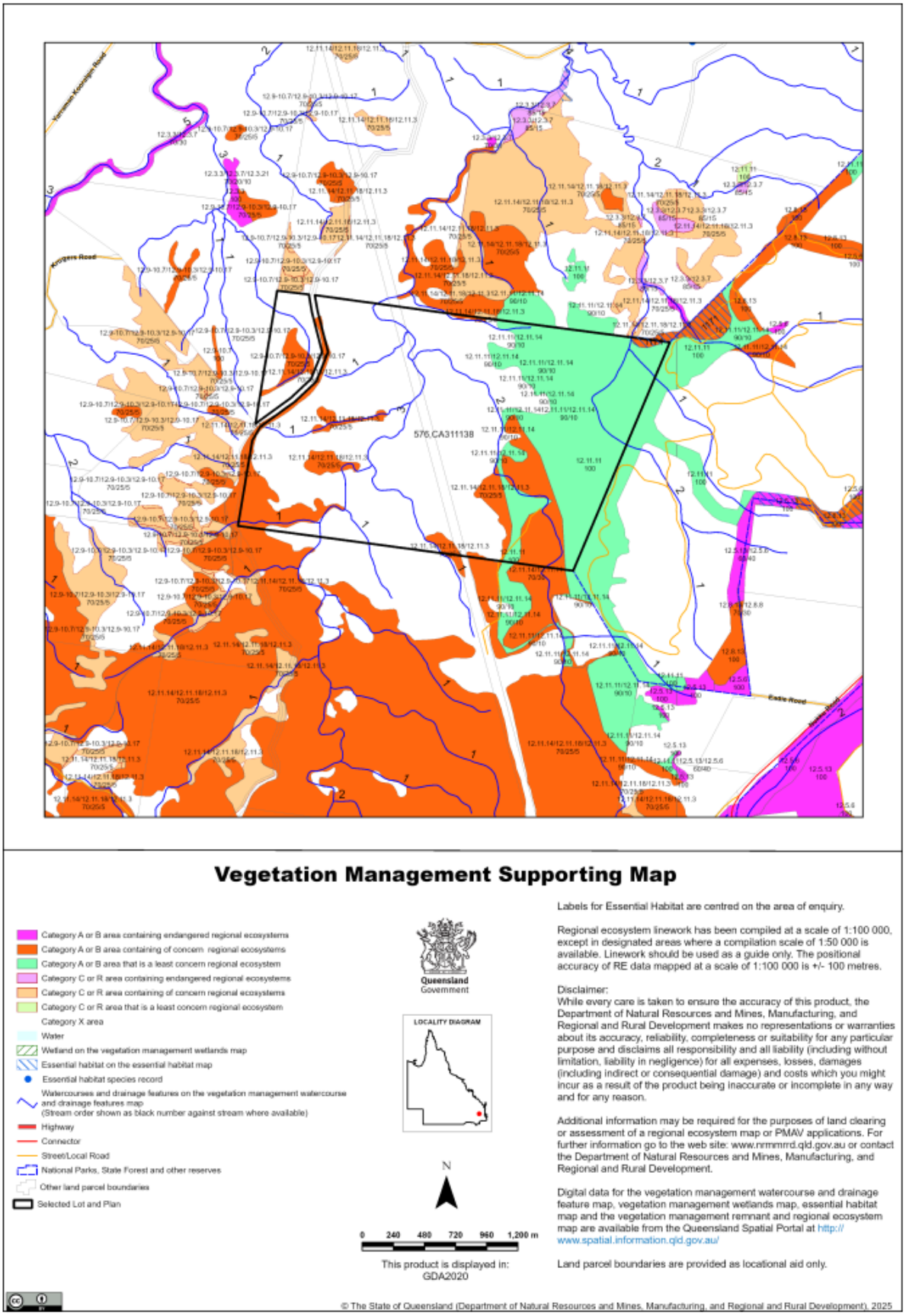



Figure 4-9: Vegetation Management Support Map providing RE context on the site (sourced from Vegetation management report, Department of Resources, 2025)


Photo 1: The proposed development area

Photo 3: Bushfire hazard vegetation VHC 13.2

### 4.4.4 Potential Bushfire Intensity Calculations

The Bushfire Resilient Communities Technical Reference Guide (QFES, 2019) defines bushfire hazard classes as follows:

- Very high potential bushfire intensity > 40,000 kW/m.
- High potential bushfire intensity 20,000-40,000 kW/m.
- Medium potential bushfire intensity 4,000-20,000kW/m.
- Grass fire hazard, generally less than 4,000kW/m.
- Potential impact buffer, where land is within 100m of a very high, high and medium potential bushfire intensity area.
- Low hazard, where potential bushfire intensity < 4,000kW/m and more than 100m to very high, high and medium potential bushfire intensity area.

Potential fireline intensity is a function of fire weather severity (Local FFDI), landscape slope and vegetation fuel load based on classified vegetation communities according to the method described by the CSIRO methodology as follow:

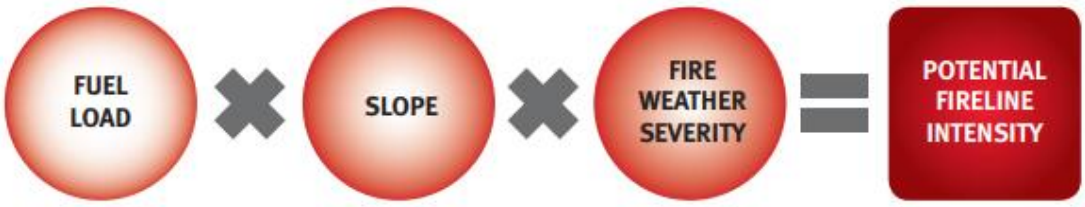



Figure 4-10: Method for calculation of potential fireline intensity (by CSIRO)

The results of the potential bushfire intensity calculations as presented in Table 4.

| Local FFDI | Lot | Ground Truthed VHC | Potential fuel load (t/ha) | Slope (°) | Potential bushfire intensity (kW/m) | Bushfire hazard class |
|---|---|---|---|---|---|---|
| 57 | Lot 1 | VHC 13.2 | 14.4 | Downslope 10 | 14610 | Medium potential bushfire intensity |
| | Lot 2 | VHC 13.2 | 14.4 | Downslope 10 | 14610 | Medium potential bushfire intensity |
| | Lot 3 | VHC 13.2 | 14.4 | Downslope 10 | 14610 | Medium potential bushfire intensity |
| | Lot 4 | VHC 13.2 | 14.4 | Downslope 10 | 14610 | Medium potential bushfire intensity |
| | Lot 5 | VHC 13.2 | 14.4 | Downslope 10 | 14610 | Medium potential bushfire intensity |

Table 4: Potential bushfire intensity calculation

## 4.5 Probable Direction of Bushfire Attack

The anticipated directions of bushfire threat to the proposed development are expected to originate from any direction, primarily in areas classified as having medium, high and very high bushfire hazard levels from downslope vegetations.

## 4.6 Radiant Heat Flux Modelling and Bushfire Management Area

The radiant heat exposure outcome for residential development, as outlined in the SPP Bushfire Prone Area Code under the Natural Hazards, Risk and Resilience – State Planning Policy State Interest guidance material (DSDMIP 2019), is a radiant heat flux of ≤ 29 kW/m².

To ensure the compliance with the requirement radiant heat flux requirement, creating and managing bushfire management area or fire breaks are critical to reduce bushfire hazard. Regular maintenance is essential to ensure their effectiveness, which may include vegetation removal and manage to low fuel condition. For the purpose of this assessment, a radius of 15m measured from the boundary of building envelope has been applied as shown on Figure 4-11. Vegetation management within the bushfire management area shall be undertaken in accordance with the requirements of the Outer Protection Area of the Asset Protection Zone.

The Radiant Heat Flux Level scenario has been assessed using the AS 3959:2018 Method 2 Calculator, with inputs and calculations presented in Figures 4-13. In accordance with the specified Asset Protection Zone (APZ) and fire management line requirements for each lot, the Class 1a buildings on all new lots will achieve a radiant heat flux of less than 29 kW/m² through appropriate separation from the classified bushfire hazard vegetation. Accordingly, the proposed development is considered to satisfy the radiant heat flux performance requirement of the State Planning Policy (SPP) Bushfire Prone Area Code.

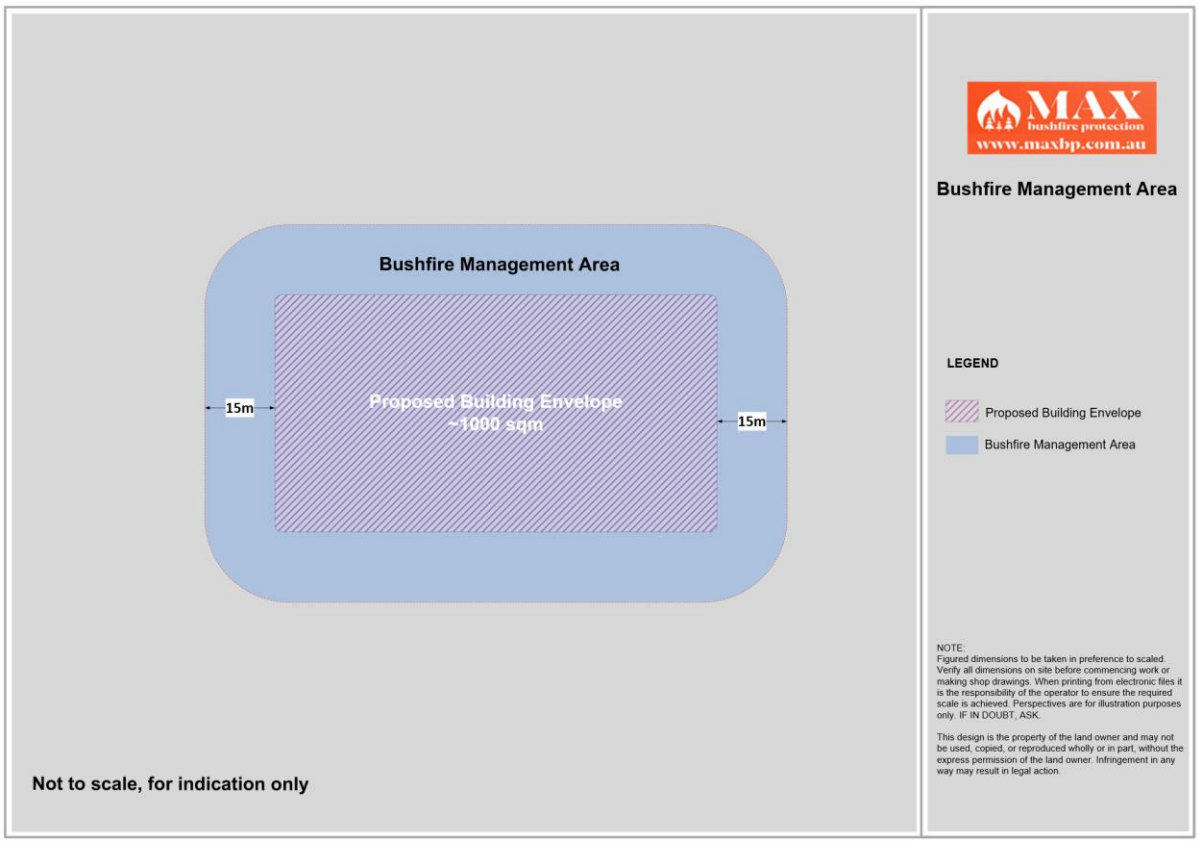



Figure 4-11: Asset Protect Zone – 15 m radius around the BLE

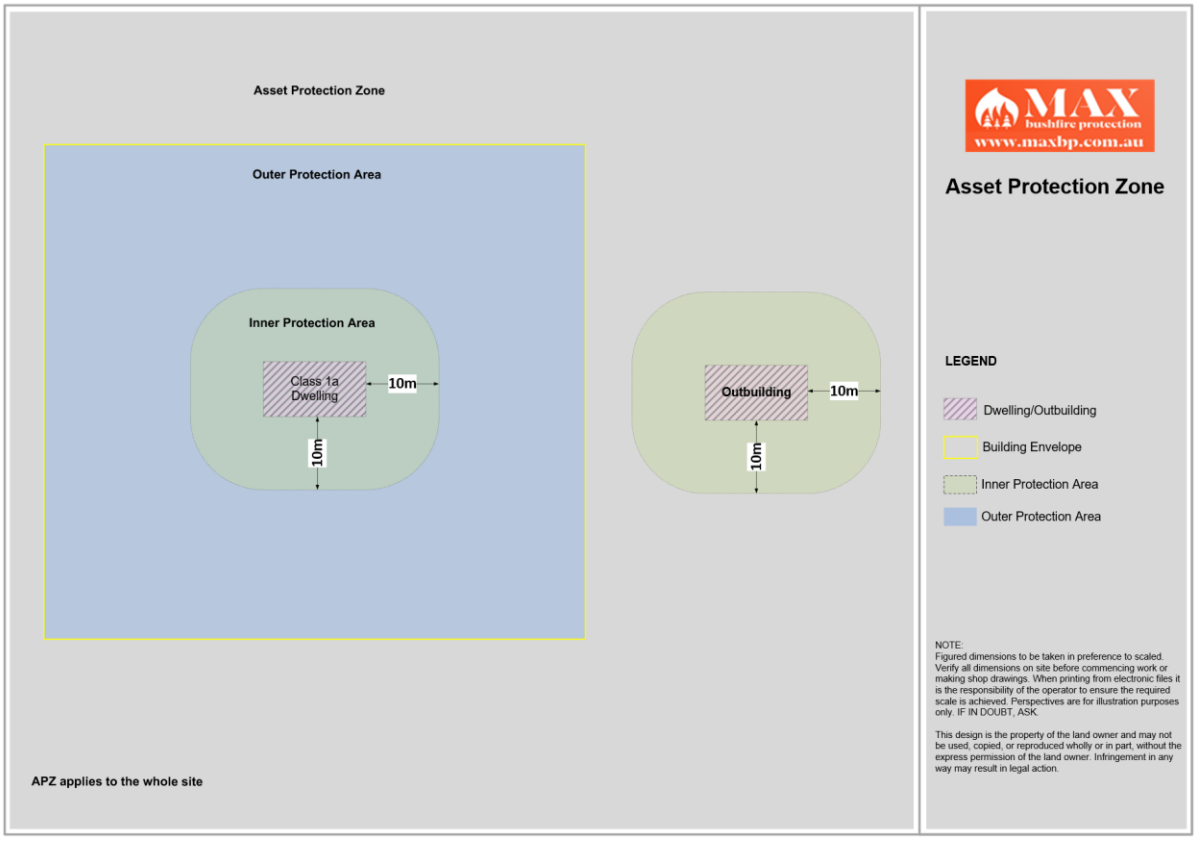



Figure 4-12: APZ within Building Envelope

**Bushfire Impact from VHC 13.2**

| Minimum Distance Calculator - AS3959-2018 (Method 2) | | | |
|---|---|---|---|
| Inputs | | Outputs | |
| Fire Danger Index | 57 | Rate of spread | 1.74 km/h |
| Vegetation Classification | Woodland | Flame length | 13.07 m |
| Understorey fuel load | 12.8 t/ha | Flame angle | 60 °, 72 °, 81 °, 85 °, 87 ° & 93 ° |
| Total fuel load | 14.4 t/ha | Elevation of receiver | 3.88 m, 3.78 m, 2.84 m, 1.31 m, 0.3 m & 0 m |
| Vegetation height | n/a | Fire intensity | 12,986 kW/m |
| Effective slope | 10 ° | Transmissivity | 0.876, 0.857, 0.832, 0.8070000000000001, 0.793 & 0.731 |
| Site slope | 10 ° | Viewfactor | 0.5962, 0.4428, 0.2999, 0.2035, 0.1654 & 0.0449 |
| Flame width | 100 m | Minimum distance to < 40 kW/m² | 10 m |
| Windspeed | n/a | Minimum distance to < 29 kW/m² | 13.7 m |
| Heat of combustion | 18,600 kJ/kg | Minimum distance to < 19 kW/m² | 20.5 m |
| Flame temperature | 1,090 K | Minimum distance to < 12.5 kW/m² | 29.5 m |
| | | Minimum distance to < 10 kW/m² | 35.3 m |

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

**Bushfire Impact by VHC 13.21**

**Bushfire Attack Level calculator - AS3959-2018 (Method 2)**

| Inputs | | Outputs | |
|---|---|---|---|
| Fire Danger Index | 57 | Rate of spread | 1.74 km/h |
| Vegetation Classification | Woodland | Flame length | 13.07 m |
| Understorey fuel load | 12.8 t/ha | Flame angle | 74 ° |
| Total fuel load | 14.4 t/ha | Panel height | 12.56 m |
| Vegetation height | n/a | Elevation of receiver | 3.63 m |
| Effective slope | 10 ° | Fire intensity | 12,986 kW/m |
| Site slope | 10 ° | Transmissivity | 0.852 |
| Distance to vegetation | 15 m | Viewfactor | 0.4086 |
| Flame width | 100 m | Radiant heat flux | 26.49 kW/m² |
| Windspeed | n/a | Bushfire Attack Level | BAL-29 |
| Heat of combustion | 18,600 kJ/kg | | |
| Flame temperature | 1,090 K | | |

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Figure 4-13: Separation Distance and Radiant Heat Flux Modelling

## 4.7 Asset Protection Zone within Building Envelope

A minimum Asset Protection Zone (APZ) will need to be established and maintained around the Class 1a dwelling to ensure adequate separation from hazardous vegetation. The APZ will apply to the whole site, comprising a 10 m radius around the proposed building as the Inner Protection Area (IPA), with the remaining area within the building envelope is designated as the Outer Protection Area (OPA).

Figure 4-12 illustrates the minimum APZ requirements. All distance measurements for the APZ should be taken as horizontal distances. Management strategies within the APZ will ensure that vegetation or other structures proposed do not increase the overall potential fuel load. The Bushfire Management Plan will detail these requirements comprehensively.

In the remaining areas on the subject site, the client should continue to maintain the current vegetation management practices. Unmanaged vegetation will increase the bushfire risk.

It is critically important to note that failure to maintain the Asset Protection Zone (APZ) will compromise its effectiveness, leading to an elevated bushfire risk to the proposed development.

## 4.8 Bushfire Attack Level and Construction Requirements

For building approval on the new lot, a bushfire report will be required once the final building location is determined, to accurately confirm the applicable Bushfire Attack Level (BAL). Based on current modelling, the BAL is expected to fall within BAL-12.5, BAL-19, or BAL-29, depending on the final building sitting and separation distances.

To assist in managing the impacts of bushfires in Queensland, the Queensland Government has developed guidelines aimed at enhancing the resilience of both new and existing homes. These guidelines provide practical, site-specific recommendations on building design and landscaping measures to improve bushfire resilience.

It is recommended that the client refer to and apply these guidelines to strengthen the bushfire resilience of the dwelling.

- Queensland Reconstruction Authority (2024). Bushfire Resilient Building Guidance for Queensland Homes. https://www.qra.qld.gov.au/sites/default/files/2024-02/0873_QRA%20CSIRO%20Bushfire%20Guideline%20(updated%20February%202024).pdf

# 5. Bushfire Management Plan

This Bushfire Management Plan (BMP) identifies the bushfire protection measures that should be implemented as part of the proposed development to manage and to reduce the risk from bushfire to an acceptable level. It is important to understand the processes that influence bushfire behaviour and the sources of damage that threaten people and property.

## 5.1 Bushfire Behaviours

Understanding bushfire behavior is crucial when planning development on bushfire-prone land to effectively mitigate the risks associated with bushfires. Three primary elements significantly influence bushfire behavior, as follows:

### 5.1.1 Topography

The physical characteristics of the landscape significantly influence bushfire behavior. It is well-established that fires tend to spread more rapidly when they move uphill. This is because flames can easily access unburnt fuel ahead of the fire, which is pre-heated by radiant heat, making it more combustible. Studies indicate that for every 10-degree increase in slope, the fire's speed can double. For example, if a fire is moving at a rate of 5 km per hour on flat ground, and it encounters a 10-degree slope, its speed can double to 10 km per hour uphill. As the fire gains momentum, it also increases in intensity, becoming even hotter.

Conversely, when a fire moves downhill, its speed decreases because the flames have less fuel to consume, and radiant heat pre-heats less fuel in front of the fire. For every 10-degree decrease in slope, the fire's speed is halved. It's important to note that fires typically move more slowly as the slope declines.

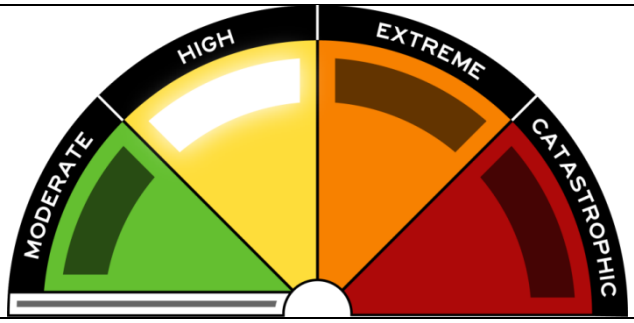
### 5.1.2 Weather Conditions

Weather conditions are a major factor in the behavior and spread of bushfires. Hot, dry, and windy conditions can make fires more intense and difficult to control, while cooler and more humid conditions can slow their spread. Wind can also influence the direction and speed of the fire, and changes in wind direction can make it more difficult for firefighters to predict the fire's behavior. Weather forecasting is a critical component of bushfire management, as it allows firefighters and other responders to anticipate changes in fire behavior and take action to mitigate the risks. In addition, many communities now use tools like automated alert systems to warn residents of potential fire danger based on weather conditions.

The new Australian Fire Danger Rating System (AFDRS) improves and simplifies the reporting of fire danger. Fire danger ratings describe the potential level of danger should a bushfire starts. It is a valuable information for taking actions to protect people and property. The AFDRS has four levels, each with a distinct title, colour and key message.

### 5.1.3 Vegetation

The amount and type of fuel available can greatly influence the behavior of a bushfire. Vegetation is the source of fuel of a bushfire. Vegetation that is dry and dead, or that is densely packed, can create more intense and long-lasting fires. In contrast, areas with little fuel or sparse vegetation may not support a fire at all. The arrangement of fuel can also play a role, as fires that encounter a continuous "fuel ladder" from the ground up into the canopy can become more severe. The amount of fuel surrounding a building can directly impact a buildings survival. Vegetation management, landscaping for bushfire and breaking the continuity of vegetation can limit the spread of fire.




**Moderate: Plan and Prepare.**
Most fires can be controlled

- Stay up to date and be ready to act if there is a fire.

**High: Be Ready to Act**
Fires can be dangerous

- Decide what you will do if a fire starts.
- There's a heightened risk. Be alert for fires in your area.
- If a fire starts, your life and property may be at risk. The safest option is to avoid bushfire risk areas.

**Extreme: Take Action Now to protect your life and property**
Fires will spread quickly and be extremely dangerous

- These are dangerous fire conditions.
- Check your bushfire plan and make sure your property is fire ready.
- If a fire starts, take immediate action.
- If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts.
- Reconsider travel through bushfire risk areas.

**Catastrophic: For your survival, leave bushfire risk areas**
If a fire starts to take hold, lives are likely to be lost

- These are the most dangerous conditions for a fire.
- Your life may depend on the decisions you make, even before there is a fire.
- For your survival, do not be in bushfire risk areas.
- Stay safe by going to a safer location early in the morning or the night before.
- If a fire starts and takes hold, lives and properties are likely to be lost.
- Homes cannot withstand fires in these conditions. You may not be able to leave and help may not be available.

Table 4: Australian Fire Danger Rating

## 5.2 Potential Bushfire Impacts and Attack Mechanisms

Bushfire attack mechanisms are typically interconnected, rarely occurring in isolation. Both people and property often face a combination of bushfire attack

factors, each operating across different spatial scales. Nevertheless, strategies aimed at mitigating the impacts of direct flame contact, radiant heat exposure, and ember attack can be effectively addressed within the framework of land use planning and development assessments, conducted at manageable scales.

The main sources of direct bushfire attack that give rise to loss of life, and damage to property and infrastructure are as follows:

### 5.2.1 Direct Flame Contact

Direct flame contact occurs when flames from a bushfire come into direct contact with a building, structure, or individuals. When this happens, the flames can ignite any flammable material present and cause fires to spread rapidly. Direct flame contact can also cause burns and other heat-related injuries to people who are in the path of the flames.

Direct flame contact is a significant concern during a bushfire, especially for buildings and structures that are located in close proximity to the fire. The intensity of the flames and the duration of the exposure can have a significant impact on the severity of the damage.

To reduce the risk of direct flame contact during a bushfire, it's essential to create a defensible space around buildings and structures, clear flammable materials from the area, and use fire-resistant building materials when constructing or renovating buildings. Additionally, it's crucial to follow evacuation orders and stay informed about the fire's behavior and movement to ensure personal safety.

### 5.2.2 Radiant Heat Exposure

Radiant heat exposure is a significant danger during a bushfire. When a bushfire occurs, the heat generated by the flames causes the air surrounding the fire to heat up, and this heat energy is then radiated out in the form of electromagnetic waves. These waves can travel a considerable distance from the fire and can cause surfaces that are not in direct contact with the flames to heat up.

During a bushfire, radiant heat exposure can be intense, and the effects can be severe. Radiant heat can ignite flammable materials, such as dry vegetation or wooden structures, and cause them to catch fire. It can also cause buildings and structures to overheat, leading to structural damage or collapse. Additionally, people who are too close to the flames can suffer from heat stress, dehydration, and serious burns.

The risk of radiant heat exposure during a bushfire can be mitigated by creating a defensible space around buildings and structures, clearing flammable materials from the area, and using fire-resistant building materials when constructing or renovating buildings. It's also important to follow evacuation orders and stay informed about the fire's behavior and movement to ensure personal safety.

### 5.2.3 Ember Attack

Ember attack, often referred to as spot fires, represents a prominent hazard during bushfires. This phenomenon occurs when burning embers, also known as firebrands or spot fires, are carried by the wind and land in different locations, potentially igniting new fires.

In the midst of a bushfire, the combination of hot air and flames generates updrafts capable of lifting burning embers over considerable distances. These embers can alight on rooftops, in gutters, or on flammable materials near buildings and structures, leading to ignition and the potential initiation of new fires.

Ember attack poses a unique danger because it can manifest hours or even days after the primary fire front has passed, and it has the capacity to ignite fires in areas previously unaffected by the bushfire. Consequently, it is imperative to prepare for ember attack through measures such as establishing a defensible space around buildings and structures, removing flammable materials from the vicinity, and sealing gaps and openings in buildings to prevent ember ingress.

### 5.2.4 Wind and Smoke Attack

Strong winds can cause a bushfire to spread more rapidly and can also increase the likelihood of ember attack, as burning embers can be carried by the wind over long distances. Wind can also push flames and radiant heat towards buildings and structures, increasing the risk of direct flame contact and radiant heat exposure.

Smoke from a bushfire can also pose a danger to people's health, particularly for those with respiratory problems. Smoke can contain particulate matter, carbon monoxide, and other harmful pollutants that can irritate the lungs and worsen respiratory conditions. In addition to health effects, smoke can reduce visibility, making it more difficult for firefighters to contain the fire and for people to evacuate safely.

### 5.2.5 Convection and Conduction

Both convection and conduction can play a significant role in the spread and intensity of a bushfire. To reduce the risk of a bushfire spreading through convection and conduction, it's important to create a defensible space around buildings and structures, clear flammable materials from the area, and use fire-resistant building materials when constructing or renovating buildings. It's also crucial to follow evacuation orders and stay informed about the fire's behavior and movement to ensure personal safety.

## 5.3 Bushfire Protection Measures

This section identifies the bushfire protection measures that will be implemented as part of the proposed development to comply with the requirements of both the State

and local council's Bushfire Prone Area code and to minimise the impact of potential bushfires on people and property.

The proposed measures are prepared in according with Queensland State Government State Planning Policy - Part E (SPP 2017), the Bushfire Resilient Communities Technical Reference Guide (QFES, 2019), the local council's Bushfire Overlay Code, and the Australian Standard (AS 3959:2018) for Construction of buildings in bushfire-prone areas.

The legislation mentioned above aims to protect individuals and buildings from bushfires by ensuring that new developments meet specific Performance Outcomes that are appropriate for the identified bushfire hazard. These Performance Outcomes are typically achieved by properly separating the development from the bushfire hazard, providing adequate access for firefighting vehicles, and constructing buildings to the appropriate standards. Additionally, the legislation includes other relevant factors that are deemed necessary for ensuring the safety of individuals and buildings during a bushfire emergency.

### 5.3.1 Asset Protection Zone (APZ)

An Asset Protection Zone (APZ) is the most important bushfire protection measure. An APZ is a designed area surrounding a building or structure that has been well managed to reduce the risk of a bushfire impacting the building or structure. An APZ provides:

- A buffer zone between a bushfire hazard and an asset
- An area of reduced bushfire fuel that allows suppression of fire
- An area from which backburning may be conducted
- An area which allows emergency services access and provides a relatively safe area for firefighters and homeowners to defend their property.

A correctly designed and regularly maintained APZ will reduce the risk of:

- Direct flame contact on the asset
- Damage to the build asset from intense radiant heat
- Ember attack on the asset

An APZ are typically designed and created by removing vegetation and other combustible materials from around the building or structure, reducing the fuel available for a bushfire. The width of the APZ and the level of vegetation removal required depend on a number of site-specific factors, including the slope of the land, the hazardous vegetation type, and the intensity of the bushfire hazard. The property owner is responsible for creating and maintaining regularly the designed APZ.

(1) Creating APZ by reducing bushfire fuel

The intensity of bush fires can be greatly reduced where there is little to no available fuel for burning. To effectively manage bushfire fuels, there are several approaches to reduce, remove, or change the condition of the fuel.

- Raking or manual removal of fine fuels
- Mowing or grazing of grass
- Removal or pruning of trees, shrubs and understorey
- Slashing and trittering

It is important to note that reducing fuel does not always require removal of all vegetation, which would cause environmental damage. Trees and plants also provide protection against bushfires by mitigating the impact of strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns. Some ground cover vegetation is also needed to prevent soil erosion.

(2) Ongoing management for APZ

The creation of an Asset Protection Zone (APZ) establishes a controlled fuel-managed area that serves to reduce the potential impact of direct flame contact and radiant heat on property development, effectively acting as a defensible space. It is crucial to emphasize that the management of vegetation and landscaping within the APZ is of paramount importance and should maintain a minimal fuel load.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bushfires, and maintenance of the APZ should be regularly undertaken, especially in advance of the bushfire season. The requirements are set out as follows.

(i) Inner Protection Area

The Inner Protection Area is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the proposed development and act as an important space. Vegetation within this area should be kept below 100 mm in height and be discontinuous.

In practical terms the Inner Protection Area is typically the curtilage around the building, consisting of a mown lawn and well-maintained gardens.

When establishing and maintaining the inner protection zone, the following requirements apply:

- General
  - A minimum 1m wide area, suitable for pedestrian traffic, must be provided around the immediate curtilage of the building
  - Planting is limited in the immediate vicinity of the building
  - All leaves and vegetation debris must be removed at regular intervals during the declared fire danger period
  - Planting does not provide a continuous canopy to the building
  - Within 10 metres of a building, flammable objects must not be located close to the vulnerable parts of the building
  - Plants greater than 10 cm in height must not be placed within 3m of a window or glass feature of the building

- Low flammability vegetation species are used

- Trees
  - Tree canopy cover should be less than 15% at maturity
  - Trees at maturity should not touch or overhang the building
  - Lower limbs should be removed up to a height of 2m above the ground
  - Tree canopies should be separated by 2 to 5m
  - Preference should be given to smooth barked and evergreen trees
- Shrubs
  - Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided
  - Shrubs should not be located under trees
  - Shrubs should 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
- Grass
  - Grass should be kept mown regularly (as a guide grass, should be kept to no more than 100mm in height)
  - Leaves and vegetation debris should be removed regularly

(ii) Outer Protection Area

The Outer Protection Area is located between the Inner Protection Area and unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns, reducing the level of direct flame, radiant heat and ember attack on the inner protection zone.

- Trees
  - Tree canopy cover should be less than 30% at maturity
  - Tree canopies should be separated by 2 to 5m
- Shrubs
  - Shrubs should not form a continuous canopy, and
  - Shrubs should not form more than 20% ground cover
- Grass
  - Grass should be kept mown regularly to height of less than 100mm
  - Leaves and other debris should be removed regularly.

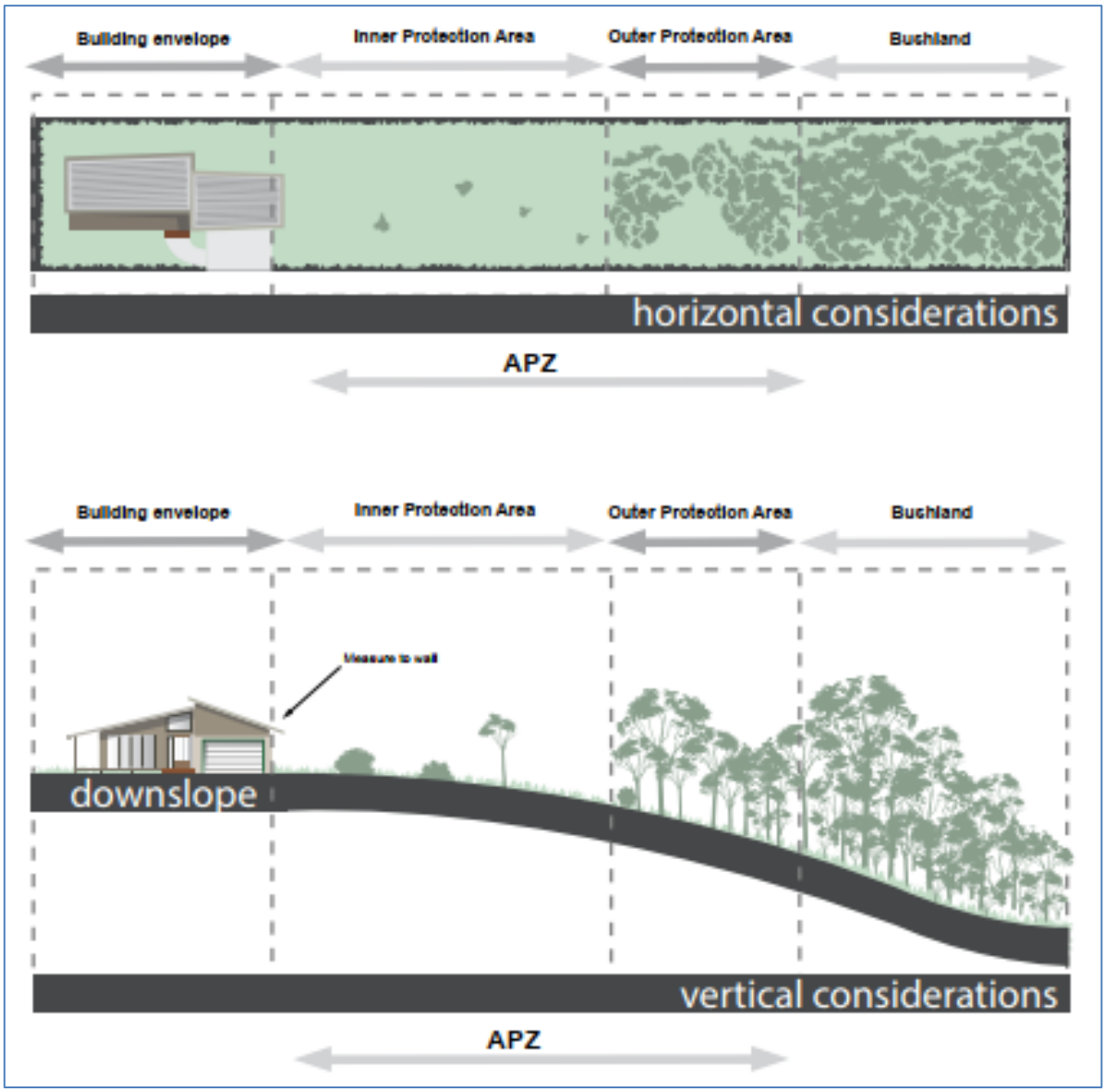



Figure 5-1: Inner protection area and Outer protection area

### 5.3.2 Building Construction, Siting and Design

The appropriate design and construction of buildings enhance their survivability from bushfires. Construction measures should not be applied as a stand-alone mitigation solution but should form part of a suite of measures. This should also include APZ, appropriate access, water supply and landscaping. Building design needs to ensure adequate protection of vulnerable building elements. Construction standards are outlined in AS 3959:2018 and the NASH Standard to provide various levels of protection for different building elements.

The outcome of the BAL assessment is BAL-29 in according with AS 3959:2018 and the Bushfire Resilient Communities.

It should be noted the Building Code of Australia only requires Classes 1, 2 and 3 and certain Class 9 buildings and Class 10a building associated with those buildings to comply with the bushfire provisions of the NCC 2022.

### 5.3.3 Access and Evacuation Arrangement

Developments in bushfire prone areas should be serviced by safe access/exit points for both site personnel and emergency services personnel in the event of an emergency. The local council's Bushfire Hazard Overlay Code prescribes appropriate access for fire management an evacuation to be provided as below:

- Do not exceed an average gradient of 12.5%
- Have a minimum width of 4m and 6m of vegetation clearing, can be up to 10m.
- Have a minimum of 4.8m vertical clearance
- Accommodate turning areas for fire-fighting appliances in accordance with Qld Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines
- Passing bays for firefighting appliances are 20m long by 3m wide, with a minimum trafficable width of 7m at the passing bay
- Reversing bays for firefighting appliances are 6m wide and 8.5m deep to any gates, meeting above turning requirements
- Passing bays or turning intervals located every 200m with a maximum grade of 5%
- Compacted driveway to ensure all weather surfaces

The proposed development will provide with vehicular access that enables safe evacuation for occupants and easy access by firefighting appliances. Consequently, the proposed development is in compliance with the Council Bushfire Hazard Overlay.

### 5.3.4 Water Supply

It is noted that AS 3959:2018 – Construction of buildings in bushfire-prone areas does not include requirements for water supply for firefighting purposes, nor is water supply a factor in determining a building's Bushfire Attack Level (BAL) rating. Accordingly, the building certifier should not impose conditions on the building approval relating to water supply for firefighting purposes, unless such conditions are required under a development permit issued by the local council or are specified in the applicable local planning scheme.

An adequate supply of water is essential for firefighting purposes and suitable water supply arrangements shall be provided. The proposed development should provide

an appropriate water supply to support effective emergency services response includes reticulated water and/or appropriate static water supply.

The reticulated hydrant system shall be designed and constructed in accordance with 'QLD Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines.

Where reticulated water is unavailable, an appropriate static water supply should consist of a dedicated water tank specifically for firefighting purposes, with suitable access for firefighting appliances. It is recommended that the tank be located within 10m of the building. To ensure durability and compliance with safety standards, it is strongly recommended that the tank be constructed underground or from non-combustible materials, such as steel or concrete.

The tank must include a take-off connection providing a minimum of 10,000 litres of static water exclusively for firefighting access. The site must permit clear access for a medium rigid fire appliance (15 tonnes) to within 6 metres of the tank.

Tanks and associated pumps must be protected from bushfire impact in accordance with AS 2304:2011 – Water storage tanks for fire protection systems. Where the site is serviced by a rural fire brigade, the tank shall be fitted with brigade-compatible fittings, including a 50-millimetre ball valve and a male camlock coupling. If the tank is underground, a minimum 200-millimetre access hole must be provided to allow suction line access. Directional signage must clearly indicate the tank's location at the street frontage.

### 5.3.5 Landscaping Management Plan

The type, location and ongoing maintenance of landscaping are considered a necessary bushfire protection measure. Landscaping management for bushfire is the process of designing, constructing, and maintaining a landscape in a way that reduces the risk of bushfire. The management strategies typically involve creating fire breaks, reducing fuel loads, and selecting vegetation that is less flammable.

Appendix A provides a list of less flammable plants.

The landscaping management shall be carried out as the requirements set out for Asset Protection Zone in Section 5.3.1.

### 5.3.6 Reducing Fuel load and Weed Management

Removing excess ground fuels and combustible material is a crucial aspect of effective fire prevention and management. This process involves the careful clearance of various flammable materials, including long dry grass, accumulated dead leaves, and fallen branches. By systematically reducing these fuel sources, the risk of fire ignition and spread is significantly mitigated. Regular maintenance of such

clearance efforts is essential to ensure ongoing fire safety and resilience within the environment.

Unmanaged invasive pest plants can swiftly amplify fuel loads, comprising fast-growing introduced grasses, dense woody weeds, and invasive climbing vines. These factors collectively escalate fuel loads, fostering a "laddering" effect, intensifying fire spread and allowing it to transition from ground to canopy. Effective weed management markedly diminishes bushfire risk to the site and surrounding properties.

# 6. Conclusion

The following recommendations are provided in relation to the requirements of Council's Bushfire Hazard Overlay Code.

- Bushfire management area and Asset Protection Zone (APZ) has been designed and will be established and maintained. Each lot contains a sufficient building area to accommodate a dwelling with a predicted radiant heat flux exposure not exceeding 29 kW/m²
- Construction of building to meet construction requirements of AS 3959:2018.
- Provision of water and service to be in accordance with the requirements.
- The location of the proposed dwelling maximizes the use of existing cleared and open space while minimizing the clearing of native vegetation and its impact on the environment.

In conclusion, the proposed development has been designed and managed to ensure that the exposure of people and property to unacceptable bushfire hazard risks has not increased. The development will mitigate bushfire risk through appropriate siting, design, and management measures. It provides suitable access and evacuation routes for both private and emergency service vehicles, in line with the nature of the development and the level of bushfire risk. An adequate water supply for firefighting purposes will be provided, and no hazardous goods will be stored on-site. Overall, the development meets all necessary requirements to minimize the risk of bushfires to people, property, public health, and the environment.

This assessment assumes that vegetation on the site will be maintained according to the client's outlined plans. Should the proposed development require the removal of site vegetation to meet specific BAL requirements set by either the developer or the client, it is the client's responsibility to comply with relevant regulations regarding native vegetation clearing.

Although emergency management arrangements are not a mandatory measure for the proposed development, it is recommended that residents in bushfire prone areas prepare a bushfire survival plan.

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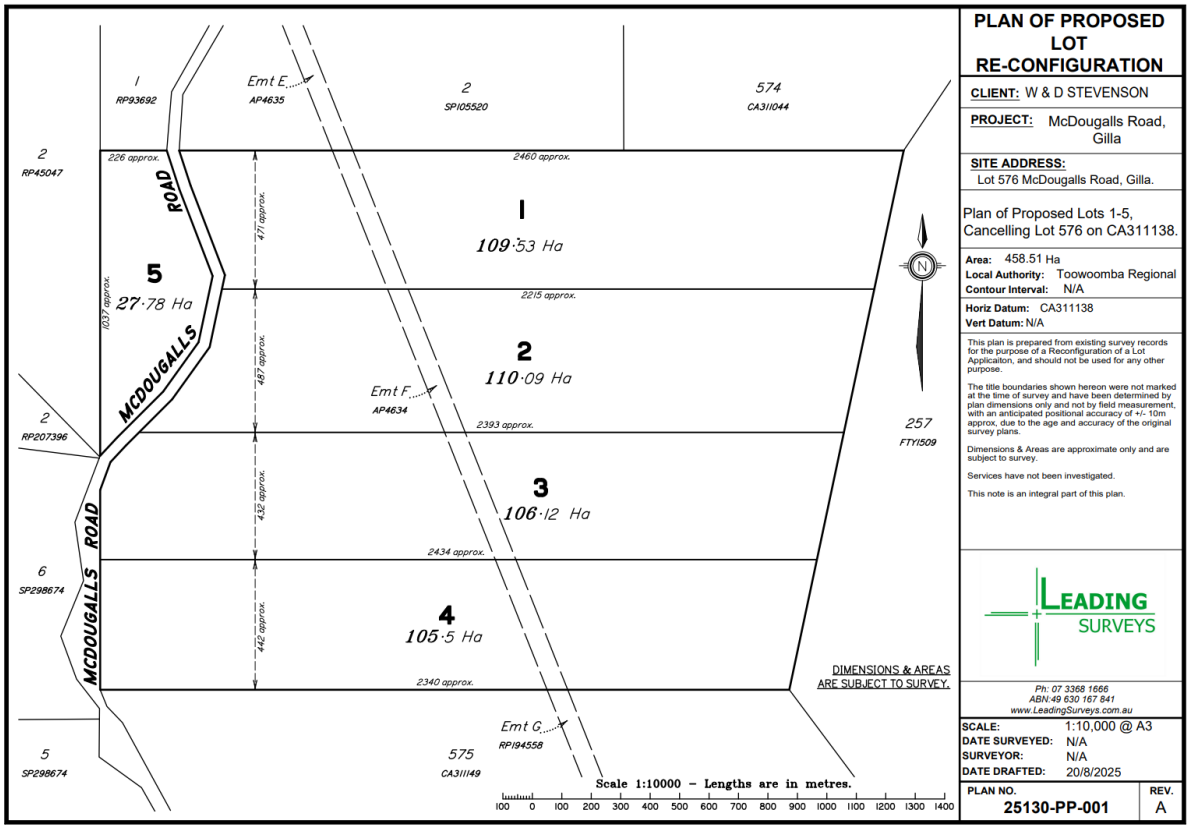
# 8. Appendix

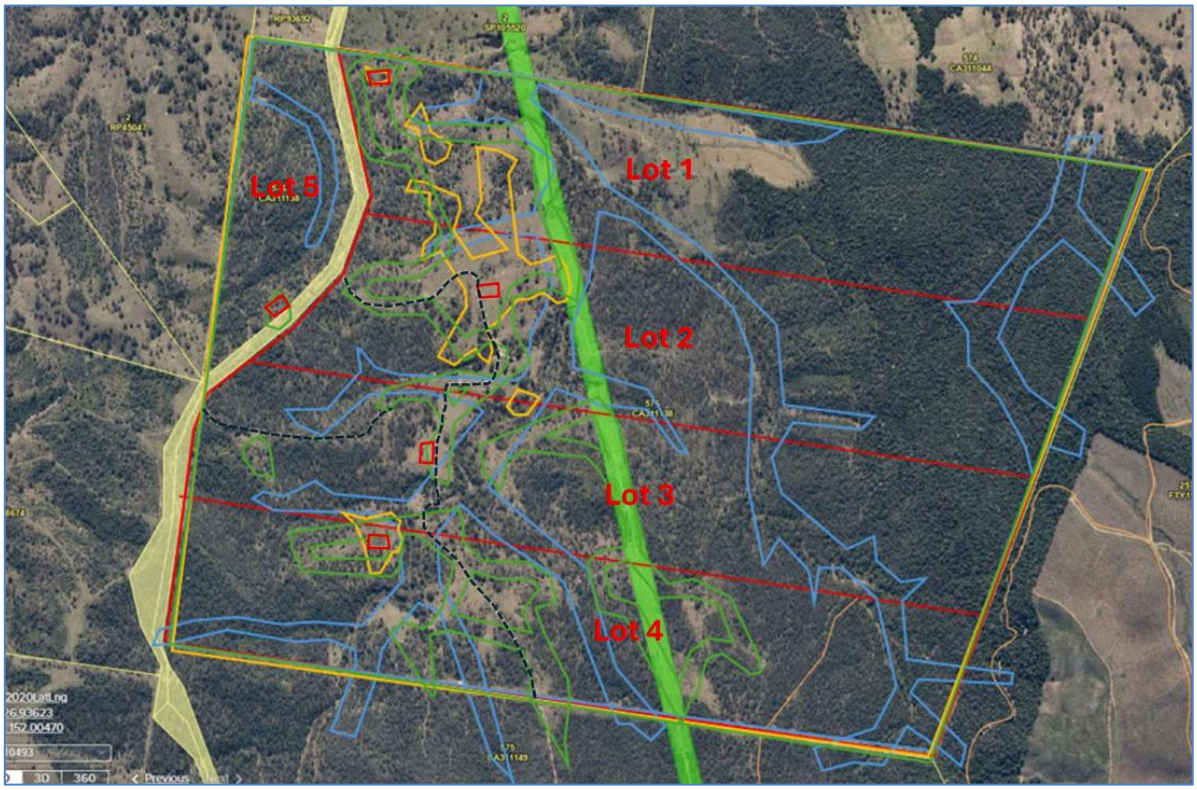
Appendix A Site Plan

Appendix B Low Flammability Plant Species List

Appendix C Summary of AS3959-2018 Construction Requirements for Bushfire Attack Level

## Appendix A Site Plan



## Appendix B Low Flammability Plant Species List

This list is intended as a general guide. It is essential to conduct independent research to identify fire-resistant species specific to the region of the subject site, as suitability varies across Queensland. Notably, all plants, whether native or exotic, will combust when exposed to extreme heat or flame; therefore, additional precautions may be required.

| **Ground covers and creeping plants** |
|---|
| • Casuarina glauca prostrate, commonly known as grey she oak or marsh she oak |
| • Anigozanthos, commonly known as kangaroo paw |
| • Carpobrotus glaucescens, commonly known as pigface |
| • Hardenbergia violacea, commonly known as sarsparilla or purple coral pea |
| • Liriope muscari, commonly known as lilyturf |
| • Lomandra longifolia, commonly known as spiny-headed mat-rush |
| • Lomandra hystrix, commonly known as mat-rush |
| • Varieties of Brachyscome |
| • Varieties of Dampiera |
| • Dianella caerulea, commonly known as blue berry lily |
| • Varieties of Dianella prunina |
| • Dianella revoluta, commonly known as blue berry lily or spreading flax lily |
| • Dichondra repens, commonly known as kidney weed |
| • Einadia nutans, commonly known as climbing saltbush |
| • Hardenbergia violacea, commonly known as false sarsaparilla, purple coral pea, happy wanderer, native lilac or waraburra |
| • Scaevola aemula, commonly known as fairy fan flower |
| • Scaevola humilis, commonly known as sandplain fan flower |
| • Varieties of Cotyledon |
| • Myoporum insulare, commonly known as boobialla, native juniper or blueberry tree |
| • Eremophila glabra, commonly known as kalbarri carpet |
| • Eremophila debilis, commonly known as winter apple |
| • Elaeocarpus eumundi, commonly known as eumundi quandong |
| • Elaeocarpus prima donna, commonly known as blueberry ash |
| • Kennedia rubicunda, commonly known as Dusky coral pea or red kennedy pea |
| • Rhododendron hybrid, commonly known as azalea |
| • Varieties of Arctotis |
| • Varieties of Photinia |
| • Westringia fruticosa, commonly known as native rosemary |

| Shrubs |
| --- |
| • All varieties of Aloe |
| • Correa reflexa, commonly known as nativefuchsia |
| • Varieties of Acacia |
| • Nerium oleander, commonly known as oleander |
| • Varieties of Atriplex, commonly known as saltbushes |
| • Varieties of Escallonia |
| • Varieties of Maireana, commonly known as cottonbush |
| • Varieties of Eremophila, commonly known as emu bushes or fuchsia bushes |
| • Varieties of Grevillea |
| • Melaleuca nodosa, commonly known as prickly leaf paperbark |
| • Varieties of Syzygium |
| • Varieties of Photinia |
| • Varieties of Rhagodia |
| • Rhaphiolepis indica, commonly known as india hawthorn |
| • Strelitziacae hutch |
| • Strelitzia banks |
| • Srelizia nicolai |
| • Sambucus australasica, commonly known as yellow elderberry or native elderberry |
| • Varieties of Coprosma |
| • Varieties of Plectranthus |
| • Senna artemisioides, commonly known as silver cassia |

| Deciduous trees |
| --- |
| • Brachychiton acerifolius, commonly known as the flame kurrajong |
| • Ulmus parvifolia, commonly known as chinese elm |
| • Morus alba, commonly known as the mullberry tree |
| • Eriobotrya japonica, commonly known as loquot |
| • Gleditsia triacanthos, commonly known as honey locust |
| • Trees from the genus Prunus, including ornamental cherries, plums and peaches |
| • Trees from the genus Malus, including apples and crab apples |

| Evergreen trees |
| --- |
| • Grevillea robusta, commonly known as silky oak |
| • Melia azedarach, commonly known as cape lilac, white cedar, persian lilac or chinaberry |
| • Lophostemon confertus, commonly known as brush box, queensland box, brisbane box or pink box |
| • Tristaniopsis laurina, commonly known as water gum, kanooka or kanuka |
| • Rapanea variabilis, commonly known as muttonwood |
| • Varieties of Acacia |
| • Varieties of Acmena |
| • Varieties of Magnolia |
| • Cupaniopsis anacardioides, commonly known as tuckeroo or beach tamarind |
| • Elaeocarpus reticulatus, commonly known as blueberry ash |
| • Alectryon subcinereus, commonly known as native quince |
| • Callicoma serratifolia, commonly known as black wattle |
| • Canthium coprosmoides, commonly known as supple jack or sweet susie |
| • Cassine australis, commonly known as red olive berry or red olive plum |
| • Croton insularis, commonly known as Queensland cascarilla, native cascarilla bark or silver croton |
| • Cuttsia viburnea, commonly known as native elderberry |
| • Varieties of Citrus |
| • Denhamia celastroides, commonly known as denhamia or orange boxwood |
| • Diospyros australis, commonly known as black plum or yellow persimmon |
| • Eupomatia laurina, commonly known as bolwarra, grey beech or native guava |
| • Glochidion ferdinandi, commonly known as the cheese tree or buttonwood |
| • Guioa semiglauca, commonly known as guioa or wild quince |
| • Hodgkinsonia ovatiflora, commonly known as golden ash |
| • Hymenosporum flavum, commonly known as native frangipani or Queensland frangipani |
| • Petalostigma triloculare, commonly known as quinine berry, forest quinine or bitter bark |
| • Podocarpus elatus, commonly known as she pine |
| • Rhodosphaera rhodanthema, commonly known as yellow cedar, tulip satinwood or deep yellow wood |
| • Sarcopteryx stipata, commonly known as corduroy |
| • Scolopia braunii, commonly known as scolopia or brown birch |
| • Stenocarpus sinuatus, commonly known as white silky oak, tulip flower, white beefwood Or wheel of flower tree |
| • Streblus brunonianus, commonly known as the whalebone tree, axehandle wood or white handlewood |
| • Symplocos stawellii, commonly known as white hazelwood |
| • Symplocos thwaitesii, commonly known as buff hazelwood |
| • Varieties of Ficus (fig trees) |

## Appendix C 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/m$^3$ 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.

### Verandas, 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.

## Summary of AS3959-2018 BAL-19 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.

Where the subfloor space is unenclosed, the support posts, columns, stumps, piers and poles are to be of non-combustible material or bushfire resisting timber.

- **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 if the underside element is greater than 400mm above finished ground level

- **External walls**

The exposed components of external walls shall be as follows:

(a) made of non-combustible materials (e.g. full masonry, brick veneer etc.) with a minimum thickness of 90 mm, or

(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, with framing made from metal or bushfire resisting timber.

- **Windows**

Frame material for windows are to be made from bushfire-resisting timber, metal or metal-reinforced uPVC.

Glazing is to be toughened glass with a minimum thickness of 5 mm if the glazing is less than 400mm from the ground.

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; or

(c) fully framed glazed door panels with framing made from metal, bushfire resisting timber or uPVC.

Door frames shall be made from metal bushfire resisting timber, metal or metal reinforced uPVC.

Where doors incorporate glazing, the glazing shall be toughened glass with a minimum thickness of 5mm.

Doors shall be tight fitting to the door frame and to an abutting door, if applicable.

Weather strips, draught excluders or draught seals shall be installed.

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

- **Garage doors**

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.

(d) A pipe or conduit that penetrates the roof covering shall be non-combustible

Tiled roofs shall be fully sarked with the sarking covering the entire roof area including ridges and hips and extend into gutters and fascias.

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, 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 sealed. Sealing material is to be non-combustible.

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

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

(d) flashing elements shall be non-combustible.

- **Eaves linings, fascias and gables**

The following apply to eaves linings, fascias and gables:

(a) gables shall comply with requirements for walls.

(b) fascias and bargeboards shall be made from bushfire-resisting timber or metal.

(c) eave linings shall be fibre-cement sheet with a minimum thickness of 4.5mm or bushfire resisting timber.

(d) eave penetrations shall be protected as for roof penetrations.

(e) eaves ventilation openings are to be fitted with ember guards and be made of corrosion resistant steel, bronze or aluminium.

(f) joints in eave linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds.

- **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.

- **Verandas, 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, trafficable surfaces of ramps and landings, balustrades and handrails 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.

Verandah posts shall be made from non-combustible material or bushfire-resisting timber.

- **Water and gas supply pipes**

Above ground, exposed water and gas supply pipes shall be metal. The metal pipe shall extend a minimum of 400mm within the building and 100mm below the ground.

## Summary of AS3959-2018 BAL-29 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.

Where the subfloor space is unenclosed, the support posts, columns, stumps, piers and poles are to be of non-combustible material or bushfire resisting timber.

- **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 if the underside element is greater than 400mm above finished ground level

- **External walls**

The exposed components of external walls shall be as follows:

(a) made of non-combustible materials (e.g. full masonry, brick veneer etc.) with a minimum thickness of 90 mm, or

(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, with framing made from metal or bushfire resisting timber.

- **Windows**

Frame material for windows are to be made from bushfire-resisting timber, metal or metal-reinforced uPVC.

Glazing is to be toughened glass with a minimum thickness of 5 mm.

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; or

(c) fully framed glazed door panels with framing made from metal, bushfire resisting timber or uPVC.

Door frames shall be made from metal bushfire resisting timber, metal or metal reinforced uPVC.

Where doors incorporate glazing, the glazing shall be toughened glass with a minimum thickness of 6mm.

Doors shall be tight fitting to the door frame and to an abutting door, if applicable.

Weather strips, draught excluders or draught seals shall be installed.

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

- **Garage doors**

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.

(d) A pipe or conduit that penetrates the roof covering shall be non-combustible

Tiled roofs shall be fully sarked with the sarking covering the entire roof area including ridges and hips and extend into gutters and fascias.

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, 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 sealed. Sealing material is to be non-combustible.

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

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

(d) flashing elements shall be non-combustible.

- **Eaves linings, fascias and gables**

The following apply to eaves linings, fascias and gables:

(a) gables shall comply with requirements for walls.

(b) fascias and bargeboards shall be made from bushfire-resisting timber or metal.

(c) eave linings shall be fibre-cement sheet with a minimum thickness of 4.5mm or bushfire resisting timber.

(d) eave penetrations shall be protected as for roof penetrations.

(e) eaves ventilation openings are to be fitted with ember guards and be made of corrosion resistant steel, bronze or aluminium.

(f) joints in eave linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds.

- **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.

- **Verandas, 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, trafficable surfaces of ramps and landings, balustrades and handrails 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.

Verandah posts shall be made from non-combustible material or bushfire-resisting timber.

- **Water and gas supply pipes**

Above ground, exposed water and gas supply pipes shall be metal. The metal pipe shall extend a minimum of 400mm within the building and 100mm below the ground.

APPENDIX F

BUSHFIRE-RESISTING TIMBER

(Normative)

## F1 GENERAL

Bushfire-resisting timber is timber that is in solid, laminated or reconstituted form and has been tested and is deemed to be acceptable to withstand exposure up to a BAL—29 condition.

Timber may be 'bushfire-resisting' by means of one or more of—

(a) the inherent properties of the material itself;

(b) being impregnated with fire-retardant chemicals; or

(c) the application of fire-retardant coatings or substrates.

## F2 TESTING

The following applies:

(a) To satisfy the requirements for bushfire-resisting timber, timber shall be tested in accordance with AS/NZS 3837 and shall meet the following criteria:

(i) The maximum heat release rate shall be not greater than 100 $kW/m^2$.

(ii) The average heat release rate for 10 minutes following ignition shall be not greater than 60 $kW/m^2$ when the material is exposed to an irradiance level of 25 $kW/m^2$.

(b) Where the timber has been altered by chemicals, the test samples shall be subjected to the regime of accelerated weathering described in Paragraph F3 except that where the timber is protected from the weather, as described in the AS 1684 series (for example, cladding protected by a veranda), accelerated weathering of the test samples is not required before being tested to AS/NZS 3837.

External timbers are deemed to be protected if they are covered by a roof projection (or similar) at 30 degrees or greater to the vertical and they are well detailed and maintained (painted or stained and kept well ventilated).

NOTE: The purpose of testing is to assess timber performance rather than to simulate a bushfire. The irradiance set for the test is not to be considered to be correlated to the BAL.

## F3 ACCELERATED WEATHERING

Where accelerated weathering is required before testing to AS/NZS 3837, external fire-retardant-coated substrates shall be subjected to the ASTM D2898 Method B weathering regime, with the water flow rate modified to be the same as that within ASTM D2898 Method A.

NOTE: Accelerated weathering does not account for mechanical wear and tear within trafficable areas and care should be exercised when using coating materials.

## F4 BUSHFIRE-RESISTING SPECIES

The species listed in Table F1 have been tested and have met the requirements of Paragraph F2.





**TABLE F1**

**BUSHFIRE-RESISTANT SPECIES**

| Standard trade name | Botanical name |
|---|---|
| Ash, silvertop | *Eucalyptus sieberi* |
| Blackbutt | *Eucalyptus pilularis* |
| Gum, red, river | *Eucalyptus camaldulensis* |
| Gum, spotted | *Corymbia maculata* |
| Ironbark, red | *Eucalyptus sideroxylon* |
| Kwila (Merbau) | *Intsia bijuga* |
| Turpentine | *Syncarpia glomulifera* |