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A006821274

Bushfire Management Report

360 Sherbrooke Road,
Willawong

CLIENT: PLANNING INSIGHTS PTY LTD

PROJECT NO. J002781

STATUS FINAL

DATE 31/03/2026

VERSION 1

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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.	Final Report	GL	WG	LMT	31/03/2026

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1 Introduction

Range Environmental was engaged by Planning Insights Pty Ltd on behalf of Cleanaway Pty Ltd to prepare a Bushfire Management Report for a proposed development at 360 Sherbrooke Road, Willawong (Figure 1) (formally described as Lot 24 SP245490, hereafter 'the site'). A development application to expand the existing facilities at the site has been submitted to Brisbane City Council (BCC) (A006821274) (Appendix A and Figure 2).

This bushfire hazard assessment is provided as an attached supporting document in accordance with Council's information request and allows for assessment against the BCP (2014 V35) Bushfire Hazard Overlay Code and the 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	360 Sherbrooke Road, Willawong
Lot on Plan	24 SP245490
Area	10.24ha
Local Government Area	Brisbane City Council (BCC)
Planning Scheme/Local Plan	Brisbane City Plan (BCP) 2014 V35
<i>Vegetation Management Act 1999</i> (VMA 1999)	Category X & Category C
Area Classification/Zone	Special purpose (Utility services)
Proposed Landuse	Special purpose (Utility services)

1.1 Site Context and Proposed Development

The site is bounded by Sherbrooke Road to the west (Figure 1). Properties zoned as Environmental Management and Industry Investigation are located to the northwest of the site that contain managed vegetation. Properties zoned as Special Purpose containing mainly cleared lands with limited native woody vegetation are located to the northeast, southeast and west of the site.

The site is currently operated as an existing landfill and waste management facility, containing limited areas of unmanaged vegetation. Approximately half of the site contains existing cleared areas with the remainder comprising canopy trees with a mown understorey. The proposed development will expand the existing facilities at the site as shown in Appendix A and Figure 2. The site and surrounds are located on flat lands with minimal underlying slopes (less than 1 degree) (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.



Photograph 1 View of VHC 16.1 to the north of the site



Photograph 2 View to the south of VHC 39.2 in the northwestern extent of the site



Photograph 3 View to the north of VHC 40.4 and existing drainage channel in the southern extent of the site



Photograph 4 View to the north of greenwaste pad



Photograph 5 View to the south of VHC 39.2 along the southern boundary of the site and limited vegetation on the neighbouring property



Figure 1 Site Locality

Project: BMR
Willawong

Client:
Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 27/02/2026
Approved by: Will Gibson Date: 27/02/2026

0 80 160 Metres

Legend

- Cadastre
- Roads
- Site boundary

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



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Figure 2 Proposed Development

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0 30 60 Metres

Legend

- Cadastre
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- Site boundary

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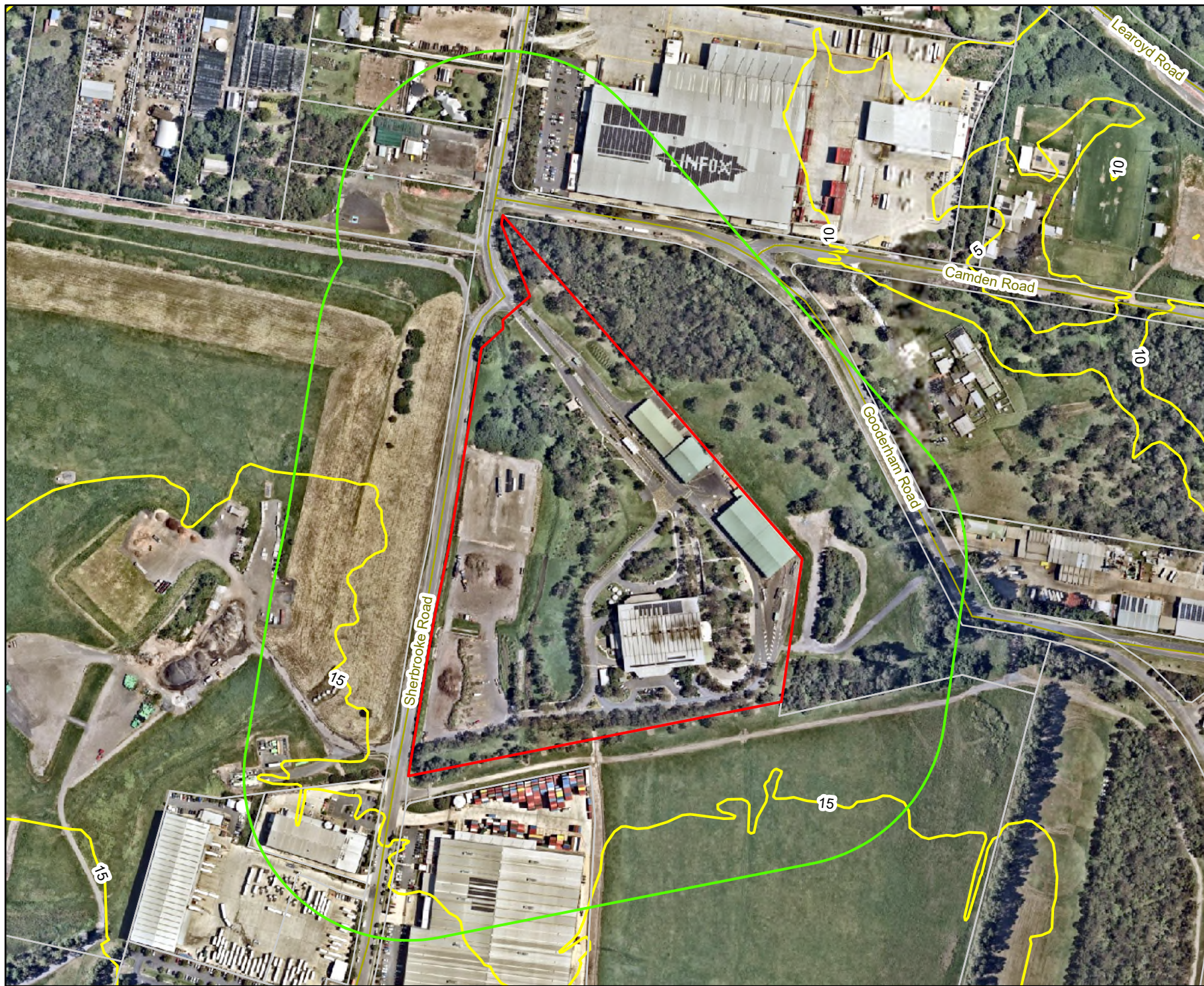


Figure 3 Topography of the Site

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0 50 100 Metres

Legend

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

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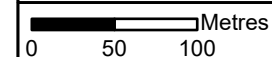
Figure 4
Real Property
Descriptions for
Adjacent Lots

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Willawong

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Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 27/02/2026
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Legend

-  Cadastre
-  Roads
-  Site boundary
-  150m buffer

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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 a limited area of Category C (regrowth) vegetation comprising Regional Ecosystem (RE) 12.3.11b in the northernmost corner of the site. The field assessment conducted by Range Environment Consultants identified that the canopy layer on the site comprised various planted eucalypt and melaleuca species with a mown understorey.

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

Table 2 Description of regional ecosystems for the site

Regional Ecosystem	12.11.3b	Conservation Status	Least concern
Description	Eucalyptus pilularis tall open forest. Other frequently occurring species include Eucalyptus microcorys, E. saligna, E. siderophloia, E. carnea, Corymbia intermedia and E. propinqua. Occurs on higher altitude (>300m) subcoastal hills and ranges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Not a Wetland. (BVG1M: 8b).		

The information above was sourced from the Queensland Herbarium (2024) Regional Ecosystem Description Database (REDD). Version 13 (May 2024) (DES: Brisbane).



Figure 5
Regulated Vegetation
and Regional
Ecosystems

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Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 27/02/2026
Approved by: Will Gibson Date: 27/02/2026

0 50 100 Metres

Legend

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

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



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3 Bushfire

Appendix B 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 Medium Potential Bushfire Intensity and Potential Impact Buffer. The site is identified by the BCP (2014 V35) mapped as not containing areas of bushfire hazard (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 present in the vicinity of 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 Brisbane Command. The closest fire brigade equipped to fight structural fires is the Durack Fire & Rescue Station (permanent) located at 506 Blunder Road, Durack approximately 4.2 kilometres by road to the northeast of the site (i.e., about 9 minutes away). The Acacia Ridge Fire and Rescue Station (permanent) is also located at 127 Bradman Street, Acacia Ridge approximately 6.4 kilometres by road to the northeast of the site (i.e. about 14 minutes away).

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.

A limited fire run of approximately 120m from the northeast is identified. Figure 8 shows the location of potential fire runs and the areas of the development that could be impacted on by a bushfire.



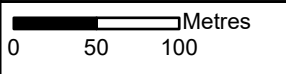
Figure 6 SPP Bushfire Hazard Map

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Client:
Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 27/02/2026
Approved by: Will Gibson Date: 27/02/2026



Legend

- Cadastre
- Roads
- Site boundary
- 150m buffer
- 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).



Figure 7 BCC Bushfire Hazard Map

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Willawong

Client:
Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 27/02/2026
Approved by: Will Gibson Date: 27/02/2026

0 50 100 Metres

Legend

- Cadastre
- Roads
- Site boundary
- 150m buffer
- High hazard area
- Medium hazard area
- High hazard buffer area
- Medium hazard buffer area

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



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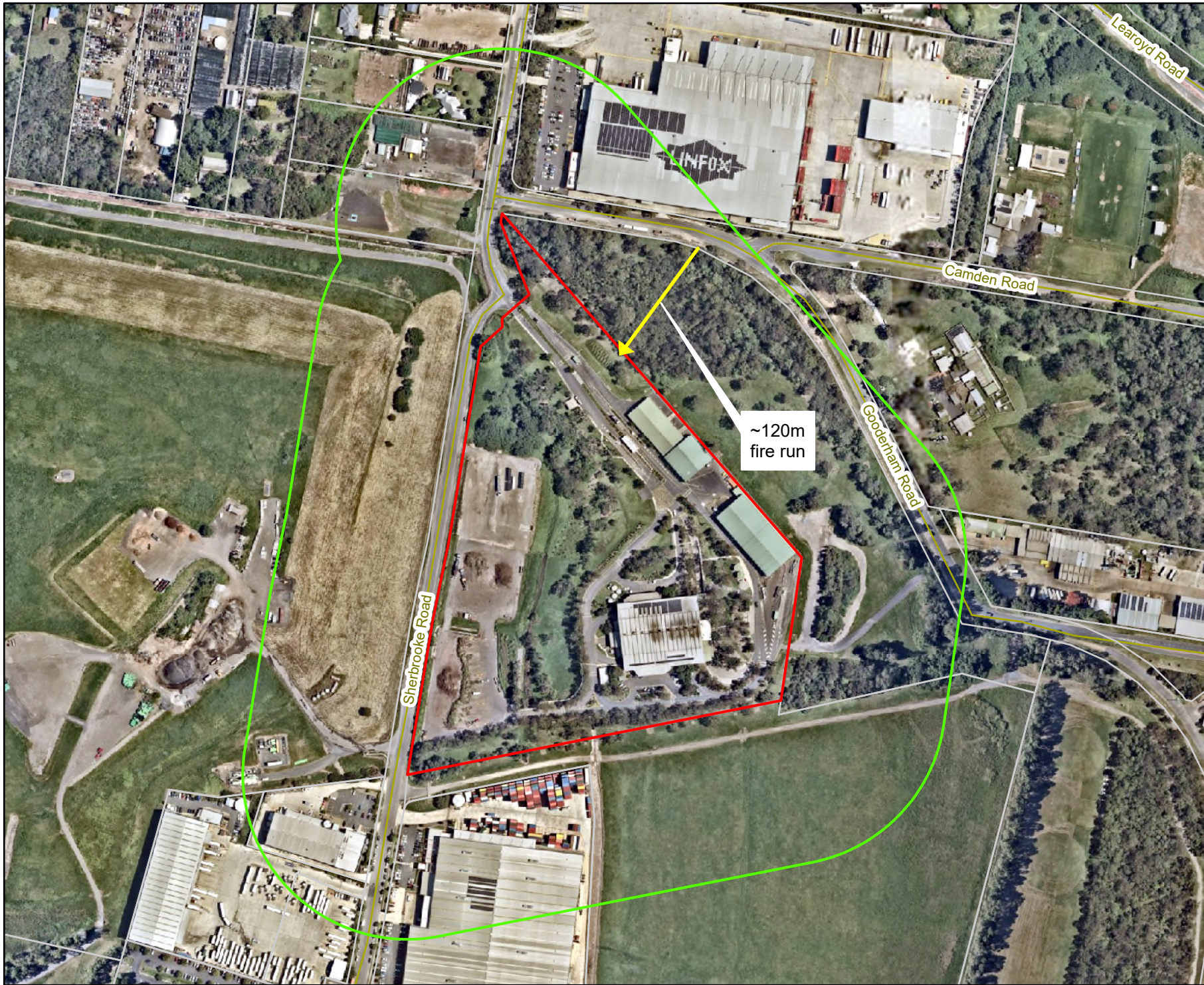


Figure 8 Potential Fire Runs

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Client:
Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 27/02/2026
Approved by: Will Gibson Date: 27/02/2026

0 50 100 Metres

Legend

- Cadastre
- Roads
- Site boundary
- 150m buffer
- ➔ Potential fire run

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



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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 B provides an explanation of the statewide methodology used to calculate potential fuel loads and VHCs.

The predominate VHCs mapped for the site and immediate adjoining areas by the State-wide mapping methodology were VHC 16.1 Eucalyptus dominated forest on drainage lines and alluvial plains and VHC 41.4 Discontinuous low grass or tree cover. Small patches of VHC 40.4 Continuous low grass or tree cover and VHC 42.6 Nil to very low vegetation cover were also mapped within 150m of the site (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 of the site) aligned predominantly with VHC 39.2 Low to moderate tree cover in built up areas, VHC 40.4, VHC 41.4 and VHC 42.6, with areas of VHC 16.1 to the north of the site. The ground truthed VHCs for the site and surrounds are shown in Figure 10.

Table 3 provides a summary of the mapped and ground truthed VHCs and potential fuel loads.

Table 3 Vegetation Hazard Class and Potential Fuel Loads

Vegetation Hazard Class (VHC)	Surface and near surface Fuel Load (t/ha)	Total Fuel Load (t/ha)	Prone type ¹	Fuel continuity ²
16.1 Eucalyptus dominated forest on drainage lines and alluvial plains	13.8	16	1	1
39.2 Low to moderate tree cover in built up areas	5	8	3	2
40.4 Continuous low grass or tree cover	4.5	5	2	1
41.4 Discontinuous low grass or tree cover	2.5	3	3	2
42.6 Nil to very low vegetation cover	2	2	3	2

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

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 39.2, 40.4, 41.4 and 42.6 are considered non-bushfire prone VHCs under Bushfire Resilient Communities (2019) and BAL calculations using the SPP APZ calculator involving these VHCs results in a radiant heat flux of 0kW/m² (BAL-Low). VHC 40.4, while listed as a grass fire prone VHC with a continuous fuel load under Bushfire

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

² Fuel continuity: 1 = Continuous, 2 = Discontinuous

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 is located in areas of VHC 39.2, 40.4 and 42.6, which has been assessed as having Potential Bushfire Hazard Class of 'Low hazard' (further detailed in Section 3.5).

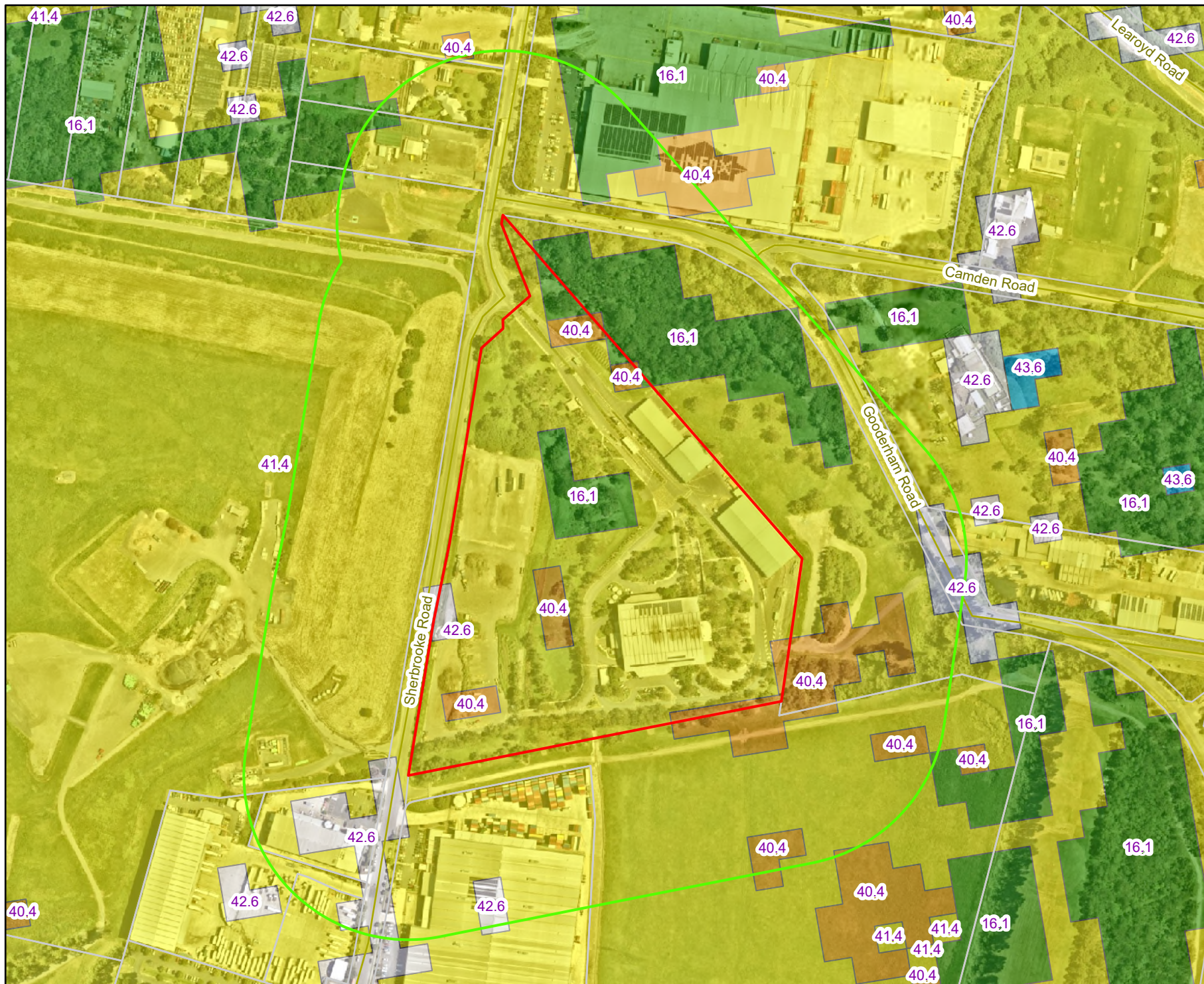


Figure 9 Vegetation Hazard Class Mapping

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Willawong

Client:
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Project No.: J002781

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Approved by: Will Gibson Date: 27/02/2026

0 50 100 Metres

Legend

- Cadastre
- Roads
- Site boundary
- 150m buffer
- 16.1 Eucalyptus dominated forest on drainage lines and alluvial plains
- 40.4 Continuous low grass or tree cover
- 41.4 Discontinuous low grass or tree cover
- 42.6 Nil to very low vegetation cover
- 43.6 Water bodies or very low vegetation cover

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Figure 10 Ground Truthed VHCs

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Project No.: J002781

Compiled by: GabiLevay Date: 19/03/2026
Approved by: Will Gibson Date: 19/03/2026

0 50 100 Metres

Legend

-  Cadastre
-  Roads
-  Site boundary
-  150m buffer
-  16.1 Eucalyptus dominated forest on drainage lines and alluvial plains
-  39.2 Low to moderate tree cover in built up areas
-  40.4 Continuous low grass or tree cover
-  41.4 Discontinuous low grass or tree cover
-  42.6 Nil to very low vegetation cover

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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 ground-truthed VHCs on the site and in the surrounding landscape in conjunction with the underlying slope of land was utilised to develop Potential Bushfire Hazard Classes. The Potential Fireline Intensity calculator was used to calculate the Potential Fireline Intensity (kW/m) to which a Potential Bushfire Hazard Class was attributed. The maximum slope in any direction was used for each area of identified ground truthed VHC as outlined in 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
16.1 Eucalyptus dominated forest on drainage lines and alluvial plains	16	55	0	8730	Medium
39.2 Low to moderate tree cover in built up areas	8	55	0	2182	Low
40.4 Continuous low grass or tree cover	5	55	0	853	Low
41.4 Discontinuous low grass or tree cover	3	55	0	307	Low
42.6 Nil to very low vegetation cover	2	55	0	136	Low

Table 5 Potential Bushfire Hazard Classes

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

Figure 11 identifies the Potential Bushfire Hazard for the site and immediate surrounding areas (within a radius of 150 metres of the site). The following methodology provided in Bushfire Resilient Communities (2019) Section 4.2.6 was utilised to refine the potential bushfire hazard for the site:

1. Remove sub-hectare areas of continuous vegetation patches that are >100m from any other continuous patches greater than 2ha.
2. Downgrade the effective fuel load of continuous vegetation patches measuring 1-2ha by 66% if the patch is >100m from any continuous patches greater than 2ha.
3. Remove narrow corridors <50m wide.

4. Remove small fragments <0.5ha in area.

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

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

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



Figure 11 **Potential Bushfire** **Hazard Map**

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Willawong

Client:
Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 24/03/2026
Approved by: Will Gibson Date: 24/03/2026

0 50 100 Metres

Legend

- Cadastre
- Roads
- Site boundary
- 150m buffer
- Medium
- Potential Impact Buffer

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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.

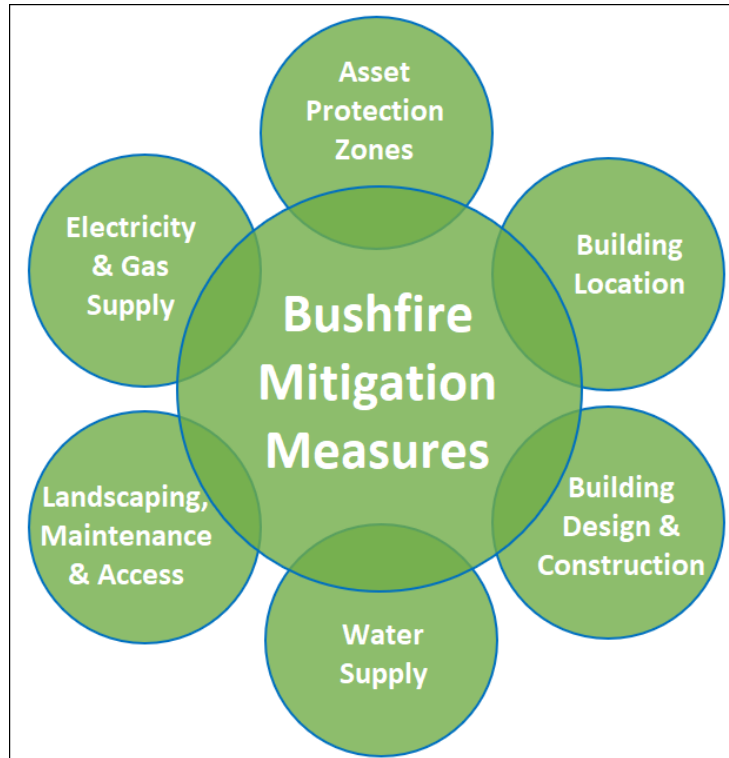


Figure 12 Bushfire mitigation measures in combination (Redrawn from Guideline for Building in Bushfire Prone Areas; Emergency Management Victoria 2016)

4.1 Building Location and Separation

Sufficient existing minimum separation distance (40m) exists between the proposed development (weighbridge) and potentially hazardous vegetation to the north such that the development is exposed to a maximum radiant heat flux of 7.67kW/m^2 (equivalent to a BAL-12.5) (Appendix C, Appendix D). The remainder of the development (excluding roadways) achieves greater separation distances.

4.1.1 Australian Standard for construction of buildings in bushfire-prone areas (AS3959-2018)

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. 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). AS3959-2018 applies to Class 1, 2, 3 and 10a structures associated with a Class 1, 2 or 3 structure.

4.1.2 National Construction Code of Australia 2022

Under the NCA 2022, when buildings are to be constructed within a designated bushfire prone area, additional requirements must be met to address additional risks which are posed by potential bushfire attacks.

In Part G5 Construction in bushfire prone areas, a designated bushfire prone area is described as “Land which has been designated under a power of legislation as being subject, or likely to be subject, to bushfires”.

4.1.3 Bushfire Prone Areas

Designated bushfire prone areas include land which has been designated under a power of legislation as being subject, or likely to be subject, to bushfires. In Queensland, this is considered to be land shown under a Local Planning Instrument (Planning Scheme) as a bushfire hazard or buffer area. The Brisbane City Council Planning Scheme includes provisions for the completion of a bushfire hazard assessment to refine and amend hazard mapping.

4.1.4 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 F 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.

It is noted that Bushfire Attack Levels (BALs) are based off radiant heat flux and relate to specific requirements for the construction of buildings in bushfire-prone areas in order to improve their resistance to bushfire attack from burning embers, radiant heat and flame contact. BALs are typically applied to Class 1, 2 and 3 buildings (habitable buildings) and associated 10a structures (sheds, carports etc.). As the proposed LTP is a structure not classified as Class 1, 2, 3 or associated 10a, a BAL level is not required. Rather, this report refers to the radiant heat flux that the structure will be subject to instead.

Appendix D Calculation of bushfire hazard contains information on the potential radiant heat flux that could be experienced on the site and Appendix E has an explanation of BALs. The development is identified as being exposed to a radiant heat flux of less than 7.67kW/m², which is equivalent to a BAL-12.5 (Appendix C, Appendix D).

This is dependent on individual facilities and their relationship with vegetation in the surrounding landscape. Radiant heat flux levels will decrease with increasing distance from potentially hazardous vegetation. It is recommended that the current level of site management be continued in order to maintain the existing level of bushfire hazard.

4.3 Access and Egress

Access to the site is via Sherbrooke Road to the west and the existing internal road network, all of which are of sealed all-weather construction.

4.3.1 Fire Trails

The development does not propose additional fire maintenance trails due to the good site access from existing roads, the small extent of development (expansion of existing facilities), and separation distances achieved from potentially hazardous vegetation.

All structures will be readily accessible by emergency service vehicles.

4.4 Vegetation Management

The current Vegetation Management Supporting Map identifies that the site is largely mapped as Category X (non-remnant) with limited areas of Category C (regrowth) vegetation located within the northernmost corner. Category C vegetation is mapped as comprising Regional Ecosystems (RE) 12.3.11b. The field assessment conducted by Range Environment Consultants identified that the vegetation in the vicinity of the proposed development comprised planted eucalypts and melaleucas with a mown understorey.

Areas of potentially hazardous vegetation are present to the north of the development. Additional areas of potentially hazardous vegetation in the surrounding landscape are located greater than 150m from the site.

Ongoing vegetation management and slashing of long grass around the development will assist in the prevention of hazardous or potentially hazardous fuel loads accumulating. General site maintenance (i.e. slashing or mowing) 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 G.

4.5 Water Supply

The BCC Planning Scheme (2014) Bushfire Overlay Code requires that the development be provided with a reliable water supply for fire-fighting purposes that is safely located and freely accessible. This can be achieved by connection to a reticulated water supply or provision of a dedicated on-site water storage system that permanently holds water (water tank) for firefighting purposes.

The SPP (2019) state interest guidance material recommends a reticulated water supply or a dedicated static water supply that is available solely for fire-fighting purposes and can be accessed by fire-fighting vehicles. It refers to QFES Bushfire Resilient Communities, which recommends referral to AS 2304–2011 Water storage tanks for fire protection systems (now superseded by AS 2304:2019) for specified static water volumes.

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.

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 BCP (2014 V35) 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 Material Change of Use (ref: A006821274) for a waste treatment facility expansion. 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 partially located in an area of mapped Potential Impact Buffer by the Queensland Government Development Assessment Mapping System Natural Hazards Risk and Resilience mapping (Bushfire). Areas to the north of the development contain areas of Medium Potential Bushfire Intensity. 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. The continuation of existing on-site vegetation management; 2. Provision of an adequate water supply that can be readily accessed for fire-fighting purposes; and 3. Adequate ingress and egress to the site.

		Provided the measures identified in the bushfire management plan are implemented and maintained, the bushfire risk to people, property and infrastructure can be kept to an acceptable level.
4	All natural hazard areas: Development supports and does not hinder disaster management response or recovery capacity and of capabilities.	PS2. Development, comprising the expansion of existing waste treatment facilities, is proposed to occur at the site in an area mapped by the Queensland Government Development Assessment Mapping System as comprising Potential Impact Buffer. 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 connection to council's reticulated water supply or by provision of a static water supply that is available solely for fire-fighting purposes, can be accessed by fire-fighting vehicles and has a volume compliant with AS 2304–2011 Water storage tanks for fire protection systems (now superseded by AS 2304:2019); 2. Maintenance of an existing internal road network that can be safely utilised by emergency services and staff in an emergency event; and 3. Ongoing maintenance of lands as low fuel load areas in the vicinity of the development.
5	All natural hazard areas: Development directly, indirectly and cumulatively avoids an increase in the severity of the natural hazard and the potential for damage on the site or to other properties	PS3. The development takes into consideration topography, location of existing vegetation and potential natural hazards. The site comprises managed gardens with open forest to the north of the site. Mitigation measures identified include: 1. Ongoing maintenance of vegetation to prevent the accumulation of hazardous fuel loads; 2. Ongoing management of woody environmental and highly flammable weeds on the site in the vicinity of buildings; 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. Potentially hazardous materials and waste materials are located within areas identified as comprising 'Low' potential bushfire hazard and 'Potential Impact Buffer'. The development is identified as being exposed to a maximum radiant heat flux of no greater than 7.67kW/m² (Appendix C, Appendix D), which is equivalent to a BAL-12.5.
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 Brisbane City Council (BCC) Planning Scheme – Bushfire

The Brisbane City Council Planning Scheme (2014) contains a Bushfire hazard overlay code.

1. The purpose of the Bushfire overlay code is to:
 - a. Implement the policy direction in the Strategic framework, in particular:
 - i. Theme 2: Brisbane’s outstanding lifestyle, and Element 2.3 – Brisbane’s healthy and safe communities;
 - ii. Theme 4: Brisbane’s highly effective transport and infrastructure networks, and Element 4.3 – Brisbane’s coordinated infrastructure planning and delivery.
 - b. Provide for the assessment of the suitability of development in the Bushfire overlay.
2. The purpose of this code will be achieved through the following overall outcomes.
 - a. Development maintains the safety of people and property by not exposing them to an unacceptable risk from bushfire.
 - b. Development does not increase the exposure of people and property to an unacceptable risk.
 - c. Development involving new premises for vulnerable uses, difficult to evacuate uses and assembly uses is not located in an area of unacceptable risk.
 - d. Development which would increase the number of people living, working on or visiting the site is not exposed to an unacceptable risk from bushfire.
 - e. Development incorporates appropriate siting, design and management measures to avoid areas at risk of bushfire and mitigate risk from bushfire.
 - f. Development for essential community infrastructure and its function during a bushfire event is protected from unacceptable risk.
 - g. Development involving the storage and handling of hazardous chemicals in the Bushfire overlay does not pose an unacceptable risk to public safety or the environment.
 - h. 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.
 - i. Development provides for fire-fighting requirements.
 - j. Development mitigates bushfire risk to people and property using measures that avoid or minimise impacts on biodiversity values, ecological features and ecological processes.
 - k. Development addresses and takes appropriate account of the potential impact of all future bushfire hazard.

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 provides responses to the Bushfire hazard overlay.

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

Performance outcomes	Acceptable Outcomes	Proposed solutions
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 exceeding amounts specified in Table 8.2.5.3.D:	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 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	PS1.2 Development is designed and sited in accordance with a bushfire hazard assessment and management plan. Potentially hazardous materials and waste materials are located within areas identified as comprising 'Low' potential bushfire hazard and 'Potential Impact Buffer'. The development is identified as being exposed to a maximum radiant heat flux of no greater than 7.67kW/m² (Appendix C, Appendix D), which is equivalent to a BAL-12.5. The site contains existing waste treatment processes within the development footprint which are proposed to be expanded.

e. does not extend beyond the bounds of the existing development footprint; f. does not increase the GFA by 10% or 100m², whichever is the greater; g. does not involve a new use on the site; h. 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.	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: b. BAL-29; or c. 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 a lot		
PO2	AO2.1	PS2.1

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. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating achievement of this performance outcome.	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 management plan, where on a lot greater than 2500m²: 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 20m from the outermost projection of the main building or any habitable structure or to the maximum extent possible on sites less than 2500m² where a building protection zone would extend into neighbouring properties; and a. clusters buildings and structures in the building protection zone;	The proposed development is located to expand existing facilities at the site. Development is designed and sited in accordance with a bushfire hazard assessment and management plan. The proposed development is located within an existing cleared area and achieves a minimum separation distance of 40m (weighbridge) from the edge of potentially hazardous vegetation to the north such that it is exposed to a radiant heat flux of less than 7.67kW/m² (equivalent to a BAL-12.5). The remainder of the development (excluding roadways) achieves greater separation distances. The proposed development facilitates the balance of relevant bushfire mitigation requirements, State koala habitat area clearing restrictions and ecological values protection. The proposed development has been located to achieve separation between buildings and hazardous vegetation which is located to the north of the site to the greatest extent practicable.
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	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. 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.	A bushfire management plan has been prepared for the site, that provides an assessment of the potential bushfire hazard exposure and corresponding bushfire protection (mitigation) measures.
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.	PS3 The proposed development does not include fencing components. If fencing is required, fencing materials are to be constructed of a non-combustible or fire retardant material.
	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.	PS3.2 If fencing is to be incorporated into the development, it is to be designed to allow for the safe movement of fauna either through gaps in the fence or by climbing.
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;	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;	PS4 While the existing internal road network exceeds 400m between the most distant part of the development (staff amenities) and the nearest public road, the internal road network achieves, and can be maintained to achieve, the following requirements for access routes in a bushfire prone area: 1. A total horizontal clearance of 6 metres.

c. enables safe evacuation of the site during a bushfire for site occupants. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	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, a safe alternative access and egress route is provided.	2. A minimum vertical clearance of 4 metres above the road. 3. 10 metres on each side of the road centre-line clear of vegetation. 4. The road is located on lands with underlying slopes not exceeding 12.5%. The majority of internal roads have a minimal slope. 5. No specific requirements are required for crossfalls on a private access road. 6. The road is of a sealed condition, allowing for urban appliances and rural fire-fighting appliances to safely utilise the internal road network. 7. The existing road network is of an all weather standard.
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.	PS5 The development has an existing internal road network, which has been constructed of a sealed, all-weather standard. The internal road network is capable of carrying emergency service vehicles. The existing access road is constructed to a width to allow the safe movement of two-way traffic.
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:	PS6 The development is to be provided with either connection to a reticulated water supply available for fire fighting requirements or a static water supply that is available solely for fire-fighting purposes, can be accessed by fire-

	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 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.	fighting vehicles and has a volume compliant with AS 2304–2011 <i>Water storage tanks for fire protection systems</i> (now superseded by AS 2304:2019). The supply is to provide a reliable fire-fighting water source (for both structural and bush fires) in compliance with AO6(b)(ii).
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);	PS7 The development is to be provided with either connection to a reticulated water supply available for fire fighting requirements a static water supply that is available solely for fire-fighting purposes, can be accessed by fire-fighting vehicles and has a volume compliant with AS 2304–2011 <i>Water storage tanks for fire protection systems</i> (now superseded by AS 2304:2019). The supply is to provide a reliable fire-fighting water source (for both structural and bush fires) in compliance with AO7.

	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; 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 the Biodiversity areas overlay if on a site larger than 2,500m 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.	PS8 The proposed development consists of an expansion to existing waste treatment facilities at the site. The development footprint is located within an existing cleared area containing existing infrastructure. Sufficient existing separation distance (40m) exists between the proposed development and potentially hazardous vegetation to the north (weighbridge) such that the development is exposed to a radiant heat flux of less than 7.67kW/m² (equivalent to a BAL-12.5) without further incursions into vegetated areas.
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. 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.	PS9.2 The proposed development is to expand existing facilities at the site. Where the proposed development potentially increases the site occupants through the provision of a place of employment, the development is serviced by roads meeting requirements of items 1–7 in Table 8.2.5.3.C. The site is serviced by Sherbrooke Road to the west. This road may be utilised for occupants to evacuate, or for emergency vehicles to enter the site in a bushfire event. The existing roads achieve, and can be maintained to achieve, the following requirements for access routes in a bushfire prone area: 1. A total horizontal clearance of 4 metres. 2. A minimum vertical clearance of 4 metres above the road. 3. 6 metres on each side of the road centre-line is to be clear of vegetation. 4. The road is located on lands with underlying slopes not exceeding 12.5%. The majority of internal roads have a minimal slope. 5. No specific requirements are required for crossfalls on a private access road. 6. The road is of a sealed condition, allowing for urban appliances and rural fire-fighting
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		appliances to safely utilise the internal road network. 7. The existing road network is of an all weather standard. 8. The existing road network is constructed to a width to allow the safe movement of two-way traffic.
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; b. 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. 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.	PS10 The proposed development is located to expand existing facilities at the site. Development is designed and sited in accordance with a bushfire hazard assessment and management plan in accordance with AO10(b).

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; d. 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; iv. enable people and property to be defended safely and effectively from a bushfire.	PS11 The proposed development does not propose a new use within a bushfire prone area and is located to expand existing facilities at the site. Development is designed and sited in accordance with a bushfire hazard assessment and management plan in accordance with AO11(b).
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:	PS12 The proposed development does not propose a new use within a bushfire prone area and is located to expand existing facilities at the site. Development is designed and sited in accordance with a bushfire hazard assessment and management plan in accordance with AO12(c). The development does not include valuable records or items of cultural or historical significance, being a waste treatment facility.

	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 <i>Public Records Act 2002</i>, 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.	PS13 Any landscaping near buildings is to consist of plants that have low flammability. Asset protection zone (APZ) requirements are provided in Appendix F and landscaping guidelines are provided in Appendix G.
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	AO14 Development provides a park landscape plan that complies with a bushfire management plan prepared in accordance with the Bushfire planning scheme policy.	PS14 Not applicable. No park landscaping is proposed as part of the development.

avoiding potential for entrapment during a bushfire; 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.		
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6 Conclusion

The bushfire assessment of the site identified that in general hazards are in the medium to low category with the development located within an area identified as 'potential impact buffer' (Figure 11) and exposed to a maximum radiant heat flux of no greater than 7.67kW/m² (Appendix C, Appendix D), which is equivalent to a BAL-12.5.

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 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:

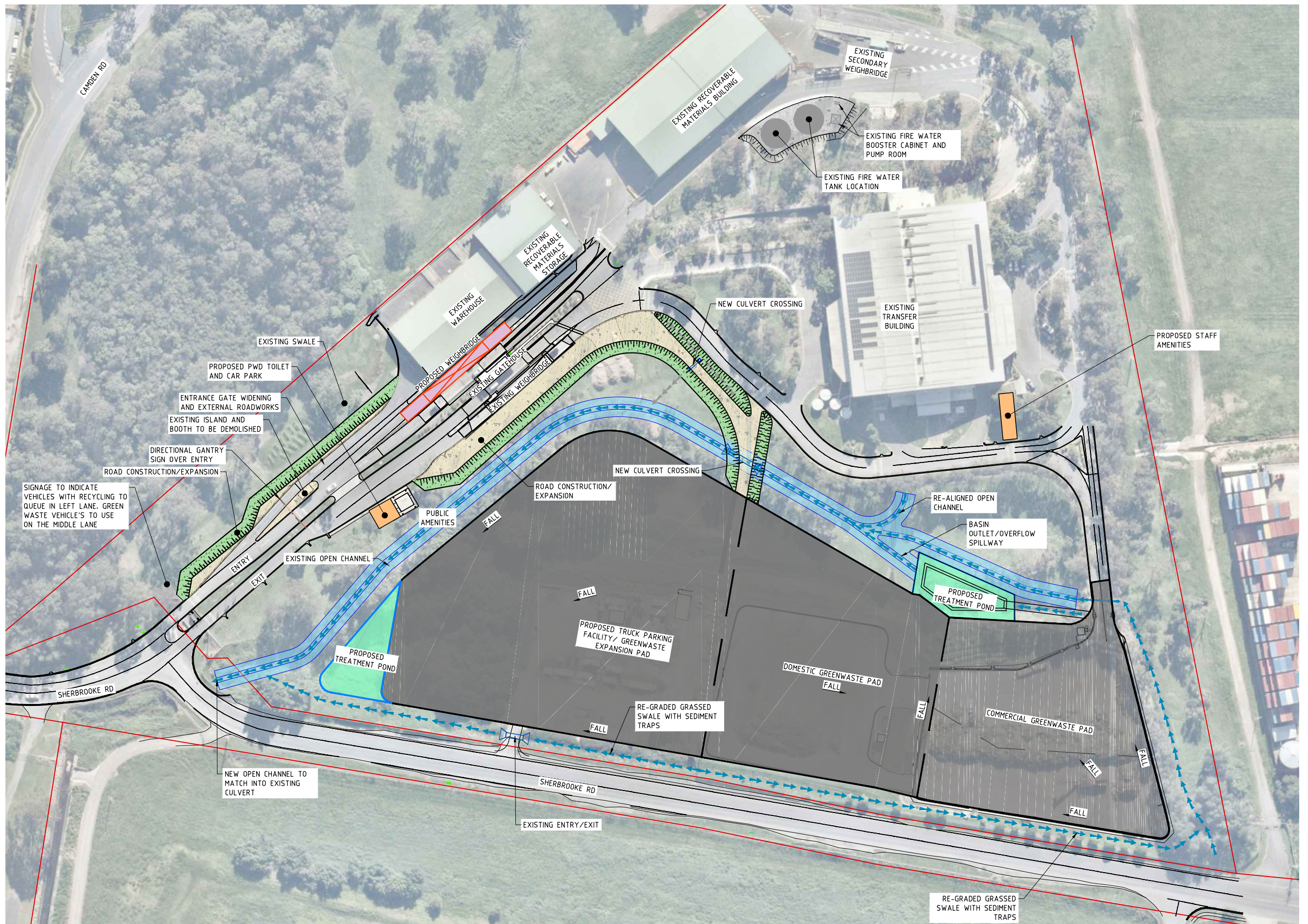
- That buildings are designed and constructed to meet the requirements of the relevant building standards prevailing at the time. This includes the BCA and relevant Council bylaws and building regulations.
- That existing vegetation management at the site be continued to minimise the accumulation of hazardous fuel loads and to control understory woody and highly flammable weeds.
- That any site vegetation landscaping areas be designed to ensure that a maximum fuel load of 8t/ha is maintained within the proposed asset protection zone.
- That any landscaping works utilise plant species and design principles suitable for bushfire prone areas and in accordance with Appendix G.
- That the development is to be provided with either connection to a reticulated water supply available for fire fighting requirements or a static water supply that is available solely for fire-fighting purposes, can be accessed by fire-fighting vehicles and has a volume compliant with AS 2304–2011 Water storage tanks for fire protection systems (now superseded by AS 2304:2019).
- That bushfire mitigation measures identified in this bushfire management report are implemented and maintained.

7 References

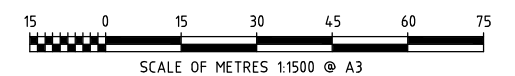
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Appendices

Appendix A Site Plan



WILLAWONG DEVELOPMENT EXPANSION PLAN - MASTER
SCALE 1:1,500



CLIENT: BRISBANE CITY COUNCIL
PROJECT TITLE: RESOURCE RECOVERY CENTER AND TRANSFER STATIONS
PROJECT NUMBER: 240197

DRAWING TITLE: WILLAWONG DEVELOPMENT EXPANSION PLAN
DESIGN STAGE: CONCEPT
PLOT TITLE: WILLAWONG

FOR INFORMATION ONLY

A.B.N. 64 005 931 288
Brisbane T +61 7 3352 7222

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DATUM: AHD
SCALE: AS SHOWN

Sheet size A3

Appendix B 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 13 illustrates the variables used to determine the Potential Fire-line Intensity.



Figure 13 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 C Potential Radiant Heat Flux Map



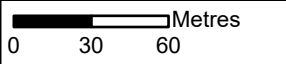
Appendix C Potential Radiant Heat Flux Map

Project: BMR
Willawong

Client:
Planning Insights

Project No.: J002781

Compiled by: GabiLevay Date: 24/03/2026
Approved by: Will Gibson Date: 24/03/2026



Legend

- Cadastre
- Roads
- Site boundary
- 150m buffer
- <10kW/m²
- <12.5kW/m²
- <19kW/m²
- <29kW/m²
- <40kW/m²
- 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).

N

Appendix D 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 55 was used for the site when calculating Bushfire Attack Levels (BAL) for 'the site'. Figure 14 provides a Fire Danger Index (FDI) map of Southeast Queensland and identifies the location of the site.

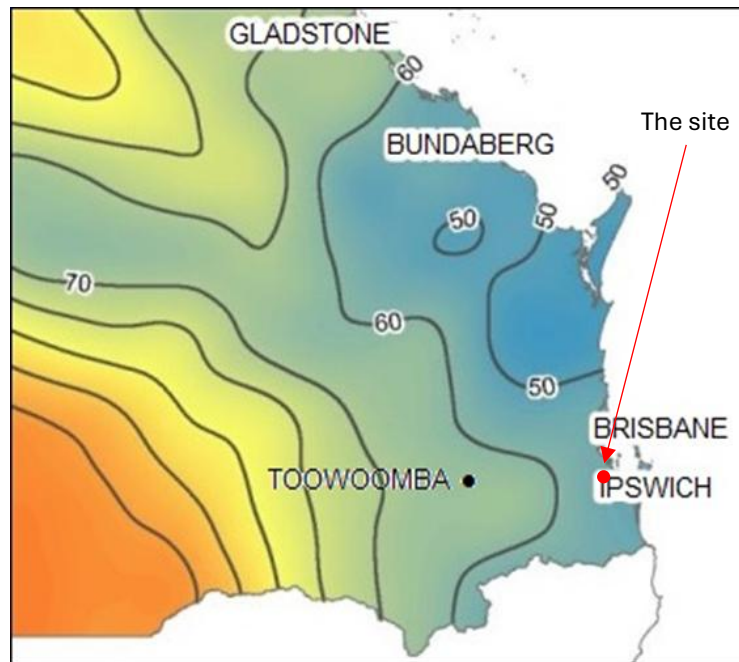


Figure 14 FDI map for Southeast Queensland. Leonard. J. A New Methodology for State-wide Mapping of Bushfire Prone Areas in Queensland. 2014

The potential radiant heat flux was calculated using the SPP APZ Width Calculator for representative areas level with the site. Figure 15 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).

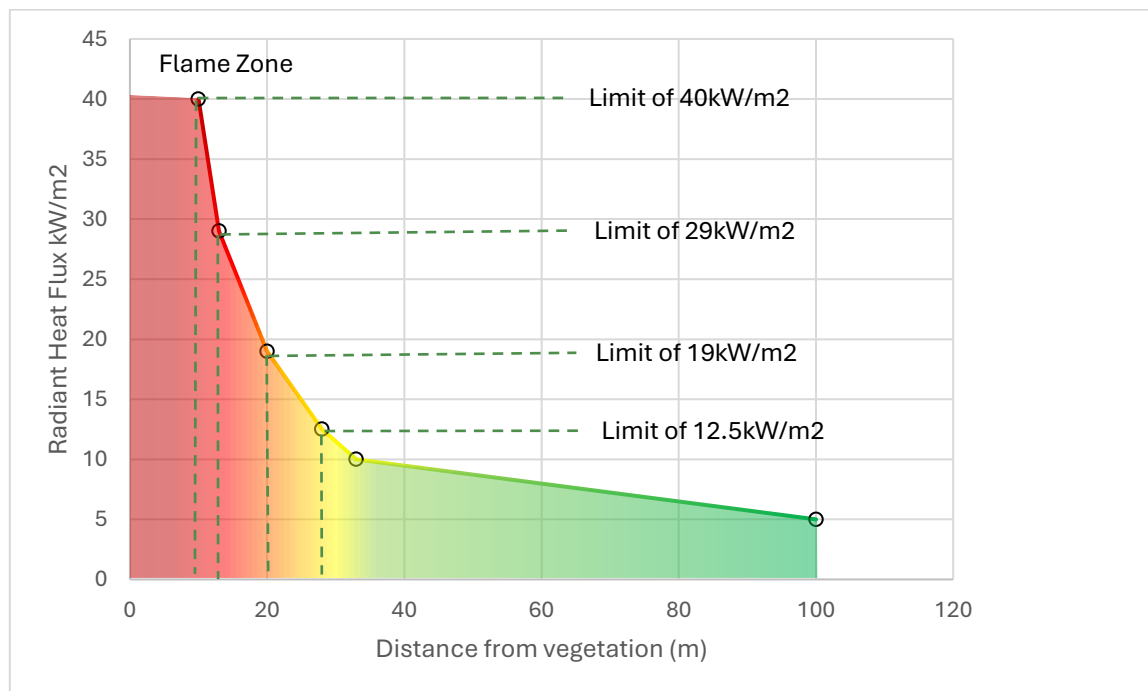


Figure 15 Potential radiant heat flux versus distance from bushland areas (VHC 16.1)

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 8 Parameters used in SPP APZ calculations

Step	Procedure	Value (VHC 16.1)
1	Fire Danger Index (FDI)	55
2	Vegetation Hazard Class (VHC)	16.1
3	Surface fuel load (t/ha)	13.8
4	Overall fuel load (t/ha)	16
5	Location of vegetation (Upslope/Downslope)	Upslope
6	Site slope	1 degree
7	Effective slope of land under classified vegetation	1 degree

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 9 provides 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 9 State Planning Policy Asset Protection Zone Width Calculator (VHC 13.2 – level and upslope)

SPP Bushfire Asset Protection Zone Width Calculator							
Variable Description	Variable	Units	Value				
Input Values							
Fire Weather Severity	FDI		55				
Vegetation Hazard Class	VHC	-	16.1 Eucalyptus dominated forest on drainage lines and alluvial plains				
Remnant Status	-	-	Non-Remnant				
Slope Type (Upslope or Downslope)	ST	-	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	<10	10	13	20	28
Output Values							
Surface Fuel Load	-	t/ha	10.00				
Near Surface Fuel Load	-	t/ha	3.80				
Bark Fuel Load	-	t/ha	1.20				
Elevated Fuel Load	-	t/ha	1.00				
Total Overall Fuel Load	W	t/ha	16.00				
Total Surface Fuel Load	w	t/ha	13.80				
Potential Fire Line Intensity	I	kW/m	7529				
Radiant Heat Flux	q	kW/m²	40+	38.04	28.81	17.97	12.13
Bushfire Attack Level (AS 3959-2018)	BAL	-	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 E Explanation of Bushfire Attack Levels

Table 10 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 F 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.

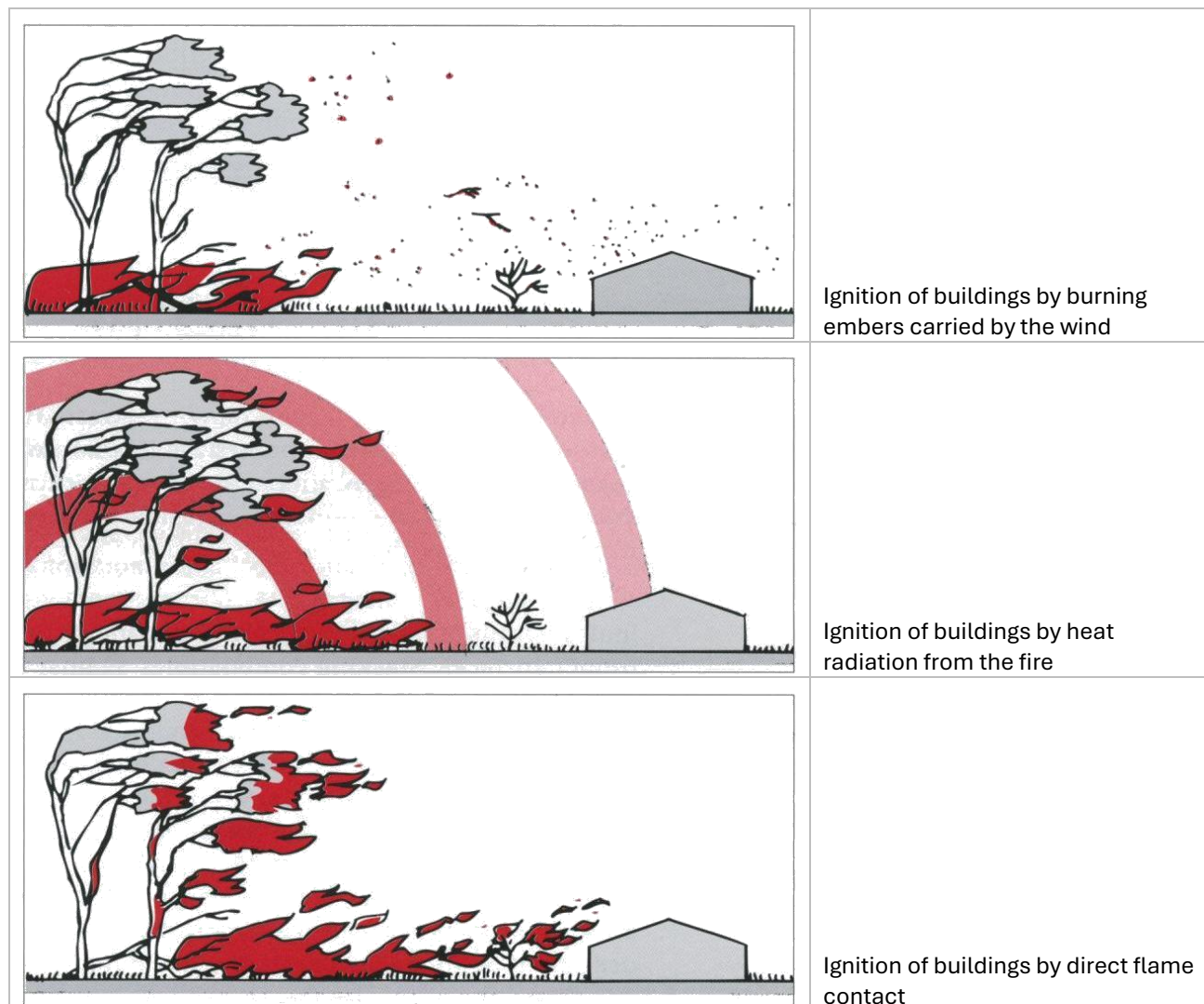


Figure 16 The three main elements of bushfire which threaten life and property. (Ramsay & Rudolf 2003)

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 17.

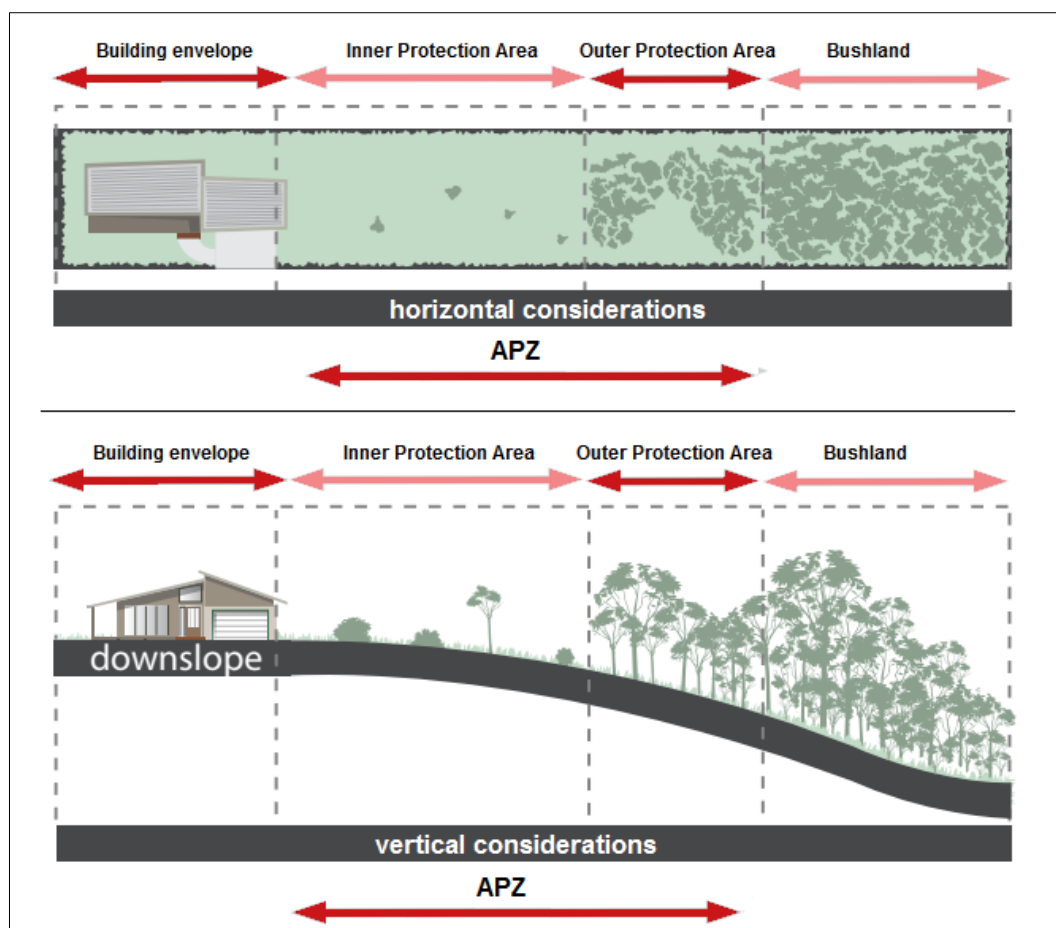


Figure 17 APZ Elements (Adapted from Planning for Bushfire Protection 2019)

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 G 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 11.

Table 11 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