QUEENSLAND BUSHFIRE PLANNING

BUSHFIRE MANAGEMENT PLAN (BMP)

Property

409, 411, 415 and 427 Beckett Road, Bridgeman Downs
Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439

Prepared for: DTS
May 2026

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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.

QUEENSLAND BUSHFIRE PLANNING

EXECUTIVE SUMMARY

Queensland Bushfire Planning has been engaged on behalf of DTS to develop a site-based Bushfire Hazard Assessment and Bushfire Management Plan in relation to a Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development at 409, 411, 415 and 427 Beckett Road, Bridgeman Downs, Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439. 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 Brisbane City Plan 2014 - 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 Brisbane City Plan 2014.

As detailed in Section 5 the bushfire hazard and risk management measures that have been incorporated into the design of the proposed development at 409, 411, 415 and 427 Beckett Road, Bridgeman Downs, Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439, combined with the implementation of the additional recommended measures during the construction and occupational phase of the development should ensure compliance with the Brisbane City Plan 2014 - Bushfire Hazard Overlay Code.

In conclusion, the Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development at 409, 411, 415 and 427 Beckett Road, Bridgeman Downs, Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439 is a residential 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 for residents and emergency services will be via constructed access to Beckett Road.
2. Reticulated water will be provided to the reconfiguration.
3. Proposed buildings will be constructed to meet the requirements of the Australian Standard AS3959- 2018 - *Construction of buildings in bushfire-prone areas.* The Heat Flux impacts on individual lots will be established after operational works have been completed.
4. The vegetation on 409, 411, 415 and 427 Beckett Road, Bridgeman Downs will be managed and maintained in a low hazard state.
5. Fencing, where established, will be designed for the safe movement of fauna and be of non - flammable construction.
6. A bushfire information kit will be provided to residents to inform them of the bushfire risks and their roles and responsibilities for prevention, preparedness and response to any fire event.

1. INTRODUCTION

This Bushfire Management Plan (BMP) has been prepared on behalf of DTS for a Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development at 409, 411, 415 and 427 Beckett Road, Bridgeman Downs, Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439. The focus of this Report 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 Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development.
- In Section 3 an assessment of the bushfire hazards and risks that will be present within the Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development pre and post completion.
- In Section 4 details concerning the bushfire hazard and risk management measures that have been incorporated into the Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) 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 Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development against the requirements of the Brisbane City Plan 2014 - 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 Brisbane City Planning Scheme 2014

The Brisbane City Plan 2014 – Planning Scheme Policy Schedule 6.4: Bushfire Planning Scheme Policy. This planning scheme policy provides information required for a development application and guidance and advice for satisfying an assessment benchmark for the preparation of a site-specific or precinct-wide bushfire hazard assessment and bushfire management plans.

A bushfire management plan identifies the strategies a development is to implement for mitigating the impacts of bushfire on life, property and the environment. This includes identifying specific risk factors associated with the development, planning for the separation of at-risk elements and potential hazards, 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 409, 411, 415 and 427 Beckett Road, Bridgeman Downs and is described as Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439 within Brisbane City (Figure 1).

Figure 1

Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439 has an area of 48 231 (total) square metres and is aligned east-west with an easterly aspect (Figure 2).

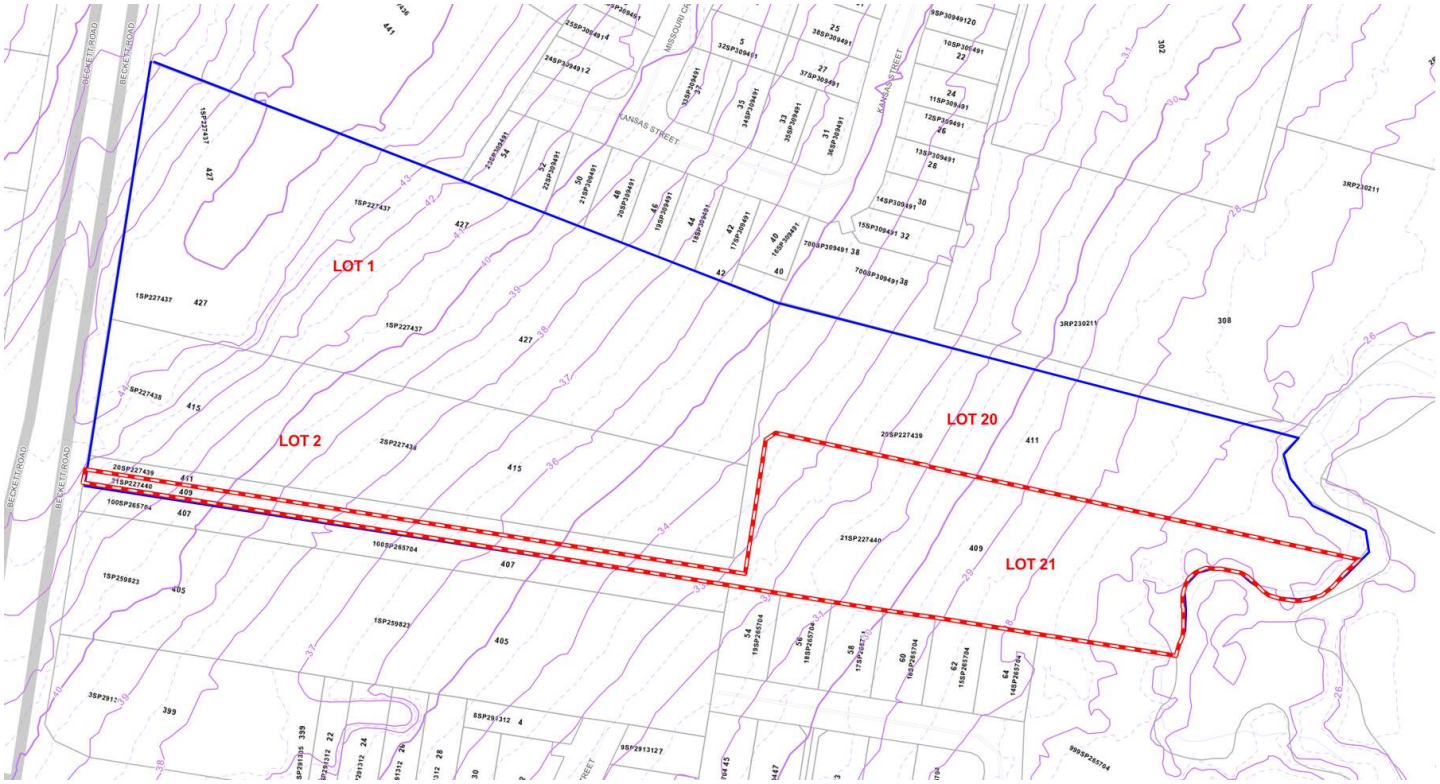


Figure 2

Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439 is currently zoned Environmental Management (Figure 3).

Figure 3

2.2 Proposed Development

The proposed development Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) (Figure 4).

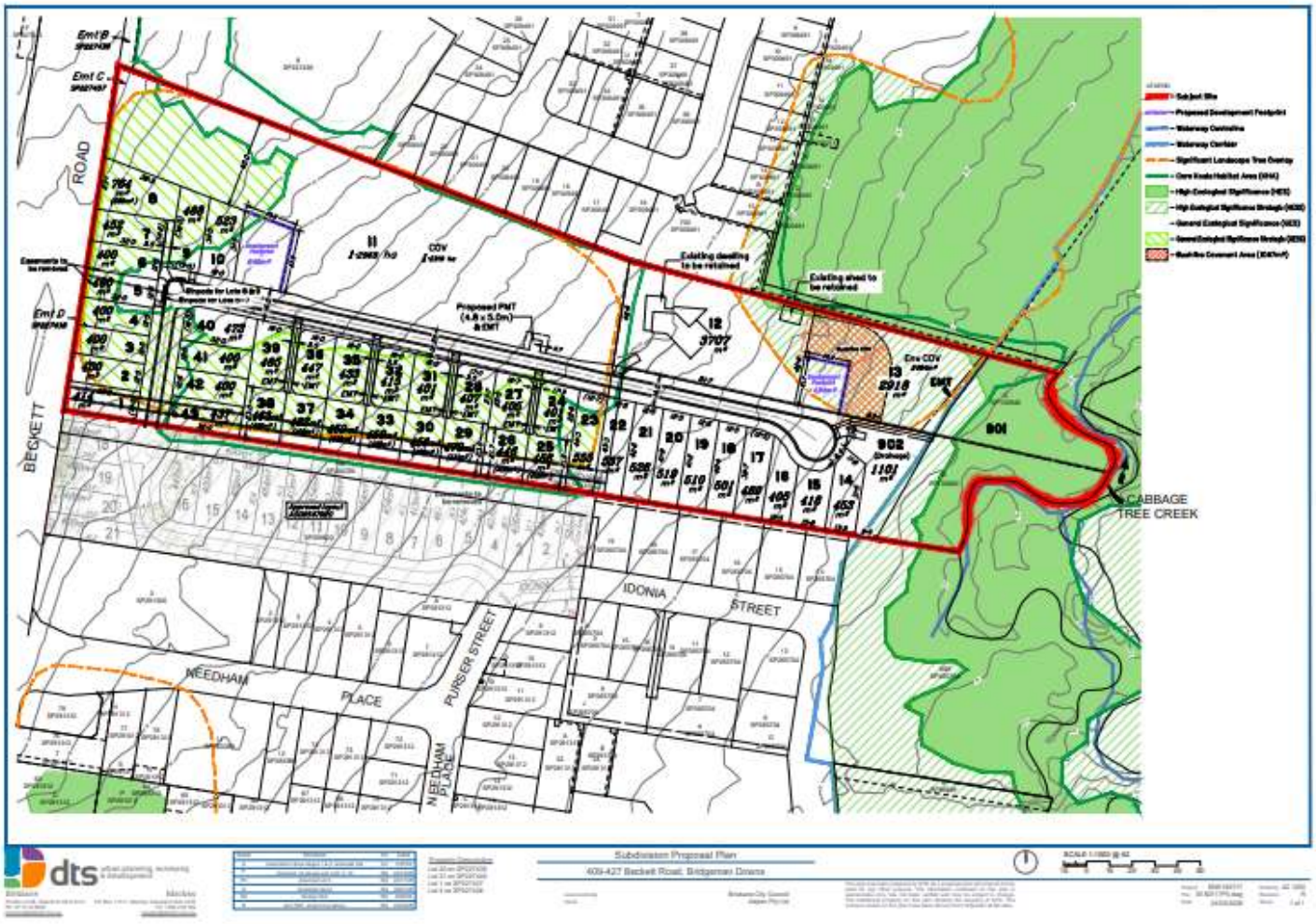


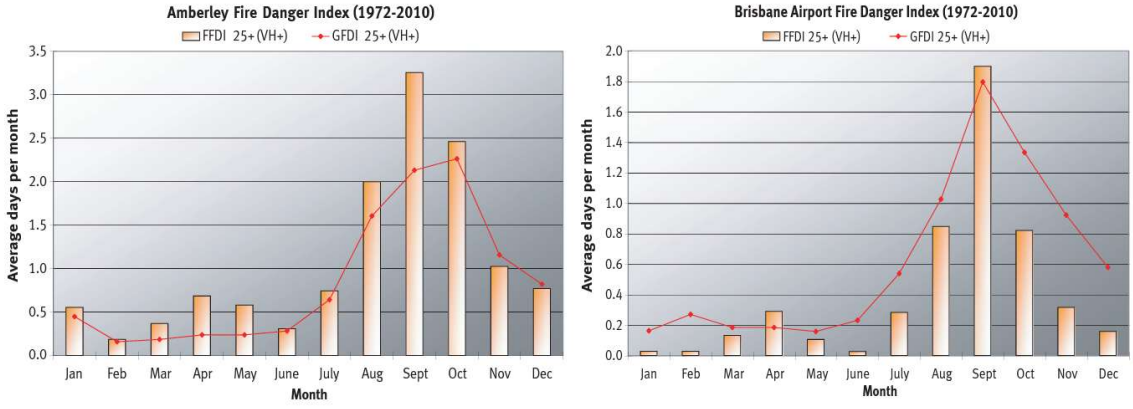
Figure 4

3. BUSHFIRE HAZARD AND RISK ASSESSMENT

3.1 Overview

Brisbane City 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 Brisbane City Planning Scheme Bushfire Risk Map

Figure 5 shows the bushfire hazard overlay mapping in the Brisbane City Planning Scheme.

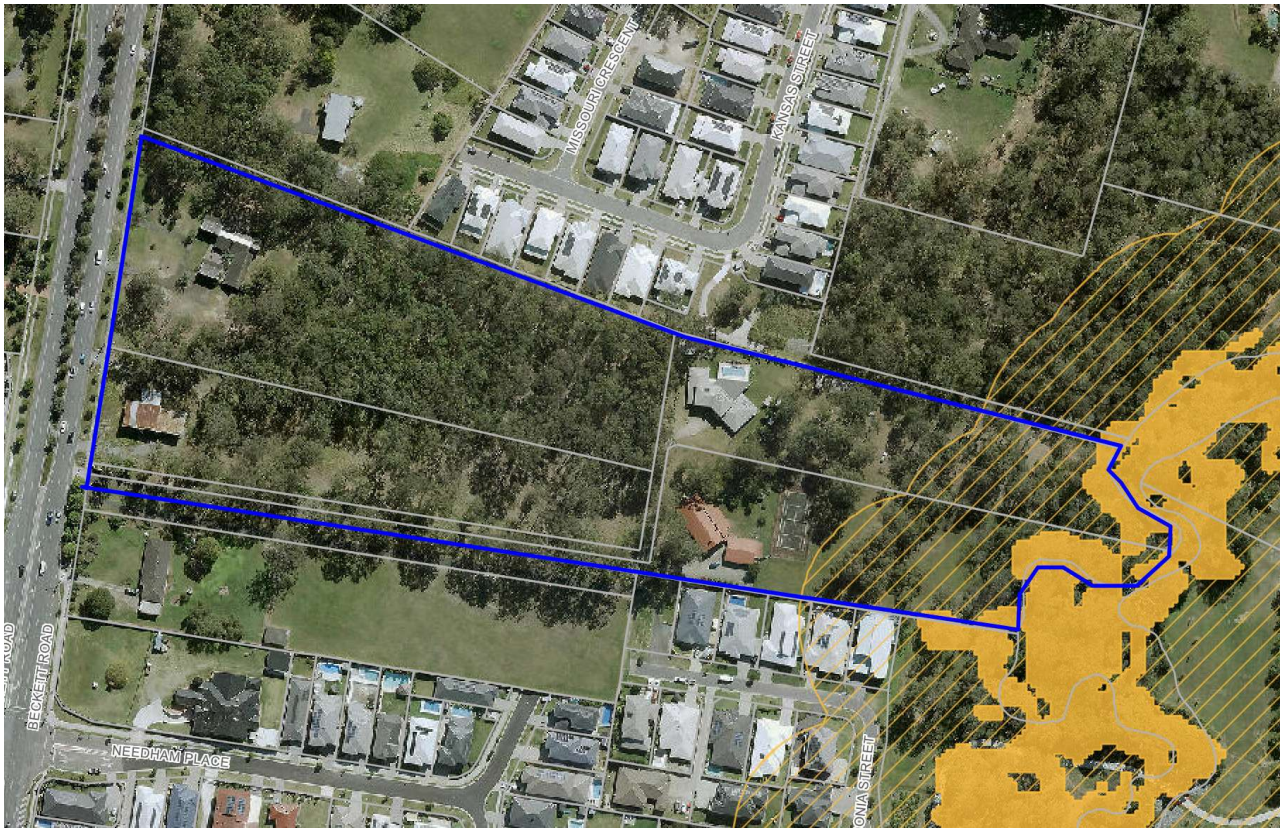


Figure 5

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).

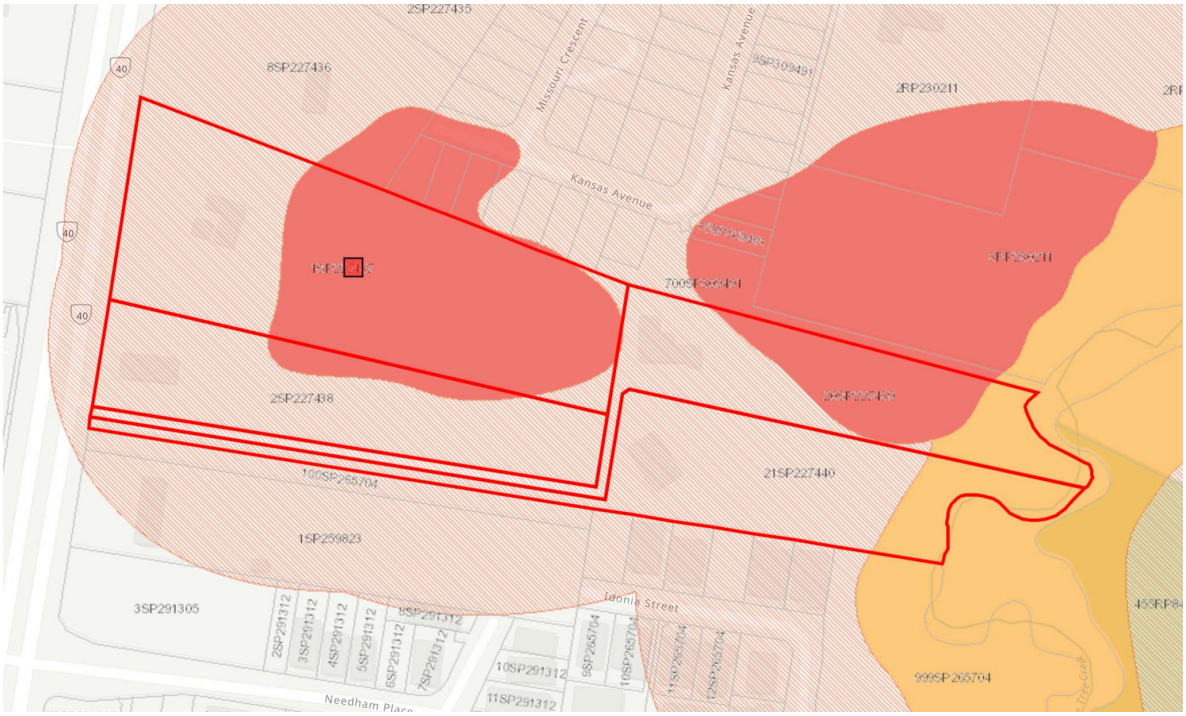


Figure 6

3.3 Site Assessment

The site specific assessment of the bushfire hazard classification for the development at 409, 411, 415 and 427 Beckett Road, Bridgeman Downs, Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439 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 25 September, 2024. The site inspection was conducted to confirm and record the relevant information to determine the bushfire hazard in accordance with the requirements of the Brisbane City Plan 2014. 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 409, 411, 415 and 427 Beckett Road, Bridgeman Downs. The site specific assessments were based on the methodology specified in Australian Standard AS3959:2018 - Construction of Building in Bushfire Prone Areas And

The site is located in an area of rapidly expanding Low Density Residential development and is bounded to the south by Cabbage Tree Creek. The Lots have been previously been utilised and managed as large Rural Residential style .
The Lots are bordered by recent Low density residential development to the North and South. Cabbage Tree Creek is predominantly a linear area of disturbed riparian vegetation managed for recreation and pedestrian/cycle routes. The area of vegetation adjoining to the north on Lot 3 RP230211 is now managed and maintained in a low hazard condition as directed by council, to reduce possible impacts on the residences on Kansas Street to the West.
Council advises that the current management is not considered long term and there fore the vegetation potential impact must be assessed. (Photo 3)

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: 9.1 (Photo 1)	12.5.3 Eucalyptus racemosa subsp. racemosa woodland on remnant Tertiary surfaces	Typical vegetation on lowlands and slopes.	21.0	24.2
2. VHC: 16.2 (Photo 2)	12.3.7 Eucalyptus tereticornis, Casuarina cunninghamiana subsp. cunninghamiana Â± Melaleuca spp. fringing woodland	Eucalyptus dominated woodland on drainage lines and alluvial plains.	11.6	11.1

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:40.4 (Photo 3)	Continuous low grass or tree cover.	Managed vegetation now present on Lot 3 on RP 230211.	4.5	5.0
2. VHC: 9.1 (Photo 3)	12.5.2a Corymbia intermedia, Eucalyptus tereticornis woodland on remnant Tertiary surfaces usually in coastal areas with deep red soils.	Vegetaion on adjoining Lot 13	11.1	11.6
3. 16.2 (Photo 4)	12.3.7 Eucalyptus tereticornis, Casuarina cunninghamiana subsp. cunninghamiana Â± Melaleuca spp. fringing woodland	Disturbed and modified Non-remnant Fringing vegetation on Cabbage Tree Ck.	11.1	11.6

Table 2

Photo 3

Photo 4 - Disturbed and modified fringing vegetation on Cabbage Tree Ck.

Based on the above, the Potential Fuel Loads available within and adjacent to Lot 1 on SP227437, Lot 2 on SP227438, Lot 20 and 21 on SP227439 range from:

- a minimum of 4.5 associated with existing and proposed fuel load: to
- a maximum of 16.0 associated with ares of remnant vegetation located within 100m of the development.

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 409, 411, 415 and 427 Beckett Road, Bridgeman Downs has resulted in an FFDI for the development of 56. An FFDI of 56 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. There 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 56 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 409, 411, 415 and 427 Beckett Road, Bridgeman Downs were measured on site using a Nixon Forestry Pro II laser rangefinder/hypsometer as 2.0 degree effective slope and 2.0 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). Cabbage Tree Creek is predominantly a linear area of disturbed riparian vegetation managed for recreation and pedestrian/cycle routes.

Risk of Hazardous Vegetation Within the Site

The small area of non-remnant vegetation to be retained on site is located on proposed Lot 12 (1 Ha approximately) has been identified as Vegetation Hazard Class (VHC) 9.1 12.5.3 - Eucalyptus racemosa subsp. racemosa woodland on remnant Tertiary surfaces. The area of vegetation subsequent to operational works and establishment of an identified BLE would not exceed 1Ha (Figure 7). An area of less than 1ha of continuous fuel and more than 100m from other continuous fuel is LOW HAZARD *(Brisbane City Council (BCC) Technical Assessment Guide -Bushfire reporting Small / Isolated Patches.*

Figure 7

The Vegetation fringing Cabbage Tree Creek is degraded and disturbed RE 12.3.7 originally *Eucalyptus tereticornis, Casuarina cunninghamiana subsp. cunninghamiana Â± Melaleuca spp. fringing woodland. VHC 16.2*

The potential BAL impacts of this vegetation is limited and will not exceed BAL 29 on the Lots at the eastern extent of the proposal (Lots 13+) (Figure 8)

Inputs		Outputs	
Fire Danger Index	56	Rate of spread	0.79 km/h
Vegetation Classification	Woodland	Flame length	6.58 m
Understorey fuel load	11.1 t/ha	Flame angle	67 °, 73 °, 79 °, 82 °, 83 ° & 87 °
Total fuel load	11.6 t/ha	Elevation of receiver	2.89 m, 2.95 m, 2.94 m, 2.84 m, 2.77 m & 1.99 m
Vegetation height	n/a	Fire intensity	4,789 kW/m
Effective slope	1 °	Transmissivity	0.882, 0.87, 0.851, 0.83, 0.8179999999999999 & 0.752
Site slope	1 °	Viewfactor	0.4035, 0.2969, 0.1989, 0.1345, 0.109 & 0.0297
Flame width	100 m	Minimum distance to < 40 kW/m²	8 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	10.9 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	16.2 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	23.6 m

Figure 8 (RE 12.3.7 - Cabbage Tree Ck.)

Risk of Hazardous Vegetation External to Site

Council has advised that the vegetation on Lot 13, currently managed fuel zone, is not considered to be managed in the long term (Photo 4).

Photo 4

The classified vegetation on Lot 3 will impact those Lots within 100 metres (Figure 9)

Figure 9

Inputs		Outputs	
Fire Danger Index	56	Rate of spread	1.35 km/h
Vegetation Classification	Woodland	Flame length	11.67 m
Understorey fuel load	17.5 t/ha	Flame angle	67 °, 73 °, 78 °, 81 °, 82 ° & 86 °
Total fuel load	24.2 t/ha	Elevation of receiver	4.88 m, 4.93 m, 4.77 m, 4.45 m, 4.24 m & 2.23 m
Vegetation height	n/a	Fire intensity	16,879 kW/m
Effective slope	2 °	Transmissivity	0.865, 0.847, 0.824, 0.8, 0.788 & 0.732
Site slope	2 °	Viewfactor	0.4124, 0.3044, 0.206, 0.1394, 0.1133 & 0.0305
Flame width	100 m	Minimum distance to < 40 kW/m²	13.8 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	18.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	26.9 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	37.5 m

Table 4

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 as shown in Table 4, a building located on the proposed site will be exposed to a radiant heat flux of refer table 4 kW/m2 equating to a Bushfire Attack Level (BAL) of (Appendix 1). Table 5 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 5

BAL Impacts

The 100 metre BAL impact is shown in Figure 8.

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 Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development at 409, 411, 415 and 427 Beckett Road, Bridgeman Downs 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.

Ultimately egress and ingress to the Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development will be via constructed access to Beckett Road. There is likely to be substantial warning of a major bushfire front approaching the development allowing site occupants sufficient time to implement their bushfire emergency plans.

4.2 Water Supply

Providing a sufficient water supply provides firefighters and residents with the appropriate levels of water to undertake building defense. There are two options in which a house site can be supplied with a sufficient water supply; from either reticulated water accessible via a hydrant, or a dedicated static water supply. Reticulated water will be supplied to the development meeting the required statutory standards.

4.3 Building Design and Construction

Buildings within the Reconfiguration of Lot (RoL), 4 into 43 Residential Lots and two drainage lots (Lot 901 and 902) development at 409, 411, 415 and 427 Beckett Road, Bridgeman Downs 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.*

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.

No classified hazardous vegetation will remain on the proposed development site. No classified hazardous vegetation impacting the proposal from adjoining Lots.

4.5 Residential Landscape Design

Inappropriate landscape design in bushfire prone areas (i.e. any land within 100 m 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

Fencing materials have the capacity to contribute to fire spread and intensity. It is recommended that non-combustible fencing materials should be used if required.

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. A household bushfire plan is required and must take account of matters such as where occupants are during the day (at home, work or school), if any occupants require special assistance (i.e. infants, the elderly or the ill), evacuation routes available, evacuation destinations, property maintenance and preparation and arrangements for pets. Planning ahead of any perceived bushfire event is essential.

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://bushfire-survival-plan.qfes.qld.gov.au/

5. COMPLIANCE ASSESSMENT

Bushfire Hazard Overlay Code - Brisbane City Plan 2014 (Section 8.2.5)

Performance Outcomes	Acceptable Outcomes	Compliance
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** 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.	The Bushfire Management Plan (BMP) prepared by Queensland Bushfire Planning (QBP) has assessed and identified the the level of bushfire hazard and the location of hazardous vegetation affecting the development.

Performance Outcomes	Acceptable Outcomes	Compliance
A. does not extend beyond the bounds of the existing development footprint; B. does not increase the GFA by 10% or 100m2, whichever is the greater; C. does not involve a new use on the site; D. is supported by a bushfire risk assessment prepared by a suitably qualified person with technical expertise in the field of bushfire hazard identification and mitigation, which demonstrates that the bushfire risk is acceptable.	**AO1.2** Development where not in compliance with an approved bushfire management plan or development footprint identifying the development footprint plan and bushfire management footprint plan: a. achieves a bushfire attack level that is less than or equal to: i. BAL-29; or ii. BAL-12.5 if for vulnerable uses, difficult to evacuate uses, assembly uses, essential community infrastructure or involving the handling or storage of hazardous chemicals exceeding the amount specified in Table 8.2.5.3.D.	BAL impacts do not exceed 29 kW/M2.
PO2 Development other than an extension to an existing building is sited, designed and maintained taking account of all relevant factors affecting the bushfire hazard on the site, including site topography, aspect, location and type and structure of vegetation to: a. minimise the number of buildings and people working, living or visiting a site exposed to bushfire risk; b. protect life during bushfire; c. increase the survival of buildings and structures during a bushfire; d. minimise bushfire risk from build-up of fuels around buildings and structures.	**AO2.1** Development is: a. sited in compliance with an approved development footprint identifying the development footprint plan and bushfire management footprint plan or bushfire management plan relevant to the full nature of the use; or b. if there is no approved development footprint identifying the development footprint plan and bushfire management footprint plan or bushfire management plan, where on a lot greater than 10 hectares, located in the area of lowest risk from bushfire on the site; and	The proposed development is not within a identified bushfire hazard area.

Performance Outcomes	Acceptable Outcomes	Compliance
	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 2,500m2: i. located away from ridgelines in compliance with Figure a; ii. located on land with a gradient less than 15%; iii. preferably located on east- to south-facing slopes and avoiding north- to west-facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffer area sub-category or the Medium hazard buffer area sub-category. **AO2.2** Development is sited within a building protection zone extending a minimum of 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; 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.	Development is not on ridgeline and on east facing land of less than 15% slope.

Performance Outcomes	Acceptable Outcomes	Compliance
PO3 Development utilises fencing that: **(a)** does not contribute to spread of bushfire **(b)** in an urban area or in proximity to accommodation uses; contributes to reducing bushfire hazard to the 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. **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.	Fencing, where established, will be designed for the safe movement of fauna and be of non - flammable construction
PO4 Development ensures that the location, siting, and design of development and associated driveways and access routes: **(a)** avoid potential for entrapment during a bushfire; **(b)** facilitate safe and efficient emergency services to access and egress the site during a bushfire; (c) enables safe evacuation of the site during a bushfire for site occupants.	**AO4** Development ensures that: the length of driveways or access (a) routes does not exceed 70m between the most distant part of any occupied building and the nearest part of the public road; or (b) where the length of the driveway or access route exceeds 70m: i. the driveway or private access route design meets the requirements of emergency vehicles in compliance with Table 8.2.5.3.C; ii. the driveway or access route provides all weather access for two-wheel-drive vehicles; iii. where relying on a private access route or driveway longer than 200m to reach a public road, a safe alternative access and egress route is provided.	Constructed roads will provide access to the lots on the proposed development.

Performance Outcomes	Acceptable Outcomes	Compliance
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.	Complies
PO6 Development makes adequate provision for fire-fighting requirements, including water supply.	**AO6** Development ensures that: (a) a reliable reticulated water supply and water pressure is available for fire-fighting requirements with water supply and pressure, which is in compliance with the standards specified by the relevant utilities provider; or: (b) where sufficient reticulated water supply is not available for: (i) residential lots, there is a minimum water supply available and retained for fire-fighting purposes in compliance with Table 8.2.5.3.B, which may be in the form of a separate tank or a reserve section as part of a main water supply tank; or development other than for residential lots involving new premises or an existing premise 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.	Reticulated water will be supplied in compliance with the standards specified by the relevant utilities provider.

Performance Outcomes	Acceptable Outcomes	Compliance
PO7 Development ensures that the water supply provided for fire-fighting is safely located and freely accessible for fire-fighting purposes at all times.	**AO7** Development, for which sufficient reticulated water supply is not available, provides: (a) a water supply outlet located away from any potential fire hazards, such as gas bottles; (b) a hardstand area of 11m by 3.5m for fire-fighting vehicles within 2m of the water supply outlet; c) tanks on the bushfire hazard side of the buildings with adequate shielding for the protection of fire fighters; (d) pumps which are shielded from bushfire hazard; (e) an outlet pipe which is 50mm in diameter and fitted with a 50mm male camlock (standard rural fire brigade fitting); (f) that any underground tank for fire-fighting purposes has an access hole of 200mm to allow a tanker to refill direct from the tank; (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.	Not applicable.

Performance Outcomes	Acceptable Outcomes	Compliance
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.	**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.	Not applicable
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.	**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, difficult to evacuate 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.	The vegetation present on Lot 3 will impact the development as a function of distance. Compliance with the requirements of the Australian Standard - *Construction of Buildings in Bushfire Prone Areas (AS 3959–2018)* will mitigate the risk and provide appropriate protection to residents

Performance Outcomes	Acceptable Outcomes	Compliance
	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.	Not applicable.
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.	No storage or handling of bulk hazardous materials proposed.

Performance Outcomes	Acceptable Outcomes	Compliance
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.	No essential community infrastructure proposed.
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	No essential community infrastructure proposed.

Performance Outcomes	Acceptable Outcomes	Compliance
	(c) implements an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that ensure that: i. essential community infrastructure is able to function during bushfire events; ii. access necessary to maintain safety or function of the development is not compromised by a bushfire; iii. mitigation measures are not unduly reliant on human activation to respond to a bushfire; iv. the safe storage of valuable records or items of cultural or historical significance, including storage of public records under the Public Records Act 2002, is able to be maintained during a bushfire event.	
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.	Not applicable.

Performance Outcomes	Acceptable Outcomes	Compliance
PO14 Development for a park is designed so that the park: **(a)** is practical to maintain and requires minimal resources to be restored to its designed function and condition after a bushfire; **(b)** provides for safe and efficient site evacuation and efficient emergency services access avoiding potential for entrapment during a bushfire; **(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.	**AO14** Development provides a park landscape plan that complies with a bushfire management plan prepared in accordance with the Bushfire planning scheme policy.	Minor park land development.
PO15 Development does not materially increase the number of premises exposed to unacceptable risk during bushfire events.	**AO15** Development does not materially increase the number of people living or working in the Bushfire overlay area.	Complies.

Performance Outcomes	Acceptable Outcomes	Compliance
PO16 Development is designed to: a. mitigate the risk of bushfire hazard to each lot; b. limit the spread of bushfire; c. achieve and maintain sufficient separation distance between development and hazardous vegetation to minimise bushfire hazard to future buildings during a bushfire; d. allow for emergency services access; e. locate buildings within a building protection zone	**AO16** Development requires that lot number, size, shape and layout allow for the siting of future buildings within the lowest hazard locations on the site being located: a. within a building protection zone in accordance with Figure b and Figure c; b. away from ridgelines and hilltop sites in compliance with Figure a; c. on land with a gradient less than 15%; d. preferably on east to south facing slopes and avoiding north to west facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffer area sub-category or Medium hazard buffer area sub-category.	Residential Lots will be located in low-hazard areas. Bal Impacts will not exceed 29kW/m². The proposed residence on Lot 13 will be established with an APZ designed to limit BAL impact to < 29kW/M2
PO17 Development promotes safe site access, avoids creating a potential entrapment situation and supports accessibility and manoeuvring for fire fighting during bushfires.	**AO17** Development provides a lot layout which: a. provides direct road access and egress for new lots to public roads, rather than the creation of easements; b. in an urban category, avoids creating a new lot less than or equal to 2,500m2 which directly adjoins hazardous vegetation; c. in an urban category, locates a future building protection zone to avoid a driveway of longer than 70m from the road frontage to a habitable building;	Lots will have direct access to public roads. Not adjoining hazardous vegetation. No driveways in excess of 70m.

Performance Outcomes	Acceptable Outcomes	Compliance
	d. in a rural category, provides for an alternative access where the private access roads or driveways are longer than 200m to reach a public road.	
PO18 Development ensures that the road layout and design provides: a. efficient emergency services access to sites and manoeuvring within the subdivision; b. safe and efficient movement of residents, workers and visitors out of the subdivision and away from an approaching bushfire; c. safe and efficient movement of emergency services into the subdivision; d. alternative egress routes considering the most likely bushfire scenarios; e. ongoing availability and maintenance of access and egress routes for the purposes of evacuation and emergency services access.	**AO18.1** Development involving a new road or fire maintenance trail is designed and constructed in compliance with: a. Table 8.2.5.3.C; or b. an approved bushfire management plan. **AO18.2** Development has a road layout and design which: a. provides for alternative access routes to the subdivision, by public roads that meet the requirements in Table 8.2.5.3.C and are able to access the arterial road network; b. excludes cul-de-sacs, except where a perimeter road with a cleared width of 20m isolates the development from hazardous vegetation; c. does not include dead-end roads or if a dead-end road is unavoidable, it is a maximum of 60m long, or 200m where located in the Environmental management zone, Conservation zone, Rural zone, or Rural residential zone, and an alternative emergency evacuation and egress route away from the most likely source of bushfire risk is provided for lots where multiple road access or exit points are not possible;	New roads will be constructed to BCC standards.

Performance Outcomes	Acceptable Outcomes	Compliance
	d. links road within the subdivision to, or provides for future links to roads in adjacent subdivisions.	
PO19 Development involving new premises provides adequate infrastructure to support fire fighting.	**AO19.1** Development involving new premises ensures that: (a) lots have access to reticulated water supply and water pressure available for fire-fighting requirements with water supply and pressure that accord with the standards specified by the relevant utilities provider; or (b) where reticulated water supply is not available for: a. 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; development other than residential lots, onsite a. water storage is provided which is appropriate to the proposed future use according to the standards specified by the relevant emergency services agency and is not less than 5,000 litres. **AO19.2** Development provides fire hydrants in accordance with Central SEQ Distributor-Retailer Authority, Queensland Urban Utilities (incorporating Water Services Association of Australia) standards.	All Lots will have access to reticulated water.

Performance Outcomes	Acceptable Outcomes	Compliance
PO20 Development is designed and constructed to reduce vulnerability to bushfire attack and addresses the bushfire hazard by a bushfire hazard assessment that: (a) utilises a fit for purpose methodology prepared in accordance with the State Planning Policy – State interest technical manual – Natural hazards, risk and resilience; (b) includes the following measures and inputs:i. potential fuel loads for vegetation in its mature state from areas subject to revegetation or regrowth vegetation; ii. a published vegetation hazard classification dataset from the relevant fire authority; iii. forest fire danger index of 54 (AEP 5%); iv. potential flame length; v. potential rate of fire spread. (b) is undertaken by a person suitably qualified and experienced with technical expertise in the field of bushfire hazard identification and mitigation, including protection of biodiversity values; (c) determines the relevant bushfire attack level for that part of the site in which development is proposed.	**A020.1** Development is designed and sited in compliance with an approved bushfire management plan relevant to the full nature of the uses, which identifies the level of future bushfire hazard and the location of future hazardous vegetation affecting the development. **AO20.2** Development other than ROL determines bushfire attack level using: (a) potential fuel loads for vegetation in its mature state from areas subject to revegetation or regrowth vegetation; (a) a published vegetation hazard classification dataset from the Relevant fire authority; (b) forest fire danger index of 54 (AEP 5%).	Bushfire Management Plan prepared by Queensland Bushfire Planning. The mature state fuel loads have been derived from vegetation hazard mapping as per the Bushfire Resilient Communities (BRC). The technical guidance in this document, Bushfire Resilient Communities (BRC), supports the State Planning Policy July 2017 (SPP) and associated State Planning Policy state interest guidance material –Natural hazards, risk and resilience – Bushfire (SPP guidance). The BRC identified the FFDI as 56

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Appendices

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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 (RE 12.5.2a Lot 13)

Step 1. Relevant Fire Danger Index

The PSBA bushfire hazard mapping identifies the FFDI as 56.

Step 2. Vegetation Classification - Fuel Loads

The vegetation type was classified as eucalyptus racemosa subsp. racemosa woodland on remnant tertiary surfaces. Available fuel weights were derived from *PSBA State – Wide Bushfire Hazard (Bushfire Prone Area) Mapping. Fuel weight was determined as: 24.2 tonne/hectare.*

Fuel weights were determined as:

- 17.5 tonne/hectare surface fuels
- 3.5 tonne/hectare near surface fuels
- 2.2 tonne/hectare elevated fuels
- 1.0 tonne/hectare bark fuels
- Total fuel weight = *24.2 tonne/hectare.*

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

The classified vegetation is downslope at 2.0 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 2.0 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 greater than 100 metres.

Step 6. Calculations

Effective slope (°) - 2.0

Site slope (°) - 2.0

Distance (m) - greater than 100

Vegetation classification — eucalyptus racemosa subsp. racemosa woodland on remnant tertiary surfaces

Forest Fire Danger Index (FFDI) – 56

Surface fuel load (t/ha) – 17.5

Overall fuel load (t/ha) – *24.2*

Heat of combustion (kj/kg) – 18600

Flame temperature (K) – 1200

Outcomes

Intensity (kW/m2) – 16 879

Radiant heat flux (kW/m2) – refer table 4

Bushfire Attack Level (BAL) - Table 4 *

*: Qld Govt Bushfire Resilient Communities technical guide

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APPENDIX 2

Determination of BAL (RE 12.3.7 Cabbage Tree Ck)

Inputs		Outputs	
Fire Danger Index	56	Rate of spread	0.79 km/h
Vegetation Classification	Woodland	Flame length	6.58 m
Understorey fuel load	11.1 t/ha	Flame angle	67 °, 73 °, 79 °, 82 °, 83 ° & 87 °
Total fuel load	11.6 t/ha	Elevation of receiver	2.89 m, 2.95 m, 2.94 m, 2.84 m, 2.77 m & 1.99 m
Vegetation height	n/a	Fire intensity	4,789 kW/m
Effective slope	1 °	Transmissivity	0.882, 0.87, 0.851, 0.83, 0.8179999999999999 & 0.752
Site slope	1 °	Viewfactor	0.4035, 0.2969, 0.1989, 0.1345, 0.109 & 0.0297
Flame width	100 m	Minimum distance to < 40 kW/m²	8 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	10.9 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	16.2 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	23.6 m

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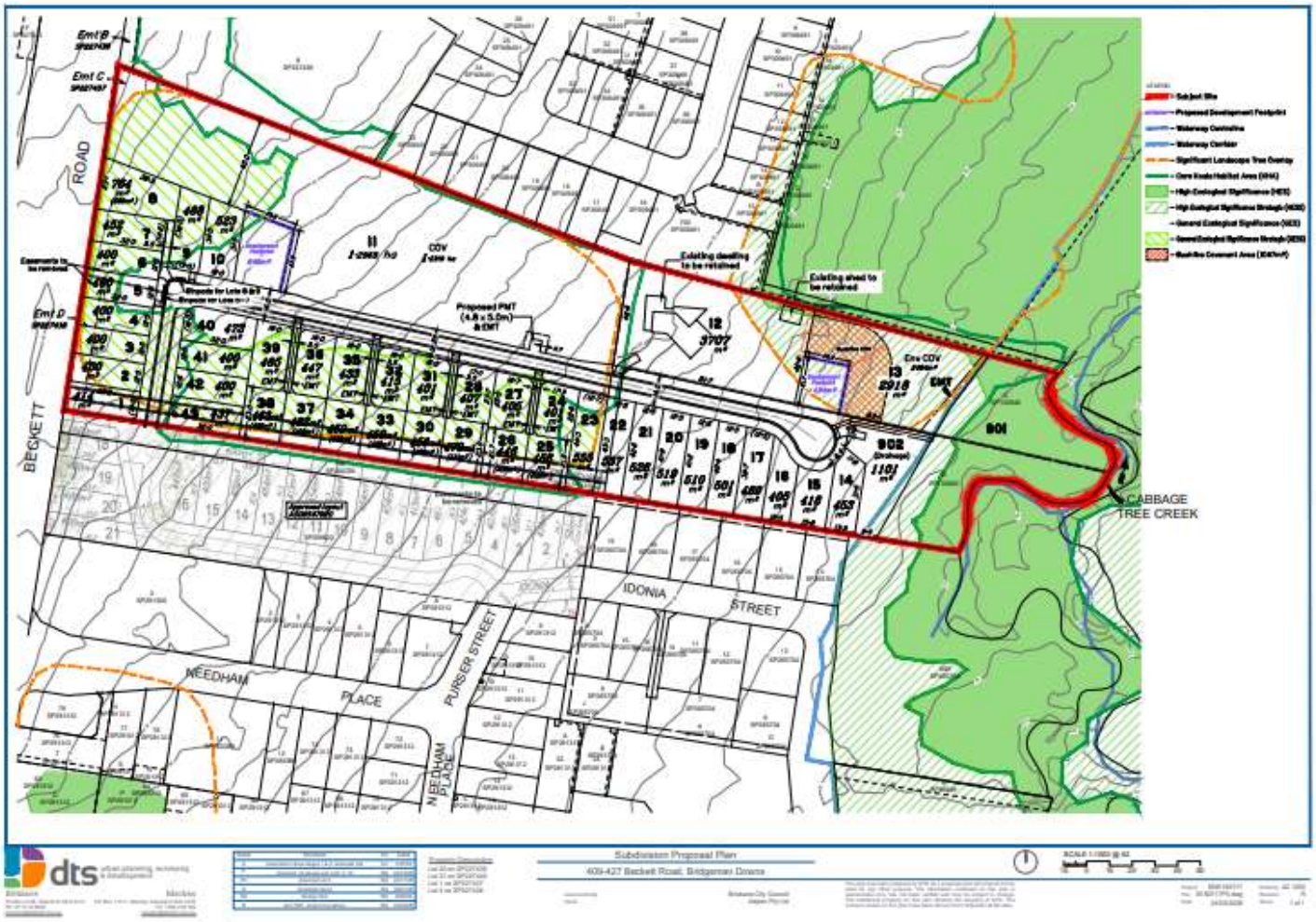
APPENDIX 3



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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: