Appendix E.5 Bushfire Hazard Assessment

QUEENSLAND BUSHFIRE PLANNING

BUSHFIRE MANAGEMENT PLAN (BMP)

Property

6206 Cunningham Highway, Kalbar
Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024

Prepared for: KALFRESH

September 2023

www.qldbushfireplanning.com.au

Disclaimer

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GLOSSARY OF TERMS AND ABBREVIATIONS

4WD	Four wheel drive
APZ	Asset Protection Zone - An area between an asset and a bushfire hazard where the bushfire fuel hazard has been reduced significantly to reduce the likely intensity of the any bushfire attack so that fire suppression and asset protection activities may be carried out.
AS3959	Australian Standard 3959-2018 - Construction of Buildings in Bushfire-prone Areas
Asset	Anything valued by the community that may be at risk of harm from bushfire, including people, house, crops, heritage buildings and places, infrastructure, the environment, businesses and forest resources.
BAL	Bushfire Attack Level as defined in AS3959 - A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.
Bushfire attack	Attack by burning debris, radiant heat or flame generated by bushfire which might result in ignition and subsequent destruction of the building.
Bushfire catchment	The geographical area surrounding a community which a bushfire ignition is likely to impact on assets valued by the community.
Bushfire hazard area	An area where the combination of fuel load, fuel arrangement and topography under particular climatic and weather conditions has the potential to sustain a bushfire of sufficient severity to pose a risk to people, property or the environment. Bushfire hazards are variable in their severity with severity levels usually measured in terms of fire intensity (kW/m2) arising from the hazard.
Bushfire management	All activities directed to the prevention, detection, damage mitigation and suppression of bushfires and recovery after bushfire events. It includes bushfire policy, administration, law enforcement, community education, training of fire fighters, planning, communication systems, equipment, research, and the multitude of field operations undertaken by land managers and emergency service personnel relating to bushfire control and use of fire to meet land management goals and objectives.

Bushfire-prone area	An area that can support bushfire or is likely to be subject to bushfire attack due to its proximity to a bushfire hazard area.
Ember attack	Attack by smouldering or flaming windborne debris that is capable of entering or accumulating around a building and may ignite the building and other combustible materials and debris (eg garden mulch, pine fencing).
Emergency warning	An emergency warning is a message signalling an imminent hazard, which may include advice on protective measures. Emergency warnings in relation to bushfires are issued by QFES and are used to inform residents of threat to properties, time to impact, the direction and strength of the fire and of the steps residents must to take to survive. There are three National bushfire warning levels defined as follows: • ADVICE: indicates a fire or other emergency has started, however there is no immediate threat. • WATCH AND ACT: there is a heightened level of threat, you need to be aware of your situation and take action to be prepared and protect yourself and your family. • EMERGENCY WARNING: you are in danger.
Environment	The term environment includes: • Ecosystems and their constituent parts, including people and communities. • Natural and physical resources. • The qualities and characteristics of locations, places and areas. • Heritage value of places. • The social, economic and cultural aspects of a thing mentioned above.
FFDI	Forest Fire Danger Index (see also FDR) - A relative number denoting an evaluation if the fire rate of spread, or suppression difficulty for specific combinations of temperature, relative humidity, drought effects and wind speed. The numbers range from 1 to 100.
FDR	Fire Danger Rating - A relative class denoting an evaluation of rate of spread, or suppression difficulty for specific combinations of temperature, relative humidity, drought effects and wind speed indicating the relative evaluation of the fire danger. Ratings are low-moderate (FDI 0-11), high (FDI 12-24), very high (FDI 25-49), severe (FDI 50-74), extreme (FDI 75-99), catastrophic (FDI 100+).
Fine fuel	Fuels such as grass, leaves, bark and twigs (dead plant material less than 6mm and live plant material less than 3mm in diameter) that ignite readily and are burnt readily when dry.

Fire control line	A natural (such as a creek line) or constructed barrier (such as trail or mineral earth break), or treated fire edge used in fire suppression and prescribed burning to limit the spread of the fire.
Fire regime	The history of fire in a particular vegetation type or area including the frequency, intensity and season of burning. It may also include proposals for the use of fire in a given area.
Fuel	Any material such as grass, leaf litter, and live vegetation which can be ignited and sustains a bushfire. Fuel is usually measured in tonnes per hectare.
Fuel layer	The layering of fuels will influence fire behaviour.The five main fuel layers consist of surface fuel, near surface fuel, elevated fuel, bark fuel and canopy fuel.
GIS	Geographic Information System
LGA	Local Government Area
QFES	Queensland Fire and Emergency Services
Regional ecosystem	A grouping of vegetation classes with common ecological requirements for fire and common fire behaviour characteristics.
Residual Risk	The risk of adverse impacts from a bushfire after implementation of risk mitigation/management measures.
Risk	The likelihood of a bushfire igniting and developing to the point that it will threaten an asset and the resultant nature and magnitude of the social, economic and environmental consequences to the community or the assets they value.
Risk mitigation/management	A systematic process that provides a range of treatments which are designed to reduce bushfire risk and thereby contribute to the wellbeing of communities and the environment which may suffer the adverse impacts of bushfire.
ROS	Rate Of Spread
SPP Interactive Mapping System	The State Planning Policy (SPP) Interactive Mapping System, as amended from time to time, published by DLGIP and located at https://spp.dsdip.esriaustraliaonline.com.au/geoviewer/map/planmaking
Unacceptable risk	A situation where people or property are exposed to a predictable hazard event that may result in serious injury to, loss of life, failure of community infrastructure, or property damage that would make a dwelling unfit for habitation.

VHC	Vegetation Hazard Class (VHC) - based on the available bushfire fuel load typically associated with a particular vegetation type.
Water point	Any natural or constructed supply of water that is readily available for fire control operations.
Wildfire	Another term for a bushfire.

EXECUTIVE SUMMARY

Queensland Bushfire Planning has been engaged on behalf of KALFRESH to conduct a site-based Bushfire Hazard Assessment in relation to a Scenic Rim Agricultural Industrial Precinct Project (SRAIP)development at 6206 Cunningham Highway, Kalbar, Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024. The site is captured by the State Planning Policy Natural Hazards and Resilience - *Bushfire Prone Area* mapping and in accordance with the provisions of the Scenic Rim Planning Scheme 2020 - Bushfire Hazard Overlay Code, a detailed Bushfire Management Plan has been prepared. This report includes a number of recommendations regarding bushfire risk mitigation in accordance with AS3959-2018 and Scenic Rim Planning Scheme 2020. As detailed in Section 5 the bushfire hazard and risk management measures that have been incorporated into the design of the proposed development at 6206 Cunningham Highway, Kalbar, Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024, combined with the implementation of the additional recommended measures during the construction and occupational phase of the development should ensure compliance with the Scenic Rim Planning Scheme 2020 - Bushfire Hazard Overlay Code.

The proposed composting use and ancillary amenities, office and plant and equipment storage are all within mapped areas of bushfire hazard. An onsite inspection has shown that the three areas shown on the SPP Bushfire Hazard Mapping can be removed using the following methodology.

> *Patches less than 3 ha are less likely to develop into a fully developed fire front due to the size and distance required for a significant fire front of high intensity. Where 0.5-2 ha, the effective fuel load is assumed to be decreased by 66%*
> *i.e. Fuel load (t/ha) X 0.34. If fireline intensity <4,000 kW/m = LOW HAZARD. (Leonard, J and Opie, K, 2017, Estimating the potential bushfire hazard of vegetation patches and corridors. CSIRO. https://publications.csiro.au/rpr/pub?pid=csiro:EP167343)*

In conclusion, the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development at 6206 Cunningham Highway, Kalbar, Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024 is a development associated with an acceptable level of risk with regards to people or property being exposed to harm in the event of a bushfire.

Recommendation
1. Ingress and egress. - Kalfresh commit to constructing formalised access roads to the proposed composting activities on Lot 19 to meet the Performance Outcomes and where possible Acceptable Outcomes, stipulated in the *QFES Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots* (03/2019).
3. Proposed infrastructure is non - residential (National Construction Code - Class 8) and are not required to meet the requirements of the Australian Standard AS3959- 2018 - *Construction of buildings in bushfire prone areas.*
4. The vegetation on 6206 Cunningham Highway, Kalbar will be managed to achieve BPZ requirements and will be maintained in managed low hazard state.

1. INTRODUCTION

This Bushfire Management Plan has been prepared on behalf of KALFRESH for a Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development at 6206 Cunningham Highway, Kalbar, Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024. The focus of this Plan refers to the statutory planning and building requirements as they may apply, pursuant to all relevant policies, standards and regulation, along with end-user consideration. In addition, this report seeks to ensure fire risk and evacuation for adjoining and nearby properties is not inadvertently adversely impacted. This assessment report aims to mitigate the risk to life and property from bushfire threat and the impact of bushfire attack which includes:

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

This Report provides:

- In Section 2 a description of the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development.
- In Section 3 an assessment of the bushfire hazards and risks that will be present within the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development pre and post completion.
- In Section 4 details concerning the bushfire hazard and risk management measures that have been incorporated into the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development and additional measures that are recommended for implementation during the construction and occupational phases of the development.
- In Section 5 assessment of the level of compliance of Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development against the requirements of the Scenic Rim Planning Scheme 2020 - Bushfire Hazard Overlay Code.

This assessment does not seek to remove the threat of any bushfire risk, but provide detailed siting, layout, building and/or servicing information to assist the ability of the owner(s) to manage the potential threat of this risk. This assessment report is prepared in accordance with best practice industry standards as applicable in Queensland and pursuant to both State and local government bushfire hazard policies and guidelines.

1.1 Bushfire Regulatory Framework

1.1.1 State Planning Policy (SPP)

The SPP identifies the Queensland Government's policies about matters of state interest in land use planning and development (DILGP, July 2017). The SPP is a broad and comprehensive statutory planning instrument. It sits above regional plans, standard planning scheme provisions and local government planning schemes within the hierarchy of planning instruments outlined in the Planning Act 2016.

The SPP is supported by the following guidance material:

- The SPP state interest guidance material - Natural hazards, risk and resilience – Bushfire ('SPP guidance') (DSDMIP, 2019), which provides further context to the SPP and explains how the SPP policies can be applied, in particular for local government when making or amending local planning instruments. The SPP guidance is also intended to assist assessment managers and practitioners in applying the SPP assessment benchmarks when state interests have not been integrated into the local planning scheme (where applicable).
- The 'Bushfire Resilient Communities – Technical Reference Guide for the State Planning Policy State Interest - Natural Hazards, Risk and Resilience – Bushfire ('BRC technical document') (QFES, 2019), which provides technical guidance and policy positions of the Queensland Fire and Emergency Services (QFES). It includes procedures for undertaking a bushfire hazard assessment (BHA), calculating asset protection zones and preparing a Bushfire Management Plan.

1.1.2 Scenic Rim Planning Scheme 2020

The purpose of Scenic Rim Planning Scheme 2020 - *Planning Scheme Policy Schedule 6.2.4: Bushfire Management Plans* is to provide guidance for the preparation of a Bushfire Management Plan (BMP) to ensure:
(a) development is designed and located to minimise risks to people and property from bushfires;
(b) bushfire risk mitigation treatments are accommodated in a manner that avoids or minimises impacts on the natural environment and ecological processes;
(c) development contributes to effective and efficient disaster management response and recovery capabilities.

This planning scheme policy applies where:
(1) development occurs within areas identified as a Bushfire Hazard Area (Very High, High, Medium or Potential Impact Buffer) on Overlay Map OM-03-B Bushfire Hazard; and
(2) the Bushfire Hazard Overlay Code requires the preparation of a Bushfire Management Plan.

A Bushfire Management Plan identifies bushfire hazards, risk to development and strategies for mitigating the impacts of bushfire on life, property and the environment. This includes identifying specific risk factors associated with developments, planning for the separation of at-risk elements and providing access and treatments to facilitate an effective response to bushfire.

1.1.3 AS3959:2018 Construction of Buildings in Bushfire Prone Area

The Australian Standard AS3959:2018 Construction of Buildings in Bushfire-Prone Areas (Standards Australia, 2009) specifies the requirements for the construction of buildings in bushfire-prone areas in order to improve their resistance to bushfire attack. AS3959:2018 applies to those areas where a regulated map (i.e. a planning scheme overlay map) identifies an area as a bushfire prone area (or similar), requiring calculation of Bushfire Attack Level (BAL) in accordance with a methodology outlined in the standard. AS3959:2018 prescribes the construction details for buildings depending on the calculated BAL. The detailed requirements relating to construction methods and materials are typically dealt with as part of building design and enabled via private certification in accordance with the Building Code of Australia.

2. SITE DESCRIPTION AND DETAILS

2.1 Overview

The site is located at 6206 Cunningham Highway, Kalbar and is described as Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024 within Scenic Rim Local Government. (Figure 1).

Figure 1

Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024 has an area of 145.218 Hectares and is aligned northwest to southeast with a predominantly easterly aspect (Figure 2).

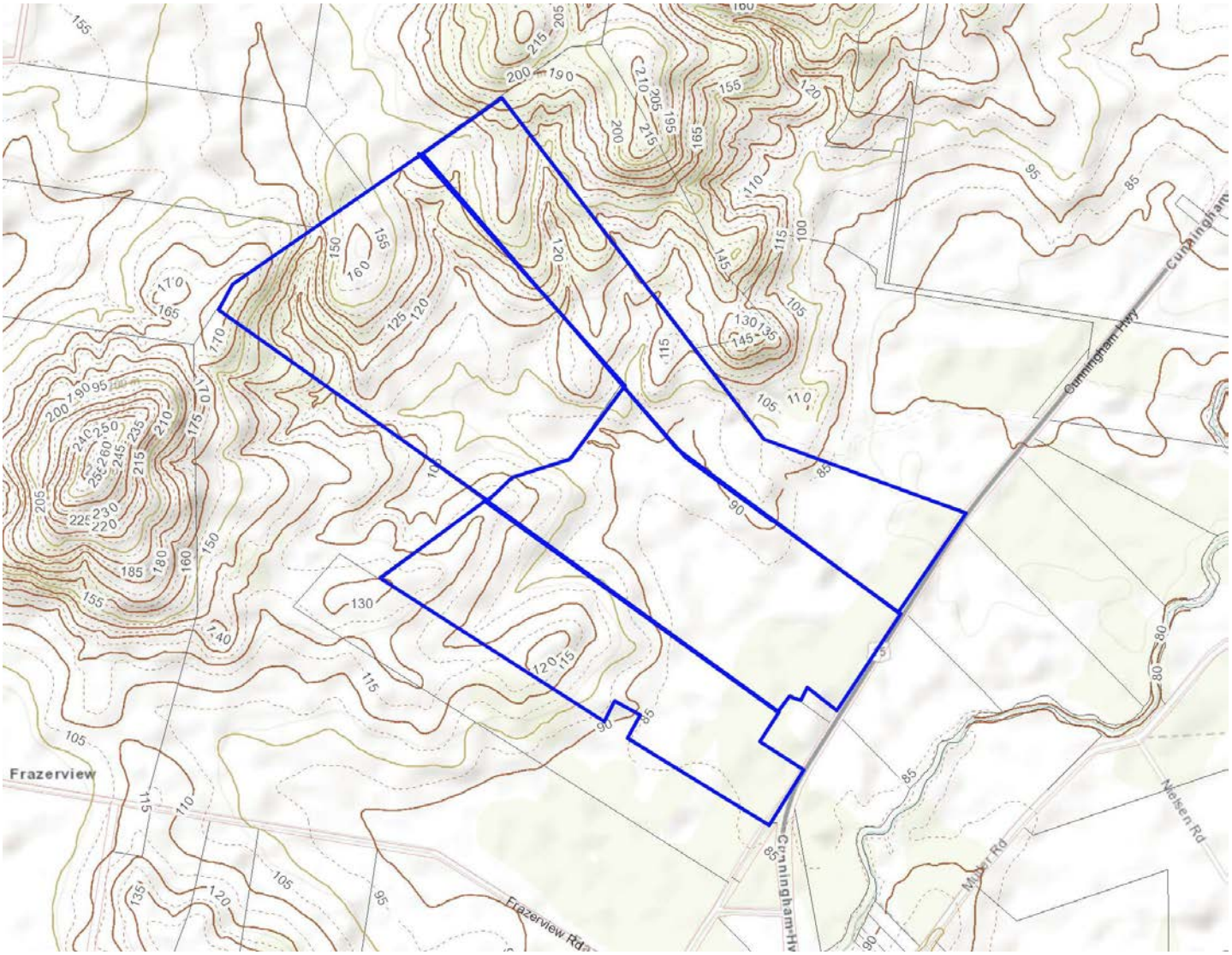


Figure 2

Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024 is currently zoned Rural (Figure 3).

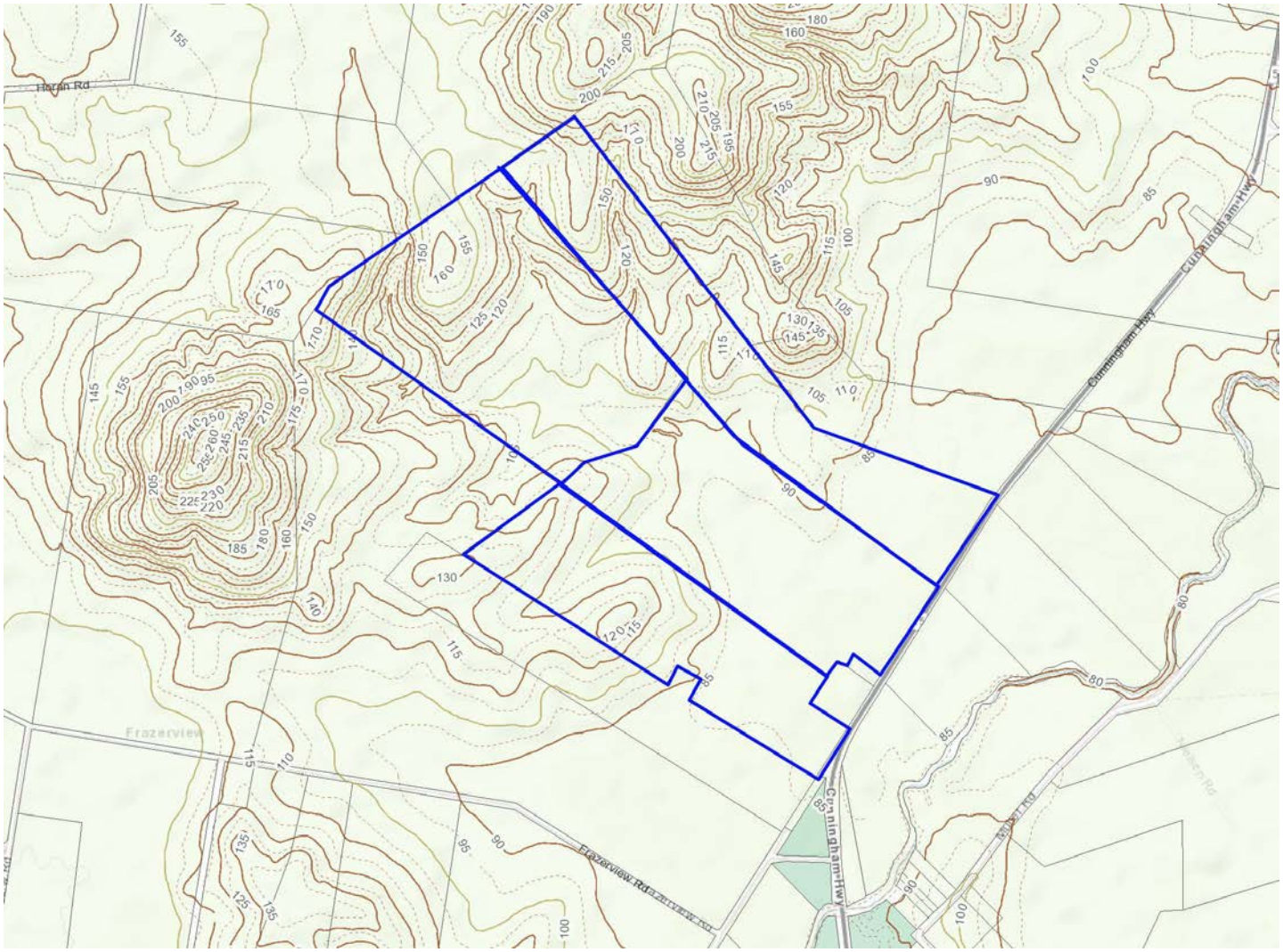


Figure 3

2.2 Proposed Development

The proposed development is a Scenic Rim Agricultural Industrial Precinct Project (SRAIP) (Figure 4).

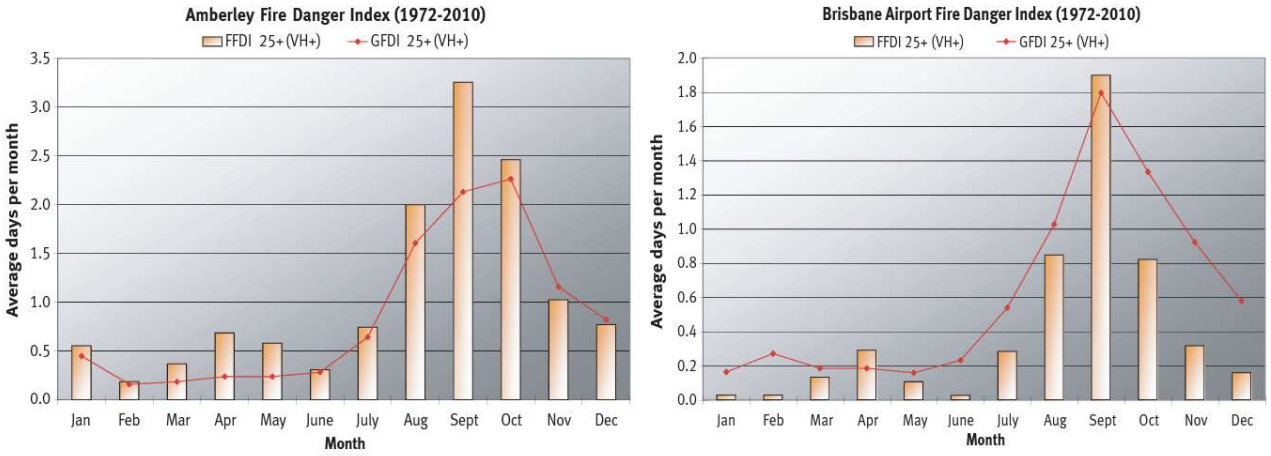
Figure 4

3. BUSHFIRE HAZARD AND RISK ASSESSMENT

3.1 Overview

Scenic Rim Regional Council is situated in Southeast Queensland, an area characterised by a mild sub-tropical costal climate which does not normally experience extended periods of server fire weather that are frequently experienced in southern Australia. The number of days each year characterised by weather conditions conducive to the ignition and rapid spread of a high intensity bushfire are limited. The Southeast Queensland (SEQ) fire season (when more severe wildfires normally occur) is generally recognised as September to December. In the southern part of SEQ, as indicated by analysis of fire weather data from Brisbane Airport and Amberley, August is also a period of elevated fire risk, and more significant than November which has a lower risk with the commencement of storm rains. September, the peak month for wildfires is characterised by frequent westerly winds, typically low rainfall, low humidity and increasing temperatures.

The graphic below illustrates the average number of days per month that were characterised by Forest Fire Danger Index (FFDI) of 25 or greater using data from the Amberley and Brisbane Airport weather stations for the period 1972 to 2010. FFDI of 25 is the base FFDI value for the Very High Fire Danger rating used in Queensland. This analysis indicates that on average there are less than 14 days per year where an FFDI of 25 or greater can be expected. For the rest of the year the prevailing meteorological conditions mean if a bushfire starts it can most likely be contained without significant risk to human health or property.



Consistent with the relatively low frequency of high risk bushfires in SEQ compared to southern states, the number of lives and houses lost as a result of bushfire is also relatively low. Not withstanding, bushfires still do frequently occur in Southeast Queensland and present a risk that needs to be considered as part of a comprehensive approach to land use planning and development.

3.2 Bushfire Hazard Assessment

3.2.1 Scenic Rim Planning Scheme Bushfire Risk Map

Figure 5 shows the bushfire hazard overlay mapping in the Scenic Rim Regional Council Planning Scheme.

Figure 5

3.2.2 SPP Natural Hazard Mapping

The State Government Single State Planning Policy (SPP) released in 2017, includes mapping that is an outcome of the new bushfire hazard mapping methodology developed by the CSIRO and the Queensland Government. The new Bushfire Prone Area mapping was found to have an average reliability of 85%. The new methodology provides a major improvement in Bushfire hazard mapping. The new modified approach calculates potential fire line intensity using total fuel loads, landscape slope and fire weather severity. A default 100-metre buffer was determined from analysis of heat and radiation decay curves and research that indicates 80% of housing loss and 80% of life loss occurred within 100 metres of bushland.

The subject site is identified on the State Planning Policy Natural Hazards Risk and Resilience mapping as being within Potential Bushfire Impact zone, requiring the bushfire hazard impacts be addressed (Figure 6).

Figure 6

3.3 Site Assessment

The site specific assessment of the bushfire hazard classification for the development at 6206 Cunningham Highway, Kalbar, Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024 and immediate locality has been completed based on a review of aerial imagery, topographic data, available vegetation mapping and a physical site inspection conducted on 21 August 2023. The site inspection was conducted to confirm and record the relevant information to determine the bushfire hazard in accordance with the requirements of the Scenic Rim Planning Scheme 2020. These assessments account for changes that will occur to the extent and nature of the vegetation types as a result of the proposed development at 6206 Cunningham Highway, Kalbar. The site specific assessments were based on the methodology specified in Australian Standard AS3959:2018 - Construction of Building in Bushfire Prone Areas. The classification of an area's Potential Bushfire Intensity takes into account three key variables:

- Total Fuel Load - primarily a function of the vegetation type(s) in an area.
- McArthur Forest Fire Danger Index (FFDI) - an index that considers variability in fire intensity associated with a range of weather variable including recent precipitation, current wind speed, relative humidity and temperature.
- Slope - an important variable controlling the rate of fire spread and fuel consumption.

3.3.1 Pre Development Vegetation

Table 1 shows the original vegetation on and about the site identified using the *Public Safety Business Agency (PSBA) State-wide Bushfire Hazard (Bushfire Prone Area)* mapping.

VHC Description	Regional Ecosystem (RE)	Site Specific Assessment of Presence	Potential Fuel Load (t/Ha) Surface	Potential Fuel Load (t/Ha) Total
1. VHC: 16.2 (Photo 1)	12.3.3 Eucalyptus tereticornis woodland on Quaternary alluvium	Original vegetation bounding Warrill Creek	11.2	11.6
2. VHC: 11.2 (Photo 2)	12.8.16 Eucalyptus crebra Â± E. melliodora, E. tereticornis woodland on Cainozoic igneous rocks	Original intermediate vegetation on lower slopes to the west. Original vegetation on elevated ground to the northwest.	11.5	13.0

Table 1

Photo 1

Photo 2

3.3.2 Classified Vegetation

Australian Standard, *Construction of Buildings in Bushfire Prone Areas* (AS 3959–2018*)* requires any classified vegetation within 100 metres of the proposed works must be assessed. Table 2 shows the vegetation on and about the site identified using the *Public Safety Business Agency (PSBA) State-wide Bushfire Hazard (Bushfire Prone Area)* mapping.

VHC Description	**Regional Ecosystem (RE)**	**Site Specific Assessment of Presence**	**Potential Fuel Load (t/Ha) Surface**	**Potential Fuel Load (t/Ha) Total**
1. VHC: 38.5 (Photo 3)	Discontinuous irrigated cropping and horticulture	Now the dominant feature of the Scenic Rim Agricultural Industrial Precinct.	1.5	2.0
2.VHC: 40.4 (Photo 4)	Continuous low grass or tree cover	Predominant vegetation on the north - western extent of Lot 2 RP44024 & Lot 2 RP20974.	4.5	5.0

Table 2

Photo 3

Photo 4

Based on the above, the Potential Fuel Loads available within and adjacent to Lot 1 on RP216694, Lots 2 to 4 on SP192221, Lot 2 on RP20974 and Lot 2 on RP44024 range from:

- a minimum of 1.5 associated with existing and proposed fuel load: to
- a maximum of 2.0 associated with ares of remnant vegetation located within 100m of the development.

The proposed composting use and ancillary amenities, office and plant and equipment storage are all within mapped areas of bushfire hazard. An onsite inspection has shown that the three areas shown on the SPP Bushfire hazard mapping can be removed using the following methodology:

Patches less than 3 ha are less likely to develop into a fully developed fire front due to the size and distance required for a significant fire front of high intensity. Where 0.5-2 ha, the effective fuel load is assumed to be decreased by 66% i.e. Fuel load (t/ha) X 0.34. If fireline intensity <4,000 kW/m = LOW HAZARD. (Leonard, J and Opie, K, 2017, Estimating the potential bushfire hazard of vegetation patches and corridors. CSIRO. https://publications.csiro.au/rpr/pub?pid=csiro:EP167343).

Area 1

Area 1 on Lot 15 on SP229448 is part of the Kangaroo Mountain Key Resource Areas (KRA141). The mapped vegetation has been disturbed and modified as a result of past and ongoing operations. Area 1 is sparsely vegetated and is an area of less than 2 Ha, not closer than 100 metres to any other classified vegetation (Figure 7).

Area 2 and 3

Area 2 and 3 are discrete and disturbed areas of less than 2 Ha and not closer than 100 metres to any other classified vegetation (Figure 7).

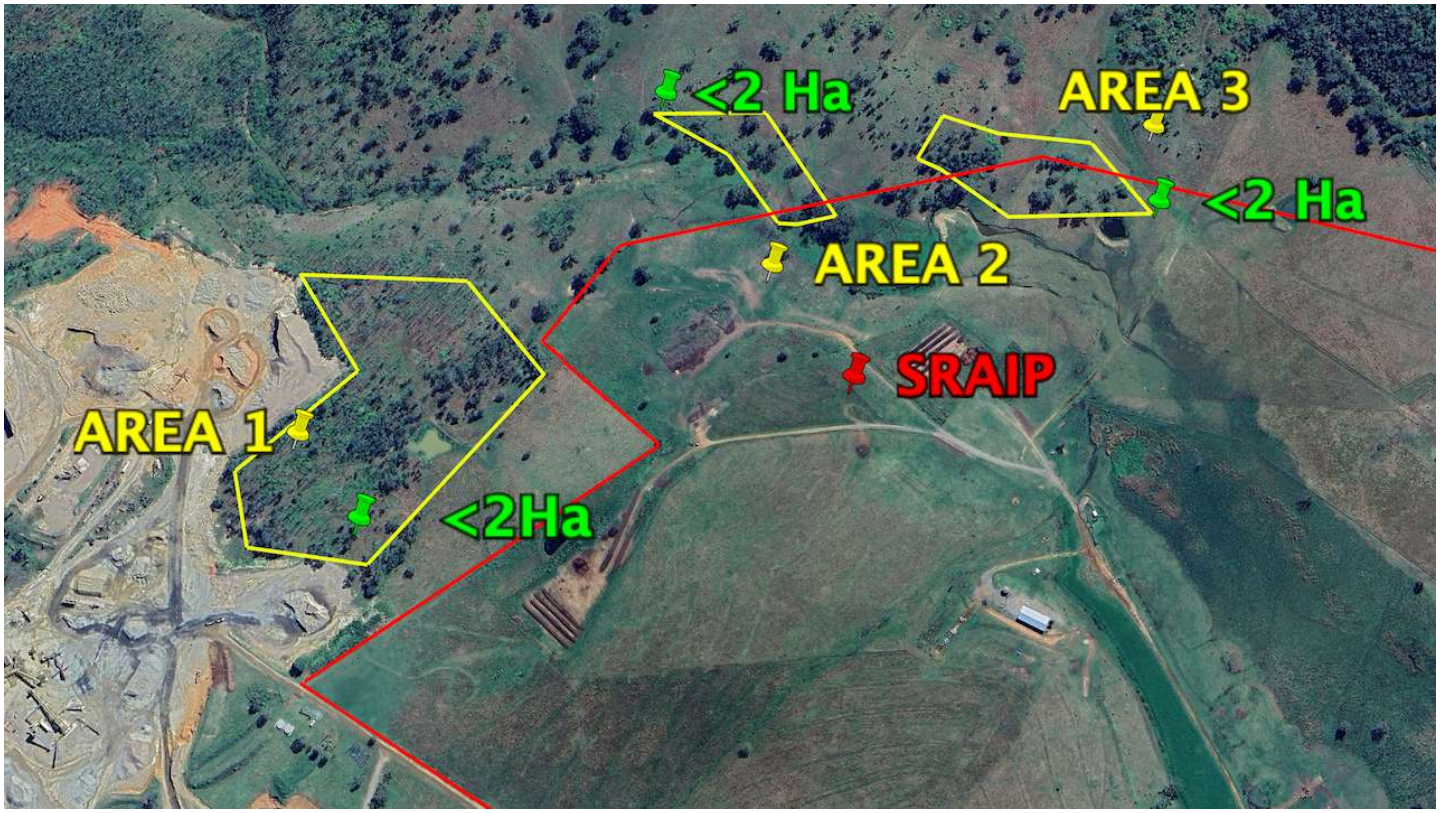


Figure 7

3.3.3 Forest Fire Danger Index

For land use planning purposes in Queensland the 1:20 year Forest Fire Danger Index, adjusted to reflect the expected climate in the year 2050, has been adopted as the design fire weather conditions. The FFDI for a 1:20 year is equivalent to a 5% annual exceedance probability (ie. 5% chance of occurring in any given year) and integrates the combined effect of a range of weather variables including long term dryness, recent precipitation, current wind speed, relative humidity and temperature.

The QFES Redi-Map Portal provides more refined mapping of FFDI (1 in 20 years) index values. Utilising this mapping the applicable FFDI for the development at 6206 Cunningham Highway, Kalbar has resulted in an FFDI for the development of 61. An FFDI of 61 falls within the Severe Fire Danger Rating (FDR) according to the FDR system developed by Australasian Fire Authorities Council (AFAC) and summarised in Table 3.

Fire Danger Rating	AFAC Description of Likely Fire Behaviour and Consequence
Catastrophic FFDI > 100	Fires will be uncontrollable, unpredictable and fast moving. These are the worst conditions for a bush or grass fire. If a fire starts and takes hold, it will be extremely difficult to control. It will take significant fire fighting resources and cooler conditions to bring it under control. Spot fires will start well ahead of the main fire and cause rapid spread of the fire. Embers will come from many directions. Homes are not designed or constructed to withstand fires in these conditions. The safest place to be is away from bushfire prone areas.
Extreme **FFDI 75-99**	Fires will be uncontrollable, unpredictable and fast moving. These are very hot, dry and windy conditions for a bush or grass fire. If a fire starts and takes hold, it will be unpredictable, move very fast. It will be very difficult for fire fighters to bring under control. Spot fires will start and move quickly. Embers may come from many directions. Homes that are prepared to the highest level, have been constructed to bushfire protection levels and are actively defended, may provide safety. You must be prepared physically and mentally to defend in these conditions. The safest place to be is away from bushfire prone areas.

Fire Danger Rating	AFAC Description of Likely Fire Behaviour and Consequence
Severe **FFDI 50-74**	Fires will be uncontrollable and move quickly .These are hot, dry and possibly windy conditions for a bush or grass fire. If a fire starts and takes hold, it will be hard for fire fighters to bring under control. Well-prepared homes that are actively defended can provide safety. You must be prepared physically and mentally to defend in these conditions.
Very High **FFDI 25-49**	Fires Can be difficult to control. Flames may burn into the tree tops. Theres is a chance people may die or be injured. Some homes and businesses may be damaged or destroyed. Well prepared and actively defended house can offer safety during a fire. Embers may be blown ahead of a fire. Spot fires may occur up to 2km ahead of the fire. Leaving is the safest option for your survival. Your home will only offer safety if it and you are well prepared and you can actively defend during a fire.
High **FFDI 12-24**	Fires can be controlled. Loss of life is highly unlikely and damage to property will be limited. Well prepared and actively defended houses can offer safety during a fire. Embers may be blown ahead of the fire. Spot fires can occur close to the main fire. Know where to get more information and monitor the situation for any changes.
Low-Moderate **FFDI <12**	Fires can be easily controlled. Little or no risk to life and property. Know where to get more information and monitor the situation for any changes

Table 3

Note: An FFDI of 61 specified for use in the SPP for land use planning purpose is higher than the FFDI of 40 specified in AS3959-2018 for all of Queensland for building design and approval purposes.

3.3.4 Slope Assessment

From a bushfire hazard perspective slope of the land under the bushfire prone vegetation can greatly influence fire behaviour. This slope is referred to as the **effective slope**. If the potentially hazardous vegetation is located upslope of the asset(s) the contribution that slope makes towards the intensity and rate of spread of the fire is negligible. **Site slope** is the gradient of the land between retained vegetation and adjoining assets. The site slope influences the 'view factor' of the flame geometries in Bushfire Attack Level models.

Where potentially hazardous vegetation is located downslope of the asset(s) the effective slope gradient of the vegetated land will have significant influence on bushfire intensity and rate of spread. Typically, for each 18-20% (or 10 degrees) increase in slope gradient the rate of forward spread and intensity of a bushfire will double for a fire moving up the slope towards an asset. Similarly if the fire is moving down the slope the rate of spread will decrease by approximately double for each 18-20% (or 10 degrees) increase in slope gradient. As the rate of spread of a bushfire increase so does its intensity.

The effective and site slope for the proposed development at 6206 Cunningham Highway, Kalbar were measured on site using a Nixon Forestry Pro II laser rangefinder/hypsometer as 6 (upslope) degree effective slope and 6 (upslope) degrees site slope.

NOTE: As fire travels slower down a hill, all classified vegetation that is upslope will assume a value of 0 degrees (i.e. flat land) *(AS3959:2018)*.

3.4 Bushfire Risk Assessment

3.4.1 Risk Classification

With reference to AS/NZS ISO 31000 Risk Management - Principles and Guidelines, The bushfire risk profile of an asset may be defined as "*the chance of something happening that will have an impact on objectives*" and can be qualified in terms of:

- **Likelihood:** the frequency with which it is expected a bushfire of a particular level of intensity will threaten an asset via smoke, embers, radiant heat or flame attack. This can be influenced by local environmental factors, fuel biomass and structure, density of potential ignition sources, fire management and intervention capability etc. , all of which can vary over time due to the influence of resource availability, weather and climate variability.
- **Consequences:** The nature and significance of the potential adverse outcomes for an asset exposed to a certain intensity of bushfire attack (eg. health effects, damage to structures, economic loss, interference with ecosystem processes, loss of biodiversity). This can be influenced by the vulnerability and resilience of the asset to bushfire exposure, the social, economic and environmental values of the asset, post fire recovery and prospects, costs and timeframes.

Assessing the risks to people and property posed by bushfires requires an understanding of the tolerances of people and property to different levels of bushfire attack, in particular attack by flames and radiant heat. For people there is generally no safe level of direct flame exposure and radiant heat is recognised as the biggest killer in a bushfire. Radiant heat levels increase with the increase in the proximity and intensity of bushfire.

The vulnerability of buildings and structures to bushfire attack is largely determined by:

- The material used in their construction.
- The severity and duration of the exposure to radiant heat or flame attack.

For land use planning purposes a maximum radiant heat flux exposure of 29 kW/m2 for residential dwellings on newly created lots is increasingly being recognised as the benchmark for an acceptable level of risk exposure. In this respect the building setback distance needed to achieve a 29 kW/m2 heat flux exposure:

- Reduces potential exposure to bushfire attack, particularly direct flame contact.
- Reduces the likelihood of piloted ignition due to radiant heat exposure.
- Provides opportunities for emergency access and operational space for firefighters before the arrival of a bushfire,
- Improves consistency between planning and building outcomes, thereby reducing the potential for conflicts between planning and building approvals.
- Avoids duplication and regulatory burden on home owners.

3.4.2 Bushfire Behaviour and Risk Exposure Modelling

For land use planning purposes, an important element of a "fit for purpose" method of assessing whether or not a proposed development provides a tolerable or acceptable level of bushfire risk is to consider likely bushfire behaviour and consequences for future residents, QFES personnel and built infrastructure under a design bushfire event. One method for assessing bushfire risk exposure levels examining the likely levels of flame, radiant heat and ember attack that people and property would be exposed to under a design fire event using the Australian Standard AS3959-2018: Construction of buildings in Bushfire Prone Areas - Bushfire Attack Level Method 2. This approach involves:

- **Step 1**: Determine the relevant FDI.
- **Step 2:** Determine the vegetation classification, fuel loads.
- **Step 3**: Determine the effective slope in degrees under the classified vegetation.
- **Step 4**: Determine the slope in degrees of the land between the site and the classified vegetation.
- **Step 5**: Determine the distance of the site from classified vegetation.
- **Step 6**: Determine the BAL rating using Method 2.

For the purposes of this assessment the relevant FFDI, classified vegetation types and slope characteristics used in this assessment are detailed in Section 3.3.2 and 3.3.4 of this Report.

3.4.3 Assessment of Bushfire Hazard

Australian Standard - *Construction of Buildings in Bushfire Prone Areas (AS 3959–2018)* requires that any classified vegetation within 100 metres of the proposed works must be assessed. Figure 9 shows the extent of the 100-metre separation zone (BAL Impact Zone).

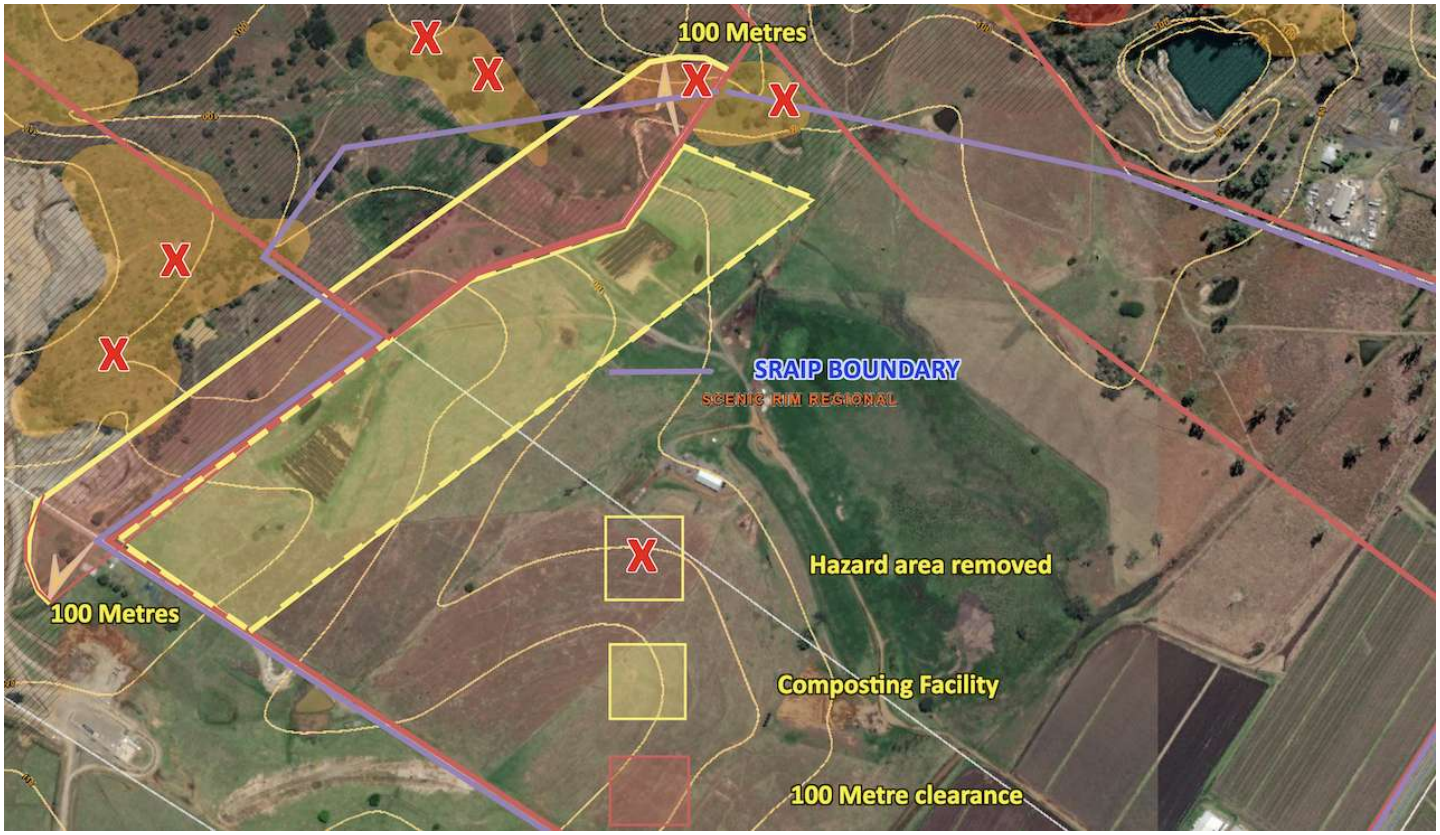


Figure 9

Calculations using AS 3959-2018, in accordance with Appendix B - *Detailed Method for Determining the Bushfire Attack Level (BAL) – Method 2 (Normative)*, indicate that at a separation distance of greater than 100 metres, infrastructure located on the proposed site will be exposed to a radiant heat flux of Nil kW/m2 equating to a Bushfire Attack Level (BAL) of LOW (Appendix 1). Table 4 describes the six (6) Bushfire Attack Levels.

Bushfire Attack Level (BAL)	Radiant Heat Exposure (AS3959)	Description of Predicted Bushfire Attack and Levels of Exposure
BAL - Low	Insignificant	The risk is very low, radiant heat on the building is insignificant to warrant specific construction requirements. However, ember attack may still occur.
BAL 12.5	0 to 12.5kW/m2	Primarily risk of ember attack. Risk of radiant heat is considered low.
BAL 19	12.5 to 19kW/m2	Risk is considered moderate with increasing levels of ember attack and burning debris ignited by wind borne embers. Increasing likelihood of exposure to radiant heat.
BAL 29	19 to 29kW/m2	Risk is considered to be high. Increasing levels of ember attack and burning debris ignited by wind borne embers. Increasing likelihood of exposure to radiant heat.
BAL 40	29 to 40kW/m2	Risk is considered to be very high. Increasing levels of ember attack and burning debris ignited by wind borne embers. Increasing likelihood of exposure to radiant heat and some direct exposure to flames possible.
BAL FZ	40kW/m2 plus (flame contact)	Risk is considered to be extreme. Direct exposure to flame from the fire front is likely in addition to high levels of radiant heat exposure and ember attack.

Table 4

4. BUSHFIRE HAZARD AND RISK MITIGATION

Figure 11 illustrates that effective protection against bushfire can only be achieved by the integration of multiple measures. Removing the bushland (hazard) will remove the risk but this option is neither necessarily possible nor desirable. An acceptable level of protection of life and property can be achieved while still retaining and protecting biodiversity and the natural values of the bushland.

Figure 11

The appropriate mitigation and management of bushfire hazards and risks involves the integration of a combination of bushfire hazard mitigation measures during the design, construction and operational phase of any development, including:

- Ensuring development design, including the layout of roads and driveways and the location, size and orientation of residential lots and buildings, is responsive to bushfire hazards;
- Appropriate firefighting and management infrastructure is provided, including an adequate and accessible water supply, fire breaks and maintenance/access trails;
- Specifications and materials for building design and construction are in accordance with AS3959-2018 Construction of Buildings in Bushfire Prone Areas;
- Management of potentially hazardous vegetation taking into account the conservation values of that vegetation and the important role fire plays in the functioning of many Australian ecosystems;
- Landscape design and property maintenance requirements;
- Community awareness, education and training; and
- Identification of parties to be responsible for specific bushfire management tasks and actions.

The design of the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development at 6206 Cunningham Highway, Kalbar has been informed by the above. The following sections provide detail concerning some of the key design elements which have been incorporated into the design of the development to ensure an acceptable level of risk to human safety and property is maintained in the event of a bushfire occurring in the general locality. Where appropriate, details concerning measures that need to be taken during construction and occupational phases of the development are also provided.

4.1 Access and Evacuation

The intent of design requirements for roads is to provide safe egress for residents and access for attending firefighting vehicles. A road system that is compliant with guideline measures provides fire services with easier access to buildings, a safe retreat for firefighters and residents, and can provide a fire control line where hazard reduction and back burning can take place. In determining safe access to a site, consideration is given to the fire brigade vehicles which are required to access public and private roads. Given the size of these vehicles and the poor visibility in which they often operate, roads need to be designed to specific requirements, including road width, grade, cross-fall, weight capacity, passing bays and turnaround areas, all of which may vary depending on whether it is a perimeter, access, cul-de-sac or battle-axe road type. Egress and ingress to the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) - Kalfresh commit to constructing formalised access roads to the proposed composting activities on lot 19 to meet the Performance Outcomes and where possible Acceptable Outcomes, stipulated in the QFES Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial lots dated 03/2019.

4.2 Water Supply

Providing a sufficient water supply provides firefighters with the appropriate levels of water to undertake building defense. There are two options in which a site can be supplied with a sufficient water supply; from either reticulated water accessible via a hydrant, or a dedicated static water supply.A static water supply complying with AS2304 - 2011 will be established, hardstand area (concrete or construction standard gravel) allowing medium rigid vehicle (15 tonne fire appliance) access within 6 metre of the static water supply. The static water supply will be fitted with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50 mm ball valve and male camlock coupling).

4.3 Building Design and Construction

Buildings within the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) development at 6206 Cunningham Highway, Kalbar situated within 100 metres of areas of hazardous vegetation (ie. bushfire prone vegetation with the capacity to support bushfires with an intensity of 4000kW/m2 or greater under design fire weather conditions) need to be designed and constructed in accordance with AS3959-2018: *Construction of Buildings in Bushfire Prone Areas.* Calculations using the AS3959 - 2018 determine the intensity of the bushfire hazard mapped areas is less than 4 000 kW/m2.

4.4 Vegetation Management

The bushfire severity potential of an area can be substantially reduced by managing vegetation in a manner that reduces or removes potential bushfire fuel loads. This includes management of areas that are intended to provide a conservation function. The failure to manage vegetation fuel loads in conservation reserves can result in high intensity wildfires that have adverse ecological impacts for the reserve as well as creating an unnecessary hazard for adjacent urban areas.

Onsite vegetation and landscape management are important to maintaining low hazard conditions by:

- Limiting fuel accumulation;
- Reducing connectivity of fuels;
- Establishing and maintaining defendable space;
- Appropriate landscaping; and
- The proposed lot size of the development will constrain the development of any additional bushfire hazard.

Clearing - No classified vegetation exists on the site.

4.5 Landscape Design

Inappropriate landscape design in bushfire prone areas (ie. any land within 100m of bushfire prone vegetation) may expose a dwelling to increased levels of ember attack, radiant heat and flame contact. Well designed and maintained landscaping with appropriate plant species can actually help protect houses by:

- Reducing the amount of radiant heat received by a house;
- Reducing the chance of direct flame contact with the house;
- Deflecting and filtering embers; and
- Reducing flammable landscaping materials within the defendable space.

All vegetation material can burn under the influence of a bushfire, therefore landscape designs in bushfire prone areas should give careful consideration to:

- Species selection;
- Species planting proximity to assets and access paths relative to their flammability.
- Avoidance of both horizontal and vertical continuity of vegetation.

In general "mesic" plant species that have a higher leaf moisture content, less bark and a lower rate of leaf drop will assist with reducing available bushfire fuel loads thereby assisting in reducing the likelihood and severity of bushfire attack. The use of mesic plant species in combination with the following guidelines form the basis for a low risk landscape design in bushfire prone areas:

- Establish and maintain lawn or paved areas such as paths and/or pebble garden with herbs near to the house.
- Maintain cleared areas around all driveways, pathways, fire trails and roadways that may be need to used as access/egress route during a bushfire.
- Plant trees at least 5m from any dwelling house to allow clear access and minimise canopy overhang of roofs and associated accumulation of leaf litter.
- Space trees and shrubs to avoid the creation of continuous canopy that may carry fire.
- Prune lower limbs of trees to height of 2m above ground level.
- Avoid using confers, paperbarks (ie. Melaleuca species), stringy bark and ribbon bark eucalyptus in landscape planting.
- Avoid using organic mulch with preference given to non-flammable mulches such as scoria (light weight volcanic stone), pebbles, recycled crushed bricks.
- Regularly water landscape plantings to maintain plant health and moisture levels.

4.5 Fencing

Not applicable.

4.6 Community Awareness

Property owners are responsible for developing their own knowledge and understanding of the level of bushfire risk specific to their respective properties.
An e Emergency Response Plan will be developed for the SRAIP complex to provide preparedness and response to all potential impacts on the site.

The warning systems now implemented by Emergency Services and Local Authorities provide timely information and advice to occupants. Understanding what to do in the event of bushfire emergency is critical. Prior knowledge as to the steps to take during the lead up to a fire event, during the passage of bushfire, and what to do immediately after the fire front has passed is critical. The Rural Fire Service Queensland (RFSQ) ‘Bushfire Survival Plan’ provides detailed information on how to prepare for the bushfire season and how to take action to survive in the event of bushfire. A copy of this publication can be obtained from the RFSQ website. (https://ruralfire.qld.gov.au/Fire_Safety_and_You/Bushfire_Survival_Plan/)

5. COMPLIANCE ASSESSMENT

Bushfire Hazard Overlay Code - Scenic Rim Planning Scheme 2020 (Section 8.2.03)

Performance Outcomes	Acceptable Outcomes	Compliance
Access for Firefighting Appliances **PO1** All premises are provided with vehicular access that enables safe evacuation for occupants and easy access by fire-fighting appliances.	**AO1.1** Development has a driveway from a *constructed road* with: (1) a minimum vertical clearance of 4.8m; and (2) a minimum formed width of 3.5m. **AO1.2** (1) a driveway does not exceed a length of 60m from a constructed road; OR (2) where a driveway from a constructed road is longer than 60m, it is designed to accommodate turning bays for firefighting appliance vehicles in accordance with Queensland Fire and Emergency Services, *Fire Hydrant and vehicle access guidelines for residential, commercial and industrial lots (2019)*.	Kalfresh commit to constructing formalised access roads to the proposed composting activities on lot 19 to meet the Performance Outcomes and where possible Acceptable Outcomes, stipulated in the QFES Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots (03/2019).
All Development **PO1** Development is located where it is not at risk from bushfire hazard.	**AO1** A site specific assessment determines that bushfire hazard is unlikely on any part of the site affected by the development.	The Bushfire Hazard Assessment prepared by Queensland Bushfire Planning has determined the bushfire hazard will not impact the Scenic Rim Agricultural Industrial Precinct Project (SRAIP) Composting Facility.

Performance Outcomes	Acceptable Outcomes	Compliance
PO2 Development complies with a site specific Bushfire Management Plan (BMP), prepared by a *suitably qualified person* in accordance with **Planning Scheme Policy 4 - Bushfire Management Plans**. The BMP demonstrates: (1) that the safety of people and property in a bushfire event can be managed and risks mitigated; and (2) how the specific outcomes of this Code can be achieved.	**AO2** No Acceptable Outcome is prescribed.	Complies
PO3 Development does not increase the number of people living, congregating or working on land in a *bushfire hazard area*, unless a Bushfire Management Plan (BMP), prepared by a *suitably qualified person* in accordance with **Planning Scheme Policy 4 - Bushfire Management Plans**, demonstrates that the safety of people and property in a bushfire event can be managed and risks mitigated.	**AO3.1** Development does not increase the number of people living, congregating or working on land in a *bushfire hazard area*. **AO3.2** Development involving a *vulnerable use* is not established in a *bushfire hazard area*.	No bushfire hazard identified. No vulnerable use.

Performance Outcomes	Acceptable Outcomes	Compliance
PO4 *Emergency services* and uses providing community support services: (1) are able to function effectively and safely during and immediately after a bushfire hazard event; and (2) can demonstrate, by a Bushfire Management Plan prepared by a *suitably qualified person* in accordance with **Planning Scheme Policy 4 - Bushfire Management Plans**, that the safety of people and buildings in a bushfire event can be managed and lives protected during a bushfire event.	**AO4** *Emergency services* and uses providing community support services; (1) are not located in a *bushfire hazard area*; and (2) ensures the *development footprint*, including internal driveways between buildings and from buildings to the roadway, does not traverse a *bushfire hazard area*.	Not applicable.
PO5 Development does not cause: (1) an adverse risk to people, property and the environment due to the impact of bushfire on hazardous materials; and (2) excess danger or difficulty for emergency services to provide an emergency response or evacuation.	**AO5** Development involving the storage, handling or manufacture of hazardous materials is not located within a *bushfire hazard area*.	No bushfire hazard impact.
PO6 Landscaping and fuel sources within the bushfire prone area between hazardous vegetation and building envelopes does not increase the potential for bushfire hazard.	**AO6** Landscaping treatments and fuel sources within a bushfire prone area, and any hazardous vegetation and building envelopes are designed and managed to achieve: (1) a potential available fuel load which is less than 5 tonnes/hectare in aggregate; and (2) a fuel structure which is discontinuous.	Will comply.

Performance Outcomes	Acceptable Outcomes	Compliance
PO7 Development is designed to minimise vegetation clearing and avoid or minimise impacts on the natural environment and ecological processes.	**AO7** Development is located in an area that does not require the removal of *native vegetation*.	No native vegetation removal required.
PO8 Development outside reticulated water supply areas include a dedicated static supply that is available solely for fire-fighting purposes and can be accessed by fire-fighting appliances.	**AO8** A water tank is provided within 10 metres of each building (other than a class 10 building) which: (1) is either below ground level or of non-flammable construction; (2) has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: (a) 10,000 litres for residential buildings; (b) for industrial, commercial and other buildings, a volume specified in AS 2304–2011; (3) includes shielding of tanks and pumps in accordance with AS2304–2011; (4) includes a hardstand area (concrete or construction standard gravel) allowing medium rigid vehicle (15 tonne fire appliance) access within 6 metre of the tank; (5) is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50 mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines); and (6) is clearly identified by directional signage at the street frontage.	A static water supply complying with AS2304 - 2011 will be estanblished, hardstand area (concrete or construction standard gravel) allowing medium rigid vehicle (15 tonne fire appliance) access within 6 metre of the static water supply. The static water supply will be fitted with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50 mm ball valve and male camlock coupling.

Performance Outcomes	Acceptable Outcomes	Compliance
PO9 Where development is undertaken in an urban area or is for urban purposes a constructed perimeter road with reticulated water supply is established between the lot or building envelope and is readily accessible at all times for urban fire fighting vehicles. The access to the perimeter road is available for both fire-fighting and maintenance works for hazard reduction purposes.	**AO9.1** Lot boundaries or building envelopes are separated from hazardous vegetation by a public road which: (1) has a two-lane sealed carriageway clear of hazardous vegetation; (2) contains a reticulated water supply; (3) is connected to public roads at both ends and at intervals of no more than 500 m; (4) accommodates geometry, turning radii and vertical clearance in accordance with *Queensland Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines* and the Department of Transport and Main Roads' Planning and Design Manual; and (5) allows and does not impede access for fire-fighting and maintenance for fire-fighting purposes. **AO9.2** Where a reticulated water supply is available, fire hydrants are designed, sited and installed in accordance with AS2419.1-2009 Fire Hydrant Installations - System Design, Installation and Commissioning, and connected to a reticulated water supply, unless otherwise specified by the relevant water entity.	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
PO10 Where development is undertaken for non-urban purposes either a constructed perimeter road or a formed, all weather fire trail is established between the development (including lots or building envelopes) and the hazardous vegetation, and is readily accessible at all times for the type of fire-fighting vehicles servicing the area. The access to the perimeter road or fire trail is available for both fire-fighting and maintenance works or hazard reduction activities. hazard reduction purposes.	**AO10** Lot boundaries or building envelopes are separated from hazardous vegetation by a public road (as per AO19), or a fire trail which has: (1) a reserve or easement width of at least 20 metres; (2) a minimum trafficable (cleared and formed) width of 4 metres and no less than 4.8 metres vertical clearance, with 3 metres each side cleared of all flammable vegetation greater than 10 centimetres in height; (3) no cut or fill embankments or retaining walls adjacent to the 4 metres wide trafficable path; (4) the trail must be capable of accommodating a 10 tonne vehicle; (5) the balance 10 metre width of the easement has managed vegetation to remove major surface hazards; (6) turning areas and vertical clearances for firefighting appliances in accordance with Queensland Fire and Emergency Services' Fire hydrant and vehicle access guidelines; (7) a maximum gradient of 12.5 per cent (8) a cross-fall of no greater than 10 degrees; (9) drainage and erosion control devices in accordance with the standards prescribed in a planning scheme policy;	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
	(10) vehicular access at each end, which is connected to the public road network at intervals of no more than 500 metres; (11) designated fire-trail signage; (12) if used, has gates locked with a system authorised by Queensland Fire and Emergency Services; (13) if a fire trail, has an access easement that is granted in favour of council and Queensland Fire and Emergency Services; and (14) allows and does not impede access for firefighting and maintenance for firefighting purposes.	
PO11 Development is not located on slopes and land forms that expose people or property to an intolerable level of risk to life or property.	**AO11.1** Development along ridgelines, saddles and crests where adjacent slopes exceed 14 degrees is avoided. **AO11.2** Development is located where the effective slope is less than 5 degree downslope.	Not Applicable
PO12 To ensure the protection of peoples' lives and property, an area designated for revegetation or rehabilitation will not create an additional bushfire prone area.	**AO12.1** The dimensions and configuration of an area designated for revegetation or rehabilitation ensure the area does not have the ability to become a medium, high or very high bushfire prone area in the future; **OR** The landscaping treatments are designed to achieve; (1) potential available fuel load which is less than 5 tonnes/hectare in aggregate; and (2) fuel structure which is discontinuous.	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
	AO12.2 A landscape maintenance plan specifies long-term management arrangements necessary to ensure that: (1) potential available fuel load is maintained at less than 5 tonnes/hectare in aggregate; and (2) fuel structure remains discontinuous.	
PO14 Essential infrastructure is designed or located to minimise the creation of ignition sources that would increase the potential risk of bushfires to people and property.	**AO14** Major electricity infrastructure, electricity distribution and transmission networks within the bushfire hazard area, are managed in accordance with Electrical Safety Act 2002 and Regulation 2013.	Not Applicable
PO15 The safety of people and property are maintained by locating house site areas and other vulnerable uses on land or part of the land not affected or accessed by bushfire hazard.	**AO15.1** (1) Land that is subject to bushfire hazard is not subdivided for residential or rural residential purposes; or (2) Proposed lots are sited on land or part of the land that is determined as having low bushfire hazard by a Bushfire Management Plan prepared by a suitably qualified person in accordance with Planning Scheme Policy 4 - Bushfire Management Plans. **AO15.2** Additional lots are not created where the only vehicular access route is through a bushfire hazard area	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
PO16 Development is located and designed to incorporate a bushfire defendable space which achieves separation between buildings and hazardous vegetation necessary to reduce risk to an acceptable or tolerable level.	**AO16.1** Lots or building envelopes are separated from hazardous vegetation by a distance that achieves a radiant heat flux level at any point on the building or envelope respectively of; (1) 10kW/m² where involving a vulnerable use; or (2) 29kW/m² otherwise. **AO16.2** Building envelopes are provided that separate adjacent buildings or building envelopes by a distance of 8 metres.	Not Applicable
PO17 Lots are designed so that their size and shape allow for efficient emergency access to buildings for firefighting appliances.	**AO17** Private driveways within individual lots: (1) a length no greater than 60 metres from the street to the dwelling; or (2) where exceeding a length of 60m, provide a turning bay with an 8m radius adjacent to the proposed location of any buildings; and (3) have a minimum formed width of 3.5m; and (4) have a minimum vertical clearance of 4.8m; and (5) serve no more than 3 dwellings or occupied buildings.	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
PO18 Development minimises the risk of damage to life and property from bushfires, by providing: (1) permanent access for fire-fighting vehicles; and (2) an adequate water supply for fire fighting purposes	**AO18.1** Development involving the opening of a new road in a bushfire hazard area: (1) provides through roads; or (2) avoids cul-de-sac and dead end roads; and (3) ensures road design is capable of providing access for fire fighting and other emergency vehicles. **AO18.2** Development: (1) where reticulated water supply is available, incorporates a reticulated water supply that provides a reliable water supply that has a minimum flow and pressure of 10 litres per second at 200 kPa; or (2) where outside reticulated water supply areas, provides an accessible water tank that is provided within 10m of each building (other than a class 10 building) that (a) is either below ground level or of nonflammable construction; (b) has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: (i) 10,000 litres for residential buildings; (ii) for industrial, commercial and other buildings, a volume specified in AS 2304–2011; (c) includes shielding of tanks and pumps in accordance with AS2304–2011;	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
	(d) includes a hardstand area (concrete or construction standard gravel) allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank; (e) is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50 mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines); and (f) is clearly identified by directional signage at the street frontage. **AO18.3** Where a reticulated water supply is available, fire hydrants are designed, sited and installed in accordance with Queensland Fire and Emergency Services Fire Hydrant and Vehicle Access Guidelines, unless other specified by the relevant water entity.	
PO19 The development design: (1) minimises the area of development exposed to bushfire attack; and (2) establishes safe evacuation routes to achieve an acceptable or tolerable risk to people.	**AO19** The development: (1) minimises the length of the development perimeter exposed to, or adjoining hazardous vegetation; (2) avoids the creation of bottle-neck points in the movement network within the development; (3) establishes direct access to a safe assembly/evacuation area in the event of an approaching bushfire;	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
	(4) ensures roads internal and external to the development are designed to have sufficient capacity for the evacuating population, and minimise traffic congestion in the event of a bushfire; and (5) ensures access routes do not expose occupants to bushfire hazard. specified by the relevant water entity.	
PO20 Emergency services and community infrastructure are able to function effectively and immediately after a bushfire event.	**AO20** Access and egress routes are: (1) public roads; (2) are designed to be used in all weather conditions; and (3) allow provision for safe passage of a fire appliance in accordance with Queensland Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines.	Not Applicable

QUEENSLAND BUSHFIRE PLANNING

Appendices

QUEENSLAND BUSHFIRE PLANNING

APPENDIX 1

POTENTIAL BUSHFIRE ATTACK LEVEL

The Australian Standard, Construction of Buildings in Bushfire Prone Areas (AS 3959-2018) provides a suitable methodology for identifying assessable vegetation and determining the requirements for the construction of buildings in order to improve their resistance to bushfire attack from burning embers, radiant heat, flame contact and a combination of the three attack forms.

Determination of BAL

Step 1. Relevant Fire Danger Index

The PSBA bushfire hazard mapping identifies the FFDI as 61.

Step 2. Vegetation Classification - Fuel Loads

Patches less than 3 ha are less likely to develop into a fully developed fire front due to the size and distance required for a significant fire front of high intensity. Where 0.5-2 ha, the effective fuel load is assumed to be decreased by 66%
i.e. Fuel load (t/ha) X 0.34. If fireline intensity <4,000 kW/m = LOW HAZARD. (Leonard, J and Opie, K, 2017, Estimating the potential bushfire hazard of vegetation patches and corridors. CSIRO. https://publications.csiro.au/rpr/pub?pid=csiro:EP167343)
The vegetation type was classified as moist to dry eucalypt woodlands on basalt areas.

Available fuel weights were derived from *PSBA State – Wide Bushfire Hazard (Bushfire Prone Area) Mapping. Fuel weight was determined as: 4.42 (13.0 x .34) tonne/hectare.*

Fuel weights were determined as:

- 2.55 (7.5 x .34) tonne/hectare surface fuels
- 1.36 (4 x .34) tonne/hectare near surface fuels
- 0.17 (0.5 x .34) tonne/hectare elevated fuels
- 0.34 (1.0 x .34) tonne/hectare bark fuels
- Total fuel weight = *4.42 (13.0 x .34) tonne/hectare.*

Step 3. Determine the effective slope in degrees under the classified vegetation

The classified vegetation is upslope at 6 (upslope) degrees, calculated using a Nikon Forestry Pro Range Finder and Inclinometer.

Step 4. Determine the slope in degrees of the land between the site and the classified vegetation

The slope between the site and the classified vegetation is with an average slope of 6 (upslope) degrees.

Step 5. Determine the distance of the site from classified vegetation

Distance is calculated from the closest edge of the classified vegetation. Classified vegetation under AS 3959-2018 does not include low threat vegetation. The distance to the classified vegetation was calculated using a Nikon Forestry Pro Range Finder and Inclinometer at 100 (nominal) metres.

Step 6. Calculations

Effective slope (°) - 6 (upslope)

Site slope (°) - 6 (upslope)

Distance (m) - 100 (nominal)

Vegetation classification — moist to dry eucalypt woodlands on basalt areas

Forest Fire Danger Index (FFDI) – 61

Surface fuel load (t/ha) – 2.55 (7.5 x .34)

Overall fuel load (t/ha) – *4.42 (13.0 x .34)*

Heat of combustion (kj/kg) – 18 600

Flame temperature (K) – 1 200

Outcomes

Intensity (kW/m2) – 1 036

Radiant heat flux (kW/m2) – Nil

Bushfire Attack Level (BAL) - LOW

QUEENSLAND BUSHFIRE PLANNING

APPENDIX 2

About the Report Author

This Report was prepared by Bushfire Specialist Bernard Trembath. Bernard has extensive practical knowledge and experience in bushfire planning and management and an intimate working knowledge of Queensland vegetation and climate, particularly in relation to fire prediction and behaviour.

Prior to establishing Queensland Bushfire Planning in 2014, Bernard was the Regional Manager Rural Operations, Brisbane Region, for Queensland Fire and Emergency Services (QFES). As Regional Manager, Bernard was responsible for bushfire mitigation within the Brisbane Region, working with Local Governments and many other organisations to help reduce the impacts of bushfires. Bernard was also the QFES bushfire planning specialist, providing specialist bushfire planning and management advice on behalf of QFES.
Since 2014, Bernard has provided his specialist bushfire planning knowledge to advise and assist a large number of individuals, companies and government agencies. His happy clients include: