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Bushfire Management Report

118 Wockner Road,
Merritts Creek

CLIENT: NJ & DE SHANNON

PROJECT NO.	J002932
STATUS	FINAL
DATE	30/09/2026
VERSION	2

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It must be borne in mind that the measures dealt with in this report cannot guarantee that a building will survive a bushfire event. This is due mainly to the unpredictable nature and behaviour of fire and the difficulties associated with extreme weather conditions.

It must also be stated that this report is based on site conditions prevailing at the time the inspection was undertaken. These conditions can and will change dependent on both weather conditions and the maintenance undertaken by property owners.

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

As site conditions can and will change over time this report is valid for a period of 2 years. Where a development application is lodged greater than 2 years following the version date of this report Range Environmental Consultants are to be contacted to ensure accuracy of this report.

Document Control

Version	Purpose	Lead Author	Reviewer	Approved by	Date
1.	Draft Report for client consultation	HB	SLM	LMT	6/08/2026
2.	Final Report	HB	WG	LMT	30/09/2026

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1 Introduction

Range Environmental was engaged by NJ & DE Shannon to prepare a Bushfire Management Report for a proposed development at 118 Wockner Road, Merritts Creek (Figure 1) (formally described as Lot 4 RP16123 and Lots 13-16 D3420, and hereafter 'the site'). A development application for a five (5) into five (5) rural lot boundary realignment is proposed to be lodged to Toowoomba Regional Council (TRC) (Figure 2).

This bushfire hazard assessment is provided as an attached supporting document for the development application and allows for assessment against the Toowoomba Regional Planning Scheme (TRPS) (2012 Version 29) Bushfire Hazard Overlay Code and the State Planning Policy (SPP) (2017) Natural hazards, risk and resilience (Bushfire) assessment requirements. A summary of site details is provided in Table 1.

Table 1 Summary of Site Details

Site details	
Address	118 Wockner Road, Merritts Creek
Lot on Plan	Lot 4 RP16123 and Lots 13-16 D3420
Total area	145.78 ha
Local Government Area	Toowoomba Regional Council (TRC)
Planning Scheme/Local Plan	Toowoomba Regional Planning Scheme (TRPS) 2012 Version 29
<i>Vegetation Management Act 1999</i> (VMA 1999)	Category X, Category C & Category B
Area Classification/Zone	Rural
Proposed Landuse	Rural

1.1 Site Context and Proposed Development

The site is bounded by the New England Highway to the east, an unnamed road reserve to the west, and Wockner Road to the south (Figure 1). Open Space properties are located to the north and north east of the site containing slash pine (*Pinus elliottii*) plantations. Rural lands are located in the eastern and western directions of the site and rural residential properties are located to the south of the site. Existing rural and rural residential properties contain a mosaic of managed farm land and unmanaged bushland areas.

The proposed development comprises a five (5) into five (5) rural lot boundary realignment (Figure 2). The site contains varying slopes due the large site extent and varying topography present, with underlying slopes in the order of 3 to 7%, or 2 to 4 degrees (Figure 3). The real property descriptions of adjacent properties are provided in Figure 4 for where references to these are made. The following photographs provide an overview of the condition of the site at the time of site assessment.

Development Envelopes have been identified on proposed Lots 2 – 5 to facilitate the location of future infrastructure (including indicative dwellings, associated asset protection zones (APZ), effluent disposal areas, and ancillary structures) to achieve a maximum BAL which is in the order of BAL-29, dependant on the final location of a dwelling within the Development Envelopes.

Due to the size of proposed Lot 1, the extent of existing vegetated areas, and existing/ongoing agricultural use of the site (livestock grazing practices), a Development Envelope has not been identified in association with this boundary realignment. Where future infrastructure is proposed to be constructed on Lot 1, sufficient areas are available which contain limited native vegetation values.



Photograph 1 View to the west of VHC 40.4 overlooking Lots 2 – 5



Photograph 2 View to the north of VHC 40.4 overlooking Lots 2 – 5



Photograph 3 View of retained canopy trees and managed understorey (VHC 39.2) in the eastern extent of Lot 2



Photograph 4 VHC 9.1 located to the east of Lot 5



Photograph 5 View to the east of VHC 39.2 within the site to the east of the development



Photograph 6 View of VHC 40.4 (foreground) and VHC 8.1 (background) to the south of the site



Photograph 7 View of VHC 8.1 located south of the site. Vegetation structure is typical within the surrounding landscape



Photograph 8 View of VHC 9.1 located in the western extent of the site. Vegetation structure is typical within the site.



Photograph 9 View of VHC 9.1 located in the central extent of the site. Vegetation structure is typical within the site.



Photograph 10 View of VHC 9.2 located in the central extent of the site. Vegetation structure is typical within the site.



Photograph 11 View of VHC 9.2 located in the central extent of the site. Vegetation structure is typical within the site.



Photograph 12 View of VHC 9.2 located in the eastern extent of the site. Vegetation structure is typical within the site.

It is noted that the current aerial imagery does not accurately reflect on-site vegetation values. Within the previous 12 months cyclical and ongoing land management has occurred within development extent. The on-ground extent of native vegetation has been appropriately reflected within the identified vegetation communities as described in Section 3.2.2 of this Ecological Assessment Report.

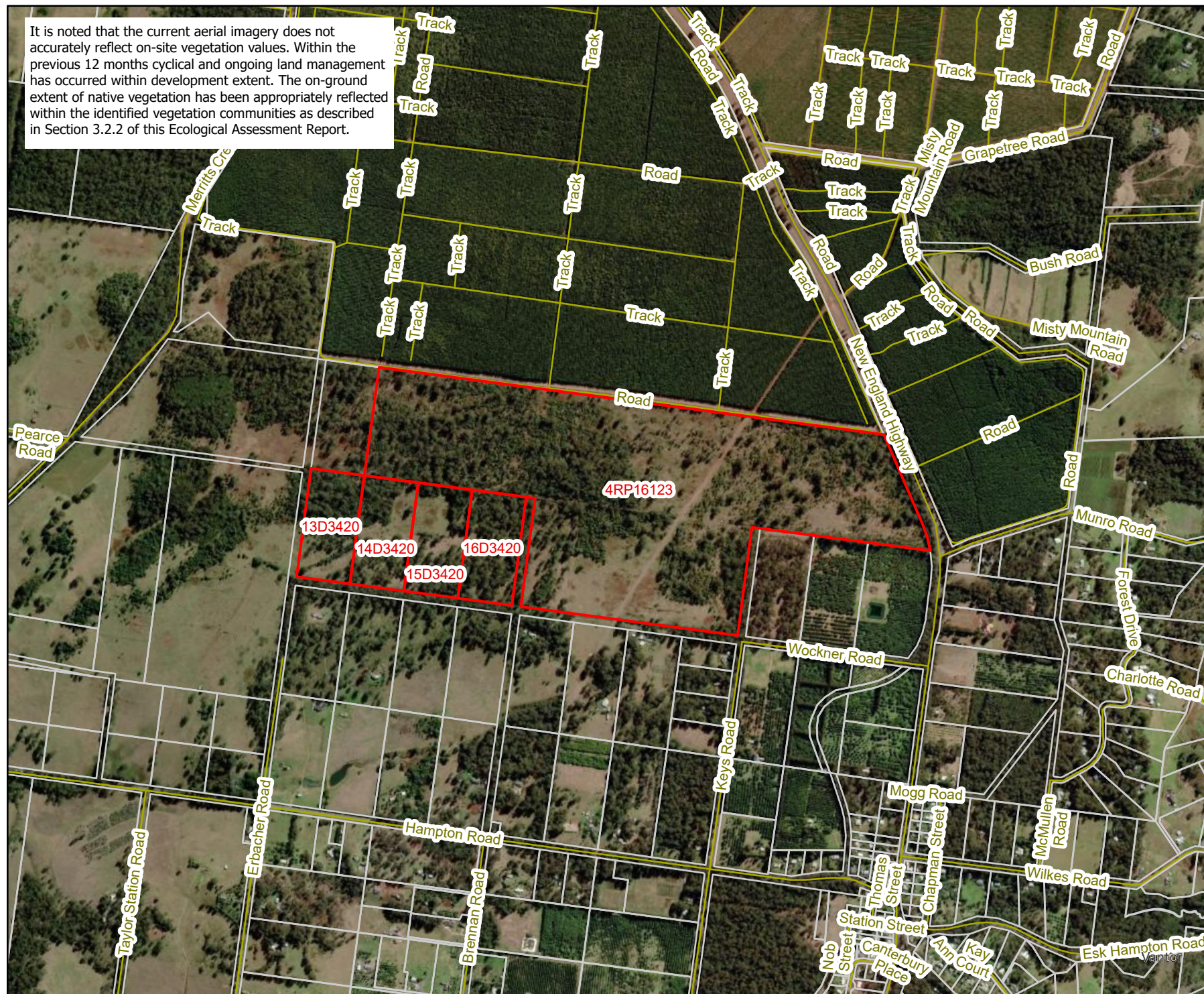


Figure 1 Site Locality

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/09/2026
Approved by: Will Gibson Date: 4/09/2026

0 230 460 Metres

Legend

- Cadastre
- Roads
- Site boundaries

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



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It is noted that the current aerial imagery does not accurately reflect on-site vegetation values. Within the previous 12 months cyclical and ongoing land management has occurred within development extent. The on-ground extent of native vegetation has been appropriately reflected within the identified vegetation communities as described in Section 3.2.2 of this Ecological Assessment Report.

It is also noted that sections of Wockner Road (east of Keys Road) is unformed.

Development Envelopes have been identified on proposed Lots 2 – 5 to facilitate the location of future infrastructure (including indicative dwellings, associated asset protection zones (APZ), effluent disposal areas, and ancillary structures) to achieve a maximum BAL which is in the order of BAL-29, dependent on the final location of a dwelling within the Development Envelopes.

Due to the size of proposed Lot 1, the extent of existing vegetated areas, and existing/ongoing agricultural use of the site (livestock grazing practices), a Development Envelope has not been identified in association with this boundary realignment. Where future infrastructure is proposed to be constructed on Lot 1, sufficient areas are available which contain limited native vegetation values.

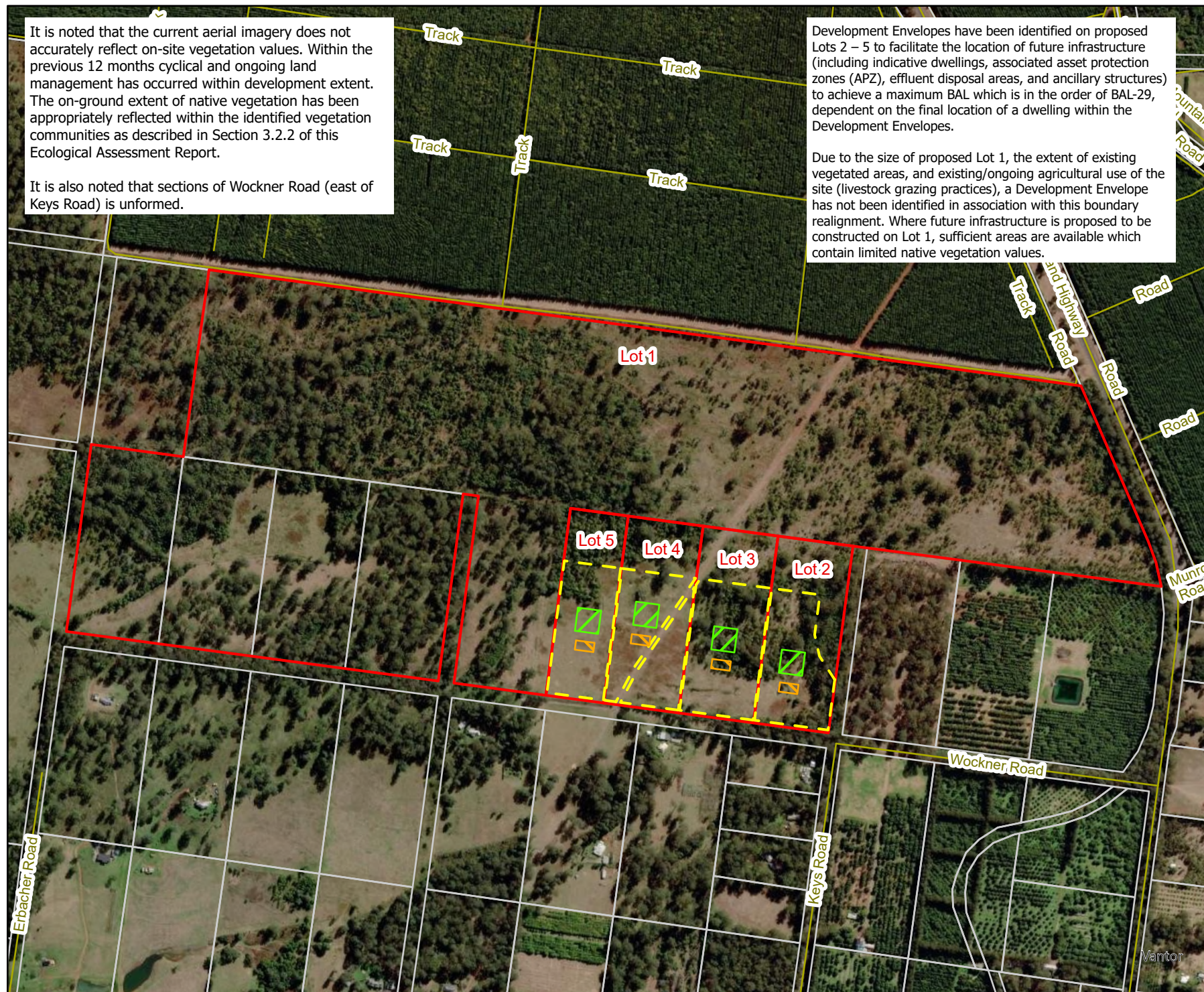


Figure 2 Proposed Development

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 30/09/2026
Approved by: Will Gibson Date: 30/09/2026

0 130 260 Metres

Legend

- Cadastre
- Roads
- Lot layout
- Development Envelope
- Indicative dwelling location (50m x 50m)
- Indicative effluent disposal location (40m x 20m)

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Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



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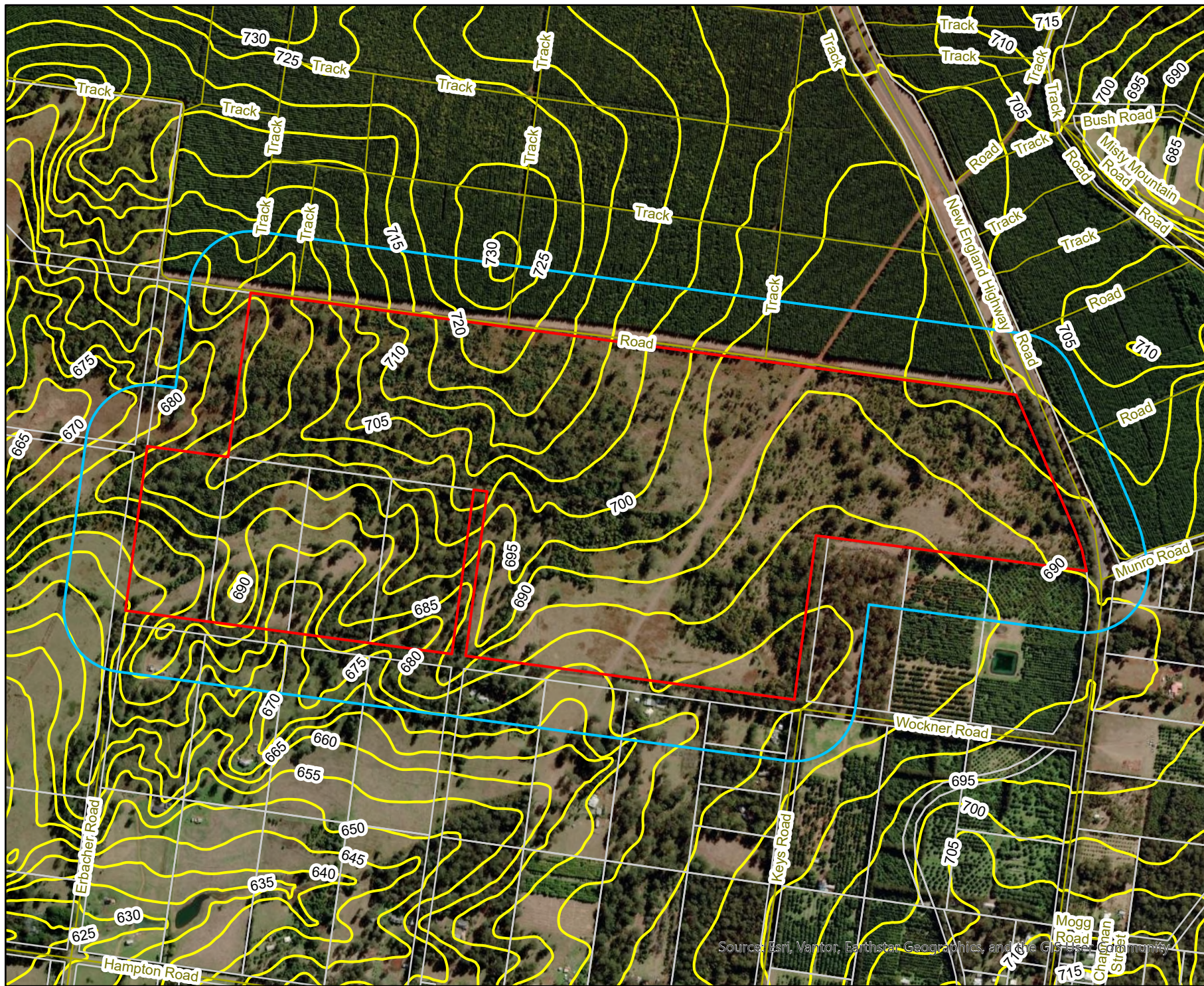


Figure 3 Topography of the Site

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/08/2026
Approved by: Will Gibson Date: 4/08/2026

0 150 300 Metres

Legend

- Cadastre
- Roads
- 150m buffer
- Site boundary
- Contours (5m)

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Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).

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Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community



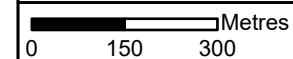
**Figure 4
Real Property
Descriptions for
Adjacent Lots**

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/08/2026
Approved by: Will Gibson Date: 4/08/2026



Legend

-  Cadastre
 Roads
 Site boundary

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



2 Vegetation

The current Vegetation Management Supporting Map identifies that the majority of vegetation at the site is mapped as Category X (non-remnant) vegetation, with the central and western extent of the site comprising portions of Category B (remnant) vegetation and Category C (high-value regrowth) vegetation which are mapped as Endangered Regional Ecosystems (REs) 12.5.13a, 12.5.6b, and 12.5.6c. The field assessment conducted by Range Environment Consultants identified that the canopy layer on the site aligned with RE 12.5.6b and 12.5.6c, with the understorey layer dominated by Pechey wattle (*Acacia neriifolia* (?)), and the woody environmental weed lantana in areas not subject to weed management.

The extent of mapped vegetation in the area and its conservation status is shown in Figure 5, with Table 2 providing a short description of the mapped REs.

Table 2 Short description of regional ecosystems for the site

RE	Short Description	VMA class
12.5.13a	<i>Microphyll to notophyll vine forest +/- Araucaria cunninghamii on remnant Tertiary surfaces</i>	Endangered
12.5.6b and 12.5.6c	<i>Eucalyptus siderophloia, E. propinqua, E. microcorys and/or E. pilularis open forest on remnant Tertiary surfaces. Usually deep red soils</i>	Endangered

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

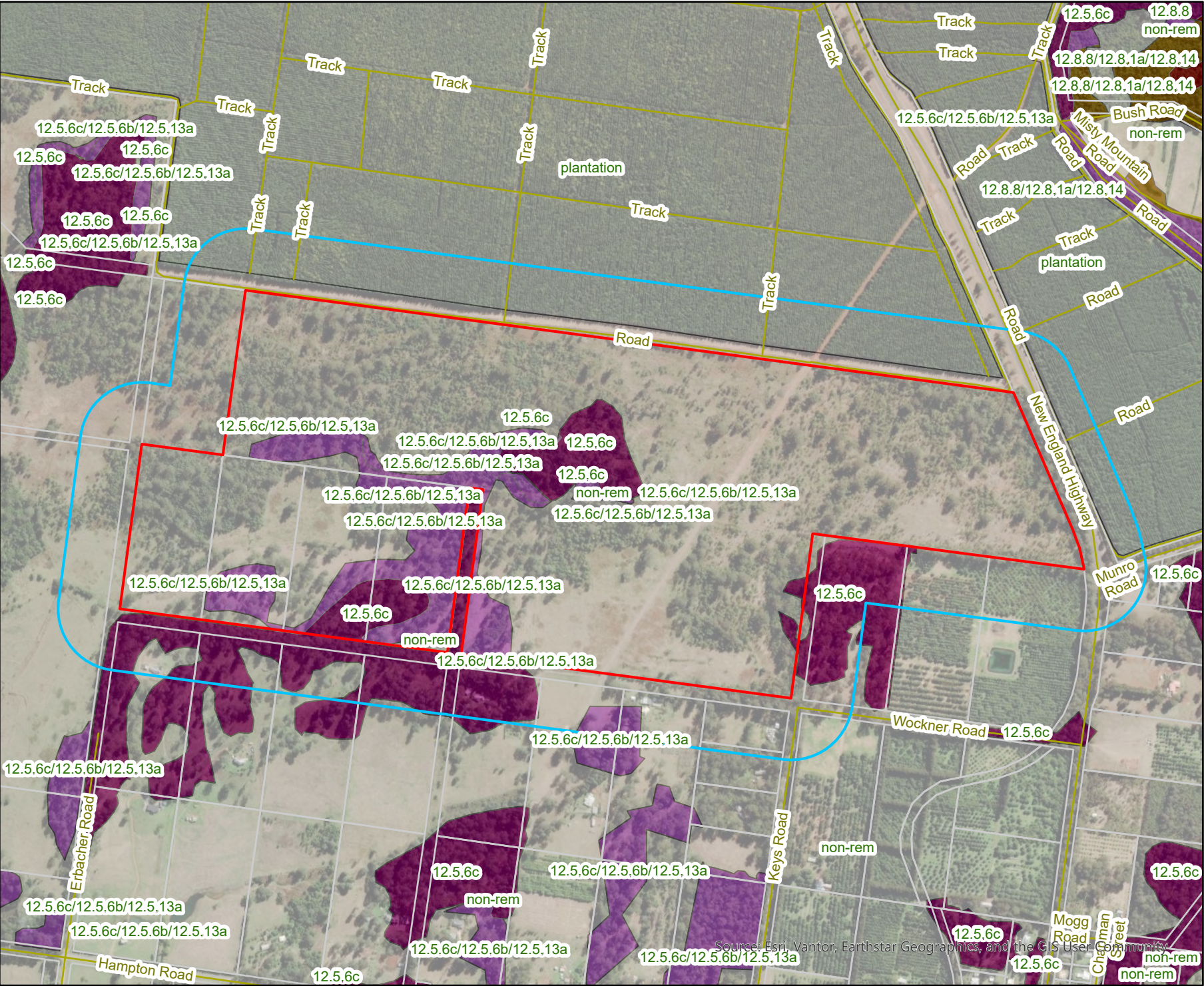


Figure 5
Regulated Vegetation
and Regional
Ecosystems

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/08/2026
Approved by: Will Gibson Date: 4/08/2026

0 150 300 Metres

- Legend**
- Cadastre
 - Roads
 - 150m buffer
 - Site boundary
 - Category A or B
containing
endangered
 - Category A or B
containing of
concern
 - Category C or R
containing
endangered
 - Category C or R
containing of
concern
 - Non-remnant

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



3 Bushfire

Appendix A provides an overview of the Queensland State-wide mapping methodology used to identify Bushfire Prone Areas.

3.1 Bushfire Hazard Mapping

The bushfire hazard for the site and surrounds as identified by the Queensland Government SPP Interactive Mapping System using the Statewide mapping methodology is shown in Figure 6. The SPP mapping indicates the site contains areas of High and Very High Potential Bushfire Intensity and Potential Impact Buffer. The Toowoomba Regional Council Bushfire Hazard Mapping indicates the site contains areas of Medium and High Fire Risk and is shown in Figure 7.

The site assessment identified that the bushfire hazard largely aligns with the levels mapped by the Queensland Government due to unmanaged native and invasive vegetation, and historical and current vegetation present on the site. Additional details are provided in Section 3.4 which identifies the VHCs present.

Under adverse conditions, a bushfire could potentially approach from virtually any direction. Severe fire weather conditions are typically associated with hot strong westerly to northerly winds. Bushfires in the area have the potential to generate quantities of embers that could impact on a building even though the fire does not necessarily reach it.

A field assessment was conducted to confirm the vegetation hazard classes (VHCs) present within and surrounding the site and the level of exposure to bushfire risk. VHCs are discussed in Section 3.4.

3.2 Fire Brigade

The development site is contained within the Queensland Fire and Rescue Service Hampton Rural Command. The closest fire brigade to the site is the Crows Nest Fire & Rescue Station (auxiliary) located 28 Creek Street, Crows Nest approximately 12 kilometres by road to the north of the site.

The closest fire brigade equipped to fight structural fires is the Toowoomba Station (permanent) located at 11 Kitchener Street, Toowoomba approximately 34 kilometres by road to the southwest of the site.

3.3 Fire Run

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

Areas of potentially hazardous vegetation are located to the south, west and north of the proposed development. Fire runs in the area are extreme due to the extensive vegetation on the site and in surrounding landscape. Fire runs on site and in the surrounding landscape are extensive and over 1 km in length. Figure 8 shows the location of potential fire runs and the areas of the development that could be impacted on by a bushfire.

Figure 6 SPP Bushfire Hazard Map

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/08/2026
Approved by: Will Gibson Date: 4/08/2026

0 150 300 Metres

Legend

-  Cadastre
-  Roads
-  150m buffer
-  Site boundary
-  Very High Potential Bushfire Intensity
-  High Potential Bushfire Intensity
-  Medium Potential Bushfire Intensity
-  Potential Impact Buffer

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



Source: Esri, Vantor, Earthstar Geographics, and the Geographical Information Society

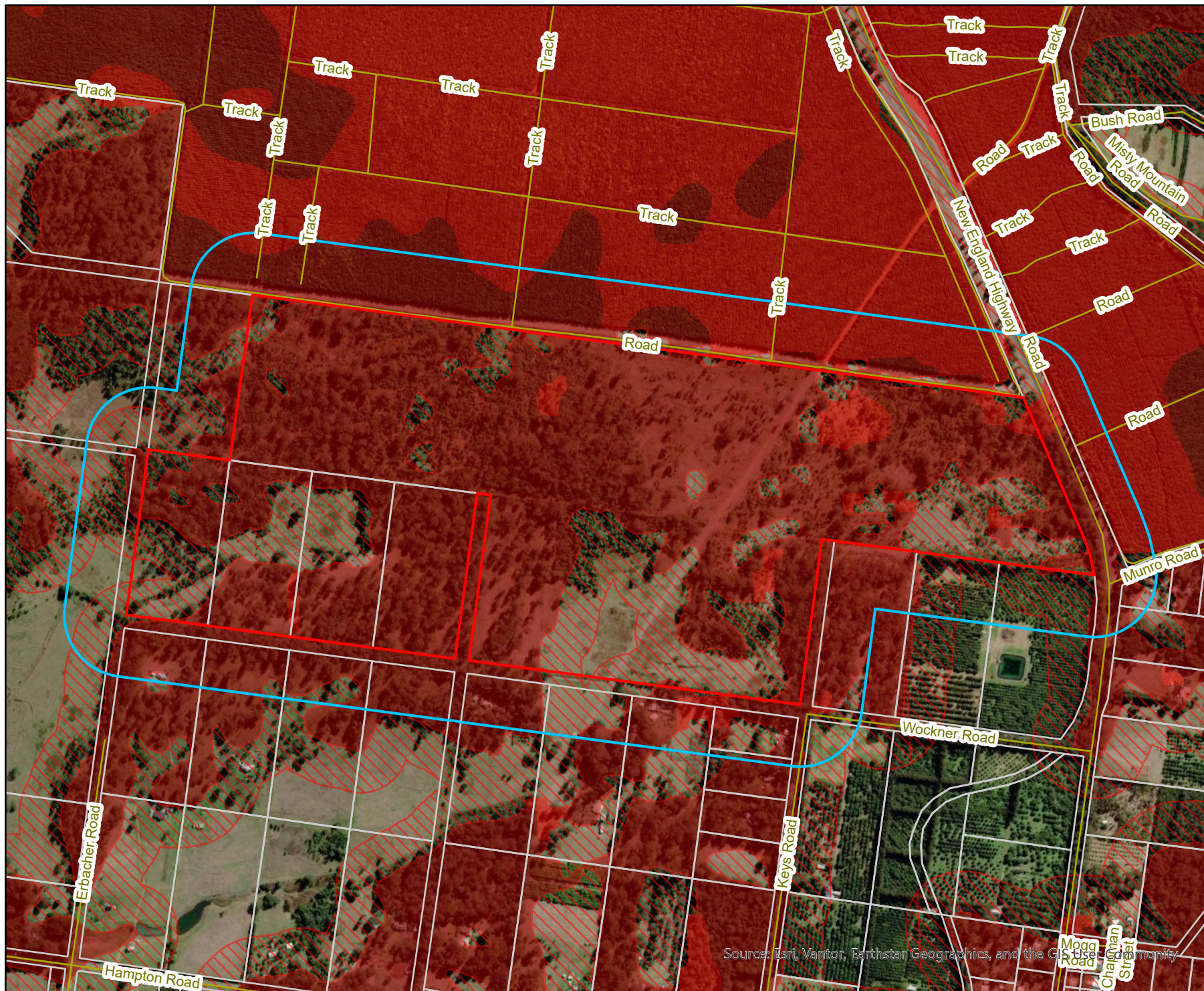




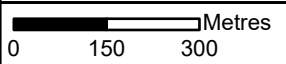
Figure 7 TRC Bushfire Hazard Map

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/08/2026
Approved by: Will Gibson Date: 4/08/2026



Legend

- Cadastre
- Roads
- 150m buffer
- Site boundary
- High Bushfire Hazard
- Medium Bushfire Hazard

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).

Source: Esri, Vantor, Earthstar Geographics, and the GLIS Community

Figure 8 Potential Fire Runs

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/08/2026
Approved by: Will Gibson Date: 4/08/2026

0 280 560 Metres

Legend

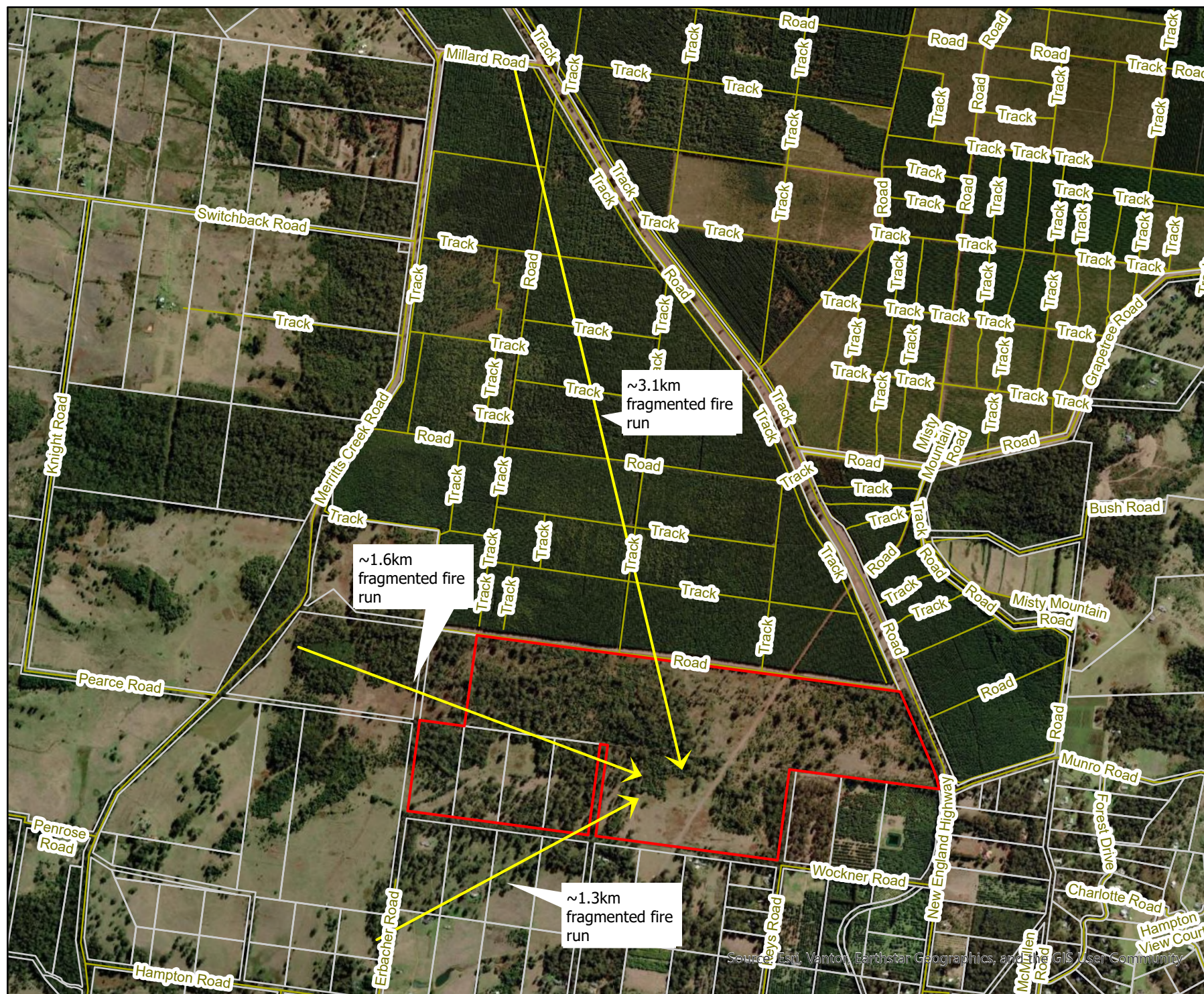
-  Cadastre
-  Roads
-  Site boundary
-  Potential fire runs

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



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Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

3.4 Vegetation Hazard Classes

A field assessment was conducted to confirm the vegetation hazard classes (VHCs) present within and surrounding the site and the level of exposure to bushfire risk. Appendix A provides an explanation of the statewide methodology used to calculate potential fuel loads and VHCs.

The VHCs mapped for the site and immediate adjoining areas (within 150m radius) by the State-wide mapping methodology were VHC 8.1 Wet eucalypt tall open forest, VHC 36.1 Exotic & hardwood plantation, VHC 38.5 Cropping and horticulture, VHC 40.4 low grass or tree cover in rural areas, and VHC 42.6 Nil to very low vegetation cover (Figure 9).

Range Environmental completed a detailed site assessment to facilitate preparation of a representative vegetation hazard class map in relation to the site. Based on detailed field assessment, a site-based vegetation hazard class map has been produced to accurately determine potential bushfire hazards and resulting building requirements for the site.

Vegetation in the greater surrounding landscape (within 150m radius) aligned predominantly with VHC 40.4, with areas of VHC 9.1 and VHC 9.2 associated with vegetation present on the site and in the surrounding landscape. The ground truthed VHCs for the site and surrounds are shown in Figure 10.

Following the development for the site, no additional vegetation management works are proposed to facilitate the development. The identified development envelopes on Lots 2- 5 are to be located in areas managed as low fuel loads consistent with VHC 40.4 or VHC 39.2. Table 3 provides a summary of the mapped, ground truthed and post development VHCs and potential fuel loads.

Table 3 Vegetation Hazard Class and Potential Fuel Loads

Vegetation Hazard Class (VHC)	Surface and near surface Fuel Load (t/ha)	Total Fuel Load (t/ha)	Prone type ¹	Fuel continuity ²
8.1 Wet eucalypt tall open forest	31.0	35.0	1	1
9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges	21.0	24.2	1	1
9.2 Moist to dry eucalypt woodlands on coastal lowlands and ranges	14.9	17.2	1	1
36.1 Exotic & hardwood plantation	23.8	26.0	1	1
38.5 Cropping and horticulture	1.5	2.0	3	2
39.2 Low to moderate tree cover in built up areas	5	8	3	2
40.4 Continuous low grass or tree cover	4.5	5	2	1
42.6 Nil to very low vegetation cover	2	2	3	2

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

The identification of VHCs determines the extent to which the vegetation contributes to prevailing bushfire hazard. All VHCs are identified as being one of three prone types¹, with prone types being a categorical indicator of the capacity of a VHC to support a significant bushfire. VHCs are also given a binary indicator of fuel continuity². Continuous fuel vegetation generally has a consistent distribution of fuel. Discontinuous fuel types include non-hazardous vegetation or land uses.

VHC 38.5, 39.2, 40.4, and 42.6 are considered non-bushfire prone VHCs under Bushfire Resilient Communities (2019) and BAL calculations using the SPP APZ calculator involving these VHCs results in a radiant heat flux of 0kW/m² (BAL-Low). VHC 40.4, while listed as a grass fire prone VHC with a continuous fuel load under Bushfire Resilient Communities (2019), is considered a non-hazardous VHC due to low fuels loads of 5t/ha or less and calculations using the SPP APZ calculator involving this VHC results in a radiant heat flux of 0kW/m² (BAL-Low).

The proposed development envelopes are to be located in areas of VHC 40.4 and VHC 39.2, which has been assessed as having Potential Bushfire Hazard Class of 'Low hazard' (further detailed in Section 3.5).

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

² Fuel continuity: 1 = Continuous, 2 = Discontinuous



Figure 9 Vegetation Hazard Class Mapping

Project: 118 Wockner Road, Merritts Creek

Client: NJ & DE Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/08/2026
Approved by: Will Gibson Date: 4/08/2026

Metres
0 150 300

Legend

- Cadastre
- Roads
- 150m buffer
- Site boundary
- 8.1 Wet eucalypt tall open forest
- 36.1 Exotic & hardwood plantation
- 38.5 Cropping and horticulture
- 40.4 Low grass or tree cover in rural areas
- 42.6 Nil to very low vegetation cover

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).

Source: Esri, Vantor, Earthstar Geographics, and the GIS community

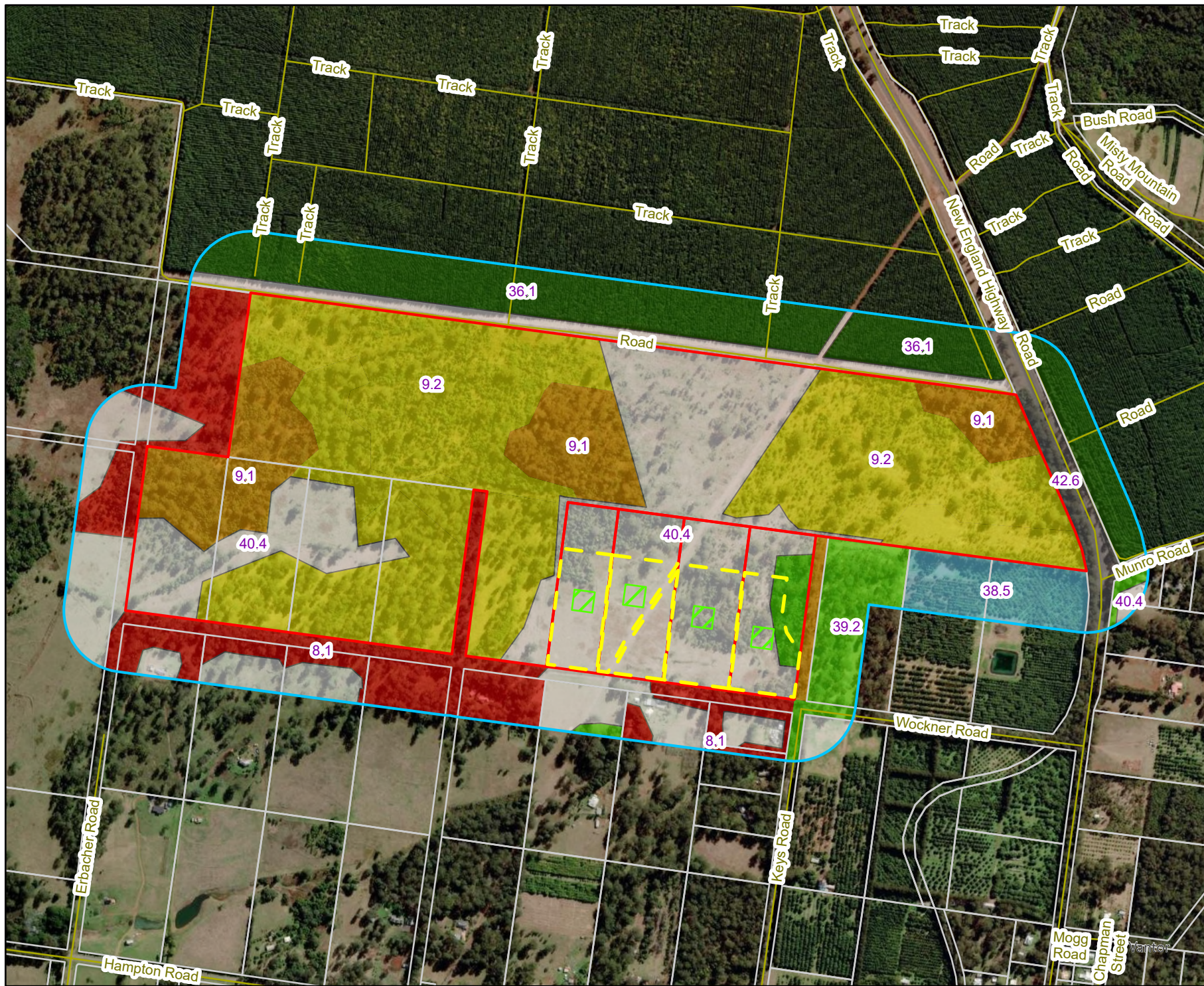


Figure 10 Ground Truthed VHCs

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: Hannah Bakker Date: 4/09/2026
Approved by: Will Gibson Date: 4/09/2026

0 150 300 Metres

Legend

- Cadastre
- Roads
- Lot layout
- Development envelope
- Indicative dwelling location (50m x 50m)
- 150m buffer
- 8.1 Wet eucalypt tall open forest
- 9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges
- 9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
- 36.1 Exotic & hardwood plantation
- 38.5 Cropping and horticulture
- 39.2 Low to moderate tree cover in built-up areas
- 40.4 Low grass or tree cover in rural areas
- 42.6 Nil to very low vegetation cover

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



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3.5 Potential Bushfire Hazard Classes

A 'fit for purpose' approach was undertaken to identify the bushfire risk present using the statewide mapping methodology in conjunction with local-scale vegetation and slope maps. The location of post-development VHCs on the site and in the surrounding landscape in conjunction with the underlying slope of land was utilised to develop Potential Bushfire Hazard Classes. The Potential Fireline Intensity calculator was used to calculate the Potential Fireline Intensity (kW/m) to which a Potential Bushfire Hazard Class was attributed. The maximum slope in any direction was used for each area of identified ground-truthed VHC as outlined Figure 10. Potentially hazardous vegetation is located level with the proposed development. Table 4 provides the various site attributes used to calculate the Potential Bushfire Hazard Class at representative locations around the site. Table 5 provides the correlation between Potential Fireline Intensity and Potential Bushfire Hazard Class.

Table 4 Attributes used to calculate the Potential Bushfire Hazard Class

Vegetation Hazard Class (VHC)	Potential Fuel Load (t/ha)	Potential Fire Weather Severity (FFDI)	Slope under hazardous vegetation (deg)	Potential Fireline Intensity (kW/m)	Potential Bushfire Hazard Class
8.1 Wet eucalypt tall open forest	35.0	65	1-7	52894 - 80021	Very High
9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges	24.2	65	1	25287	High
9.2 Moist to dry eucalypt woodlands on coastal lowlands and ranges	17.2	65	1-4	12774 - 15712	Medium
39.2 Low to moderate tree cover in built up areas	8	65	1	1079 – 2763	Low
40.4 Continuous low grass or tree cover	5	65	1-4	1328	Low
42.6 Nil to very low vegetation cover	2	65	1	173	Low

Table 5 Potential Bushfire Hazard Classes

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

Areas assessed as Low hazard within a 100-metre radius of vegetation mapped as comprising Medium Potential Intensity or higher were classified as 'Potential Impact Buffer'.

Following development of the site, Figure 11 identifies a post development potential bushfire hazard map for the site which considers the extent of retention and rehabilitation of bushland reserves. The maximum slope in any direction was used for each area of identified ground-truthed VHC as outlined in Figure 10.

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

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

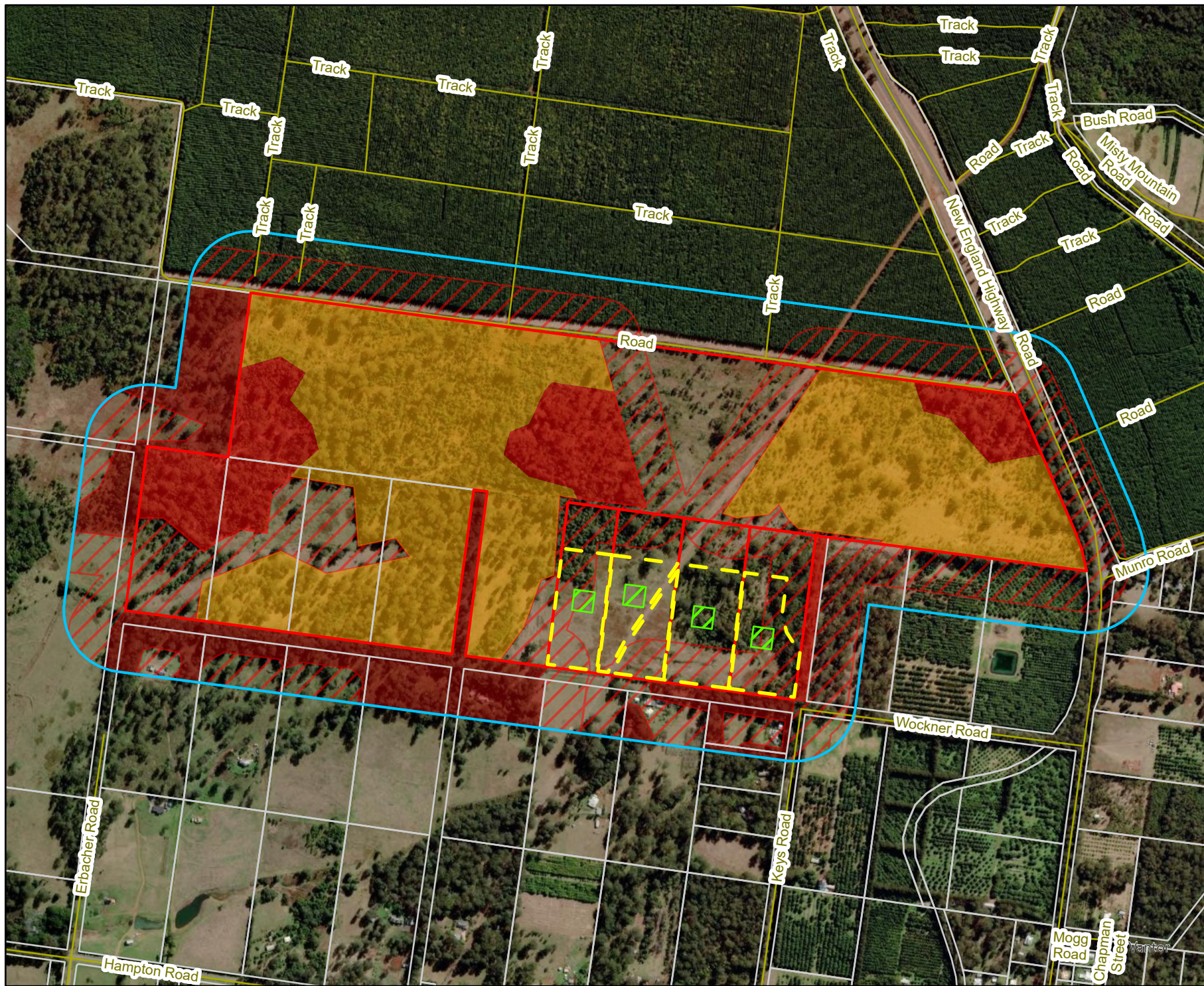


Figure 11 Potential Bushfire Hazard Map

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/09/2026
Approved by: Will Gibson Date: 4/09/2026

0 150 300 Metres

Legend

- Cadastre
- Roads
- 150m buffer
- Lot layout
- Development envelope
- Indicative dwelling location (50m x 50m)
- Very High Potential Intensity
- High Potential Intensity
- Medium Potential Intensity

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Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



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4 Mitigating Potential Bushfire Impact

A number of actions should be implemented to mitigate the potential impacts of bushfire on the development. This suite of bushfire mitigation measures, when implemented in an integrated manner can achieve a better outcome for the site than when used individually and in isolation from other measures. This suite of potential measures is illustrated in Figure 12.

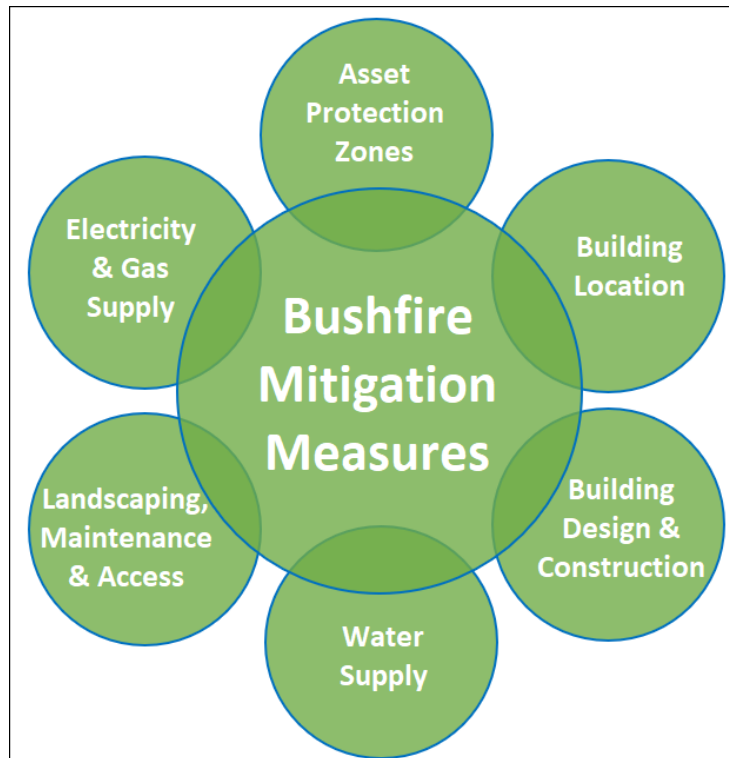


Figure 12 Bushfire mitigation measures in combination (Redrawn from Guideline for Building in Bushfire Prone Areas; Emergency Management Victoria 2016)

4.1 Building Location and Separation

The location of buildings and their relationship with vegetation in the immediate surrounding area is critical for maximising their survival in the event of a bushfire. The development layout has been designed to ensure that potential dwellings are able to achieve adequate minimum separation distances from potentially hazardous vegetation.

Development envelopes have been identified for Lots 2 - 5, with sufficient area to ensure that potential dwellings are able to achieve minimum separation distances from hazardous vegetation to enable a BAL of no greater than BAL-29 to be achieved (Appendix B).

4.1.1 Asset Protection Zones

The establishment of an Asset Protection Zone (APZ) is an effective mechanism for reducing bushfire hazards that a building may be exposed to. An APZ is a fuel-reduced area surrounding a built asset or structure. Potential bushfire fuels should be minimised within an APZ, so that the vegetation within it does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy. An APZ, if designed correctly, implemented, and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;

- damage to the built asset from intense radiant heat; and
- ember attack.

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

4.2 Building Design and Construction

Careful design of new buildings in areas of mapped bushfire hazard needs to be undertaken, which includes consideration of site characteristics. Buildings should be constructed to meet the requirements of the relevant building standards and Council bylaws prevailing at the time to enable a building to be designed and constructed according to the site conditions. This includes the Building Code of Australia (BCA, 2022) and the Australian Standard for “Construction of buildings in bushfire-prone areas (AS3959 – 2018). Building issues can be adequately addressed during the design and construction phase with compliance to the National Construction Code and the Australian Standard for construction of buildings in bushfire-prone areas (AS3959-2018). Currently a site-specific assessment is required for all new dwellings being constructed in identified bushfire prone areas.

Indicative Bushfire Attack Levels (BAL) for future dwellings located on all proposed lots within 100m of potentially hazardous vegetation (post development as assessed in Section 3.5) are in the order of BAL-12.5 to BAL-29, dependant on the final location of a dwelling within the lot. Where a future dwelling is located greater than 100m from potentially hazardous vegetation, it will readily achieve a BAL-Low. A BAL map is provided in Appendix B. A site-specific Bushfire Building Report should be prepared at the time of constructing a dwelling on a lot within 100m of potentially hazardous vegetation that identifies actual building location, separation distances from potentially hazardous vegetation, level of vegetation management activities undertaken, BAL and level of construction required.

In assessing vegetation classes for forests, woodlands and rainforests, the classified vegetation will be determined by the unmanaged understorey rather than either the canopy (drip line) or trunk of any trees (AS3959-2018).

Appendix C Calculation of bushfire hazard contains information on the methodologies used to calculate the potential bushfire hazard that the site is exposed to and Appendix D has an explanation of BALs.

4.3 Access and Egress

Access to the site is via Wockner Road to the south and each proposed lot will have adequate frontage to this road. Future driveways which connect to Wockner Road are to be of all-weather construction.

4.3.1 Fire Trails

The development does not propose a new road or fire maintenance trails due to the good site access from existing roads, the small extent of development (five into five lots), identification of a development envelope of Lots 2 – 5 (including indicative dwelling locations) and separation distances achieved from potentially hazardous vegetation by the establishment of the identified asset protection zone at the time of constructing the dwelling on Lots 2 - 5.

All lots will be readily accessible by emergency service vehicles.

4.4 Vegetation Management

Vegetation across the development extent comprises of Category X (non-remnant) vegetation associated with agricultural practices, including open paddocks with grassy understoreys.

Areas suitable for the construction of future dwellings are to be well-separated from areas of unmanaged vegetation. Ongoing vegetation management and control of woody weeds (such as lantana) will assist in the

prevention of hazardous or potentially hazardous fuel loads accumulating. General site maintenance (i.e. slashing or grazing) within the development envelopes on Lots 2 - 5 will limit the potential for the accumulation of potentially hazardous vegetation to occur.

4.4.1 Landscaping

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

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

Guidelines for landscaping in fire prone areas are provided in Appendix F.

4.5 Water Supply

An adequate water supply suitable for firefighting purposes should be available at all times. The TRPS (2012 Version 29) Bushfire Hazard Overlay Code contains a provisions for bushfire prone areas which requires that the development be provided with a reliable water supply for fire-fighting purposes that is safely located and freely accessible. This can be achieved by:

- A dedicated on site water storage system that permanently holds a minimum of 10,000 litres (e.g. water tank) for fire fighting purposes and has fire brigade tank fittings.

The proposed development will be serviced by a dedicated on site water storage system that is capable of providing a fire-fighting water supply.

4.6 Prepare, Act, Survive

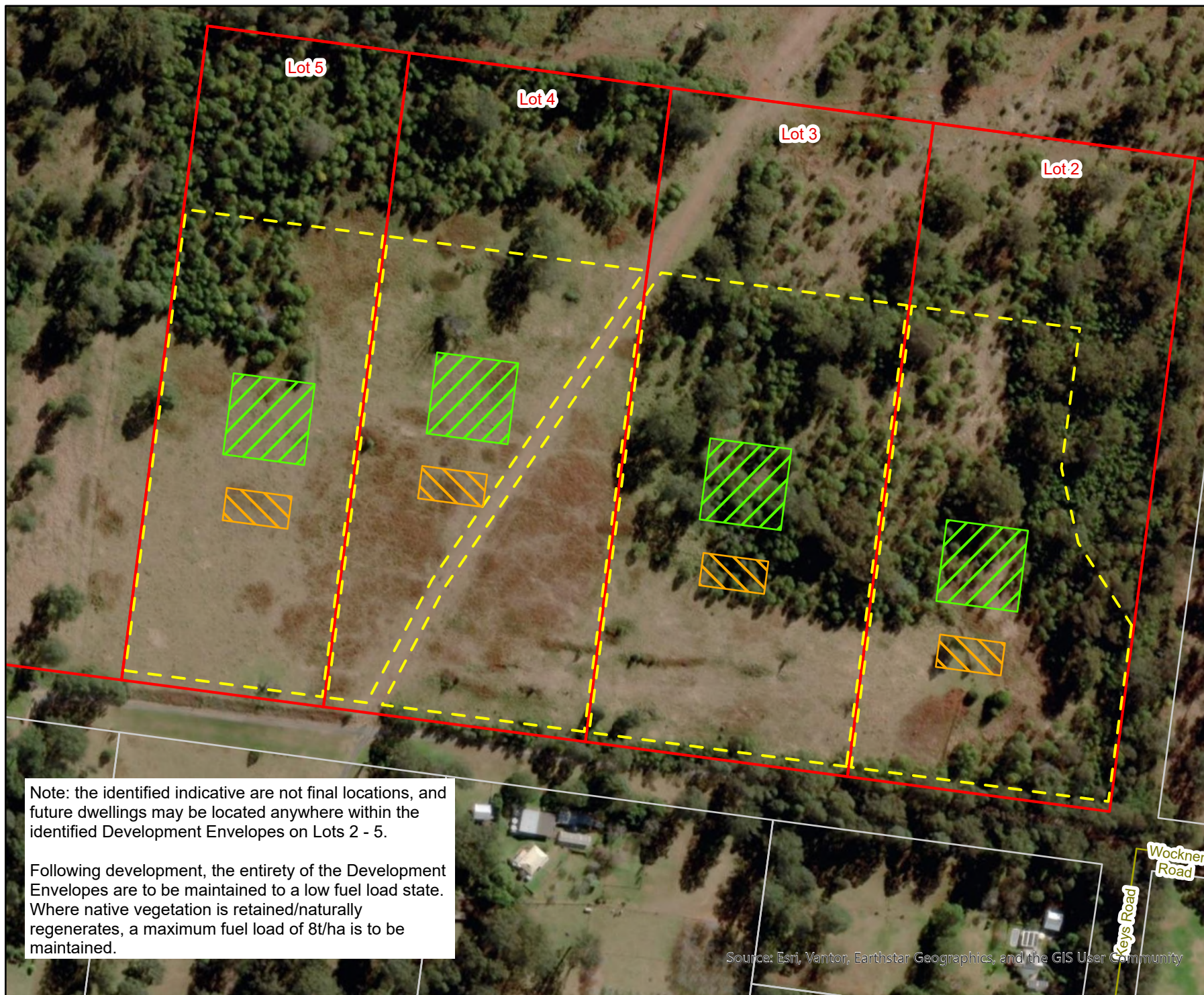
It is important that residents are well prepared during times of high fire danger and have well made plans that can be readily enacted in a time of bushfire emergency. This includes having plans in place to guide actions on days of extreme and catastrophic, identifying safe refuge areas and planning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

https://www.qfes.qld.gov.au/sites/default/files/2023-06/Bushfire-Safety-Guide_0.pdf and

<https://bushfire-survival-plan.qfes.qld.gov.au/>

4.7 Maintenance of Bushfire Mitigation Measures

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



Note: the identified indicative are not final locations, and future dwellings may be located anywhere within the identified Development Envelopes on Lots 2 - 5.

Following development, the entirety of the Development Envelopes are to be maintained to a low fuel load state. Where native vegetation is retained/naturally regenerates, a maximum fuel load of 8t/ha is to be maintained.

Figure 13 Indicative Asset Protection Zone for Buildings

Project: 118 Wockner Road, Merritts Creek

Client: NJ & DE Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/09/2026
Approved by: Will Gibson Date: 4/09/2026

0 30 60 Metres

Legend

- Cadastre
- Roads
- Lot layout
- Development Envelope
- Indicative dwelling location (50m x 50m)
- Indictative effluent disposal location (40m x 20m)

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Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).

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5 Planning Requirements

The Queensland Government's State Planning Policy (SPP) for Natural Hazards (Bushfire) contains development assessment requirements that developments in bushfire prone areas are required to address. Likewise, the TRPS (2012 Version 29) Bushfire hazard overlay code contains provisions to protect the safety of people and property in bushfire risk areas. The Code proposes Performance outcomes and Acceptable outcomes which have been addressed through Proposed Solutions.

5.1 State Planning Policy – Bushfire

The State Planning Policy (July 2017) provides a comprehensive set of principles which underpin Queensland's planning system to guide local government and the state government in land use planning and development assessment. The State's interest in relation to natural hazards is: "The risks associated with natural hazards are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards". The State Planning Policy (July 2017) development assessment requirements have been addressed in Table 6.

Table 6 State Planning Policy development assessment requirements (Natural hazards, risk and resilience - Bushfire)

Assessment Benchmark	Development Assessment Requirement	Proposed Solution
Applicable development	A development application for a material change of use, reconfiguration of a lot or operational works on premises in any of the following: 1. bushfire prone areas 2. flood hazard areas 3. landslide hazard areas 4. storm tide inundation areas 5. erosion prone area.	Development is a Reconfiguration of a Lot (RoL) that will result in the boundary realignment of five (5) into five (5) rural lots with lots sizes between 6.51 ha to 120 ha. Development is proposed in an area identified as bushfire prone.
3	Bushfire, flood, landslide, storm tide inundation, and erosion prone areas outside the coastal management district: Development other than that assessed against (1) above, avoids natural hazard areas, or where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level.	PS1. The development is located in an area of mapped Potential Impact Buffer and High and Very High Potential Bushfire Intensity by the Queensland Government Development Assessment Mapping System Natural Hazards Risk and Resilience mapping (Bushfire). The Toowoomba Regional Council Bushfire Hazard Overlay Code mapping identifies the site as being contained within an area of Medium and High bushfire hazard. A site assessment was conducted to confirm the presence of mapped VHC classes and the level of potential bushfire hazard present. A Bushfire Management Plan was prepared that identifies measures to mitigate the risks to people and property to an acceptable level. Included in the hazard assessment were identification of vegetation hazard class (VHC) present and the calculation of Bushfire Attack Levels. Mitigation measures identified include: 1. Establishment of Asset Protection Zones at the time of constructing new dwellings on the site; 2. Buildings to comply with relevant standards of building construction including the BCA and AS3959-2018. Indicative Bushfire Attack Levels (BAL) for lots within 100m of potentially hazardous vegetation (post development as assessed in

		Section 3.5) are in the order of BAL-Low to BAL-29, dependant on the final location of a dwelling within the lot. A BAL map is provided in Appendix B. A site-specific Bushfire Building Report should be prepared at the time of constructing a dwelling on a lot within 100m of potentially hazardous vegetation that identifies actual building location, separation distances from potentially hazardous vegetation, level of vegetation management activities undertaken, BAL and level of construction required. 3. Provision of an adequate water supply that can be readily accessed for fire-fighting purposes; and 4. Adequate ingress and egress to the site. Provided the measures identified in the bushfire management plan are implemented and maintained, the bushfire risk to people, property and infrastructure can be kept to an acceptable level.
4	All natural hazard areas: Development supports and does not hinder disaster management response or recovery capacity and of capabilities.	PS2. Development, comprising a boundary realignment, is proposed to occur at the site in an area mapped by the Queensland Government Development Assessment Mapping System as comprising Potential Impact Buffer and High and Very High Potential Bushfire Intensity. The development actively assists and supports disaster management capacity and capabilities by: 1. Providing ready access to a water supply suitable for fire-fighting purposes. This can be achieved by provision of a dedicated on site water storage system that permanently holds a minimum of 10,000 litres at the time of constructing infrastructure on the site; 2. Managing potentially hazardous fuel loads on the site; and 3. The design and construction of dwellings in accordance with AS3959:2018.
5	All natural hazard areas:	PS3.

	Development directly, indirectly and cumulatively avoids an increase in the severity of the natural hazard and the potential for damage on the site or to other properties	The development takes into consideration topography, location of existing vegetation and potential natural hazards. The site comprises open forest. Mitigation measures identified include: 1. Maintenance of vegetation (including understorey) on the site to prevent the accumulation of hazardous fuel loads; 2. Ongoing management of woody environmental and highly flammable weeds on the site such as lantana in the vicinity of dwellings; 3. Landscaping near buildings to consist of plants that have low flammability.
6	All natural hazard areas: Risks to public safety and the environment from the location of hazardous materials and the release of these materials as a result of a natural hazard are avoided.	PS4. Development is a rural boundary realignment. It does not involve the location or use of hazardous materials on the site. In this situation there is no potential for the release of these materials as a result of a natural hazard event.
7	All natural hazard areas: The natural processes and the protective function of landforms and the vegetation that can mitigate risks associated with the natural hazard are maintained or enhanced.	PS5 The development seeks to maintain and enhance the protective function of landforms and vegetation present on the site by: 1. Ongoing and effective management of environmental weeds on the site; and 2. Ensuring that any landscape plantings are compatible with the natural environment and do not contribute to an elevated bushfire hazard. Incorporation of these measures in the development will enable natural processes and functions to continue and aid in the mitigation of risks associated with potential natural hazards.

5.2 Toowoomba Regional Planning Scheme – Bushfire

The Toowoomba Regional Planning Scheme (TRPS) (2012 Version 29) contains a Bushfire hazard overlay code.

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

This code identifies performance outcomes and acceptable outcomes. Where appropriate, this Code has been applied to the development and outcomes proposed to comply with the accepted development and assessment benchmarks. Table 7 and Table 8 provide responses to the Bushfire hazard overlay code.

Table 7 Bushfire Hazard Overlay Code –requirements for accepted development and assessment benchmarks for assessable development

Performance outcomes	Acceptable Outcomes	Proposed solutions
PO1 Development is provided with an adequate water supply for fire fighting purposes that is safely located and freely accessible.	AO1.1 Development within a water supply area involving the creation of a new lot/s or involving proposed and existing buildings with a combined gross floor area greater than 50m², is connected to Council's reticulated water supply system. It will be readily available at all time for fire fighting vehicles and a water supply outlet located within the road reserve is within 40m² of the following: 1. All of the land; or 2. A building envelope designated on each lot; or 3. The centre of each lot, excluding access handles (where no building envelope is designated); and 4. All existing and proposed buildings And Fire hydrants are designed and installed in accordance with Queensland Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines, unless otherwise specified by the relevant water entity. AO1.2 Development outside a water supply area involving proposed or existing buildings with a combined gross floor area greater than 50m², are provided with a dedicated on site water storage system that permanently holds a minimum of 10,000 litres (e.g. dam, swimming pool or water tank) for fire fighting purposes.	PS1.1 Not applicable. The site is located outside of a reticulated water supply area. PS1.2 Where a lot doesn't have access to a reticulated water supply in accordance with AO1.1, a dedicated on-site water storage system that permanently holds a minimum of 10,000 litres for fire-fighting purposes is to be provided at the time of constructing a dwelling on that lot. PS1.3 Where a water tank is provided for firefighting purposes, then it is to comply with the requirements of AO1.3

	AO1.3 A water tank is provided within 10m of each building (other than a class 10 building) which: a. Is either below ground level or of non flammable construction; b. Has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: i. 10,00 litres for residential buildings; ii. For industrial, commercial; and other buildings, a volume specified in AS2304 2011 c. Includes shielding of tanks and pumps in accordance with AS2304-2011 d. Includes a hardstand area allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank e. Is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines); and f. Is clearly identified by directional signage at the street frontage	
PO2 Development provides for the safety of people and property by avoiding areas of High or Medium bushfire risk.	AO2.1 Development is not located on land that is subject to High or Medium bushfire risk. OR AO2.2	PS2.1 The proposed development extent is mapped by Council as being partially contained within areas of Medium Bushfire Hazard. Mapping by the Queensland Government identifies the bushfire hazard as comprising Potential Impact Buffer and High Potential Bushfire Intensity. PS2.2

	Where development is located in a High or Medium bushfire risk area (except for single dwellings on existing lots), it complies with a Bushfire Management Plan for the premises.	A Bushfire Management Plan has been prepared for the site which identifies the standard of building required, emergency fire-fighting water supplies and ingress and egress requirements. New buildings to be constructed are to comply with current relevant building standards. This includes the Building Code of Australia (Parts 1 and 2) and AS3959-2018.
PO3 Development provides for the safety of people and property by mitigating the bushfire risk through the siting of buildings.	AO3.1 Buildings and structures: - are sited in locations of lowest hazard within the lot; and - achieve setbacks from hazardous vegetation of 1.5 times the predominant mature canopy tree height or 10 m, whichever is the greater; and - are 10 m from any retained vegetation strips or small areas of vegetation; and - are sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard.	PS3.1 - Suitable areas are available on proposed lots which enable future buildings are able to be located in areas of least hazard. Sufficient area is available on for future dwellings to achieve a BAL of BAL-Low to BAL-29, dependant on the final location of a dwelling within the lot. (post development as assessed in Section 3.5); and - A concept APZ for future dwellings allows a future dwelling to achieve minimum separation distances (outlined in Appendix C) from potentially hazardous vegetation to be exposed to a maximum BAL of 29 (Appendix B). The height of mature canopy trees on the site is in the order of 25 metres. The Australian Standard AS3959-2018 allows for the construction of buildings closer to vegetation than this provided that they are built to a higher standard; and - Implementation of an APZ at the time of constructing a dwelling on each lot will ensure a separation distance sufficient to achieve a maximum BAL-29 between buildings and bushland areas; and

		d. Elements least susceptible to fire such as tennis courts or swimming pools should be located closest to the bushfire hazard. Appendix C provides additional information on the level of bushfire hazard posed to buildings and the methodology used to calculate it. A site-specific bushfire report should be prepared to guide the construction of new dwellings taking into account location of buildings and prevailing building requirements.
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Table 8 Bushfire Hazard Overlay Code - assessment benchmarks for assessable development

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

	The community infrastructure development is located within a bushfire hazard area (as identified in the Bushfire Hazard Overlay Maps) but is designed to function effectively during and immediately after bushfire events. <i>Note for AO2.3: The development application must include and comply with a comprehensive Bushfire Management Plan.</i>	
Water Supply		
PO3 Development is provided with an adequate water supply for fire fighting purposes that is safely located and freely accessible.	AO3.1 Development within a water supply area involving the creation of a new lot/s or involving proposed and existing buildings with a combined gross floor area greater than 50m², is connected to Council's reticulated water supply system. It will be readily available at all times for fire fighting vehicles and a water supply outlet located within the road reserve is within 40m² of the following: a. All of the land; or b. A building envelope designated on each lot; or c. The centre of each lot, excluding access handles (where no building envelope is designated); and d. All existing and proposed buildings And Fire hydrants are designed and installed in accordance with Queensland Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines, unless otherwise specified by the relevant water entity, unless otherwise specified by the relevant water entity.	PS3.1 Development is not located within a Council reticulated water supply area. A dedicated on-site water storage system that permanently holds a minimum of 10,000 litres for fire-fighting purposes is to be provided at the time of constructing a dwelling on proposed lots. PS3.2 Where a lot doesn't have access to a reticulated water supply in accordance with AO1.1, a dedicated on-site water storage system that permanently holds a minimum of 10,000 litres for fire-fighting purposes is to be provided at the time of constructing a dwelling on that lot. PS3.3 Where a water tank is provided for firefighting purposes, then it is to comply with the requirements of AO1.3

	AO3.2 Development outside a water supply area involving proposed or existing buildings with a combined gross floor area greater than 50m², are provided with a dedicated on site water storage system that permanently holds a minimum of 10,000 litres (e.g. dam, swimming pool or water tank) for fire fighting purposes. AO3.3 A water tank is provided within 10m of each building (other than a class 10 building) which: a. Is either below ground level or of non-flammable construction; b. Has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: i. 10,00 litres for residential buildings; ii. For industrial, commercial; and other buildings, a volume specified in AS2304-2011 c. Includes shielding of tanks and pumps in accordance with AS2304-2011 d. Includes a hardstand area allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank e. Is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines); and f. Is clearly identified by directional signage at the street frontage	
Hazardous Materials		
PO4 Public safety and the environment are not adversely affected by the detrimental	AO4.1 Development complies with a Bushfire Management Plan for the premises.	PS4.1

impacts of bushfire on the manufacture or storage of hazardous materials in bulk.	<i>Note: 'Hazardous materials in bulk' is defined in Section 9, Glossary of the SPP Guideline. Where the assessment manager has not previously approved a Bushfire Management Plan (see Note 1.7 above), the development proponent will be expected to prepare such a plan to the satisfaction of the assessment manager. See Appendix 8 for more information on bushfire management plans.</i>	Development is to comply with this bushfire management plan. The proposed land use does not include the storage of bulk quantities of hazardous materials.
Reconfiguring a lot and Material Change of Use		
PO5 Lot design and the siting of buildings provide safe sites for habitable and non-habitable buildings.	AO5.1 All development enables buildings and structures to achieve setbacks from hazardous vegetation that are: - sited within the area of lowest hazard within the lot; and - provide for adequate setbacks from hazardous vegetation; and 1.5 times the predominant mature canopy tree height or 10m, whichever is the greater; and 10m from any retained vegetation strips or small areas of vegetation; and - sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard.	PS5.1 The proposed RaL configuration enables buildings and structures to be sited within development in areas with: - The lowest area of bushfire hazard; - Adequate setbacks from potentially hazardous vegetation are achieved; - The identified development envelopes on Lots 2 - 5 allows future dwellings to achieve minimum separation distances (outlined in Appendix C) from potentially hazardous vegetation to be exposed to a maximum BAL of 29 (Appendix B). The height of mature canopy trees on the site is in the order of 25 metres. The Australian Standard AS3959-2018 allows for the construction of buildings closer to vegetation than this provided that

		they are built to a higher standard; and d. A distance of greater than 10m from retained vegetation strips or small areas of vegetation maintained by APZ; and e. Consideration of siting of less susceptible development uses (e.g. swimming pools) in areas of increased bushfire hazard. Construction of structures is to comply with AS3959-2018 and the BCA. Appendix C provides additional information on the level of bushfire hazard posed to buildings and the methodology used to calculate it. A site-specific bushfire report should be prepared to guide the construction of new dwellings taking into account location of buildings and prevailing building requirements.
PO6 For development that will result in multiple buildings or lots, roads and access are designed to mitigate against bushfire hazard by ensuring adequate access for:	AO6.1 The road design is capable of providing access for fire fighting and other emergency vehicles, in accordance with the standards identified in SC6.2 PSP No. 2 – Engineering Standards – Roads and Drainage Infrastructure. AO6.2	PS6.1 The adjacent road which services the site (Wockner Road) is capable of providing access to firefighting and other emergency vehicles

a. fire fighting and other emergency vehicles; and b. the evacuation of people in the event of an emergency.	The lot layout ensures that all roads are through roads. AO6.3 The lot layout does not include long narrow lots, long access ways or rear lots. AO6.4 The road has a maximum gradient of 1 in 8 (12.5%).	PS6.2 The lot layout avoids the potential for entrapment and elevated levels of hazard to residents and responders in the event of a bushfire. Fire fighting vehicles and other emergency vehicles will have adequate access to proposed dwellings. PS6.3 The development does not result in long narrow lots. PS6.4 No new roads are proposed in association with the development. Wockner Road, which provides existing access to the site, is located on lands with underlying slopes which do not exceed 12.5%.
PO7 For development that will result in multiple buildings or lots, fire breaks are provided that: a. adequately and effectively separate the development site from surrounding vegetation to mitigate against bushfire hazard;	AO7.1 The development incorporates a fire break provided by a perimeter road that: a. separates the boundary of the lots and the adjacent bushland; b. has a minimum cleared width of 20m; c. has a formed road width of 6m; and d. is constructed to an all weather standard.	PS7.1-4 Due to the siting and nature of the development, the use of perimeter roads as firebreaks and fire management lines are not proposed. The proposed development envelope locations provide separation from unmanaged woodland to the north and west of the site and Wockner

b. have sufficient width to enable continuous access for fire fighting and other emergency vehicles, residents and equipment; and c. are in secure tenure and are maintained.	AO7.2 The development includes fire breaks which are located as close as possible to the boundaries of the lot(s) and the adjoining bushfire hazard and the fire breaks have: a. a minimum cleared width of 6m; b. a minimum formed width of 4m; c. a maximum gradient of 1 in 8 (12.5%); d. are constructed and maintained to prevent erosion, provide adequate drainage and provide continuous access for fire fighting vehicles; e. provide passing bays and turning areas for fire-fighting appliances; and f. are either located on public land, or within an access easement that is granted in favour of the Toowoomba Regional Council and the Queensland Fire and Rescue Service. AO7.3 Vehicular access is provided along and at each end of the fire break to existing fire maintenance trails or roads. AO7.4 The development includes sufficient cleared breaks of 6m minimum width in retained bushland within the development (e.g. creek corridors and retained vegetation) to allow burning of sections and access for bushfire response.	Road provides good access and egress for residents and emergency services.
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6 Conclusion

The bushfire assessment of the site identified that in general hazards are in the medium category, with indicative Bushfire Attack Levels (BAL) indicating that sufficient area is available within each identified lot to readily achieve a maximum BAL which is in the order of BAL-12.5 to BAL-29. Development Envelopes have been identified on proposed Lots 2 – 5 to facilitate the location of future infrastructure (including building envelopes, associated asset protection zone (APZ), effluent disposal areas, and ancillary structures) to achieve a maximum BAL which is in the order of BAL-29 (Appendix B), dependant on the final location of a dwelling and extent of vegetation management works within the Development Envelopes.

Bushfire Attack Levels (BAL) in the order of BAL-12.5 to BAL-29 achievable for future dwellings located within 100m of potentially hazardous vegetation (post development), and BAL-Low for future dwellings located greater than 100m from potentially hazardous vegetation (Appendix B).

The bushfire risk to built assets can be effectively managed at the design and construction phase through the application of the National Construction Code and the Australian Standard Construction of buildings in bushfire-prone areas (AS3959-2018) and ongoing vegetation maintenance.

6.1 Recommendations

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

- That buildings are designed and constructed to meet the requirements of the relevant building standards prevailing at the time. This includes AS3959 – 2018, the BCA and relevant Council bylaws and building regulations.
- That vegetation within the identified development envelopes be managed to fuel load no greater than 8 t/ha.
- That vegetation be managed in each proposed lot to minimise the accumulation of hazardous fuel loads and to control understory woody and highly flammable weeds such as lantana.
- That any landscaping works utilise plant species and design principles suitable for bushfire prone areas and in accordance with Appendix F.
- That all lots are provided with a minimum 10,000L permanent water supply be established at the time of construction of a structure which is capable of supplying water for fire-fighting purposes.
- That bushfire mitigation measures identified in this bushfire management report are implemented and maintained.

7 References

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Appendices

Appendix A Queensland Statewide Mapping Methodology

Overview

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

The Potential Fire-line Intensity is calculated using 3 key factors operating at a landscape level, these being Potential Fuel Load (tonnes / hectare), Maximum Landscape Slope (degrees) and Fire Weather Severity (Forest Fire Danger Index). Figure 14 illustrates the variables used to determine the Potential Fire-line Intensity.



Figure 14 Variables used to determine Potential Fire-line Intensity. (Redrawn from Leonard et al 2013)

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

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

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

Fuel Loads and Vegetation Hazard Classes

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

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

Appendix B Bushfire Attack Levels

Appendix B Bushfire Attack Levels

Project: 118 Wockner
Road, Merritts Creek

Client: NJ & DE
Shannon

Project No.: J002932

Compiled by: HannahBakker Date: 4/09/2026
Approved by: Will Gibson Date: 4/09/2026

0 30 60 Metres

Legend

-  Cadastre
-  Roads
-  Lot layout
-  Development envelope
-  Indicative dwelling location (50m x 50m)
-  BAL 12.5
-  BAL 19
-  BAL 29
-  BAL 40
-  BAL Flame Zone

The content of this document includes third party data. Range Environmental Consultants does not guarantee the accuracy of such data.

Source: Cadastral data sourced from DNRME (2026). Aerial imagery sourced from NearMap (2026).



Note: the identified indicative are not final locations, and future dwellings may be located anywhere within the identified Development Envelopes on Lots 2 - 5. Each Development Envelope provides sufficient area for a future dwelling to be built within an area subject to a maximum radiant heat flux of kW/m2 (BAL 29 standard).

Following development, the entirety of the Development Envelopes are to be maintained to a low fuel load state. Where native vegetation is retained/naturally regenerates, a maximum fuel load of 8t/ha is to be maintained.

Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

Appendix C Calculation of Bushfire Hazard

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

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

Determination of Bushfire Attack Level – SPP APZ Calculator

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

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

Climatic Conditions and Forest Fire Danger Index

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

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

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

Adopting a worst-case scenario, an FDI of 65 was used for the site when calculating Bushfire Attack Levels (BAL) for 'the site'. Figure 15 provides a Fire Danger Index (FDI) map of Southeast Queensland and identifies the location of the site.

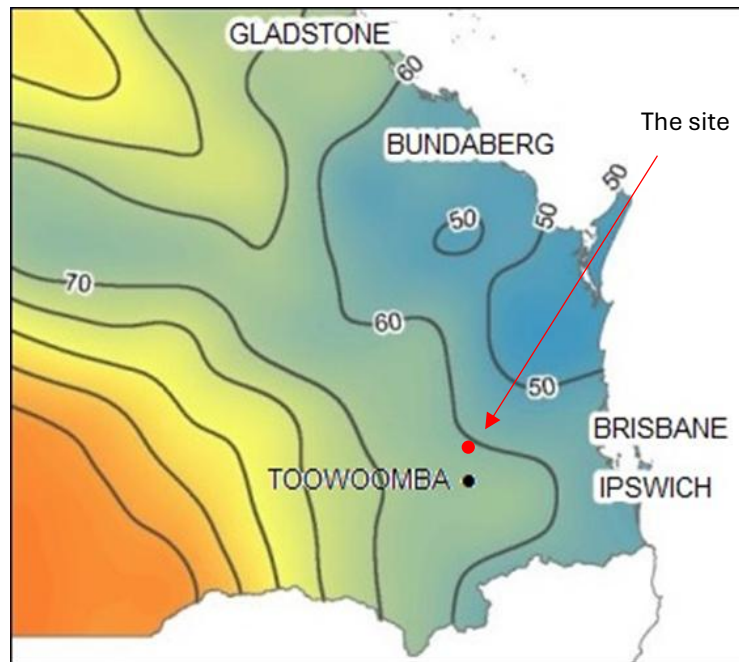


Figure 15 FDI map for Southeast Queensland. Leonard. J. A New Methodology for State-wide Mapping of Bushfire Prone Areas in Queensland. 2014

The potential radiant heat flux was calculated using the SPP APZ Width Calculator for representative areas level with, and upslope of the site. Figure 16 shows the radiant heat flux vs distance from vegetation and potential BALs.

In assessing vegetation classes for forests, woodlands and rainforests, the classified vegetation will be determined by the unmanaged understorey rather than either the canopy (drip line) or trunk of any trees (AS3959-2018).

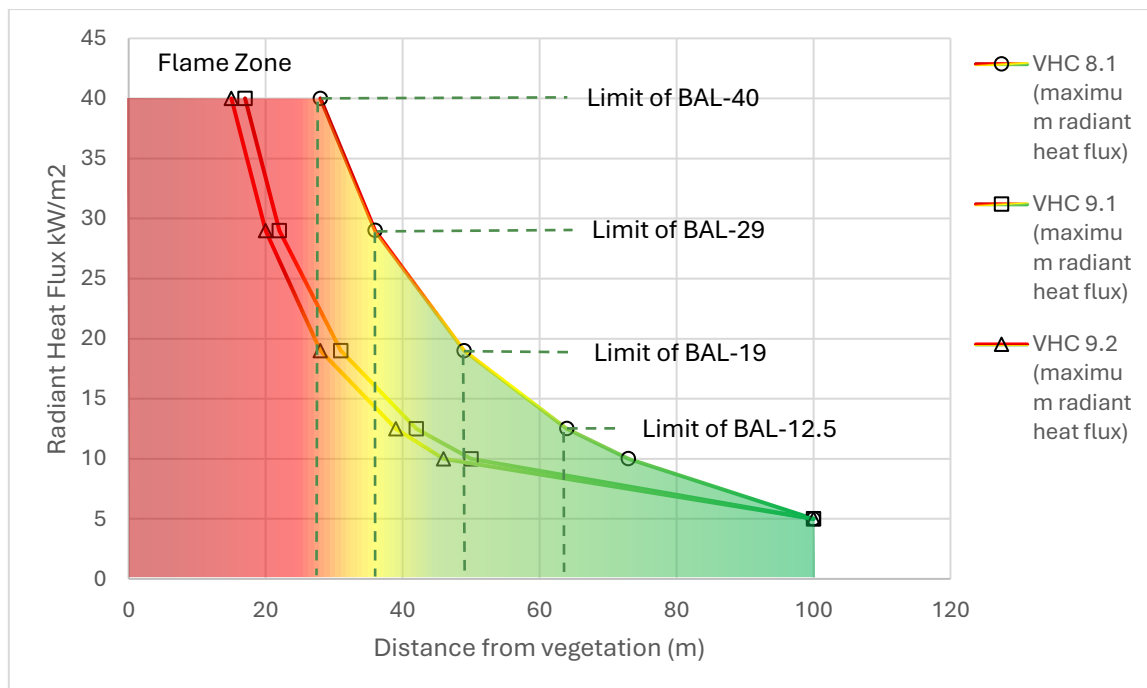


Figure 16 Potential radiant heat flux versus distance from bushland areas (maximum radiant heat)

Calculation of Bushfire Attack Level – SPP APZ Calculator

The following steps were carried out using information collected from the relevant site and applying this information to the conditions required and set out in QFES SPP Bushfire Asset Protection Zone Calculator and the Australian Standard 'Construction of Buildings in Bushfire-prone areas' (AS 3959-2018).

Table 9 Parameters used in SPP APZ calculations

Step	Procedure	Value (VHC 8.1)	Value (VHC 8.1)	Value (VHC 9.1)	Value (VHC 9.2)	Value (VHC 9.2)	Value (VHC 36.1)
1	Fire Danger Index (FDI)	65	65	65	65	65	65
2	Vegetation Hazard Class (VHC)	8.1	8.1	9.1	9.2	9.2	36.1
3	Surface fuel load (t/ha)	31	31	21	14.9	14.9	23.8
4	Overall fuel load (t/ha)	35.0	35.0	24.2	17.2	17.2	26.0
5	Location of vegetation (Upslope/Downslope)	Downslope	Level & Upslope	Level & Upslope	Downslope	Level & Upslope	Level & Upslope
6	Site slope	7 degrees	0 degrees	0 degrees	4 degrees	0 degrees	0 degrees
7	Effective slope of land under classified vegetation	1 degree	0 degrees	0 degrees	1 degree	0 degrees	0 degrees

In assessing vegetation classes for forests, woodlands and rainforests, the classified vegetation will be determined by the unmanaged understorey rather than either the canopy (drip line) or trunk of any trees (AS3959-2018).

Table 10 to Table 14 provide details of the BAL calculations for the site using the SPP APZ Calculator in relation to the areas of unmanaged vegetation in the vicinity of the development.

Table 10 State Planning Policy Asset Protection Zone Width Calculator (VHC 8.1– downslope)

SPP Bushfire Asset Protection Zone Width Calculator							
Variable Description	Variable	Units	Value				
Input Values							
Fire Weather Severity	FDI		65.00				
Vegetation Hazard Class	VHC	-	8.1 Wet eucalypt tall open forest				
Remnant Status	-	-	Remnant				
Slope Type (Upslope or Downslope)	ST	-	Downslope				
Effective Slope Under the Hazardous Vegetation	eSlope	degrees	5.00				
Slope Between Site and Hazardous Vegetation	θ	degrees	1.00				
Distance of the Site from Hazardous Vegetation	d	m	<28	28.00	36.00	49.00	64.00
Output Values							
Surface Fuel Load	-	t/ha	28.00				
Near Surface Fuel Load	-	t/ha	3.00				
Bark Fuel Load	-	t/ha	2.00				
Elevated Fuel Load	-	t/ha	2.00				
Total Overall Fuel Load	W	t/ha	35.00				
Total Surface Fuel Load	w	t/ha	31.00				
Potential Fire Line Intensity	I	kW/m	57624				
Radiant Heat Flux	q	kW/m²	40+	39.73	28.87	18.74	12.36
Bushfire Attack Level (AS 3959-2018)	BAL	-	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5
Disclaimer: Fire-line intensity and radiant heat calculations where effective slope exceeds 20 degrees (downslope) or 15 degrees (upslope) may be unreliable. In these locations, specialist assessment is warranted.							

Table 11 State Planning Policy Asset Protection Zone Width Calculator (VHC 8.1– level and upslope)

SPP Bushfire Asset Protection Zone Width Calculator							
Variable Description	Variable	Units	Value				
Input Values							
Fire Weather Severity	FDI		65.00				
Vegetation Hazard Class	VHC	-	8.1 Wet eucalypt tall open forest				
Remnant Status	-	-	Remnant				
Slope Type (Upslope or Downslope)	ST	-	Level & Upslope				
Effective Slope Under the Hazardous Vegetation	eSlope	degrees	1.00				
Slope Between Site and Hazardous Vegetation	θ	degrees	1.00				
Distance of the Site from Hazardous Vegetation	d	m	<23	23.00	30.00	42.00	55.00
Output Values							
Surface Fuel Load	-	t/ha	28.00				
Near Surface Fuel Load	-	t/ha	3.00				
Bark Fuel Load	-	t/ha	2.00				
Elevated Fuel Load	-	t/ha	2.00				
Total Overall Fuel Load	W	t/ha	35.00				
Total Surface Fuel Load	w	t/ha	31.00				
Potential Fire Line Intensity	I	kW/m	43726				
Radiant Heat Flux	q	kW/m²	40+	39.65	28.81	18.50	12.46
Bushfire Attack Level (AS 3959-2018)	BAL	-	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5
Disclaimer: Fire-line intensity and radiant heat calculations where effective slope exceeds 20 degrees (downslope) or 15 degrees (upslope) may be unreliable. In these locations, specialist assessment is warranted.							

Table 12 State Planning Policy Asset Protection Zone Width Calculator (VHC 9.1– level and upslope)

SPP Bushfire Asset Protection Zone Width Calculator							
Variable Description	Variable	Units	Value				
Input Values							
Fire Weather Severity	FDI		65.00				
Vegetation Hazard Class	VHC	-	9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges				
Remnant Status	-	-	Remnant				
Slope Type (Upslope or Downslope)	ST	-	Level & Upslope				
Effective Slope Under the Hazardous Vegetation	eSlope	degrees	1.00				
Slope Between Site and Hazardous Vegetation	θ	degrees	1.00				
Distance of the Site from Hazardous Vegetation	d	m	<17	17.00	22.00	31.00	42.00
Output Values							
Surface Fuel Load	-	t/ha	17.50				
Near Surface Fuel Load	-	t/ha	3.50				
Bark Fuel Load	-	t/ha	2.20				
Elevated Fuel Load	-	t/ha	1.00				
Total Overall Fuel Load	W	t/ha	24.20				
Total Surface Fuel Load	w	t/ha	21.00				
Potential Fire Line Intensity	I	kW/m	20480				
Radiant Heat Flux	q	kW/m²	40+	37.50	28.05	18.60	12.46
Bushfire Attack Level (AS 3959-2018)	BAL	-	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5
Disclaimer: Fire-line intensity and radiant heat calculations where effective slope exceeds 20 degrees (downslope) or 15 degrees (upslope) may be unreliable. In these locations, specialist assessment is warranted.							

Table 13 State Planning Policy Asset Protection Zone Width Calculator (VHC 9.2 – downslope)

SPP Bushfire Asset Protection Zone Width Calculator								
VARIABLE DESCRIPTION	VARIABLE	UNITS	VALUE					
Input Values								
FIRE WEATHER SEVERITY	FDI		65.00					
VEGETATION HAZARD CLASS	VHC	-	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges					
REMNANT STATUS	-	-	Remnant					
SLOPE TYPE (UPSLOPE OR DOWNSLOPE)	ST	-	Downslope					
EFFECTIVE SLOPE UNDER THE HAZARDOUS VEGETATION	eSlope	degrees	4.00					
SLOPE BETWEEN SITE AND HAZARDOUS VEGETATION	θ	degrees	1.00					
DISTANCE OF THE SITE FROM HAZARDOUS VEGETATION	d	m	<15	15	20.00	28.00	39.00	
Output Values								
SURFACE FUEL LOAD	-	t/ha	11.40					
NEAR SURFACE FUEL LOAD	-	t/ha	3.50					
BARK FUEL LOAD	-	t/ha	1.30					
ELEVATED FUEL LOAD	-	t/ha	1.00					
TOTAL OVERALL FUEL LOAD	W	t/ha	17.20					
TOTAL SURFACE FUEL LOAD	w	t/ha	14.90					
POTENTIAL FIRE LINE INTENSITY	I	kW/m	13611					
RADIANT HEAT FLUX	q	kW/m²	40+	38.05	27.67	18.67	12.21	
BUSHFIRE ATTACK LEVEL (AS 3959-2018)	BAL	-	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5	
DISCLAIMER: Fire-line intensity and radiant heat calculations where effective slope exceeds 20 degrees (downslope) or 15 degrees (upslope) may be unreliable. In these locations, specialist assessment is warranted.								

Table 14 State Planning Policy Asset Protection Zone Width Calculator (VHC 9.2 – level and upslope)

SPP Bushfire Asset Protection Zone Width Calculator							
VARIABLE DESCRIPTION	VARIABLE	UNITS	VALUE				
Input Values							
FIRE WEATHER SEVERITY	FDI		65.00				
VEGETATION HAZARD CLASS	VHC	-	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges				
REMNANT STATUS	-	-	Remnant				
SLOPE TYPE (UPSLOPE OR DOWNSLOPE)	ST	-	Level & Upslope				
EFFECTIVE SLOPE UNDER THE HAZARDOUS VEGETATION	eSlope	degrees	1.00				
SLOPE BETWEEN SITE AND HAZARDOUS VEGETATION	θ	degrees	1.00				
DISTANCE OF THE SITE FROM HAZARDOUS VEGETATION	d	m	<12	12.00	16.00	23.00	33.00
Output Values							
SURFACE FUEL LOAD	-	t/ha	11.40				
NEAR SURFACE FUEL LOAD	-	t/ha	3.50				
BARK FUEL LOAD	-	t/ha	1.30				
ELEVATED FUEL LOAD	-	t/ha	1.00				
TOTAL OVERALL FUEL LOAD	W	t/ha	17.20				
TOTAL SURFACE FUEL LOAD	w	t/ha	14.90				
POTENTIAL FIRE LINE INTENSITY	I	kW/m	10328				
RADIANT HEAT FLUX	q	kW/m²	40+	38.57	28.29	18.82	12.14
BUSHFIRE ATTACK LEVEL (AS 3959-2018)	BAL	-	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5
DISCLAIMER: Fire-line intensity and radiant heat calculations where effective slope exceeds 20 degrees (downslope) or 15 degrees (upslope) may be unreliable. In these locations, specialist assessment is warranted.							

Table 15 State Planning Policy Asset Protection Zone Width Calculator (VHC 36.1 – level and upslope)

SPP Bushfire Asset Protection Zone Width Calculator							
Variable Description	Variable	Units	Value				
Input Values							
Fire Weather Severity	FDI		65.00				
Vegetation Hazard Class	VHC	-	36.1 Exotic & hardwood plantation				
Remnant Status	-	-	Remnant				
Slope Type (Upslope or Downslope)	ST	-	Level & Upslope				
Effective Slope Under the Hazardous Vegetation	eSlope	degrees	1.00				
Slope Between Site and Hazardous Vegetation	θ	degrees	1.00				
Distance of the Site from Hazardous Vegetation	d	m	<18	18.00	24.00	34.00	46.00
Output Values							
Surface Fuel Load	-	t/ha	22.30				
Near Surface Fuel Load	-	t/ha	1.50				
Bark Fuel Load	-	t/ha	1.20				
Elevated Fuel Load	-	t/ha	1.00				
Total Overall Fuel Load	W	t/ha	26.00				
Total Surface Fuel Load	w	t/ha	23.80				
Potential Fire Line Intensity	I	kW/m	24938				
Radiant Heat Flux	q	kW/m²	40+	39.57	28.49	18.58	12.30
Bushfire Attack Level (AS 3959-2018)	BAL	-	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5
Disclaimer: Fire-line intensity and radiant heat calculations where effective slope exceeds 20 degrees (downslope) or 15 degrees (upslope) may be unreliable. In these locations, specialist assessment is warranted.							

Appendix D Explanation of Bushfire Attack Levels

Table 16 BAL Descriptions - Australian Standard - Construction of Buildings in Bushfire-prone Areas (AS 3959-2018)

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

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

Appendix E Living in a Bushfire Prone Area

A bushfire can ignite fuel and spread in three ways:

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

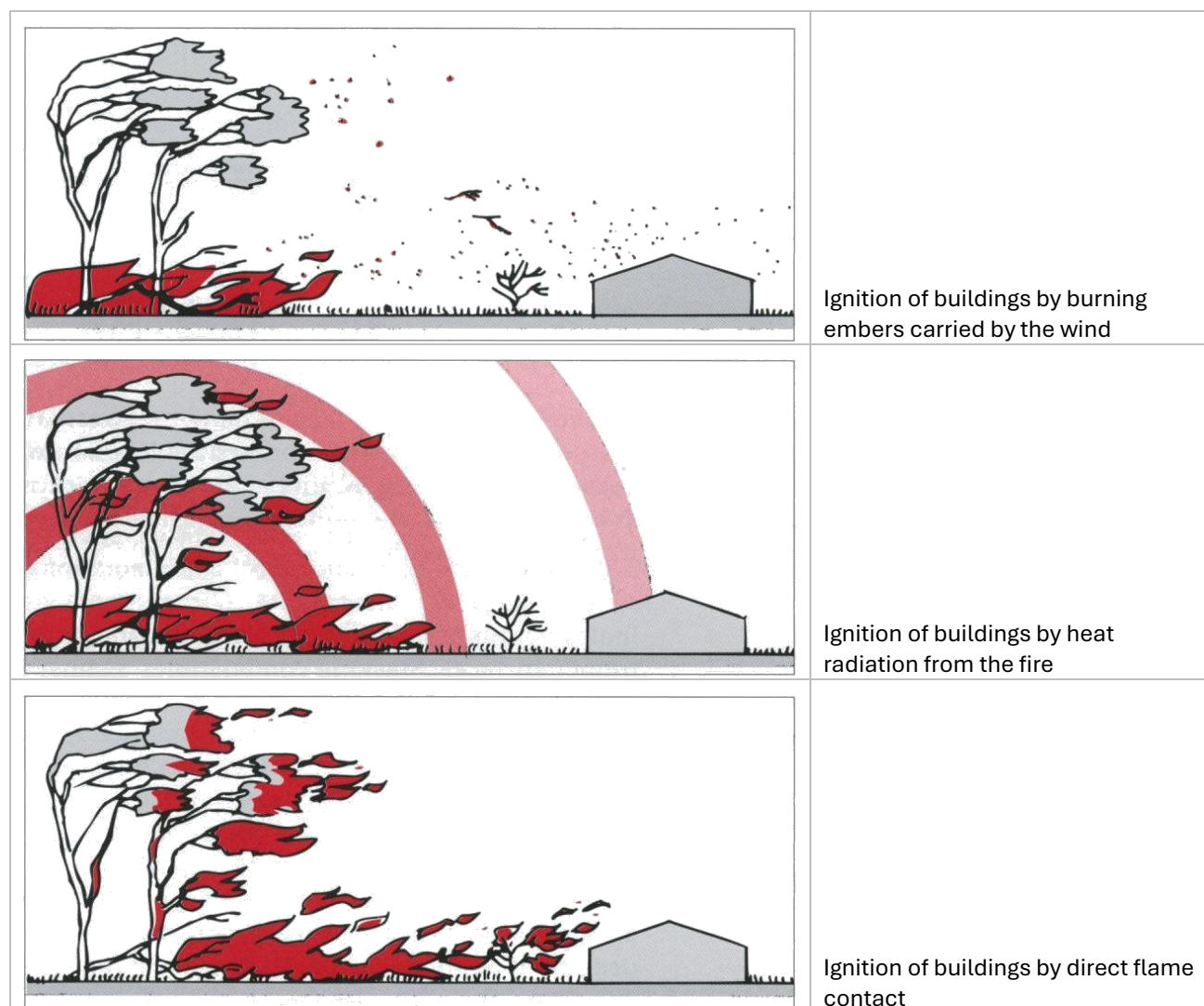


Figure 17 The three main elements of bushfire which threaten life and property. (Ramsay & Rudolf 2003)

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

Whilst research shows that ember attack ultimately claims more vacant houses than radiant heat or flames, if a house is occupied, ember attack can be relatively easily dealt with. The consequence of leaving a house unattended is that there will probably be nobody there to prevent the small fires which initially start, from gradually taking hold of various parts of the structure. This process can occur over a significant period of time, usually simply with embers which fly about and settle, and start smouldering. The hot windy conditions associated with the fire help fan the smouldering clumps of fuel and bring many small fires to life. These are

usually easy fires to extinguish if there is someone there with the equipment and water to put them out. In their absence, often some time, even hours after the initial fire front, the house succumbs to small fires which have grown to larger ones.

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

Asset Protection Zones

The most immediate form of defence for an asset is a well-designed Asset Protection Zone (APZ). An APZ is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, or commercial buildings.

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

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

An APZ provides:

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

Potential bush fire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;
- damage to the built asset from intense radiant heat; and
- ember attack on the asset.

The APZ can be made up of an Inner Protection Area (IPA) and an Outer Protection Area (OPA).

Inner Protection Area (IPA)

The IPA 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 development and act as a defendable space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

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

When establishing and maintaining an IPA, the following requirements apply:

Trees

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building (preferably, there should be no trees within 10 metres of a dwelling);
- lower limbs should be removed up to a height of 2m above the ground; and
- tree canopies should be separated by 2 to 5m.

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; and
- 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 (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed.

Outer Protection Area (OPA)

An OPA is located between the IPA and the 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 IPA.

When establishing and maintaining an OPA the following requirements apply:

Trees

- tree canopy cover should be less than 30%; and
- canopies should be separated by 2 to 5m.

Shrubs

- shrubs should not form a continuous canopy; and
- shrubs should form no more than 20% of ground cover.

Grass

- grass should be kept mown to a height of less than 100mm; and
- leaf and other debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bushfires.

Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.

The required distances for Asset Protection Zones are dependent on the vegetation type (hazard), the slope of the site and whether the hazard is upslope or downslope from the asset. An example of an APZ in relation to a dwelling is provided in Figure 18.

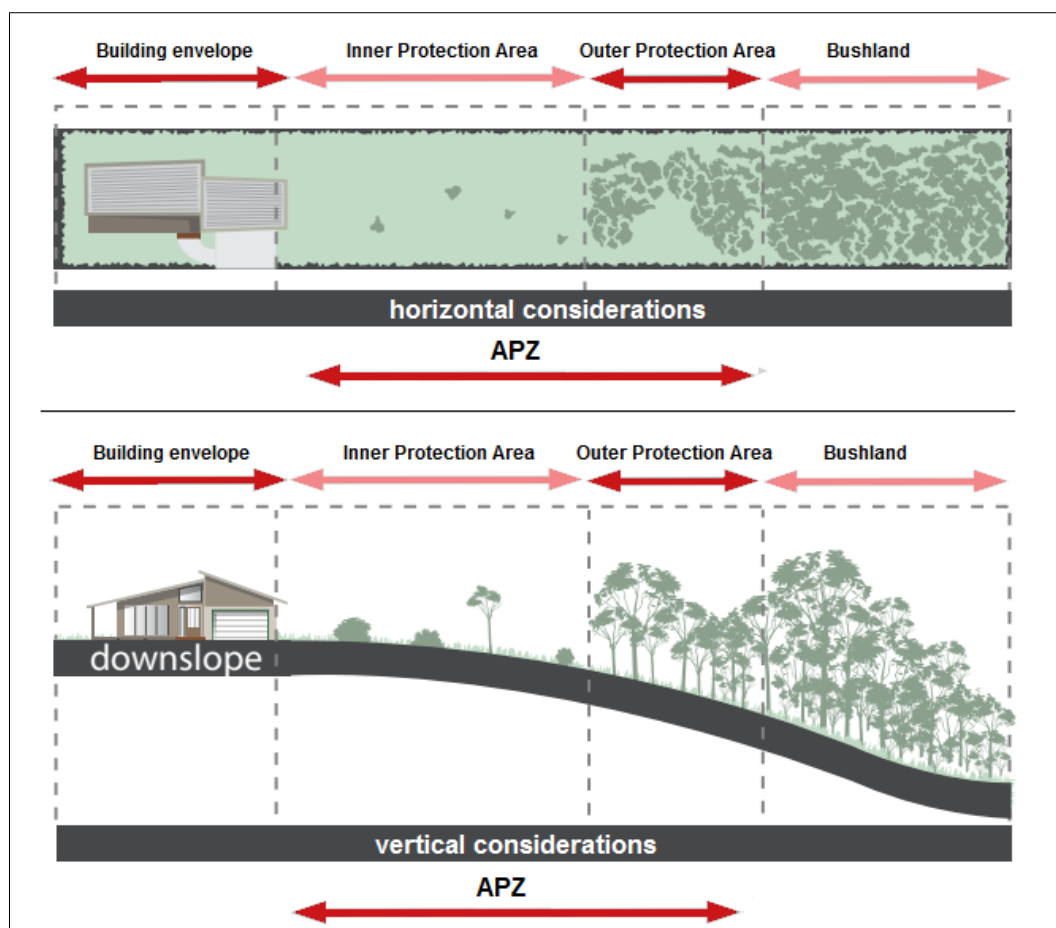


Figure 18 APZ Elements (Adapted from Planning for Bushfire Protection 2019)

Information presented in this Appendix was drawn from Planning for Bushfire Protection, A guide for councils, planners, fire authorities and developers (NSW Rural Fire Service November 2019) and Standards for Asset Protection Zones (NSW Rural Fire Service undated).

Appendix F Landscaping in Fire Prone Areas

The design, management, and maintenance of the landscape in the immediate vicinity of buildings are fundamental to the chances of survival of both people and buildings in a bushfire event. Vegetation provides the major fuel element in a bushfire. All vegetation, regardless of how succulent or green it is will eventually burn, provided the fire has sufficient intensity. When landscaping in bushfire prone areas, it is important to use or retain plants of low flammability that have the relevant characteristics as identified in Table 17.

Table 17 Characteristics of low flammability species and effect on performance in bushfire situations

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

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

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

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

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

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



www.rangeenviro.com.au

BRISBANE

Unit 1/7 Birubi Street
Coorparoo Qld 4151

TOOWOOMBA

Office A, 189 Hume St
Toowoomba QLD 4350

T 07 4588 6711

E admin@rangeenviro.com.au