S5 ENVIRONMENTAL

BUSHFIRE HAZARD ASSESSMENT AND MANAGEMENT PLAN

23 Cedarleigh Road, Kenmore

Client:	Mr Hesam Darouei C/- Jeff Nichols Town Planning
Reference:	S524253_BHAMP_v2.0
Date:	20 April 2026

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Quality Control

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Version Control

Version	Description	Date	Author	Reviewer	Approver
1.0	For Submission	28 August 2025	JD (EnvSci.)	RS (Director)	RS (Director)
1.1	Updated	4 December 2025	JD (EnvSci.)	DE (Snr. Env. Consultant)	RS (Director)
2.0	Updated Layout	20 April 2025	JD (EnvSci.)	RS (Director)	RS (Director)

Disclaimer

S5 Consulting Pty Ltd trading as S5 Environmental has developed this Bushfire Hazard and Bushfire Attack Level Assessment, taking into consideration the Australian Standard (AS3959-2018) - Construction of Buildings in Bushfire-prone Areas, the State Planning Policy and relevant local authority policies and guidelines. However, there can be no guarantee that following the recommendations made in this assessment can guarantee safety of property and human life.

Fire is an element of nature, and as such fire events (small or large) can have disastrous outcomes even with the best planning in place. The authors of this report and S5 Consulting Pty Ltd accept no responsibility for any harm to property or human life caused by fire or any other cause to persons utilising property or structures.

Abbreviations

AS 3959-2018	*Australian Standard 3959-2018 Construction of Buildings in Bushfire-prone Areas*
BAL	Bushfire Attack Level
BCA	Building Code of Australia
BCC	Brisbane City Council
BMP	Bushfire Management Plan
BPA	Bushfire Prone Area
BPZ	Building Protection Zone
BRC	Bushfire Resilient Communities (The State of Queensland 2019b)
CFA	Country Fire Authority
DETSI	Department of Environment, Technology, Science and Innovation
FFDI	Forest Fire Danger Index
ha	Hectares
QFD	Queensland Fire Department
RE	Regional Ecosystem
RFS	Rural Fire Service
SEQ	South East Queensland
SPP	*State Planning Policy, 2017*
VHC	Vegetation Hazard Class

1.0 INTRODUCTION

S5 Environmental was commissioned by Jeff Nichols Town Planning, on behalf of their client Mr Hesam Darouei, to undertake a Bushfire Hazard Assessment and Management Plan (BHAMP) as part of a proposed Development Application for a residential Reconfiguring a Lot (RoL) at 23 Cedarleigh Road, Kenmore, refer to Table 1.

The aim of this BHAMP is to undertake a site-specific bushfire hazard assessment, determine any set back required between the proposed development and hazardous vegetation and prepare a Bushfire Management Plan to ensure the proposed development is not exposed to an unacceptable bushfire risk and can comply with the relevant legislative bushfire requirements.

Table 1. Site Description

Street Address	23 Cedarleigh Road, Kenmore 4069	Lot on Plan	Lot 4 on RP87287
LGA	Brisbane City Council (BCC)	Area	10,117 m^2
Zone	Emerging Community		
Current State	Lot 4 on RP87287 herein referred to as the 'subject site', is a large lot distinctly divided into two parts, with the southern portion containing a dwelling, landscaped gardens and a large mown grass area with scattered canopy trees. The northern portion contains remnant vegetation with a dense weedy ground and mid-storey, refer to Figure 1. The site slopes downwards, from Cedarleigh Road in the south to the northern boundary. A waterway enters through the western boundary and exits the site to the north-east.		
Proposed Development	S5 Environmental understands the client wishes to subdivide the southern portion of the site (1 into 4 lots), with the proposed development area largely corresponding to area of the existing dwelling, maintained gardens and lawns. The northern balance of the site containing remnant vegetation is to be retained as an environmental covenant as part of Lot 2. See Figure 2 for the proposed development footprint.		
Potentially Hazardous Vegetation	Post development, potentially hazardous vegetation is situated to the north, north-east, west and south. This vegetation was determined to reflect the regional ecosystems (RE) 12.11.5 and 12.11.3, which are described as: RE 12.11.5: *Corymbia citriodora* subsp. *variegata* woodland to open forest +/- *Eucalyptus siderophloia*/*E. crebra*, *E. carnea*, *E. acmenoides*, *E. propinqua* on metamorphics +/- interbedded volcanics. RE 12.11.3: *Eucalyptus siderophloia*, *E. propinqua* +/- *E. microcorys*, *Lophostemon confertus*, *Corymbia intermedia*, *E. acmenoides* open forest on metamorphics +/- interbedded volcanics.		

Figure 1. Site Aerial (source: Nearmap, date: 5/11/2025)

Figure 2. Proposed Development (Jeff Nicholls Town Planning, JN100-SMJ-43 Rev C, 26.3.26)

2.0 STATUTORY REQUIREMENTS

2.1 Development Applications in Bushfire Prone Areas

Bushfire Prone Areas are identified at both the State and Local Government Level. The State Planning Policy (SPP) Bushfire Prone Area map was developed by CSIRO to map areas with Very High, High and Medium Potential Bushfire Intensity. The SPP also maps a 100 m Potential Impact Buffer.

The Brisbane City Council (BCC) *City Plan 2014* implements the Bushfire hazard overlay code which acts as a development constraint within the BCC locality. It is understood that the *City Plan 2014* has not integrated all aspects of the SPP: Safety and Resilience to Hazards (Natural Hazards, Risk and Resilience – Bushfire Prone Areas). As such the SPP bushfire hazard mapping, as well as BCC's Bushfire hazard overlay, were consulted to determine the preliminary bushfire hazard ratings of the site and locality (within 150 m), refer to Figure 3 and Figure 4.

The BCC Bushfire Hazard Overlay has mapped the proposed development area and the balance of the subject site as a mix of high hazard, medium hazard and high hazard buffer area. The assessment area is a patchwork of all four Bushfire Hazard categories (i.e., high hazard area, medium hazard area, high hazard buffer area and medium hazard buffer area), associated not only with the mapped remnant vegetation but also vegetation throughout the surrounding urban area.

The SPP Bushfire Prone Areas Overlay maps the subject site and proposed development area plus the western, northern and eastern areas northern as high potential bushfire intensity, with a potential impact buffer extending off this patch. The mapping is largely associated with the area of mapped remnant vegetation.

Due to potentially hazardous vegetation being mapped within and around the proposed development site, further investigation of the site-specific bushfire hazard characteristics has been undertaken to determine the actual hazard of the site.

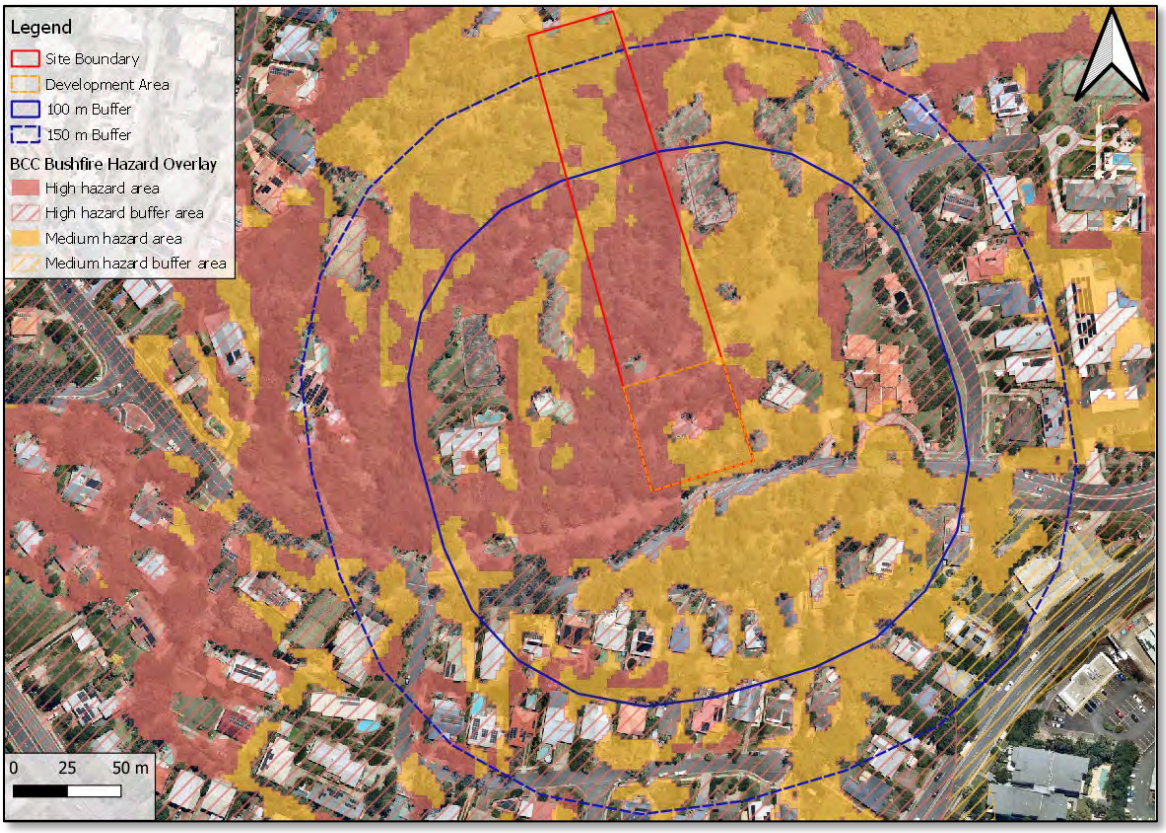

Figure 3. BCC Bushfire Hazard Mapping within and in Proximity to the Site

Figure 4. SPP Bushfire Prone Area Mapping within and in Proximity to the Site

3.0 METHODOLOGY

3.1 Bushfire Hazard Assessment

The SPP Potential Bushfire Intensity classifications are based on the *New Methodology for State-wide Mapping of Bushfire Prone Areas in Queensland* (Leonard *et al.* 2014). This State-wide mapping methodology was developed to identify Bushfire Prone Areas in support of bushfire hazard provisions of Queensland's State Planning Policy. The new methodology scales bushfire hazard based on the Potential Fire-line Intensity (PFLI) of a severe bushfire and can be used to predict the radiation profile of areas located adjacent to potentially hazardous vegetation and an associated Potential Impact Buffer.

Accordingly, the classification of an area's PFLI is calculated as a combination of the following three metrics, using the below equation (Leonard *et al.* 2014):

- Total fuel load (W);
- The McArthur Forest Fire Danger Index (FFDI), and
- Maximum Landscape Slope (θ in ^{o}).

$$FI = 0.62\, W^2\, FFDI \exp(0.069\, \theta)$$

For the purposes of the bushfire hazard assessment, S5 Environmental have utilised data from the Queensland Fire Department (QFD) published to the Queensland Government's Queensland Spatial Catalogue (QSpatial) for fuel load and FFDI. PFLI is delineated into a number of hazard categories shown in Table 2, and each patch of hazardous vegetation can be classed as Very High, High, Medium, Grassland or low hazard according to the PFLI determined for that specific patch. Any patch of hazardous vegetation classed as Very High, High or Medium is buffered by 100 m called the Potential Impact Buffer.

The Potential Impact Buffer is also considered a Bushfire Prone Area, along with hazardous vegetation with a PFLI of Very High, High or Medium. Any development within a bushfire prone area requires further assessment of radiant heat exposure, assessment against the relevant local planning scheme bushfire code and/or an assessment against the SPP assessment benchmarks for Natural hazards, risk and resilience relevant to bushfire and the development of a site-specific bushfire management plan to ensure that the proposed development is exposed to an acceptable or tolerable bushfire risk.

Table 2. Potential Bushfire Intensity Classification

Potential Bushfire Intensity Class	Potential Fire-line Intensity (PFLI)
Very high	>40,000kW/m
High	20,000 – 40,000kW/m
Medium	4,000 – 20,000kW/m
Low	<4,000kW/m

3.2 Modification of Potential Intensity of Small Patches and Corridors

Using the Bushfire Resilient Communities (BRC) methodology in Section 4.2.6 (The State of Queensland 2019b), small patches and narrow corridors of hazardous vegetation were removed from the map of hazardous vegetation within 150 m of the proposed development. This is as small, isolated and/or narrow patches of hazardous vegetation are not large enough to support a fully developed fire. As stated in the BRC methodology (The State of Queensland 2019b), small, isolated or narrow patches are unlikely to reach a potential fire-line intensity greater than 4,000 kW/m^2 and as such, are considered to be low hazard and not classed as a Bushfire Prone Area. The *SPP Technical Reference Guide - Bushfire Resilient Communities* (2019) summarises research by Leonard and Opie (2017) outlines four steps to filter out small patches and narrow corridors of continuous fuel (see Table 3 below).

Table 3. Steps to Downgrade Bushfire Intensity

Step	Description
1	Remove small, isolated patches of **continuous** fuel (< 1 ha) surrounded completely by either discontinuous fuel or no fuel. These patches must be further than 100 m from other continuous fuel patches greater than 2 ha in area.
2	Downgrade intensity of small patches (0.5 to 3 ha) of **continuous** vegetation surrounded completely by either discontinuous or no fuel, which is more than 100 m from other **continuous** fuel patches greater than 2 ha in area.
3	Remove narrow corridors of **continuous** fuel (≤ 50 m in width). The process erodes, then dilates by 25 m in width all **continuous** fuel patches in relation to **discontinuous** areas.
4	Remove small fragments (< 0.5 ha) of shrub-dominated or hazardous tree vegetation.

3.3 Radiant Heat Exposure Assessment

Radiant heat exposure for the proposed development was calculated using a Method 2 from the AS 3959-*2018 Construction of Buildings in Bushfire-prone Areas*. This Method 2 calculates the Bushfire Attack Level (BAL) for a proposed development by determining the minimum distance between hazardous vegetation and the development to achieve each BAL level. As BAL directly correlates to radiant heat exposure, this calculation reflects the level of bushfire risk for a proposed development (see Table 4 and Figure 5).

To determine the radiant heat exposure for the proposed development, the online Flamesol Minimum Distance Calculator (FPA, 2023) was used to determine the required setbacks to hazardous vegetation to achieve an acceptable radiant heat exposure for the proposed development.

Currently, S5 Environmental understand there are two sets of inputs for a Method 2 calculation in accordance with AS3959-2018 or Bushfire Resilient Communities (BRC), which are accepted by BCC, one utilising all standard parameters as outlined in Appendix B of AS3959-2018, and the other method utilising alternative datasets. Accordingly, the inputs to the BAL/radiant heat exposure assessment used for the purposes of

this assessment are summarised in Table 5 below. For this assessment, the standard parameters have been utilised.

Table 4. BAL and Radiant Heat Exposure

BAL Score	Radiant Heat Exposure
Low	-
12.5	12.5 kW/m^2
19	19 kW/m^2
29	29 kW/m^2
40	40 kW/m^2
Flame zone (FZ)	> 40 kW/m^2

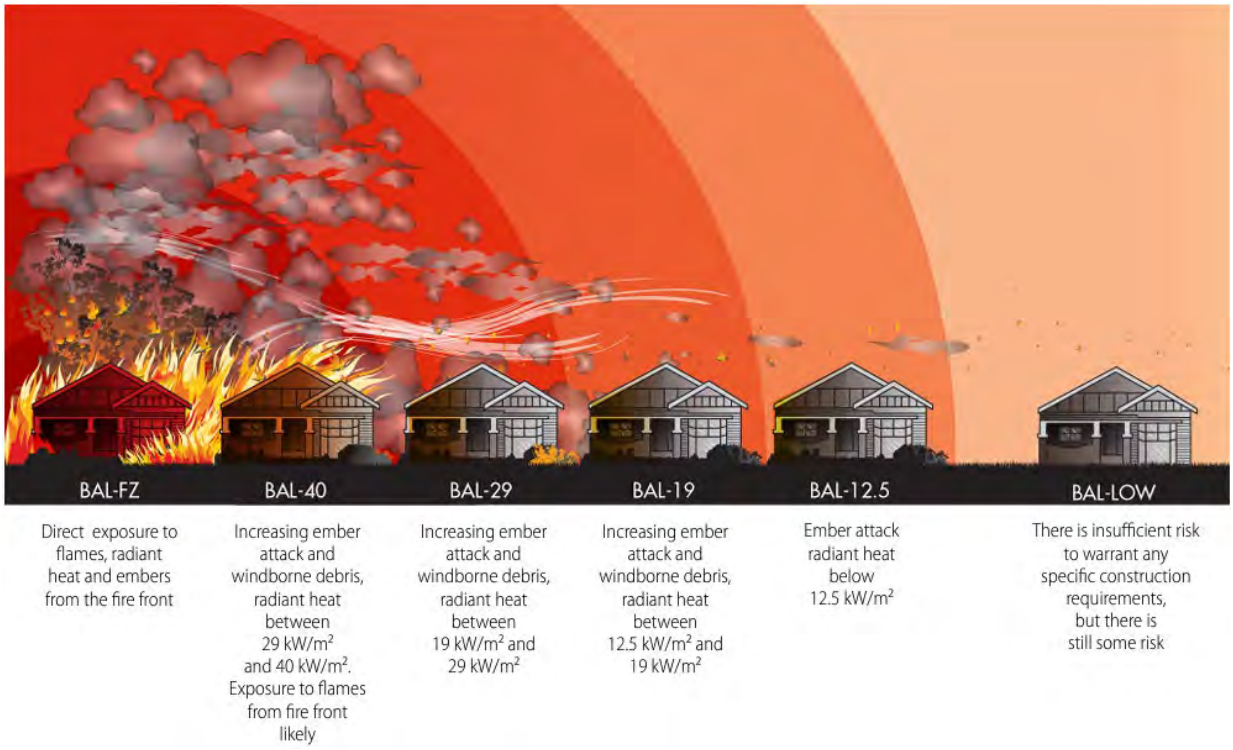

Figure 5. Bushfire Attack Levels (BAL) (Source: WAPC, 2024)

Table 5. Parameter inputs for Method 2 from AS3959-2018

Parameter	AS Method 2 (Alternative Dataset)	AS Method 2 (Standard Inputs)
Surface fuel load (t/ha)	Surface fuel load for identified VHC (surface + near surface)	As per Table B3 of Appendix B for the applicable Vegetation Classification (2.2.3), as described in AS3959-2018
Overall fuel load (t/ha)	Total fuel load for identified VHC	
Flame temperature	1,200 K	1,090 K
FDI/FFDI	From BRC MapViewer/QSpatial	Queensland: FDI 40 (AS3959-2018, Table 2.1)
Standard inputs	Bushfire Resilient Communities (QG 2019b)	AS3959-2018
Effective slope	Measured as the slope under the hazardous vegetation.	AS3959-2018
Site slope	Measured as the slope between the hazardous vegetation and the site.	
Flame Width	Flame width is assumed to be 100 m (AS 3959-2018) unless a short-fire run.	100 m

3.4 Short Fire Run

Small or narrow patches of hazardous vegetation are unlikely to support a fully developed bushfire due to their limited size (see **Figure 6** for a schematic representation of how fire moves across a landscape). As such, the flame width and height in these small patches will not reach the standard inputs for the Method 2 from AS3959-2018 as these standard inputs are based on a fully developed bushfire. In these cases, a short fire run calculation can be used. The short fire run methodology can only be applied when there is a maximum fire run of 150 m as measured on the effective slope. In these cases where a short fire run can be justified, and thus a reduced flame width and height for a Method 2 calculation, the method from the *Short Fire Run: Methodology for Assessing Bush Fire Risk for Low Risk Vegetation* (NSW Rural Fire Service, 2019) is adopted. A Short Fire Run ***has not been utilised*** for this assessment.

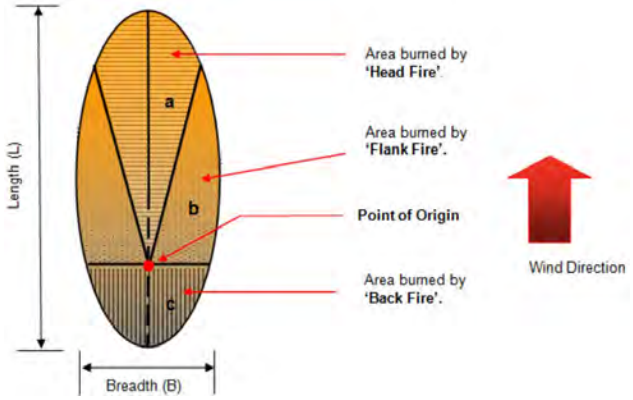

Figure 6. Schematic Diagram of Simple Elliptical Fire Growth Model (Van Wagner 1969) from NSW Rural Fire Surface (2019)

The Short Flame Run formula utilised to calculate the flame width is as follows:

$$\frac{Length\ of\ Vegetation\ along\ effective\ slope\ (xx\ m)}{1.0 + 0.0012\ (Wind\ speed\ (30km/hr)^{2.154}} = Flame\ Width\ (xx\ m)$$

4.0 BUSHFIRE HAZARD ASSESSMENT

4.1 Potential Fire-line Intensity Assessment

In accordance with *A New Methodology for State-wide mapping of bushfire prone areas in Queensland* (Leonard *et al.* 2014), fuel loads derived from ground-truthed Vegetation Hazard Classes (VHCs), effective slope and FFDI were used to calculate the PFLI of hazardous vegetation within 150 m of the proposed development and hazardous into the relevant PFLI category. The following sections discuss how these parameters were determined to calculate PFLI for hazardous vegetation in proximity to the proposed development.

4.1.1 Vegetation Hazard Class Mapping

In accordance with the *New Methodology for State-wide Mapping of Bushfire Prone Areas in Queensland* (Leonard *et al.* 2014), potential fuel loads are assigned to vegetation categories (Vegetation Hazard Classes – VHCs) formed by amalgamating land use and vegetation types with a moderately consistent fuel load and structure.

The potential fuel load assigned to each VHC is generally representative of the higher fuel load expected for the typical vegetation types, landscape and site conditions within each VHC and approximates the ***80th percentile (%) fuel load of the "long unburnt condition"*** for the class (generally greater than 10 years without burning).

Using the QFD BRC MapViewer, numerous VHCs were mapped within and adjacent to the subject site, an extract is shown below in Figure 7.

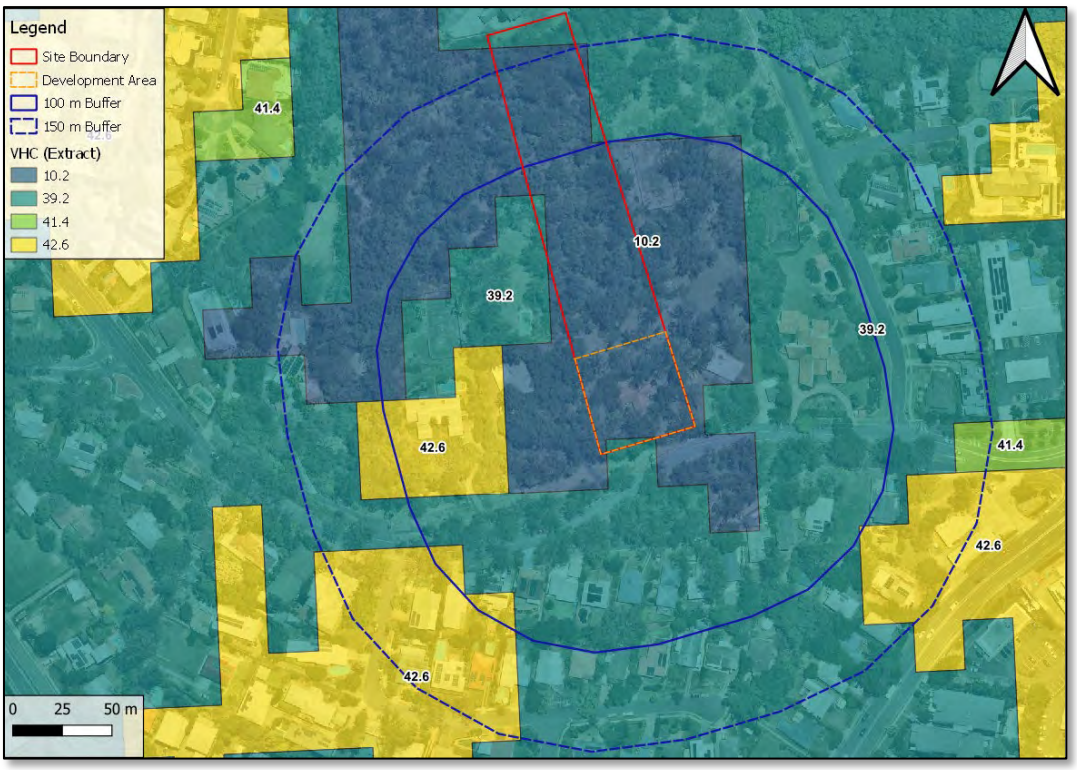

Figure 7. Extract of Vegetation Hazard Classes from the BRC MapViewer

4.1.2 Vegetation Hazard Class Verification

To ground-truth the State Government VHCs mapped within and adjacent to the subject site, S5 Environmental's Ecologists conducted a site visit on the 27th of February 2025 and subsequently undertook a Reliability Assessment in accordance with BRC comparing available bushfire and vegetation mapping with on-ground conditions. The reliability assessment incorporated a comprehensive review of available aerial mapping of the site, including a 150 m buffered area, external to the proposed development.

Post development, the area broadly incorporating the existing dwelling, gardens and lawns is the proposed development area and has been modified from the mapped VHC 10.2 '*spotted gum dominated woodlands*', to VHC 39.2 reflecting '*low to moderate tree cover in built-up areas*'. The surrounding residential lots to the south and east in addition to cleared areas associated with dwellings through the urban area, have largely maintained the mapped VHC 39.2, with several patches of state mapped VHC 42.6 'Nil to very low vegetation cover', have been modified to the higher fuel load of VHC 39.2, reflecting the leafy nature of the area.

The vegetation within the northern extent of the site and connected to the west, north-west and a patch south of Cedarleigh Road, are State mapped as VHC 10.2. Where the vegetation is associated with the mapped Regional Ecosystem (RE) 12.11.5, this has been modified to the corresponding VHC for this RE, of 10.1 '*Spotted gum dominated open forests*' and has been extended along the waterways including the northern boundary of the subject site, through to the north-east. The mapped RE 12.11.3 corresponds to VHC 9.1 '*Moist to dry eucalypt woodland on coastal lowlands and ranges*' and this is associated with the lower elevation areas of a waterway. The canopy cover in these mapped RE areas is tall (27-29 m) and mid-dense (45 % canopy cover), with the associated modified REs better reflecting the vegetation structure class as per BRC (2019). The patch of vegetation south of Cedarleigh Road and an area to the west of the site have maintained the VHC as per state mapping.

The VHC mapping has, therefore, been modified to reflect the on-ground conditions and the regional ecosystems more accurately, and to reflect the post-development state of the subject site and locality (see Figure 9). As spatially indicated in Figure 9, the modified VHCs have been restricted to a 150 m buffer from the development area, as the more distant areas are not relevant for the purposes of this Bushfire Hazard Assessment.

Plates 1 to 8 below show the various areas and communities existing across the site and throughout the assessment area, corresponding to the locations indicated on Figure 8.

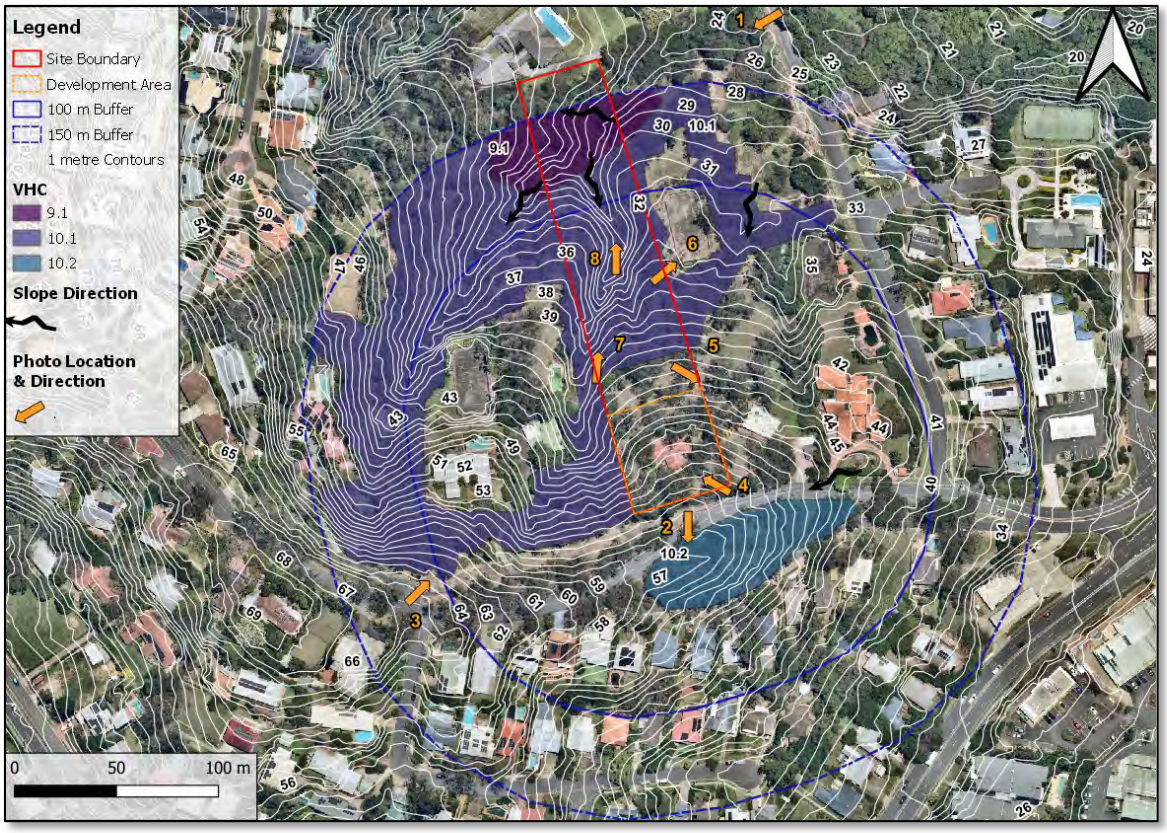

Figure 8. Assessment Area Photograph Locations

Plate 1. Waterway - VHC 9.1.

Plate 2. Small patch to south of Cedarleigh Rd – VHC 10.2.

Plate 3. West of subject site - VHC 10.1

Plate 4. Existing dwelling – post-development VHC 39.2.

Plate 5. Dwelling to the east, VHC 39.2.

Plate 6. Tennis court to north-east (VHC 39.2) with VHC 10.1 surrounding.

Plate 7. Western boundary, VHC 10.1

Plate 8. Vegetation in northern portion, VHC 10.1

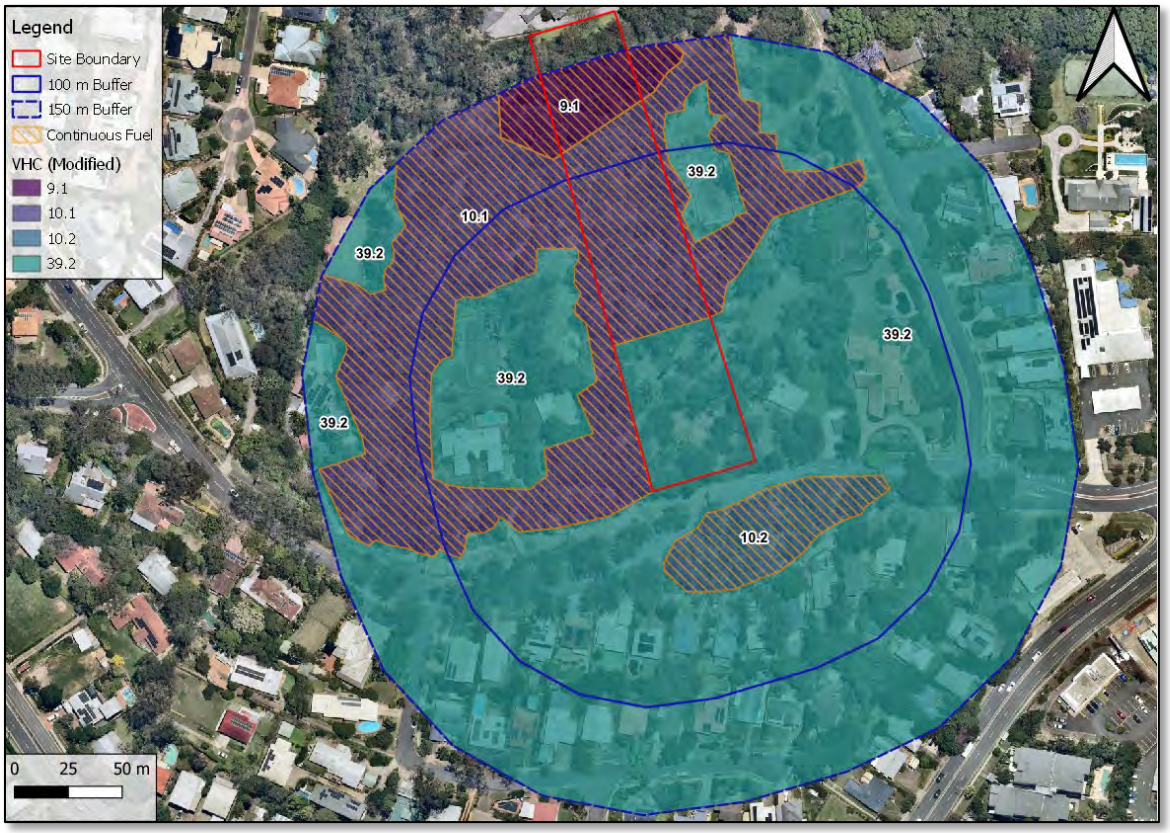

Figure 9. Ground-truthed and Post-development Vegetation Hazard Classes

4.1.3 Vegetation Management – Essential Management Provisions

Essential Management clearing provisions apply to the existing dwelling for bushfire management to protect approved or existing infrastructure. The existing dwelling will be retained and renovated with a modified footprint. The Queensland Government allow for the clearing of native vegetation to address a threat of Bushfire Attack which is generally referred to as Essential Management Clearing. This means a landholder can undertake certain clearing activities to protect their property from bushfires without an approval or notification under the vegetation management framework. The allowance, in this case is "*For a firebreak necessary to protect buildings and other structures (other than a fence line): to a width of up to 1.5 times the height of the tallest vegetation or 20 m (whichever is wider)*" and "*Clearing to establish a necessary fence, road or vehicular track to a maximum width of 10 m*". S5 Environmental interpret this to be 5m either side of the boundary line.

With regard to necessary clearing, the State's Fact Sheet – *Clearing for Bushfire Management*, provides advice on necessary clearing and states "*Landholders intending to operate under this exemption may only clear firebreaks and fire management lines where they are* **necessary** *to protect lives and property*."

In this instance the maximum width of the firebreak is 1.5 times the height of the tallest tree in the vicinity of the dwelling. A tree survey has been undertaken by S5 Ecologists with numerous tall trees located upslope to the south of the dwelling and north of the dwelling within the modified portion of the site. Trees have been measured up to 32 m in height, with tree 96 (*Corymbia citriodora subsp. variegata*), to the north of the dwelling, and tree 32 (*C. citriodora subsp. variegata) at 30 m to the south of the existing dwelling* being the

trees adopted for the calculation. A maximum width, therefore, of 48 metres to the north of the existing dwelling and 45 m to the south of the dwelling may be applicable for essential management clearing as shown in Figures 10 and 11, below. Additionally, provisions allow for a 5 metre buffer on each side of a boundary fence, with the 5 metres within the subject site also indicated on Figures 10 and 11, below. Any clearing undertaken in relation to the essential management provisions must be contained wholly within the subject site boundary.

The clearing rights afforded to the owner are largely contained to the existing modified area of the residential lot, with a small incursion into the area where the understorey is unmanaged. Ongoing maintenance of the understory within the northern extent of the lot particularly where it is dominated by weed species, should be permitted to address the long-term Bushfire Risk within the lot.

It should be noted that a Natural Asset Local Law (NALL) Permit will still be required prior to the undertaking of any clearing.

Figure 10. Essential Management Clearing Exemption Area Within the Site.

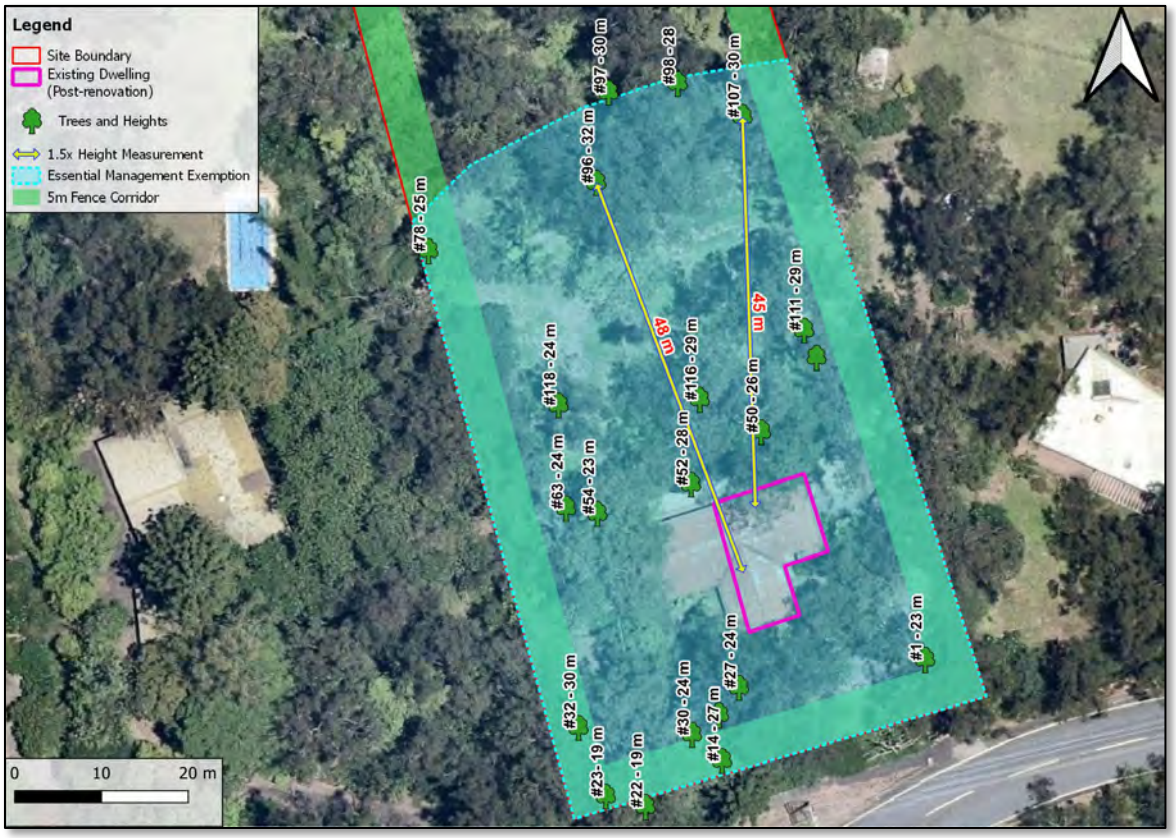

Figure 11. Essential Management Clearing Exemption Area – Southern Extent

4.1.4 Fuel Loads

Table 6 below, summarises the associated fuel loads of the final VHCs in relation to the proposed development.

Table 6. Summary of VHCs and their Associated Fuel Continuity and Loads

VHC	VHC Description	Fuel Continuity	Potential Fuel Load * (t/ha)
			Total
9.1	Moist to dry eucalypt open forests on coastal lowlands and ranges	Continuous	24.2
10.1	Spotted gum dominated open forests	Continuous	20.8
10.2	Spotted gum dominated woodlands	Continuous	18.0
39.2	Low to moderate tree cover in built-up areas	Discontinuous	8

*CSIRO A Methodology for State-wide Mapping of Annual Fuel Load and Bushfire Hazard in Queensland. Glenn Newnham, Kimberley Opie, Justin Leonard CSIRO Land and Water, 2017.

After ground-truthing the VHCs within the assessment area, continuous VHCs were rasterized to undergo the processing stages. Continuous and discontinuous fuel VHCs are defined as:

- Continuous: Vegetation and land use which possess generally consistent fuel loads which can develop a full flame front; and
- Discontinuous: Vegetation and land use which possess fuel loads which are incapable of supporting a full flame front.

The rasterization process extracts the attribute value of the polygon which occupies the centre of the raster pixel (a 25 m by 25 m cell) and uses it to populate the same cell within a raster layer. This will result in continuous VHCs within the assessment area being rasterized whilst discontinuous VHCs remain un-rasterized. Refer to Figure 12.

4.1.5 Modification of Potential Intensity of Small Patches and Corridors

Following the rasterization of the continuous VHCs as outlined above (i.e., VHCs 9.1, 10.1 and 10.2) S5 Environmental have applied Step 3 in accordance with the downgrading stages outlined within both Leonard and Opie (2017) and BRC (2019). Step 3 is separated into two parts:

A. the shrinking of continuous fuel load pixels adjacent to discontinuous fuel loads (i.e., continuous fuel pixels adjacent to discontinuous fuel are removed); and
B. the dilation of residual continuous fuel patches by one pixel (i.e., residual continuous fuel pixels are dilated back out one pixel).

This will result in the removal of narrow corridors less than 50 m in width (2 pixels), as following the initial shrinking of continuous fuel pixels adjacent to discontinuous vegetation (Step 3a), no residual pixels associated with the narrow corridor will remain and dilation cannot occur (Step 3b). Refer to Figure 12 and Figure 13.

Following the implementation of the processing stages, narrow corridors to the north-east, west and south south have been downgraded through Step 3 (eroded on all sides with no residual pixels remaining). A patch of vegetation within the northern extent of the subject site, extending to the north-west and north-east remains as the potentially hazardous vegetation in proximity to the site.

The pixelated form of the finalised continuous vegetation is to be utilised within the PFLI calculations in Section 4.1.8, was smoothed to reflect ground-truthed conditions, refer to Figures 14 and 15.

Figure 12. Shrinking of patches of continuous fuel at the interface with non-continuous fuel

Figure 13. Step 3b – Dilation of residual continuous fuel patches

Figure 14. Pixelated hazardous vegetation within the assessment area

Figure 15. Smoothed hazardous vegetation to reflect ground-truthed conditions and vegetation

4.1.6 Slope Assessment

The slope of vegetated land over which a bushfire passes has a strong influence on both the intensity and rate of spread of the bushfire. From a bushfire hazard assessment perspective, the relevant slopes to consider are the slopes beneath areas of potentially hazardous vegetation, defined as "effective slope" in AS 3959-2018, that would be retained within or adjacent to the proposed development site. Also relevant, is whether the vegetated land is situated upslope or downslope of the proposed development. As fire travels faster upslope, there is a significant reduction in risk and fire-line intensity for sites that sit below the vegetation. Potentially hazardous vegetation to north was determined to be downslope of the proposed development. The slope most likely to impact the subject site development area was adopted for the PFLI and BAL Setback calculations (refer Figure 16 and Appendix B).

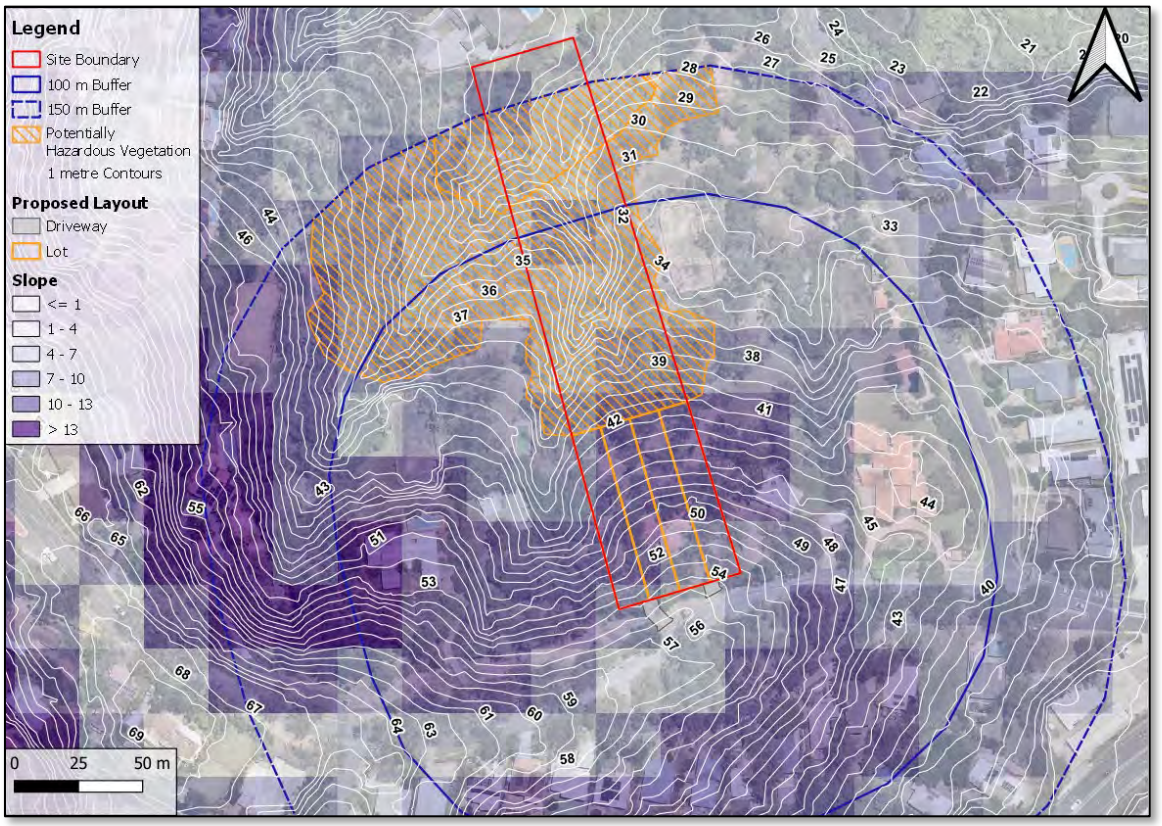

Figure 16. Slope within and in Proximity to the Proposed Development

4.1.7 Forest Fire Danger Index

In accordance with the Australian Standard (AS) 3959-2018, *Construction of Buildings in Bushfire Prone Areas*, the Fire Danger Index (FDI) indicates the chance of a fire starting, its intensity, rate of spread and the difficultly of its suppressions, according to several combinations of relative humidity, air temperature, wind speed as well as long- and short-term drought effects. The FDI for Queensland as per Table 2.1 of the AS 3959-2018 (standard inputs) is 40.

4.1.8 Final PFLI

A final PFLI for patches of hazardous vegetation (determined in Section 4.1) has been calculated using the PFLI equation in Section 3.1. Based on this PFLI calculation, the potentially hazardous vegetation to the north of the proposed development was mapped to contain very high potential bushfire intensity (i.e., >40,000 kW/m) associated with VHC 9.1 and VHC 10.1. Refer to Figure 17.

4.2 Hazardous Vegetation

Vegetation mapped as VHCs 9.1 and 10.1 to the north, north-west and north-east was determined to be the only hazardous vegetation within the assessment area. As this vegetation is within 100 m of the proposed development area, the proposed residential subdivision is therefore within a Bushfire Prone Area. A Bushfire Attack Level (BAL) assessment has been conducted to determine the radiant heat flux future Lots may be exposed to.

Figure 17. Potential Fire Line Intensity

5.0 BUSHFIRE ATTACK LEVEL ASSESSMENT

This BAL assessment has focused on the potential impact of a fire event in hazardous vegetation located within 100 m of the subject site. Hazardous vegetation in relation to the proposed development was determined to be the vegetation to the north, north-east and west of the development area (refer to Figure 16). A Method 2 assessment in accordance with AS3959-2018 utilising the online Flamesol Minimum Distance Calculator was undertaken to determine the required setbacks from hazardous vegetation to the north of the proposed development (see Table 7 and Figure 18 and Figure 19). Refer to Appendix B for inputs and outputs from the Flamesol Minimum Distance Calculator.

Table 7. Summary of Setbacks and Radiant Heat Exposure for the Proposed Development

Radiant Heat Exposure (kW/m^2)	BAL	Distance from Hazardous Vegetation
-	Low	100 m
12.5	12.5	40.6 m
19	19	29.2 m
29	29	20.2 m
40	40	14.8 m
> 40	FZ	< 14.8 m

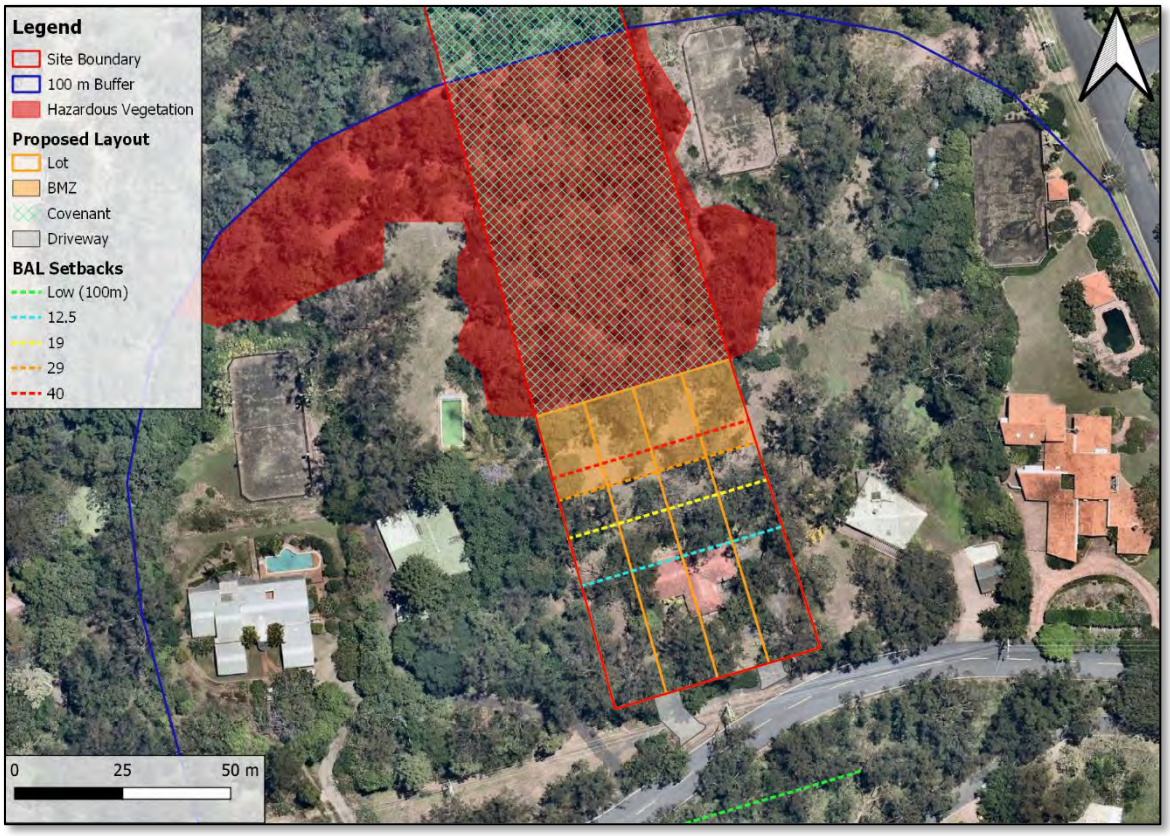

Figure 18. BAL Setbacks

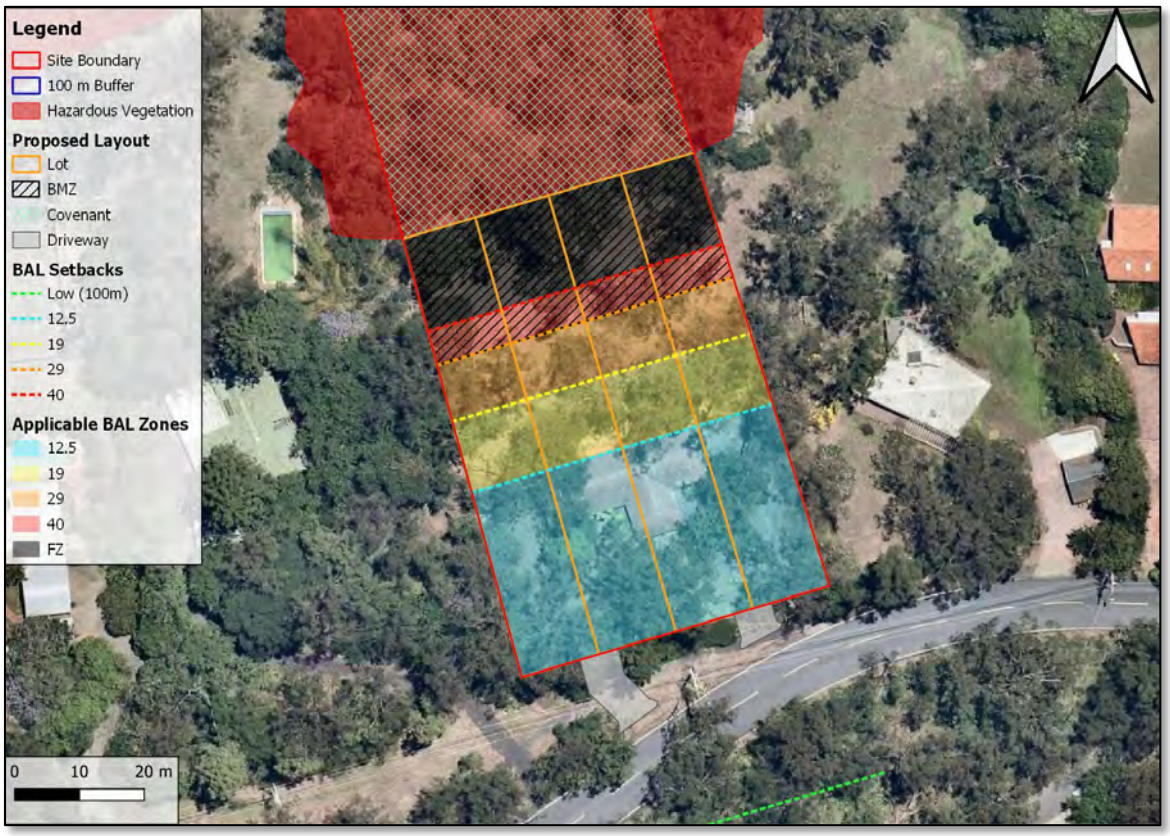

Figure 19. BAL Setbacks over Proposed Development

Based on the results of the radiant heat exposure assessment, the proposed lots located within the planned Bushfire Management Zone (BMZ) will be exposed to a maximum of BAL Flame Zone (BAL FZ). However, moving south and away from the hazardous vegetation, and outside of the BMZ, the balance of the lot area will achieve a maximum of BAL 29.

The lots, south of the BMZ area, achieve a maximum of BAL 29 across the developable portion of the lots. Each lot may accommodate a Building Location Envelope (BLE) that achieves a maximum of BAL 12.5 or 19 depending on the siting of the dwelling and associated structures. It is recommended that BLEs are not exposed to BALs greater than BAL 29 due to the increased risk to occupants and the higher construction costs associated with meeting additional bushfire protection requirements.

It is important to note that where a dwelling and associated structures (including non-habitable structures that have not achieved the required setback from a habitable building) straddle multiple BAL setbacks, the highest BAL applying to any part of the structure, governs the construction standard of the entirety of that structure. For example, if a dwelling is constructed wholly south of the BAL 12.5 setback, BAL 12.5 construction requirements would apply. Conversely, if any portion of the dwelling, such as an attached garage, extends into the BAL 19 area, BAL 19 construction requirements may apply to both the dwelling and the garage. BAL for construction purposes. For example, if a dwelling was to be constructed wholly south of the BAL 12.5 setback, then the BAL 12.5 construction requirements would apply, however, if part of the dwelling such as an attached garage. Construction solutions may address this issue and it is recommended an architect, building certifier or similarly qualified person provides advice in this instance.

Certain features such as swimming pools may be located in areas with a BAL greater than BAL 29 (i.e. within the BMZ). Non-habitable structures, including sheds, may also be sited within this area provided they achieve the required setback distance from habitable building. Any infrastructure within the BMZ must not impede access to hazardous vegetation or the environmental covenant area.

A BMZ has been incorporated into the proposed layout and is designed to extend to the BAL 29 setback contour. Management requirements for the BMZ are outlined in the recommendations of the Bushfire Management Plan. The BMZ between the hazardous vegetation and the BAL 29 setback is intended to reduce bushfire risk, provide defendable space, and assist in maintaining the assessed maximum BAL of 29 for the BLEs.

As the development is located within a bushfire prone area, a Bushfire Management Plan has been prepared and is presented in Section 6.0.

6.0 BUSHFIRE MANAGEMENT PLAN

This Bushfire Management Plan (BMP) identifies management measures that must be implemented to ensure that the risk of bushfire attack is reduced to an acceptable level. It is first important to understand the processes that influence bushfire behaviour (Section 6.1), and the sources of damage that threaten people, infrastructure and property (Section 6.2).

6.1 Bushfire Behaviour

Understanding bushfire behaviour is imperative when planning new development. There are three main factors which influence fire behaviour as follows:

1) Topography

Slope influences the speed and intensity of a fire. Fire is known to burn faster uphill as flames and radiant heat preheat the vegetation ahead of the fire, drying it out and making it increasingly flammable. As a rule of thumb, for every 10 degrees slope, fire doubles in speed. Refer to Figure 20, below.

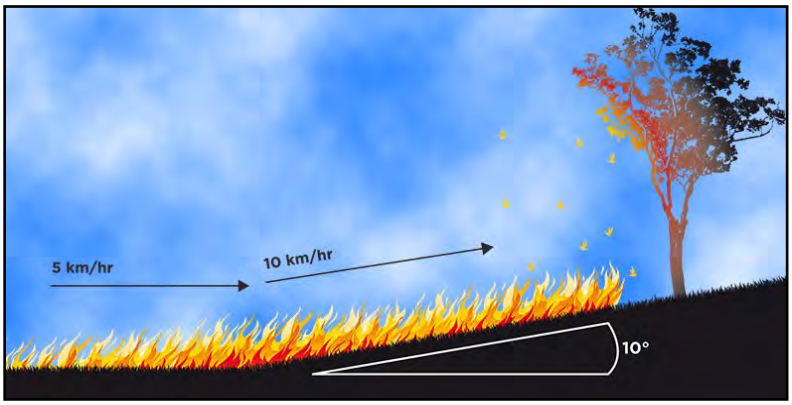

Figure 20. Effects of Topography on Bushfire (source: Country Fire Authority)

2) Weather Conditions

Bushfire weather conditions are fundamentally defined by temperature, humidity, wind, atmospheric conditions and past rainfall. For example, summer weather conditions increase the flammability of vegetation. Wind influences the speed and direction in which fire travels, fire intensity and possibility of spot fires from burning debris. A measure of weather conditions is the Forest Fire Danger Index (FFDI) and Grassland Fire Danger Index (GFDI). These measures are useful in determining the fire danger rating (refer to Figure 21).

3) Vegetation

Vegetation is the source of fuel for a bushfire. The amount of fuel surrounding a building can directly impact a buildings survival. Vegetation management, landscaping for bushfire and breaking the continuity of vegetation can limit the spread of fire.

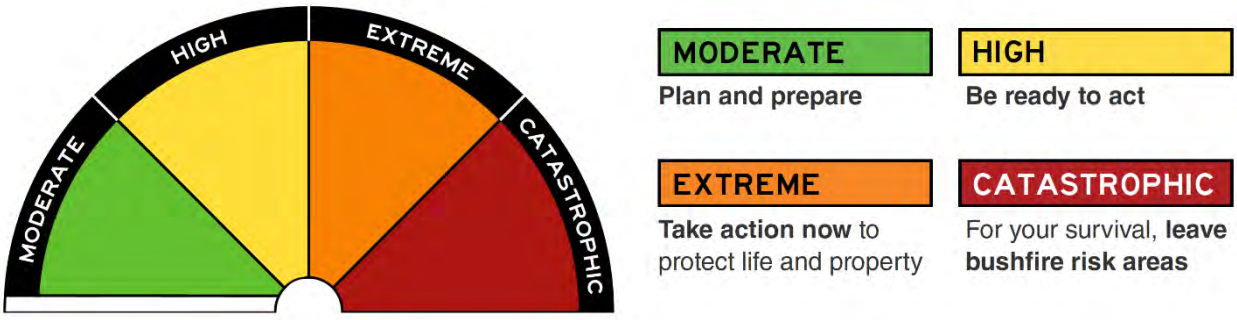

Figure 21. Australian Fire Danger Rating System (source: AFAC, 2025)

6.2 Bushfire Damage Sources

The Country Fire Authority (2012) states, "*Bushfires can vary in intensity and scale across the landscape*". As the past bushfire events throughout Australia have illustrated, bushfires can be devastating and lead to long-running fires which are difficult to suppress. Building survival is influenced by many interacting factors. The four main ways buildings are destroyed during a bushfire include:

- Ember attack;
- Radiant heat;
- Direct flame contact; and
- Fire-driven wind.

Ember Attack

Research indicates that the most common way buildings catch on fire is through ember attack (80% of house loss). Ember attack occurs when small burning twigs, bark, leaf are carried by wind and land in and around a building. Embers can ignite flammable plants, leaf litter, fences, outdoor furniture and sheds (refer to Figure 22, below). Ember attack is addressed within the AS 3959-2018 through Construction Standard requirements.

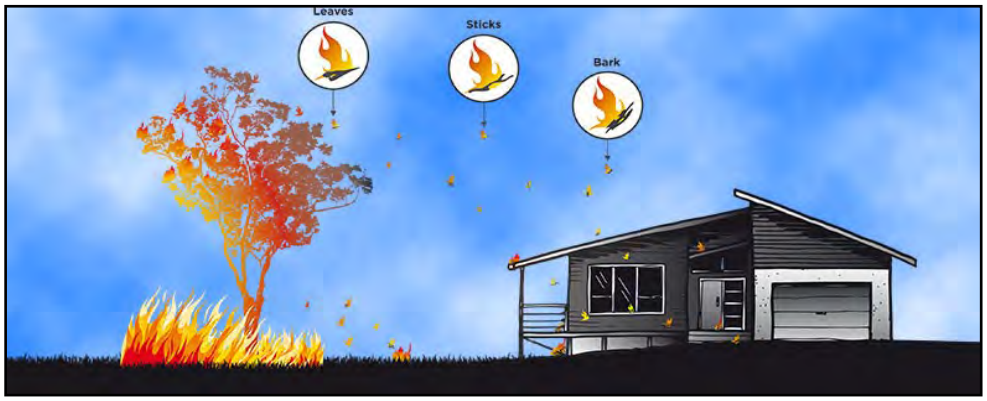

Figure 22. Ember Attack (source: Country Fire Authority)

Radiant Heat

Radiant heat is the heat created from burning fuel during a bushfire. Radiant heat can ignite surfaces without direct flame contact or ember attack, dry out vegetation ahead of the bushfire, crack glass (allowing embers to enter a building) and distort and melt materials (refer to Figure 23, below). The most common cause of loss of human life is via radiant heat (CFA, 2018).

Figure 23. Radiant Heat (source: Country Fire Authority)

Direct Flame Contact

Direct flame contact occurs when a fire front reaches a building, this is referred to as the 'Flame Zone'. Approximately 20% of house loss occurs when houses/buildings are directly adjacent to bushland.

Fire-driven Wind

Fire-driven wind can carry embers, cause trees to fall onto buildings, can break windows and destroy structures. The closer a building is to a fire front, the more severe the impact of fire-driven wind.

6.3 Management and Mitigation Measures – Permanent Buildings

Management and mitigation measures are generally outlined in relevant planning instruments at both the State and Local Government level.

Mitigation measures emphasize resilience to bushfire and are categorised into the following groups for the permanent structures within the site.

- Layout design;
- Building and construction requirements;
- Firefighting infrastructure;
- Bushfire emergency plan; and
- Vegetation management and landscaping.

6.3.1 Layout Design

Access and Egress

Access to the proposed residential subdivision will be achieved directly off Cedarleigh Road to the south, away from the hazardous vegetation.

S5 Environmental recommend the driveway be constructed to the 'private access roads or driveways' design requirements as outlined in *Table 8.2.5.3.C* '*Road design requirements for emergency vehicle access*', within of Section 8.2.5 Bushfire Overlay Code, to be confirmed by the Project Town Planner or Engineer. Cedarleigh Road is considered suitable to carry emergency fire-fighting appliances, provide emergency evacuation and to prevent entrapment during a bushfire.

Siting of Development

The proposed residential development is sited within an area of Low Potential Fire Line Intensity (> 4,000 kW/m^2). S5 Environmental stipulate that the BLEs for proposed lots be located to ensure a maximum BAL of 29 is achieved (i.e., south of the BAL 29 setback). Following this, BAL 29 will be the maximum BAL score achieved by the proposed development. Setbacks were modelled utilising the Flamesol BAL Minimum Distance Calculator (refer to Appendix B). The siting of the development is considered to ensure the proposed development is exposed to an acceptable level of bushfire risk.

6.3.2 Building and Construction Requirements

In accordance with the BCA, the AS 3959-2018 requirements for construction of buildings applies to any new Class 1, 2, 3 or 10a Building (when ancillary to a Class 1, 2, or 3 Building). Therefore, any future habitable Class 1, 2 and/or 3 buildings and their ancillary Class 10a building/s within the development must adhere to the relevant BAL construction Standards based on their location.

Early Warning Systems

Smoke alarms should be installed in accordance with the Building Code of Australia and the AS 3786-1993 - *Smoke Alarms*. The Queensland Fire and Emergency Services recommend photoelectric smoke alarms (not ionization alarms). Photoelectric smoke alarms are generally more effective than ionization types as they detect visible particles of combustion.

6.3.3 Firefighting Infrastructure

The site is expected to be connected to a reticulated water supply network. It is expected that the reticulated water supply network within the area complies with the provisions outlined in the SEQ Water Supply, Sewage Design and Construction Code. Additionally, fire hydrants are to be designed, sited and installed within the subdivision in accordance with AS2419.1-2009.

6.3.4 Bushfire Emergency

In the event of a Bushfire Emergency, call triple zero (000).

The Pullenvale Fire Station is located approximately 3.3 km (by road) to the south-west of the subject site. The contact details for the Pullenvale Fire Station are:

- Address: 6 Pullenvale Road, Pullenvale 4069
- Phone: (07) 3032 2900

The Taringa Fire & Rescue Station is located approximately 5.1 km (by road) to the north-east of the subject site. The contact details for the Taringa Fire & Rescue Station are:

- Address: 26 Whitmore Street, Taringa 4068
- Phone: (07) 3022 7700

6.3.5 Vegetation Management and Landscaping

Bushfire Management Zone and Building Protection Zones (BMZ and BPZ)

The QFD acknowledges the type, location and ongoing maintenance of landscaping as a necessary Bushfire Protection Measure. A Bushfire Management Zone (BMZ) of 20.2m in width, being the space between the hazardous vegetation and the BAL 29 setback, has been incorporated in the proposed development plan, so that the development area is exposed to no greater than BAL 29 (see Figure 24). The BMZ must be maintained in a very low fuel state in ***perpetuity***, to provide a level of ongoing protection from bushfires in the locality and maintain the maximum of BAL 29 for the BLEs. The BMZ must be maintained as follows:

- New fences are to be constructed of non-combustible materials (e.g. steel, masonry);
- Grass is to be maintained ± 100 mm in height;
- Leaves and vegetation debris are to be removed at regular intervals, particularly during times of greater bushfire risk;
- Flammable objects must not be located within 6 m of any building or combustible structure;
- Mulch is not to be comprised of combustible materials (e.g. bark or ground litter). Suitable non-combustible mulches include scoria, pebbles and gravel.
- Shrubs must not be located under the canopy of trees or within 3 m of a dwelling;
- Individual clumps of shrubs must not form a continuous corridor of vegetation;
- Trees and shrubs must not overhang or touch buildings;
- The mature canopy of individual trees must be separated by at least 2 metres so as not to form a continuous canopy; and
- Clearance of 2 m between the lowest tree branches and the ground.

Non-habitable infrastructure such as swimming pools may be located within the BMZ where it does not hinder access to the hazardous vegetation and Environmental Covenant Area.

The balance of the development area is within a bushfire prone area, and as such is to be designated a Building Protection Zone (BPZ). Due to the narrow width of the proposed lots separate inner and outer BPZs

cannot be accommodated individually within each lot. The BPZ is to be maintained in a more moderate low fuel state as described below under 'Landscaping'.

Note that much of the BMZ is accommodated by the essential management clearing provisions applicable to the existing dwelling and the site boundary fencing.

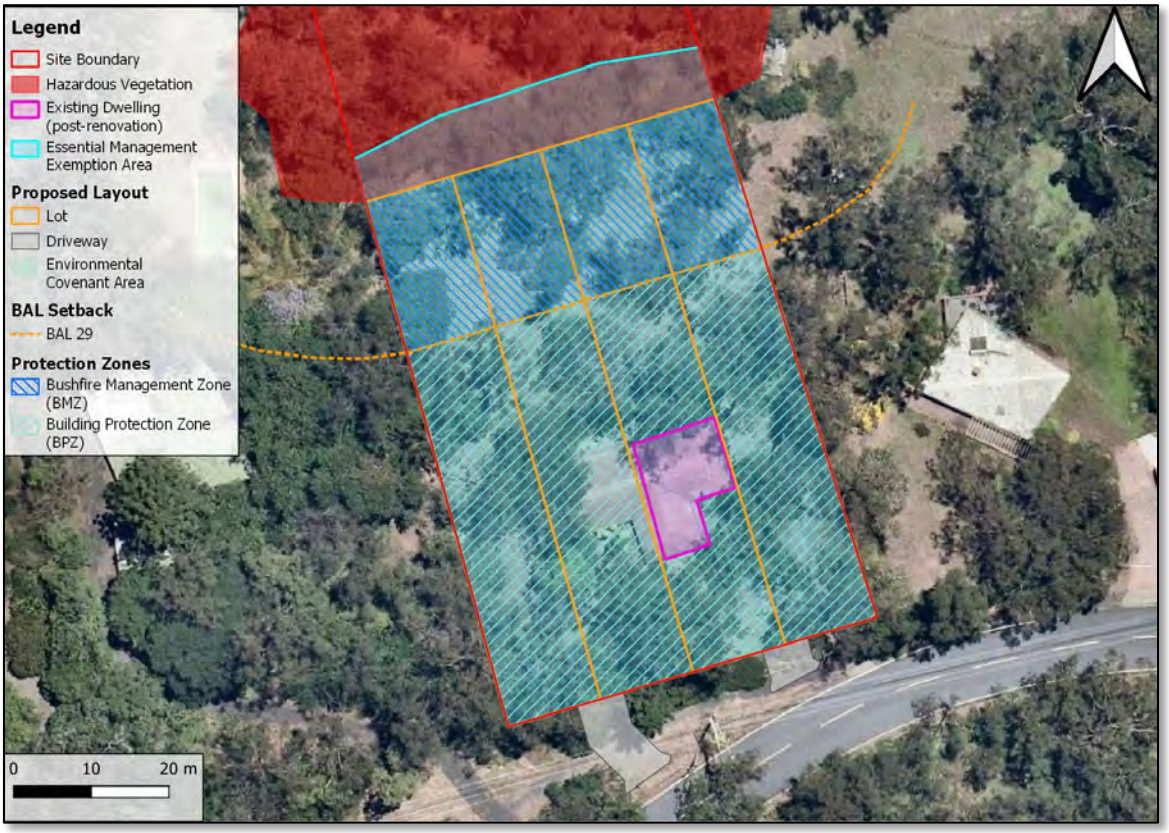

Figure 24. Proposed Bushfire Management and Building Protection Zones

Landscaping

S5 Environmental recommend that future lot owners adhere to the following advice (outlined in the SPP Technical Reference Guide – Bushfire Resilient Communities) on low flammability landscaping, particularly for areas located within 100 m of hazardous vegetation.

Landscaping plays an important role in increasing a buildings' ability to endure bushfire attack. Landscaping for bushfire reduces the risk of ember attack which is the most common cause of building loss during bushfire. This includes utilisation of low flammability treatments such as rock mulches (gravel and fertilizer), concrete retaining blocks, and appropriate plantings.

Appropriate plant attributes to consider implementing in landscape design to reduce bushfire risk include:

- High leaf moisture content;
- Lower volatile oil content;
- Higher leaf mineral content;
- Broad-leaved species;

- Resilience to pruning;
- Low ignition likelihood;
- A low volume of persistent dead leaves/branches;
- Smooth or tightly held bark; and,
- Leaves and twigs that do not regularly fall.

Management of landscaped areas should ensure that there is no accumulation of litter and woody debris on garden beds. Any grass within the proposed lots should never exceed 100 mm in height. Irrigation of garden and greenery areas could be considered to ensure a well-watered, low flammability landscape. Trees should not overhang the roofline of the building, touch walls or other elements of a building.

The Victorian Country Fire Authority (CFA) have produced an online Plant Selection Key which facilitates landscape designers and property owners to select fire wise garden plants. The CFA have also produced the publication '*Landscaping for Bushfire: Garden Design and Plant Selection*' (CFA, 2022). This publication, in conjunction with the '*Bushfire Resilient Building Guidance for Queensland Homes*' (QLD Government and CSIRO, 2020), outlines planning, designing, choosing suitable plants, maintaining gardens and provides a Plant Selection Key, and can be obtained from their website.

7.0 CONCLUSION

This Bushfire Hazard Assessment concluded that the proposed development is within 100 m of potentially hazardous vegetation to the north. The AS 3959-2018 Method 2 radiant heat flux exposure assessment determined that the developable area (south of the proposed BMZ) of the proposed residential development will be exposed to a maximum radiant heat exposure of 29 kW/m^2, equivalent to BAL 29, with the four lots potentially able to accommodate BLES that may achieve lesser BAL scores. Accordingly, all buildings exposed to BAL 12.5 or greater must adhere to the relevant BAL construction requirements.

S5 Environmental have prepared a site-specific Bushfire Management Plan to support the proposed residential development, which recommends key mitigation measures to be implemented to ensure the risk to people, infrastructure and property is acceptable and minimised. Of note, a BMZ is recommended and has been incorporated into the proposed development plan, between the hazardous vegetation and the BAL 29 setback to provide a level of ongoing protection from bushfires in the locality and assist in maintaining the BALs as assessed. Additionally, as the balance of the development area is within a bushfire prone area, it should be managed as per the landscaping guidelines outlined in the BMP as a Building Protection Zone.

Overall, the proposed development complies with the relevant BCC bushfire related assessment benchmarks, refer to Appendix A.

8.0 REFERENCES

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APPENDIX A

BCC Bushfire Hazard Overlay Code Response

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
Section A – If for accepted development subject to compliance with identified requirements (acceptable outcomes only) or assessable development)			
PO1 Development: a. minimises the bushfire hazard; b. maximises the protection of life and property from bushfire; c. addresses the bushfire hazard determined by a bushfire hazard assessment; d. where not in compliance with an approved bushfire management plan or development footprint: i. achieves a bushfire attack level that is less than or equal to BAL-29; or ii. achieves a bushfire attack level that is less than or equal to BAL-12.5 if for vulnerable uses, difficult to evacuate uses, assembly uses, essential community infrastructure or involving the handling or storage of hazardous chemicals exceeding amount specified in Table 8.2.5.3.D; or iii. if on a site of an existing premises and not a vulnerable use, difficult to evacuate use, assembly use, essential community infrastructure or involving the handling or storage of hazardous chemicals	AO1.1 Development is designed and sited in compliance with: a. an approved bushfire management plan relevant to the full nature of the uses, which identifies the level of bushfire hazard and the location of hazardous vegetation affecting the development; or b. an approved development footprint identifying the development footprint plan and bushfire management footprint plan; or c. a bushfire hazard assessment and bushfire management plan prepared in accordance with the Bushfire planning scheme policy which: i. is undertaken by a suitably qualified person with technical expertise in the field of bushfire hazard identification and mitigation; ii. determines the relevant bushfire attack level for that part of the site in which development is proposed; iii. identifies the location of hazardous vegetation that poses a bushfire risk to the development. Note—Where a bushfire hazard assessment determines that the bushfire hazard for the part of the site in which development	Complies – S5 Environmental understand that, following the approval of this report, the proposed development will be designed and sited in compliance with an approved bushfire management plan. Additionally, the above bushfire hazard assessment determined the proposed residential subdivision will be sited in an area of Low PFLI and all lots can accommodate a BLE which will achieve a maximum of BAL 29.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
exceeding amounts specified in Table 8.2.5.3.D: a) does not extend beyond the bounds of the existing development footprint; b) does not increase the GFA by 10% or 100m^2, whichever is the greater; c) does not involve a new use on the site; d) is supported by a bushfire risk assessment prepared by a suitably qualified person with technical expertise in the field of bushfire hazard identification and mitigation, which demonstrates that the bushfire risk is acceptable. Note—Bushfire hazard is generally assessed based on the vegetation existing on site, adjacent and nearby to the site at the time of application. However, the level of bushfire hazard posed by any areas subject to revegetation or regrowth vegetation is assessed as if that area had reached its mature state. The Bushfire planning scheme policy provides advice about the sources of information to be consulted to determine areas subject to revegetation or regrowth vegetation and the hazard classification of that vegetation in its mature state. Note—Where a bushfire risk assessment is required it must be carried out in accordance with the State Planning Policy and the National Emergency Risk Assessment Guidelines prepared by the Australian Institute of Disaster Resilience.	is proposed is 'low', no further assessment against this code is required. Note—A 'low' bushfire attack level must not be assumed for development in the Potential impact sub-category and in any areas subject to revegetation or regrowth vegetation even where the area is non-vegetated or vegetation is considered low threat in accordance with AS 3959 Construction of buildings in bushfire-prone areas. The Bushfire planning scheme policy provides advice about the sources of information to be consulted to determine areas subject to revegetation or regrowth vegetation and the hazard classification of that vegetation in its mature state. Note—A bushfire management plan is to be prepared having regard to any bushfire hazard assessment undertaken to prepare a neighbourhood plan. Note—Any bushfire management zone, asset protection zone or similarly defined area approved as part of a bushfire management plan used for bushfire management purposes is considered to be a bushfire management footprint plan. A building protection zone can compromise both the development footprint plan and the bushfire management footprint plan.		
	AO1.2 Development where not in compliance with an approved bushfire management plan or development footprint identifying the development footprint plan and bushfire management footprint plan: a. achieves a bushfire attack level that is less than or equal to: i. BAL-29; or	N/A – Following approval of this report, the proposed development will be in compliance with an approved bushfire management plan.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	ii. BAL-12.5 if for vulnerable uses, difficult to evacuate uses, assembly uses, essential community infrastructure or involving the handling or storage of hazardous chemicals exceeding the amount specified in Table 8.2.5.3.D. Note—Bushfire attack level (BAL) is the radiant heat flux that will be experienced during a bushfire and is a measure of heat energy impact expressed as kW/m2. BAL is measured within the area of the nominated development footprint plan and excludes the area of any bushfire management footprint plan.		
If for development other than reconfiguring of a lot			
PO2 Development other than an extension to an existing building is sited, designed and maintained taking account of all relevant factors affecting the bushfire hazard on the site, including site topography, aspect, location and type and structure of vegetation to: a. minimise the number of buildings and people working, living or visiting a site exposed to bushfire risk; b. protect life during bushfire; c. increase the survival of buildings and structures during a bushfire; d. minimise bushfire risk from build-up of fuels around buildings and structures.	AO2.1 Development is: a. sited in compliance with an approved development footprint identifying the development footprint plan and bushfire management footprint plan or bushfire management plan relevant to the full nature of the use; or b. if there is no approved development footprint identifying the development footprint plan and bushfire management footprint plan or bushfire management plan, where on a lot greater than 10 hectares, located in the area of lowest risk from bushfire on the site; and c. if there is no approved development footprint identifying the development footprint plan and bushfire management footprint plan or bushfire	N/A Development is for a RoL	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating achievement of this performance outcome.	management plan, where on a lot greater than 2,500m2: i. located away from ridgelines in compliance with Figure a; ii. located on land with a gradient less than 15%; iii. preferably located on east- to south-facing slopes and avoiding north- to west-facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffer area sub-category or the Medium hazard buffer area sub-category.		
	AO2.2 Development is sited within a building protection zone extending a minimum of 20 m from the outermost projection of the main building or any habitable structure or to the maximum extent possible on sites less than 2500m^2 where a building protection zone would extend into neighbouring properties; and a. clusters buildings and structures in the building protection zone; b. designs the inner 10m of the building protection zone to maintain a very low fuel state in the first 10m, and a fuel-reduced state to the extent of the building protection zone, in compliance with Figure b and Figure c.		

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	Note—The building protection zone includes the dwelling and all ancillary structures and may extend to a road or a building protection zone in an adjoining site.		
PO3 Development utilises fencing that: a. does not contribute to the spread of bushfire; b. in an urban area or in proximity to accommodation uses, contributes to reducing bushfire hazard to a building; c. facilitates the safe movement of fauna.	AO3.1 Development for a fence within 20m of any building used for accommodation comprises non-combustible or fire retardant materials.	N/A Development is for a RoL	
	AO3.2 Development for a fence: a. incorporates gaps and spacing to allow the safe movement of fauna; or b. is designed to enable fauna to climb the fence.		
PO4 Development ensures that the location, siting, and design of development and associated driveways and access routes: a. avoid potential for entrapment during a bushfire; b. facilitate safe and efficient emergency services to access and egress the site during a bushfire; c. enables safe evacuation of the site during a bushfire for site occupants.	AO4 Development ensures that: a. the length of driveways or access routes does not exceed 70m between the most distant part of any occupied building and the nearest part of the public road; or b. where the length of the driveway or access route exceeds 70m: i. the driveway or private access route design meets the requirements of emergency vehicles in compliance with Table 8.2.5.3.C; ii. the driveway or access route provides all weather access for two-wheel-drive vehicles; iii. where relying on a private access route or driveway longer than 200m to reach a public road,	N/A Development is for a RoL	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	a safe alternative access and egress route is provided.		
PO5 Development has adequate road access to the site for emergency vehicles and safe evacuation in a bushfire.	AO5 Development has frontage to a constructed, all-weather public road capable of carrying emergency service vehicles.	N/A Development is for a RoL	
PO6 Development makes adequate provision for fire-fighting requirements, including water supply.	AO6 Development ensures that: a. a reliable reticulated water supply and water pressure is available for fire-fighting requirements with water supply and pressure, which is in compliance with the standards specified by the relevant utilities provider; or: b. where sufficient reticulated water supply is not available for: i. residential lots, there is a minimum water supply available and retained for fire-fighting purposes in compliance with Table 8.2.5.3.B, which may be in the form of a separate tank or a reserve section as part of a main water supply tank; or ii. development other than for residential lots involving new premises or an existing premises with a gross floor area greater than 50m2, on-site water storage is provided which is appropriate to the use, according to the standards specified by the relevant	N/A Development is for a RoL	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	emergency services agency and is not less than 5,000 litres. Note—Water supply for fire fighting is in addition to water supply for household use. Where a non-reticulated supply of water is required, swimming pools, creeks and dams should not be used as a substitute for a dedicated static supply as these sources of water are not reliable during drought conditions.		
PO7 Development ensures that the water supply provided for fire-fighting is safely located and freely accessible for fire-fighting purposes at all times.	AO7 Development, for which sufficient reticulated water supply is not available, provides: a. a water supply outlet located away from any potential fire hazards, such as gas bottles; b. a hardstand area of 11m by 3.5m for fire-fighting vehicles within 2m of the water supply outlet; c. tanks on the bushfire hazard side of the buildings with adequate shielding for the protection of fire fighters; d. pumps which are shielded from bushfire hazard; e. an outlet pipe which is 50mm in diameter and fitted with a 50mm male camlock (standard rural fire brigade fitting); f. that any underground tank for fire-fighting purposes has an access hole of 200mm to allow a tanker to refill direct from the tank;	N/A Development is for a RoL	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	g. that any above-ground water tank is made of concrete or metal and its stand is protected from bushfire hazard; h. that all above-ground water pipes external to the building are metal, including and up to any taps. Note—Plastic tanks are not to be used.		
Additional performance outcomes and acceptable outcomes for all development in Biodiversity areas overlay if on a site larger than 2,500 m^2			
PO8 Development through the siting, design, and construction of buildings, access routes and fire maintenance trails, and ongoing site management: a. provides effective separation from sources of bushfire risk; b. responds to the bushfire risk in that location; c. maintains the safety and protection of people and property over time; d. maximises the protection of vegetation in areas of high biodiversity value. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome that ensures: • ongoing site management, such as the bushfire risk to buildings, does not increase beyond the standard to which they have been designed and constructed; • appropriate design and maintenance of the site, and access routes and driveways.	AO8 Development locates building protection zones as shown on Figure b and Figure c, driveways and access routes and any fire maintenance trails: a. outside of the Biodiversity areas overlay; or b. within the existing disturbed, degraded or cleared areas, using natural fire breaks to avoid vegetation clearing and to avoid or otherwise minimise fragmentation or incursions into a habitat area, fauna movement corridor or remnant vegetation.	Complies – S5 Environmental understand the proposed development is located within the southern extent of the subject site and is proposed for the area currently occupied by a dwelling and the associated cleared garden areas, which contain landscaping and a grass, maintained groundcover. The remnant native vegetation throughout the northern extent of the site will largely be retained, maintaining the vegetation corridor through the site associated with the waterways and maintaining landscape corridors for fauna movement (refer: Detailed Ecological Assessment: S524253_DEA_v1.4 and the associated Vegetation Retention Plan.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
		All lots will have direct access to Cedarleigh Road and driveways are to be designed and constructed in accordance with Table 8.2.5.3.C of the *Brisbane City Plan 2014* to ensure that it will be capable of supporting fire-fighting appliances.	
Section B—If for assessable development other than ROL			
PO9 Development: a. provides for safe and efficient evacuation and emergency services access to the site during a bushfire; b. does not concentrate large numbers of people or locate significant worker or resident populations in an area of bushfire hazard; c. avoids locating the following uses in an area of bushfire hazard: i. vulnerable uses; ii. difficult to evacuate uses; iii. assembly uses. Note—This includes consideration of appropriate alternative shelter for vulnerable uses, management of health and wellbeing requirements during evacuation, safe site operation, and access and egress arrangements in bushfire events. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	AO9.1 Development: a. does not increase the number of people living, working on or visiting the site by more than 10%; or b. increasing the number of people living, working on or visiting the site, or vulnerable uses, difficult to evacuate uses or assembly uses by more than 10%, implements the recommendations of an approved bushfire management plan, which identifies measures that address the identified bushfire risk relevant to the development.	N/A Development is for a RoL	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	AO9.2 Development provides alternative access routes that meet the road design requirements of items 1–7 in Table 8.2.5.3.C, for the following: a. an extension to existing premises which increases the number of people living, working on or visiting the site by more than 10%; b. the introduction of vulnerable, difficult to evacuate or assembly uses.	N/A Development is for a RoL	
Additional performance outcomes and acceptable outcomes if involving storage or handling on site of hazardous chemicals in quantities that would be equivalent to or exceed the threshold quantities set out in Table 8.2.5.3.D			
PO10 Development does not cause: a. unacceptable risk to people, property and the environment due to the impact of bushfire on the storage or handling on site of hazardous chemicals; excessive danger or difficulty to emergency services for emergency response or evacuation.	AO10 Development for storage or handling of hazardous chemicals: a. is not located within the bushfire overlay; or b. complies with an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that ensure the development: i. mitigates the bushfire risk relevant to the development; ii. does not pose an unacceptable risk to people, public health and safety or risk environmental harm; iii. does not present significant difficulties to emergency services for emergency response or evacuation.	N/A – S5 Environmental understand the proposed development is residential and will not include the storage or handling of hazardous chemicals.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	Note—Bushfire management plans and site-based risk assessments are prepared in accordance with the Bushfire planning scheme policy. Guidance on the preparation of a hazard and risk analysis is provided in the Industrial hazard and risk assessment planning scheme policy. Note—Any risk mitigation measures, including construction of underground tanks or fire-protected above-ground tanks or package stores, are in compliance with AS 1940-2004 The storage and handling of flammable and combustible liquids.		
Additional performance outcomes and acceptable outcomes for essential community infrastructure			
PO11 Development for essential community infrastructure is located, designed and sited to: a. protect the safety of people during a bushfire; b. not create or increase the exposure of people to an unacceptable risk from a bushfire; c. minimise the risk to vulnerable populations from a bushfire; mitigate the impacts on the community and environment from the effects of a bushfire on the development.	AO11 Development for essential community infrastructure: a. is ancillary to and not relied on for the provision of the essential service during a bushfire; or b. implements an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that: i. ensure the development allows for safe and efficient emergency access and site evacuation during a bushfire; ii. do not pose an unacceptable risk to people on a premises during a bushfire; iii. ensure the development is not at risk of failure during a bushfire which results in health or safety risks or adverse environmental impacts;	N/A – Proposed development will not include essential community infrastructure.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	iv. enable people and property to be defended safely and effectively from a bushfire.		
PO12 Development for essential community infrastructure is able to function effectively during and immediately after bushfire events.	AO12 Development for essential community infrastructure: a. is ancillary to and not relied upon for the provision of the essential service during a bushfire; or b. containing elements vital to the function of the essential service during a bushfire is not located in the Bushfire overlay area; or c. implements an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that ensure that: i. essential community infrastructure is able to function during bushfire events; ii. access necessary to maintain safety or function of the development is not compromised by a bushfire; iii. mitigation measures are not unduly reliant on human activation to respond to a bushfire; iv. the safe storage of valuable records or items of cultural or historical significance, including storage of public records under the *Public Records Act*	N/A – Proposed development will not include essential community infrastructure.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	2002, is able to be maintained during a bushfire event.		
Additional performance outcomes and acceptable outcomes if for landscaping or a park landscape plan is a requirement for development			
PO13 Development provides landscaping that does not create an unacceptable risk to people or property and provides for ongoing management of risk to the development and people from a bushfire.	AO13 Development is in compliance with a landscaping plan which: a. is prepared in compliance with an approved bushfire management plan; b. preserves the requirements of any building protection zone; c. does not increase the exposure of a habitable building not located in a building protection zone to a bushfire hazard. Note—The requirements of a building protection zone are shown in Figure b and Figure c.	N/A – Proposed development does not include landscaping.	
PO14 Development for a park is designed so that the park: a. is practical to maintain and requires minimal resources to be restored to its designed function and condition after a bushfire; b. provides for safe and efficient site evacuation and efficient emergency services access avoiding potential for entrapment during a bushfire;	AO14 Development provides a park landscape plan that complies with a bushfire management plan prepared in accordance with the Bushfire planning scheme policy.	N/A – Proposed development does not include a park.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
c. does not place unacceptable bushfire risk on an adjoining or nearby site, people and assets; d. provides efficient access for fire fighting; e. provides ongoing protection from bushfire for major park assets and buildings. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.			
Section C – If for ROL			
PO15 Development does not materially increase the number of premises exposed to unacceptable risk during bushfire events.	AO15 Development does not materially increase the number of people living or working in the Bushfire overlay area.	Complies The development is situated in an area of Low PFLI. The development does not propose an excessive number of new lots. The siting of the development has ensured an acceptable level of risk during the event of a bushfire for the additional residents, with the BLEs to be sited so they achieve a maximum of BAL 29 (can achieve lower) and are located within an area of Low PFLI.	
PO16 Development is designed to: a. mitigate the risk of bushfire hazard to each lot; b. limit the spread of bushfire; c. achieve and maintain sufficient separation distance between development and	AO16 Development requires that lot number, size, shape and layout allow for the siting of future buildings within the lowest hazard locations on the site being located: a. within a building protection zone in accordance with Figure b and Figure c;	Complies All lots can accommodate a BLE which will be exposed to a maximum radiant heat flux of 29 kW/m^2, equivalent to BAL 29, and dependent on siting, may achieve a lesser BAL exposure.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
hazardous vegetation to minimise bushfire hazard to future buildings during a bushfire; d. allow for emergency services access; e. locate buildings within a building protection zone Note—Lot size, location, configuration, dimensions and building measures are balanced to achieve an acceptable level of risk to future occupants. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	b. away from ridgelines and hilltop sites in compliance with Figure a; c. on land with a gradient less than 15%; d. preferably on east to south facing slopes and avoiding north to west facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffer area sub-category or Medium hazard buffer area sub-category.	A Bushfire Management Plan has been proposed along with an A Bushfire Management Zone (BMZ)) between the hazardous vegetation and the BAL 29 setback to be maintained in perpetuity to assist with maintaining the BAL as assessed so the BLEs are not exposed to greater than BAL 29 in future. The balance of the site is to be maintained as per landscaping recommendations outlined in the BMP as a Building Protection Zone (BPZ) to further reduce vulnerability to bushfire attack. Access to lots will be directly off Cedarleigh Road. The internal driveway to the dwellings should be designed and constructed in accordance with Table 8.2.5.3.C of the *Brisbane City Plan 2014* to ensure that they will be capable of supporting fire-fighting appliances.	
PO17 Development promotes safe site access, avoids creating a potential entrapment situation and supports accessibility and manoeuvring for fire fighting during bushfires. Note—This includes easements and boundary realignments.	AO17 Development provides a lot layout which: a. provides direct road access and egress for new lots to public roads, rather than the creation of easements;	Complies Lots will have direct access to Cedarleigh Rd to the south, away from the hazardous vegetation. Cedarleigh Rd connects to Moggill Rd to the south-east or a number of local streets which also access Moggill Road to allow	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	b. in an urban category, avoids creating a new lot less than or equal to 2,500m2 which directly adjoins hazardous vegetation; c. in an urban category, locates a future building protection zone to avoid a driveway of longer than 70m from the road frontage to a habitable building; d. in a rural category, provides for an alternative access where the private access roads or driveways are longer than 200m to reach a public road.	movement away from the hazardous vegetation. The internal driveway to the dwellings should be designed and constructed in accordance with Table 8.2.5.3.C of the *Brisbane City Plan 2014* to ensure that it will be capable of supporting fire-fighting appliances. Separation from the BLEs and hazardous vegetation is provided by the BMZ, to be maintained in a low fuel state in perpetuity.	
PO18 Development ensures that the road layout and design provides: a. efficient emergency services access to sites and manoeuvring within the subdivision; b. safe and efficient movement of residents, workers and visitors out of the subdivision and away from an approaching bushfire; c. safe and efficient movement of emergency services into the subdivision; d. alternative egress routes considering the most likely bushfire scenarios; e. ongoing availability and maintenance of access and egress routes for the purposes of evacuation and emergency services access.	AO18 Development involving a new road or fire maintenance trail is designed and constructed in compliance with: a. Table 8.2.5.3.C; or b. an approved bushfire management plan.	N/A - new roads are not part of the proposed development.	
	AO18.2 Development has a road layout and design which: a. provides for alternative access routes to the subdivision, by public roads that meet the requirements in Table 8.2.5.3.C and are able to access the arterial road network; b. excludes cul-de-sacs, except where a perimeter road with a cleared width of 20m isolates the development from hazardous vegetation;	N/A - new roads are not part of the proposed development.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	c. does not include dead-end roads or if a dead-end road is unavoidable, it is a maximum of 60m long, or 200m where located in the Environmental management zone, Conservation zone, Rural zone, or Rural residential zone, and an alternative emergency evacuation and egress route away from the most likely source of bushfire risk is provided for lots where multiple road access or exit points are not possible; d. links road within the subdivision to, or provides for future links to roads in adjacent subdivisions. Note—Where staged development occurs or development is in accordance with an approved master plan, a temporary perimeter road may be considered, subject to availability of reticulated water supply.		
PO19 Development involving new premises provides adequate infrastructure to support fire fighting.	AO19.1 Development involving new premises ensures that: a. lots have access to reticulated water supply and water pressure available for fire-fighting requirements with water supply and pressure that accord with the standards specified by the relevant utilities provider; or b. where reticulated water supply is not available for: i. residential lots, there is a minimum water supply available and retained for fire-	Complies. Lots are to be connected reticulated water, and this is expected to comply with the relevant standards. Fire hydrants to be specified where required as outlined in the BMP.	

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	COMMENTS	COUNCIL USE ONLY
	fighting purposes in compliance with Table 8.2.5.3.B, which may be in the form of a separate tank or a reserve section as part of a main water supply tank; ii. development other than residential lots, onsite water storage is provided which is appropriate to the proposed future use according to the standards specified by the relevant emergency services agency and is not less than 5,000 litres. Note—Water supply for fire-fighting is in addition to water supply for household use. Where a non-reticulated supply of water is required, swimming pools, creeks and dams should not be used as a substitute for a dedicated static supply as these sources of water are not reliable during drought conditions.		
	AO19.2 Development provides fire hydrants in accordance with Central SEQ Distributor-Retailor Authority, Queensland Urban Utilities (incorporating Water Services Association of Australia) standards.		

APPENDIX B

Flamesol Inputs and Outputs

Summary of Input Parameters for Hazardous Vegetation to the North

Parameter	Input	Note
FDI	40	Standard input for QLD, in accordance with Table 2.1 of AS 3959-2018.
Understorey Fuel Load	25 t/ha	Standard input for forests in accordance with Table B3 of AS 3959-2018.
Total Fuel Load	35 t/ha	Standard input for forests in accordance with Table B3 of AS 3959-2018.
Effective Slope	10 º	In accordance with Table B1 of AS 3959-2018 for downslope of >5 to 10 degrees, where the calculated slope was 9.09 º
Site Slope	10 º	In accordance with Table B1 of AS 3959-2018 for downslope of >5 to 10 degrees, where the calculated slope was 8.51 º
Flame Temperature	1,090 K	Standard input, in accordance with Table B1 of AS 3959-2018.
Flame Width	100 m	Standard input, in accordance with Table B1 of AS 3959-2018.

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FPA AUSTRALIA

Calculated April 13, 2026, 4:09 pm (MDc v.4.9)

S524253 SP (Layout: Version 5)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	40	Rate of spread	2.39 km/h
Vegetation Classification	Forest	Flame length	19.75 m
Understorey fuel load	25 t/ha	Flame angle	59 °, 70 °, 78 °, 82 °, 84 ° & 91 °
Total fuel load	35 t/ha	Elevation of receiver	5.83 m, 5.71 m, 4.51 m, 2.62 m, 1.42 m & 0 m
Vegetation height	n/a	Fire intensity	43,263 kW/m
Effective slope	10 °	Transmissivity	0.864, 0.84, 0.811, 0.785, 0.773 & 0.716
Site slope	10 °	Viewfactor	0.6083, 0.4514, 0.3071, 0.2087, 0.1698 & 0.0458
Flame width	100 m	Minimum distance to < 40 kW/m²	14.8 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	20.2 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	29.2 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	40.6 m

Flamesol Calculator Outputs for Required Setbacks from Hazardous Vegetation to the North

APPENDIX C

Slope Lines and Calculations

Project: 23 Cedarleigh Road, Kenmore Number: S524253											
BUSHFIRE SLOPE CALCULATOR											
Vegetation to the North											
Effective Slope						**Site Slope**					
Direction	Downslope					Direction	At Boundary				
Top Elevation	42	m				Top Elevation	45	m			
Bottom Elevation	28	m	Slope %	15.87%		Bottom Elevation	42	m	Slope %	14.85%	
Distance	88.2	m	**Slope (°)**	**9.09**		Distance	20.2	m	**Slope (°)**	**8.51**