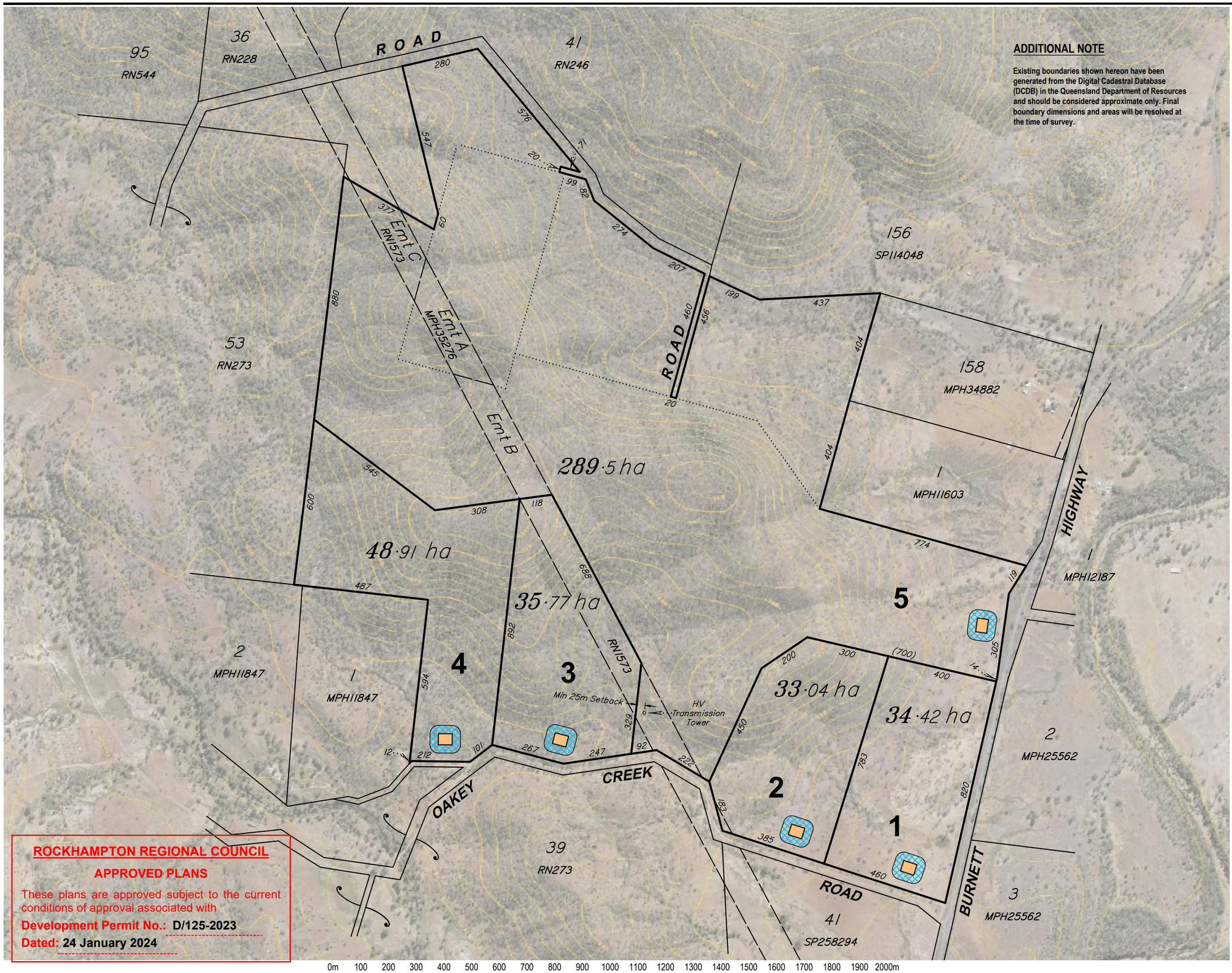

ADDITIONAL NOTE

Existing boundaries shown hereon have been generated from the Digital Cadastral Database (DCDB) in the Queensland Department of Resources and should be considered approximate only. Final boundary dimensions and areas will be resolved at the time of survey.

Denotes Proposed Building Location Envelope 50m x 40m & Asset Protection Zone 30m Wide

IMPORTANT NOTE

This plan was prepared to accompany an application to Rockhampton Regional Council and should not be used for any other purpose.

The dimensions and areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

In particular, no reliance should be placed on the information on this plan for any financial dealings involving the land.

This note is an integral part of this plan.

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/125-2023

Dated: 24 January 2024

client

Bronsan Pty Ltd

project

49600 Burnett Highway, Oakey Creek

plan of

Reconfiguration Plan
5 Lots into 5 Lots Realignment
(With QLD Globe Underlay)

rpd

Lot 1 on MPH11602, Lot 1 on MPH11649, Lot 1 on MPH11791, Lot 1 on MPH11839 & Lot 40 on RN228

lga

Rockhampton Regional Council

issue	date	details	authorised
A	25-08-2023	Initial Issue	RJKF
B	14-01-2024	Prop lots 3-5 amended, BLE & APZ added	RJKF

created

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scale: **1:12500 @ A3**

datum: **AHD 10m Contours**

sheet no.: **1 of 1**

cad file: **9106-01-ROL-B**

plan no.: **9106-01-ROL**

issue: **B**

Bushfire Hazard Assessment and Management Plan

4960 Burnett Highway, Oakey Creek

Prepared for Rod Harms Rural

Prepared by:

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: **D/125-2023**

Dated: **24 January 2024**

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In preparing this report we have assumed that all information and documents provided to us by the Client, or as a result of a specific request or enquiry, were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

In this note, a reference to loss and damage includes past and prospective economic loss, loss of profits, damage to property, injury to any person (including death) costs and expenses incurred in taking measures to prevent, mitigate or rectify any harm, loss of opportunity, legal costs, compensation, interest and any other direct, indirect, consequential or financial or other loss.

Document Records - Quality

TITLE	Bushfire Hazard Assessment and Management Plan for 4960 Burnett Highway, Oakey Creek
FILED AS	PR23290_BHAMP_4960 Burnett Highway, Oakey Creek_VerA

Version	Date	Revision Details/Status	Prepared by	Reviewed by	Approved
Version A	13/12/2023	Draft Issue to Client	MM	JA	Client

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FIGURES

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PLATES

Acronyms and Glossary

Terms	Definitions
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BCA	Building Code of Australia
BHA	Site-specific bushfire hazard assessment
BMP	Bushfire Management Plan
BPA	Bushfire Prone Areas
BRC	Bushfire Resilient Communities
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwth)
DES	Department of Environment and Science (QLD)
DOR	Department of Resources (QLD)
DSDILGP	State Development, Infrastructure, Local Government and Planning (QLD)
ERP	Emergency Response Plan
GTRE	Ground-truthed regional ecosystem
HSE	Health Safety and Environment
IPA	Inner Protection Area
OPA	Outer Protection Area
QDC	Queensland Development Code
QFES	Queensland Fire Emergency Services
RE	Regional ecosystem
SARA	State assessment and referral agency
SDAP	State development assessment provisions
Site	Refers to the area within which development, over- and under-ground services, access tracks and other associated infrastructure may be located.
Site boundary	The extent of the properties that the project is located within
SPP	State Planning Policy
VM Act	*Vegetation Management Act 1999* (Qld)

1 Introduction

1.1 Background

Green Tape Solutions was engaged by Rod Harms Rural to prepare a bushfire hazard assessment and management plan (BAMP) for a site located at 49600 Burnett Highway, Oakey Creek (formally described as Lot 1 on MPH11602, Lot 1 on MPH11649, Lot 1 on MPH11791, Lot 1 on MPH11839 and Lot 40 on RN228) (the 'site').

This report has been prepared for a development application for reconfiguring a lot for boundary realignment (five lots into five lots, consisting of four lots and one balance lot). Lot 1 on MPH11602, Lot 1 on MPH11649, Lot 1 on MPH11791 and Lot 1 on MPH11839. Currently situated on north of Lot 40 on RN228, these lots lack practical access due to their frontage being to an unformed, gazetted road. The proposed realignment relocates these lots to the southern side of Lot 40 on RN228, providing frontage and practical access from Oakey Creek Road. This shift aims to create more regular-shaped lots while increasing their sizes, without altering the physical land itself. The proposed development layout is provided in **Appendix 1**.

1.2 Site Description

Table 1 provides the detail of the development site. **Figure 2** depicts the location of the site.

Table 1: Property Information

Address	49600 Burnett Highway, Oakey Creek
Lot / Plan	Lot 1 on MPH11602 (Lot 1) Lot 1 on MPH11649 (Lot 2) Lot 1 on MPH11791 (Lot 3) Lot 1 on MPH11839 (Lot 4) Lot 40 on RN228 (Lot 5)
Area ($m^{2)}$	441.47 ha
LGA	Rockhampton Regional Council
Zone	Rural

The site is located on five lots comprising a total area of approximately 441.47 ha within the Rockhampton City Council (RCC) local government area **(Figure 1)**. The land abuts a State Controlled Road (Burnett Highway) to the west. The site is bounded by highly vegetated rural lots to the north west and south.

The boundary realignment does not change the existing level of risk of bushfire. Lots 1, 2 and 5 have areas outside of the mapped hazard for future use/dwelling house to be established. The land is situated in the foothills on the western side of the Mount Morgan Ranges, with undulating hills and rises throughout. Some of the land within the site is mapped as steep. The site contains three mapped various waterways, Matters of State Environmental Significance (MSES) and Matters of Local Environmental Significance (MLES) biodiversity areas.

A more detailed description of the vegetation communities within and surrounding the site is provided in **Section 3.1.2**

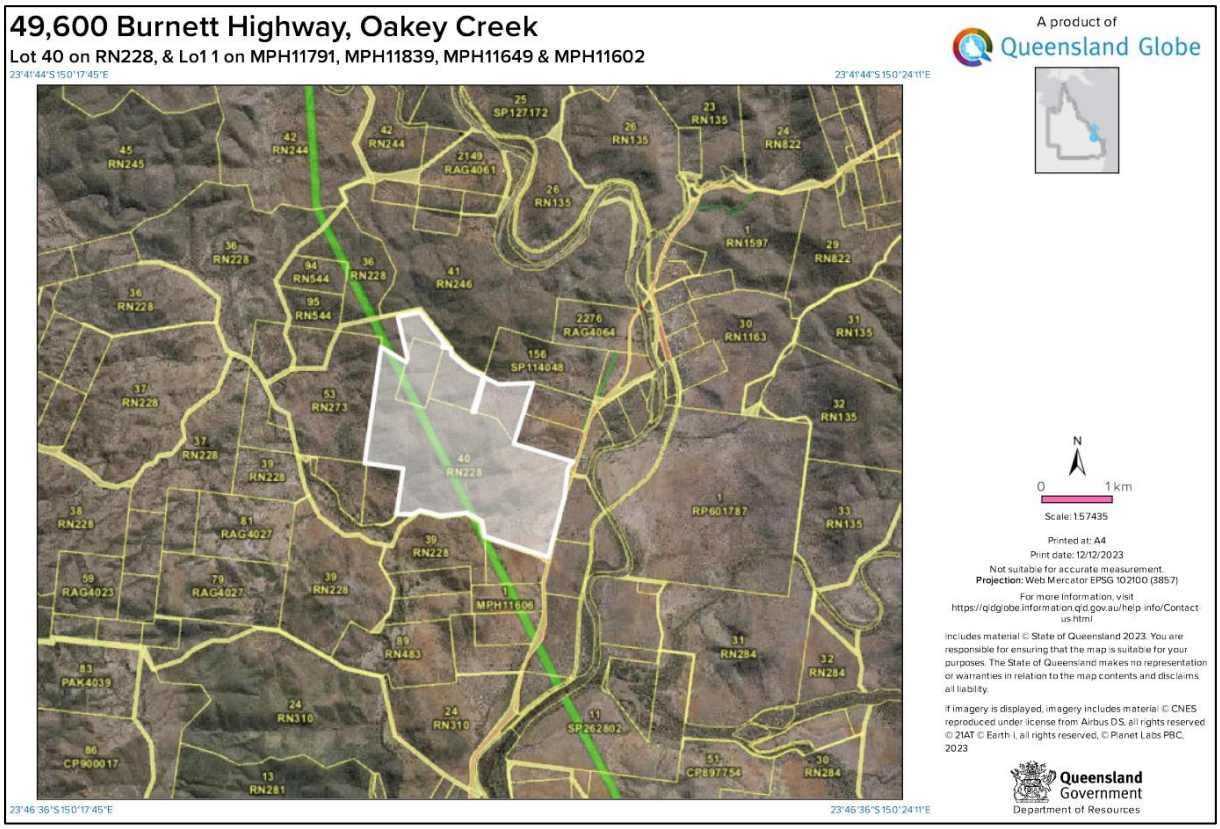

Figure 1 Site location (Source: Queensland Globe).

1.3 Scope of Work

The purpose of this BHAMP is to provide a site-specific assessment of bushfire hazard and to assess compliance of the proposed development with the outcomes sought by the Rockhampton Region Planning Scheme 2015 (Version 4.4), in particular the assessment benchmarks outlined in the Bushfire hazard overlay code. The BHAMP also provides a plan for bushfire risk management including building construction requirements, asset protection zones, fuel management, access requirements and emergency responses measures. Recommendations are consistent with legislative requirements to reduce the risk to life and property.

1.4 Qualifications and Experience

The Queensland Fire and Emergency Service (QFES) *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and resilience – Bushfire' October 2019* ('BRC Technical Guide') (QFES, 2019) provides guidance on suitably qualified people for assessments identified in the BRC Technical Guide. This guidance includes the following recommendations:

- Fine-scale assessment of vegetation communities in accordance with the 'Vegetation Hazard Class' assessment methodology be undertaken by a suitably qualified person with experience in botanical survey methods; and
- Applicant-initiated assessments and reports be prepared or peer-reviewed by suitably qualified and experienced people with degree (AQF Level 8) qualifications in environmental science, environmental management (or an equivalent discipline), demonstrated experienced in botanical surveys and spatial analysis methods, including use of geographic information systems (GIS) software); demonstrated experience in the assessment of bushfire hazard and risks or technical qualifications in environmental science, environmental management (or and equivalent discipline) and demonstrated relevant industry experience in the assessment of bushfire hazard and risks for a minimum of five years.

The author of this report meets Council and QFES' criteria as follows:

- possesses knowledge and experience in applying relevant legislation, plans, policies, standards and guidelines relating to bushfire hazard and fire ecology relating to Queensland requirements and Central Queensland conditions;
- has knowledge, experience in botanical survey methods and GIS analysis and at least 5 years' experience in undertaking bushfire hazard assessment and preparing bushfire management plans, including experience in undertaking fine-scale assessment of vegetation communities and application of the QFEs Bushfire Hazard Assessment methodology outlined in the BRC Technical Guide; and
- has qualifications and experience in the field of ecology, environmental management or similar to assess and protect site-based and strategic biodiversity values relating to Central Queensland.

2 Bushfire Regulatory Framework

Given that bushfire hazard can cause harm to people and social wellbeing, damage to property and impacts to the economy and environment, the management of bushfire hazard in Queensland is considered an integral component of land use planning and development decisions.

There are three regulatory mechanisms/instruments applicable to the site that regulate development to avoid and mitigate potential impacts associated with bushfire hazard:

- State Planning Policy (SPP) and associated guidelines (Department of Infrastructure, Local Government and Planning (DILGP), July 2017);
- Rockhampton Region Planning Scheme 2015 (Version 4.4); and
- Australian Standard AS3959:2018 – Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018).

2.1 National Construction Code

The National Construction Code 2022 (NCC 2022) sets out requirements for the design and construction of a building in Australia, including minimum required levels for the safety of certain buildings. The NCC contains additional requirements for the construction of buildings in designated bushfire prone areas, to address additional risks posed by bushfire attack. The NCC is given legal effect through the *Building Act 1975* (Qld) and is varied through amendments to the *Building Regulation 2006* that adopts the Queensland Development Code (QDC). Rockhampton Regional Council's Bushfire hazard overlay mapping designates bushfire prone areas for the purposes of the National Construction Code, the *Building Regulation 2006* and the Queensland Development Code (QDC).

2.2 State Planning Policy (SPP)

The SPP identifies the Queensland Government's policies about matters of state interest in land use planning and development (Department of Infrastructure, Local Government and Planning (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 'BRC – Technical Reference Guide for the State Planning Policy State Interest - Natural Hazards, Risk and Resilience – Bushfire ('BRC Technical Guide') (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.

The SPP assessment benchmarks outlined in Part E of the SPP and Section 4.0 of the SPP guidance apply to development to the extent that the development is assessable against a planning scheme and only to the extent that the planning scheme is inconsistent with the SPP.

The SPP is also supported by a state-wide map of bushfire prone areas (BPA) (also referred to as 'bushfire hazard area') that was developed based on the CSIRO modelling of potential fireline intensity using the methodology described by Leonard *et al.* (2014). The BPA mapping identifies areas of Very High (>40,000 kW/m), High (20,000 – 40, 000 kW/m) and Medium (4,000 – 20,000 kW/m) Potential Bushfire Intensity. The Potential Impact Buffer includes all land within 100 metres of any area with a potential fireline intensity greater than 4,000 kW/m (i.e. medium, high or very high bushfire hazard/potential bushfire intensity). This mapping triggers assessment against the State Planning Policy Assessment Benchmarks.

An excerpt from the SPP Assessment Benchmark – BPA mapping published on the SPP Interactive Mapping System (IMS) is provided in **Figure 2**. The site and surrounds is mapped as containing areas of Very high, High and Medium Potential Bushfire Intensity and Potential Impact Buffer.

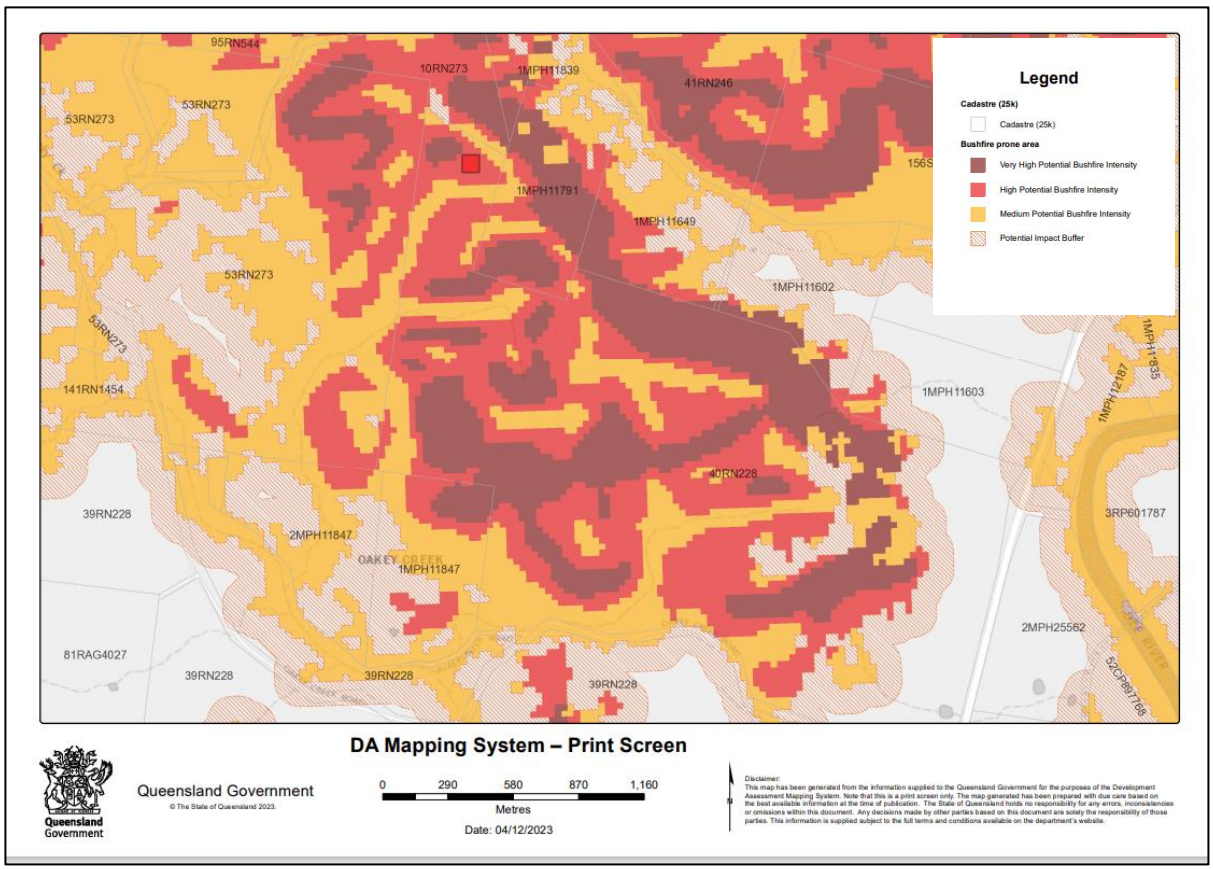

Figure 2 Excerpt from DSDMIP SPP IMS – Bushfire prone area (Source: DSDMIP SPP IMS).

2.3 Rockhampton Region Planning Scheme 2015

The site is located within the Rockhampton City local government area and is subject to the provisions of the Rockhampton Region Planning Scheme 2015. The planning scheme's Bushfire hazard overlay maps the site and surrounds as containing areas of Very high, High and Medium Potential Bushfire Intensity and Potential Impact Buffer. An excerpt from the overlay map identifying the mapped bushfire hazard areas in relation to the proposed development site is shown in **Figure 3.**

Rockhampton Regional Council's Bushfire hazard overlay mapping designates bushfire prone areas for the purposes of Section 7 of the Building Regulation 2021. The provisions of the Building Code of Australia (BCA) or Queensland Development Code (QDC) are applicable to any building assessment work in a designated bushfire prone area.

The Rockhampton Region Planning Scheme Bushfire hazard overlay Code requires that development addresses the bushfire hazard determined by a site-specific bushfire hazard assessment based on vegetation existing within, adjacent and nearby to the site including any areas subject to, or likely to be subject to, ecological restoration (e.g., Council waterway corridors), revegetation or regrowth, which are to be assessed as if these areas have reached their mature state.

The State Planning Policy states that bushfire hazard assessments should be based on the approved methodology outlined in the Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire' October 2019 (BRC) document.

Therefore the site-specific bushfire assessment provided in this plan has been undertaken in accordance with the BRC Technical Guide (QFES, 2019).

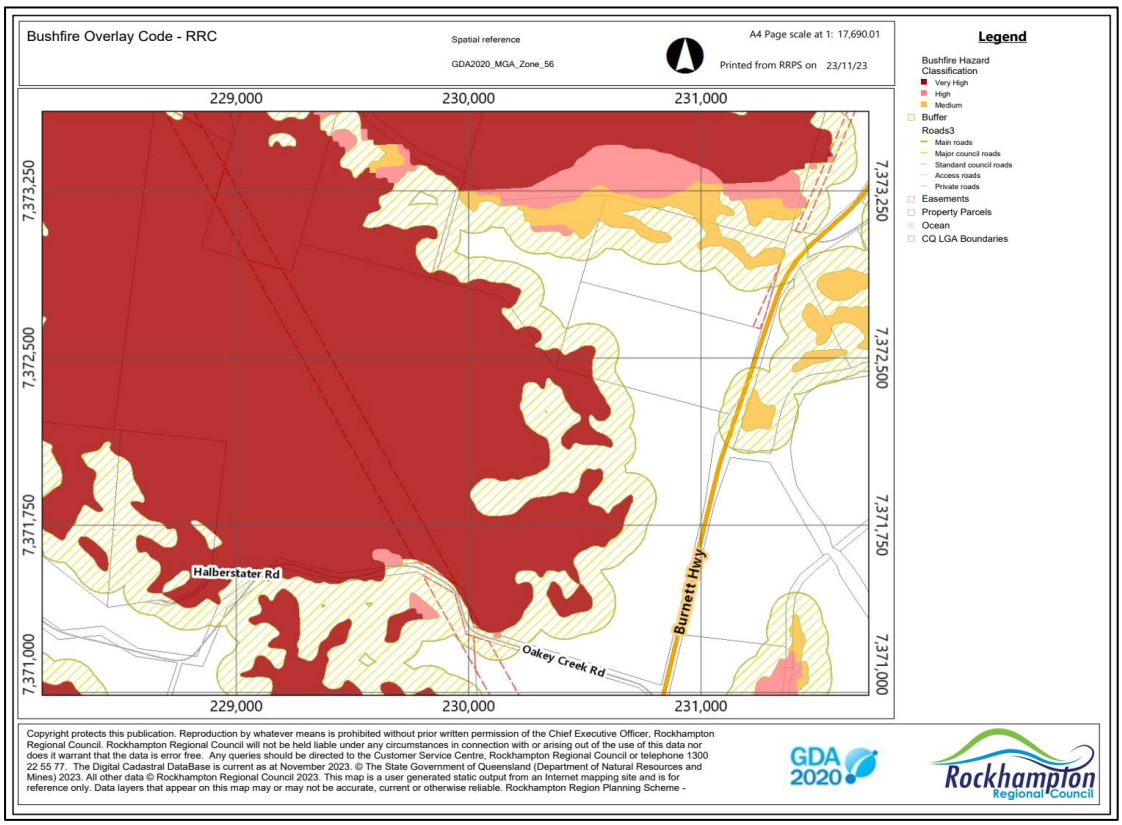

Figure 3 Bushfire hazard overlay RRPS 2015 – (Source: Rock e Map, 2023).

2.4 AS3959:2018 Construction of Buildings in Bushfire Prone Areas

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 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 thus 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.

2.5 AS3959:2018 Construction of Buildings in Bushfire Prone Areas

The National Construction Code 2022 (NCC 2022) sets out requirements for the design and construction of a building in Australia, including minimum required levels for the safety of certain buildings. The NCC contains additional requirements for the construction of buildings in designated bushfire prone areas, to address additional risks posed by bushfire attack. The NCC is given legal effect through the Building Act 1975 (Qld) and is varied through amendments to the Building Regulation 2006 that adopts the Queensland Development Code (QDC). Moreton Bay Regional Council's Bushfire hazard overlay mapping designates bushfire prone areas for the purposes of the National Construction Code, the Building Regulation 2006 and the Queensland Development Code (QDC).

3 Bushfire Hazard Assessment

A site-specific bushfire hazard assessment (BHA) for the site has been undertaken in accordance with the methodology outlined in the 'Bushfire Resilient Communities' (BRC) technical document (QFES, 2019). The methodology underpinning the BHA process consists of three stages:

1. An assessment to verify the reliability of existing BPA mapping over the site and land surrounding the site (the 'assessment area').
2. A hazard assessment involving field investigations to ground-truth the accuracy of the BPA mapping for the site, where required. The hazard assessment area must include the development area and all land within 150 metres of the development footprint.
3. Using the results of the site-specific assessment, the asset protection zone width needed to achieve the requisite radiant heat flux levels is calculated using the SPP Bushfire asset protection zone (APZ) width calculator or Method 2 of AS3959:2018.

Where the precision and/or accuracy of BPA mapping or map input datasets are insufficient (e.g. where there has been changes in land use and vegetation cover within the assessment area), the process enables applicants to create a local-scale BPA map based on the results of the site investigation and to apply modified input variables that reflect changes that have occurred over time. The BHA process adapts the method used to generate the state-wide BPA mapping, described in Leonard *et. al.* (2014) with further refinement to allow for the downgrade and/or filtering of small patches and narrow corridors where needed in accordance with contemporary mapping rules outlined in the BRC technical guide and Leonard and Opie (2017).

Where effective fuel loads have been reduced based on patch size and isolation in accordance with the patch and corridor filtering rules outlined in 4.2.6 of the QFES BRC technical guide, reduced effective fuel loads can be used as inputs into a Method 2 BAL assessment.

The assessment has been based on vegetation existing within, adjacent and nearby to the site including any areas subject to revegetation or regrowth, which have been assessed as if these areas have reached their mature state.

3.1 Hazard Assessment

The following steps have been undertaken to assess spatial factors that contribute to potential bushfire intensity for the site and surrounding land:

- **Step 1: Identification of Fire weather severity**

  Identification of all Forest Fire Danger Index (FFDI) values estimated at a 1:20 year (5%) Annual Exceedance Probability (AEP) using the Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset from the Queensland Government data portal.

- **Step 2: Identification of Vegetation Hazard Classes**

  Assessment of vegetation communities to identify the relevant vegetation hazard classes (VHCs) using a combination of remnant and pre-clearing regional ecosystem maps, high-resolution aerial imagery and a ground-truthed assessment of vegetation present within the site and within the required 150 m assessment area.

- **Step 3: Slope assessment**

  Identification of site slope and effective slope, and determination of whether proposed buildings are upslope or downslope of hazardous vegetation using Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset from the Queensland Government data portal and 5 m LiDAR-derived contour data.

- **Step 4: Remodeling of bushfire hazard and calculation of potential fireline intensity** - Where a change to the distribution, extent and/or classification of VHCs within the assessment area is proposed, remodeling of bushfire hazard is undertaken to determine how the changes to VHCs and associated fuel loads affect potential fireline intensity. Potential fireline intensity is to be calculated in accordance with the method outlined in Leonard *et. al.* (2014).

VHCs and associated potential fuel loads are in accordance with Leonard *et al.* (2017), as provided in the BRC Technical Guide and SPP Bushfire APZ width calculator published by the QFES.

Relevant spatial datasets published by the QFES were accessed via the Queensland Spatial Catalogue (QSpatial) and the Catalyst Fire Management System (Queensland Fire and Emergency Services, 2020).

3.1.1 Step 1 – Fire Weather Severity

Central Queensland has a subtropical climate with hot, moist summers and warm, dry winters, with occasional frost in the south. It is subject to influence from monsoonal climate systems and easterly troughs. Annual and seasonal average rainfall are variable, affected by local factors such as topography and vegetation, and broader scale weather patterns, such as the El Niño–Southern Oscillation. Seasonality is not pronounced; however, the 'wet' season generally occurs during the December – April period. The fire danger season usually occurs from spring to mid-summer (August/September to December) with the greatest danger after a dry winter and spring and when deep, low-pressure systems near Tasmania bring strong, hot and dry westerly winds to the coastal districts (Bureau of Meteorology, 2021). Severe bushfire weather is characterised by days with high temperatures over 35 degrees, low relative humidity and winds from the north to north-west.

The Forest Fire Danger Index (FFDI) provides an annual accumulated index of fire weather severity (i.e. the potential danger of a bushfire) based on a combination of vegetation dryness, air temperature, wind speed and humidity. The relevant FFDI for the site was derived from the Fire Weather Severity (Forest Fire Danger Index) raster provided as part of the Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset.

The FFDI for the site and surrounding land is 69.

3.1.2 Step 2 - Vegetation Hazard Classes and Potential Fuel Loads

3.1.2.1 Vegetation Hazard Classes

Different types of vegetation communities determine the rate at which dry fuel accumulates. Some vegetation communities protect fuel from drying out in all but extreme bushfire seasons and can then be susceptible to very destructive bushfires. Alternatively, vegetation communities may expose fuels to drying and therefore be frequently available for burning. Frequent bushfires can result in the

development of bushfire-tolerant grassy woodlands or grasslands and less destructive bushfire behaviour.

Vegetation Hazard Classes (VHCs) provided within the Bushfire Prone Area – Vegetation hazard class – Central Queensland spatial dataset was reviewed for the site and surrounding land **(Figure 4).** The following VHCs are mapped within the required 150 m assessment area about the site:

- 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite;
- 16.1 Eucalyptus dominated forest on drainage lines and alluvial plains;
- 16.2 Eucalyptus dominated woodland on drainage lines and alluvial plains;
- 40.4 Continuous low grass or tree cover; and
- 42.6 Nil to very low vegetation cover.

The reliability of State-mapped VHCs was assessed through:

- review of Vegetation management remnant and pre-clearing regional ecosystem (RE) mapping published by the Department of Resources (DoR); and
- an assessment of existing vegetation undertaken by Green Tape Solutions in November 2023 as part of site investigations to support preparation of a BHAMP.

DoR's remnant RE mapping shows that remnant vegetation is mapped within the assessment area. this vegetation Is identified as containing the following REs:

- RE11.11.15 - *Eucalyptus crebra woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics;*
- RE11.11.3 - *Corymbia citriodora, Eucalyptus crebra, E. acmenoides open forest on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges;*
- RE11.3.26 - *Eucalyptus moluccana or E. microcarpa woodland to open forest on margins of alluvial plains;*
- RE11.3.2 - *Eucalyptus populnea woodland on alluvial plains;*
- RE 11.3.4 - *Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains.*

The site assessment determined that vegetation within the 150 m assessment area consists of a mosaic of native vegetation and areas of pasture with low tree cover. The site is predominantly vegetated, with some areas of cleared, low hazard pasture land. Vegetation adjacent to and within proximity of the development consists of three (3) site-verified communities.

- **Vegetation community 1 – Pasture Vegetation**

  Large areas of the site have been thinned and cleared historically and are currently grazed by cattle as an exotic pasture. Some very sparse native paddock trees and shrubs are present. This vegetation is expected to continue to be grazed and actively managed in a low fuel state.

  Landscape vegetation within the 150 m assessment area has been classified as **VHC 40.4** – Continuous Low to moderate tree cover.

- **Vegetation community 2 – Ironbark open woodland**

  The majority of vegetation across the site conforms to a narrow-leaved ironbark woodland. This community is dominated by narrow-leaved ironbark (*Eucalyptus crebra*). Associated species include red bloodwood (*Corymbia erythrophloia*) and false sandalwood (*Eremophloia mitchellii*).

  This community is mapped as Category B (remnant) vegetation containing the regional ecosystem (RE) 11.11.15. – *narrow leaf ironbark (Eucalyptus crebra) woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics*. The ground-truthed vegetation assessment determined that this vegetation meets the criteria for remnant status and is generally consistent with RE 12.3.6.

  The ironbark open woodland community within the site and on adjoining land has been classified as **VHC 13.2** – Dry to moist eucalypt woodlands on undulating metamorphics and granite.

- **Vegetation community 3 – Riparian open woodland**

  Riparian vegetated along the creek lines and watercourses across the site conforms to an open woodland community. This community is dominated by Qld blue gum (*Eucalyptus tereticornis*), Moreton Bay Ash (*Corymbia tessellaris*) and narrow-leaved ironbark (*Eucalyptus crebra*). The midstory is dominated by black tea tree (*Melaleuca bracteata*). This community is degraded and invaded by lantana camara.

  This community corresponds to **VHC 16.2** – Eucalyptus dominated woodland on drainage lines and alluvial plains. Due to the nature of riparian vegetation being narrow and found within valleys and drainage lines this Vegetation Hazard class is not considered to significantly impact bushfire hazard calculations compared to the surrounding vegetation (VHC 13.2) and is too small an area to be mapped within **Figure 5.**

Non-vegetated areas (roads, footpaths and buildings) and low-threat vegetation (including grassland maintained in a minimal fuel condition, maintained lawns, maintained public reserves and parklands and cultivated gardens) within the 150 m assessment area have been classified as VHC 42.6 – Nil to very low vegetation cover. These areas have been excluded from the BAL assessment as they meet the criteria for exclusion as low threat vegetation.

Figure 5 depicts the location of ground-truthed VHCs within the 150 m assessment area.

Plate 1 Vegetation Community 1

Plate 2 Vegetation Community 1

Plate 3 Vegetation Community 2

Plate 4 Vegetation Community 2

Plate 5 Vegetation Community 3

Plate 6 Vegetation Community 3

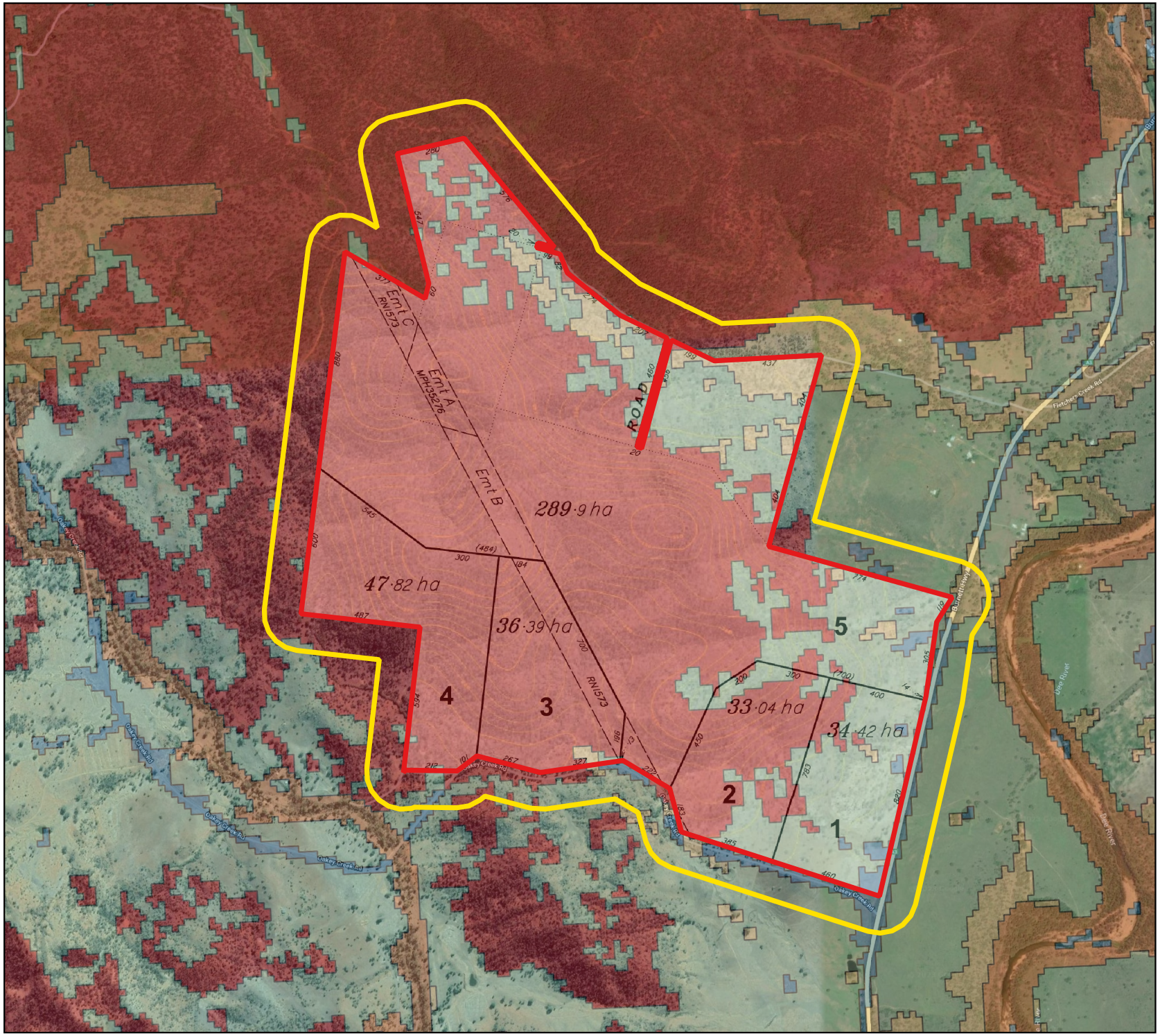

Figure 4: State-Mapped Vegetation Hazard Classes

Project: PR23290_49600 Burnett Highway, Oakey Creek

LotBoundary

Hazard Assessment Area

Vegetation Hazard Class

- 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
- 16.1 Eucalyptus dominated forest on drainage lines and alluvial plains
- 16.2 Eucalyptus dominated woodland on drainage lines and alluvial plains
- 40.4 Continuous Low grass or tree cover
- 42.6 Nil to very low vegetation cover

Notes:
- Survey Data by Green Tape Solutions
- Site Infrastructure and Impact Areas from Client
- Base map Copyright (c) Qld Globe and its data suppliers.

Created By: MM
Date: 12/12/2023
Version: 1

0 0.25 0.5 km

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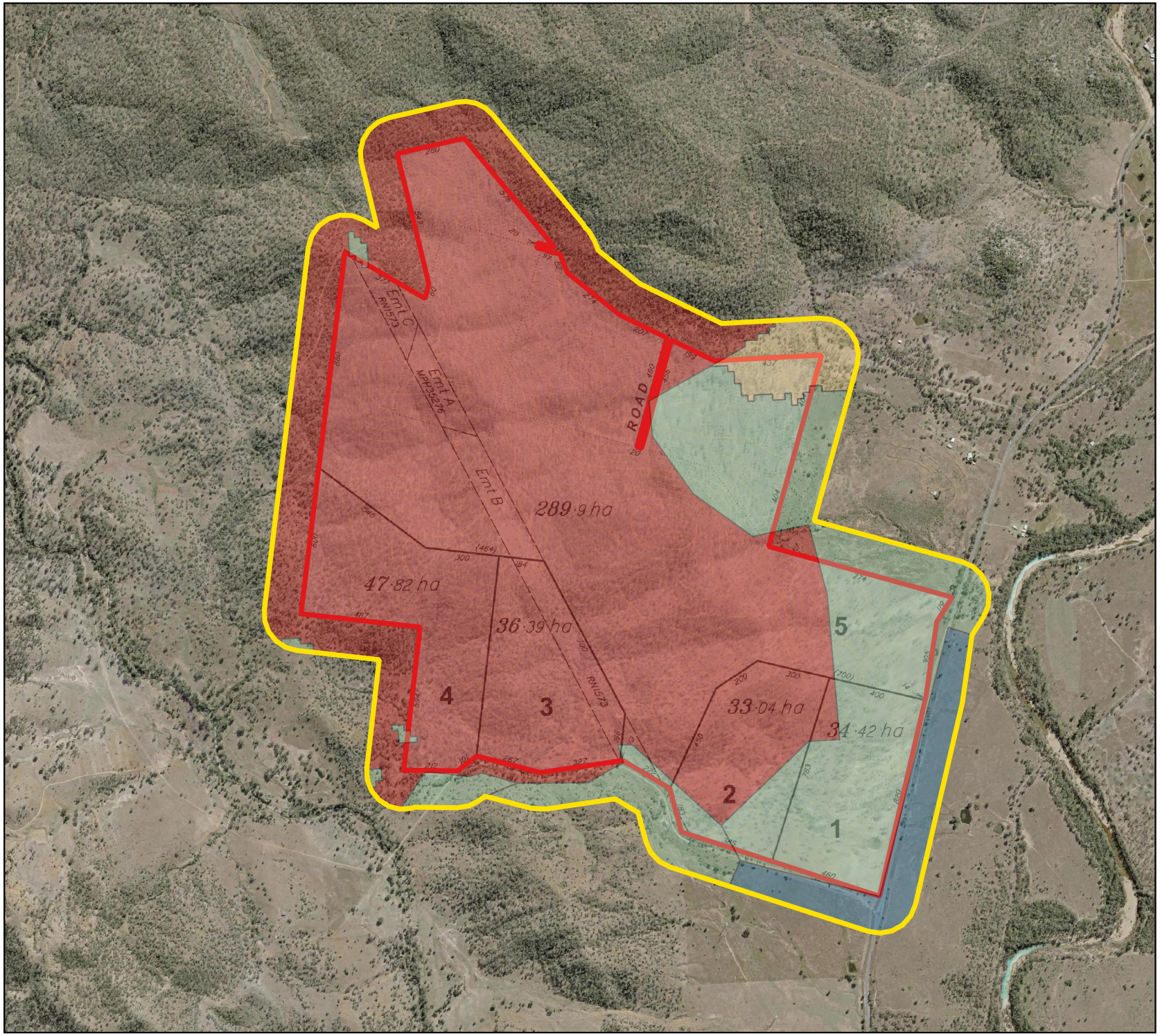

Figure 5: Ground-truthed Vegetation Hazard Classes

Project: PR23290_49600 Burnett Highway, Oakey Creek

LotBoundary

Hazard Assessment Area

Vegetation Hazard Class

- 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
- 16.2 Eucalyptus dominated woodland on drainage lines and alluvial plains
- 40.4 Continuous Low grass or tree cover
- 42.6 Nil to very low vegetation cover

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Created By: MM
Date: 12/12/2023
Version: 1

0 0.25 0.5 km

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3.1.2.2 Potential Fuel Loads

Fuel loads have been allocated for each VHC to represent the long-unburnt condition that would be typically exhibited 10 years after fire. In accordance with the values provided in Figure 14 of the BRC Technical Guide (QFES, 2019a), the potential fuel load values for ground-truthed VHCs within and surrounding the site are as provided in **Table 2**.

Table 2 Potential fuel loads for classified vegetation within 150 m assessment area.

VHC		Total potential surface fuel load (t/ha)	Total overall potential fuel load (t/ha)	Prone type [1]		Fuel continuity[2]	
13.2	Dry to moist eucalypt woodlands on undulating metamorphics and granite	12.8	14.4	1	Bushfire-prone – Forest or shrub fires	1	Continuous
16.2	Eucalyptus dominated woodland on drainage lines and alluvial plains	11.1	11.6	1	Bushfire-prone – Forest or shrub fires	1	Continuous
40.4	Continuous low grass or tree cover	4.5	5.0	2	Non-bushfire prone – Grassland fire	2	Discontinuous
42.6	Nil to very low vegetation cover	0	0	2	Non-bushfire prone – Grassland fire	2	Discontinuous

3.1.3 Step 3 - Site and Effective Slope

Two slope input parameters are required for the estimation of fire behaviour and separation. Site slope is the slope of the ground between the edge of the proposed development (or site boundary) and the edge of hazardous vegetation. Effective slope refers to the slope of the land beneath hazardous vegetation. Effective slope is the more important parameter as it has a direct influence on the potential rate of fire spread, fuel consumption and thus, potential fireline intensity. For each vegetation hazard class, the effective slope is determined by assessing the slope beneath classified vegetation (in degrees) which most influences bushfire behaviour and the relative position of land supporting hazardous vegetation in relation to the development i.e. upslope or downslope. Where there is more than one slope beneath classified vegetation, each slope should be individually assessed, and the worst-case scenario adopted.

[1] Prone type taken from the VHC_Data sheet of the SPP Bushfire APZ Calculator.
[2] Fuel continuity type taken from Figure 14 of the QFES BRC Technical Guide.

The topography of the site and surrounding land is undulating with variable slopes due to dissection by gullies and watercourses. Slope measurements have calculated using LiDAR-derived 5 metre contour data published by the Department of Resources and verified by site measurement. The site slope and effective slope angles for all hazardous vegetation within the assessment area have been calculated and are shown in **Table 3** below.

Table 3: Slope angles for assessable fire runs to the proposed building envelopes.

Lot	Slope location in relation to development area	Max effective slope (degrees)	Max site slope (degrees)	Fire run in relation to development	Fire run scale
2	North-west	5.71	1.0	Upslope	Fully Developed Fire
3	North	4.57	1.0	upslope	Fully Developed Fire
3	East	11.31	1.0	upslope	Fully Developed Fire
3	West	5.5	1.0	Downslope	Fully Developed Fire
4	North	5.71	1.0	Upslope	Fully Developed Fire
4	East	1	1.0	Downslope	Fully Developed Fire
4	West	1	1.0	Downslope	Fully Developed Fire

3.1.4 Step 4 - Remodelling of Bushfire Hazard

Given that site-specific assessment determined that VHCs provided within the BPA – VHC – Central Queensland spatial dataset do not entirely reflect the ground-truthed VHCs, remodelling of bushfire hazard has undertaken to determine how the changes to VHCs and associated fuel loads affect potential fireline intensity. Potential fireline intensity has been calculated in accordance with the method outlined in Leonard *et. al.* (2014).

Potential fireline intensity (PFI) is a standard measure of the rate at which an advancing fire would consume fuel energy per unit time per unit length of the fire front. This metric combines potential fuel load (PFL), maximum landscape slope (slope) and fire weather severity (FFDI) to provide a potential fireline intensity metric. The potential fireline intensity (PFI) is represented as the following equation:

$PFI = 0.62\ PFL^2 \times FFDI \exp(0.069 \times slope)$

Where: PFI = Potential fire line intensity (kW/m), PFL = Potential fuel load (tonnes / ha), FFDI = Potential severe fire weather (FFDI) and Slope = Max slope

Table 4 shows the potential fireline intensity ranges (in kilowatts per metre) and the corresponding potential bushfire hazard classes.

Table 4: Potential fireline intensity ranges and bushfire hazard classes

Potential Fireline Intensity (kW/m)	Potential Bushfire Hazard Class
40,000+ kW/m	Very high
20,000 – 40,000 kW/m	High
4,000–20,000 kW/m	Medium
0 – 4,000 kW/m	Low/Not bushfire prone

Section 4.2.6 of the QFES BRC technical guide provides a series of mapping rules ('patch and corridor filtering') for modifying the potential fireline intensity of bushfire-prone areas to reflect the likelihood of lower potential fireline intensities in smaller vegetation patches and narrow vegetated corridors. These rules are applied as follows:

1. Remove patches of continuous fuel < 1 ha in area that are surrounded by either no fuel or non-continuous fuel and are further than 100 m from any other continuous fuel greater than 2 ha;
2. Downgrade the effective fuel load of small patches of continuous fuel measuring a. 1 – 2 ha – downgrade by 66% and b. 2 – 3 ha – downgrade by 50 % if the patch is surrounded by either non-continuous fuel or a low-hazard vegetation or land-use type and if the patch is further than 100m from any other continuous -fuel vegetation patch greater than 2 ha; and
3. Remove narrow corridors and area of continuous fuel that are less than 50 m in width.

Based on the results of the site-specific assessment, vegetation within the assessment area **does not** meet any of the patch and corridor filtering rules outlined in QFES (2019).

The potential fireline intensity was calculated for bushfire-prone vegetation within 150 m of the site using the inputs from Steps 1 - 3. In accordance with Section 7.6 of the BRC Technical Guide, fireline intensity, radiant heat flux and BAL is not required to be calculated for non-bushfire prone (i.e. VHCs with a prone type of 2) or low hazard VHCs (i.e. VHCs with a prone-type of 3), therefore VHCs 40.4 and 42.6 have been excluded from calculation of potential fireline intensity. Potential fireline intensity for bushfire-prone vegetation is provided in **Table 5.**

Table 5: Potential fireline intensity for classified VHCs within 150 m assessment area

Location of classified vegetation in relative to development area	VHC	Status	Effective slope – average slope beneath bushfire-prone vegetation in relation to development (degrees)		Fire weather severity (FFDI)	Potential fireline intensity (PFI)	Remodelled bushfire hazard class
Lot 2, North-west	13.2	Remnant	5.71	upslope	69	5,317 kW/m	Medium
Lot 3, North	13.2	Remnant	4.57	upslope	69	5,752 kW/m	Medium
Lot 3, East	13.2	Remnant	11.31	upslope	69	3,613 kW/m	Low
Lot 3, West	13.2	Remnant	5.5	downslope	69	11,524 kW/m	Medium
Lot 4, North	13.2	Remnant	5.71	upslope	69	5,317 kW/m	Medium
Lot 4, East	13.2	Remnant	1	upslope	69	7,359 kW/m	Medium
Lot 4, West	13.2	Remnant	1	upslope	69	7,359 kW/m	Medium

The results of the potential fireline intensity calculation for bushfire-prone vegetation within the assessment area show that vegetation across the site has a potential bushfire hazard class of 'medium'. All other vegetation within 150 m of the development site is not classified as bushfire-prone and therefore, calculation of radiant heat flux/ BAL is not applicable.

Section 5 outlines the requirements for management and mitigation of bushfire hazard for the bushfire-prone vegetation within the site.

3.2 Radiant Heat Exposure and Bushfire Attack Levels

BALs are used to quantify the levels of attack (radiant heat exposures/flux) that built structures may experience during a fire event. The BAL is defined as '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' (Standards Australia, 2018).

AS3959:2018 adopts six BAL categories, which are based on the level of radiant heat flux to which buildings may be exposed to during a bushfire event. This level of heat flux generally relates to the type of vegetation, effective slope and how far a building is from hazardous vegetation. BALs apply to buildings and any attached or adjacent structure within 6 m of the building.

The BRC Technical Guide requires that radiant heat exposure/ BALs are calculated using either the SPP Bushfire APZ calculator (QFES, 2019b), which is the preferred method or Method 2 of AS3959:2018. Where Method 2 is used, the following inputs are to be used:

- site-specific values for FFDI (Step 1);
- ground-truthed VHCs (Step 2) and their associated fuel loads (provided in Figure 14 of the BRC Technical Guide); and
- site and effective slopes (Step 3).

The Flamesol Method 2 Minimum Distance calculator has been used to calculate the minimum separation distance required between the development and bushfire-prone vegetation for each BAL. These results are provided in **Appendix 2**, **Figure 6**, and summarised in **Table 6.**

Table 6: Determination of BAL minimum separation distances for bushfire-prone vegetation.

Bushfire attack level (BAL) →	BAL-Flame zone (FZ)	BAL-40	BAL-29	BAL-19	BAL-12.5
Lot 2, North-west	0 - <7.9 m	7.9- <10.7 m	**10.7- < 15.8 m**	15.8 - <23.1 m	**23.1 - < 100m**
Lot 3, North	0 - <8.3 m	8.3 - <11.3 m	**11.3- < 16.7 m**	16.7 - <24.2 m	**24.2 - < 100m**
Lot 3, East	0 - <6 m	6 - <8.3 m	**8.3.- < 12.3 m**	12.3 - <18.1 m	**18.1 - < 100m**
Lot 3, West	0 - <14 m	14 - <18.9 m	**18.9.- < 27.2 m**	27.2 - <37.8 m	**37.8 - < 100m**
Lot 4, North	0 - <7.9 m	7.9 - <10.7 m	**10.7.- < 15.8 m**	15.8 - <23.1 m	**23.1 - < 100m**
Lot 4, East	0 - <10 m	10 - <13.5 m	**13.5.- < 19.9 m**	19.9 - <28.4 m	**28.4 - < 100m**
Lot 4, West	0 - <10 m	10 - <13.5 m	**13.5.- < 19.9 m**	19.9 - <28.4 m	**28.4 - < 100m**

PO6 of the Rockhampton Planning scheme 2015 specifies that building envelopes on reconfigured lots are to be separated from hazardous vegetation such that they achieve a radiant heat flux of BAL 29 (29 kW/m^2). To achieve this outcome, building envelopes on the proposed future lots will need to be sited according to **Table 6**. However, a BAL of 12.5 (12.5kWm^2) is achievable on all new lots 2, 3 and 4.

Figure 6 shows the locations of the proposed building envelopes for each new lot and the required separation distances to achieve a BAL 29 and meet Asset Protection Zone (APZ) requirements. Lots 1 and 5 are in a Low BAL area and an APZ is not required for these lots, however given the rural nature of the sites a separation distance is recommended for all building envelopes.

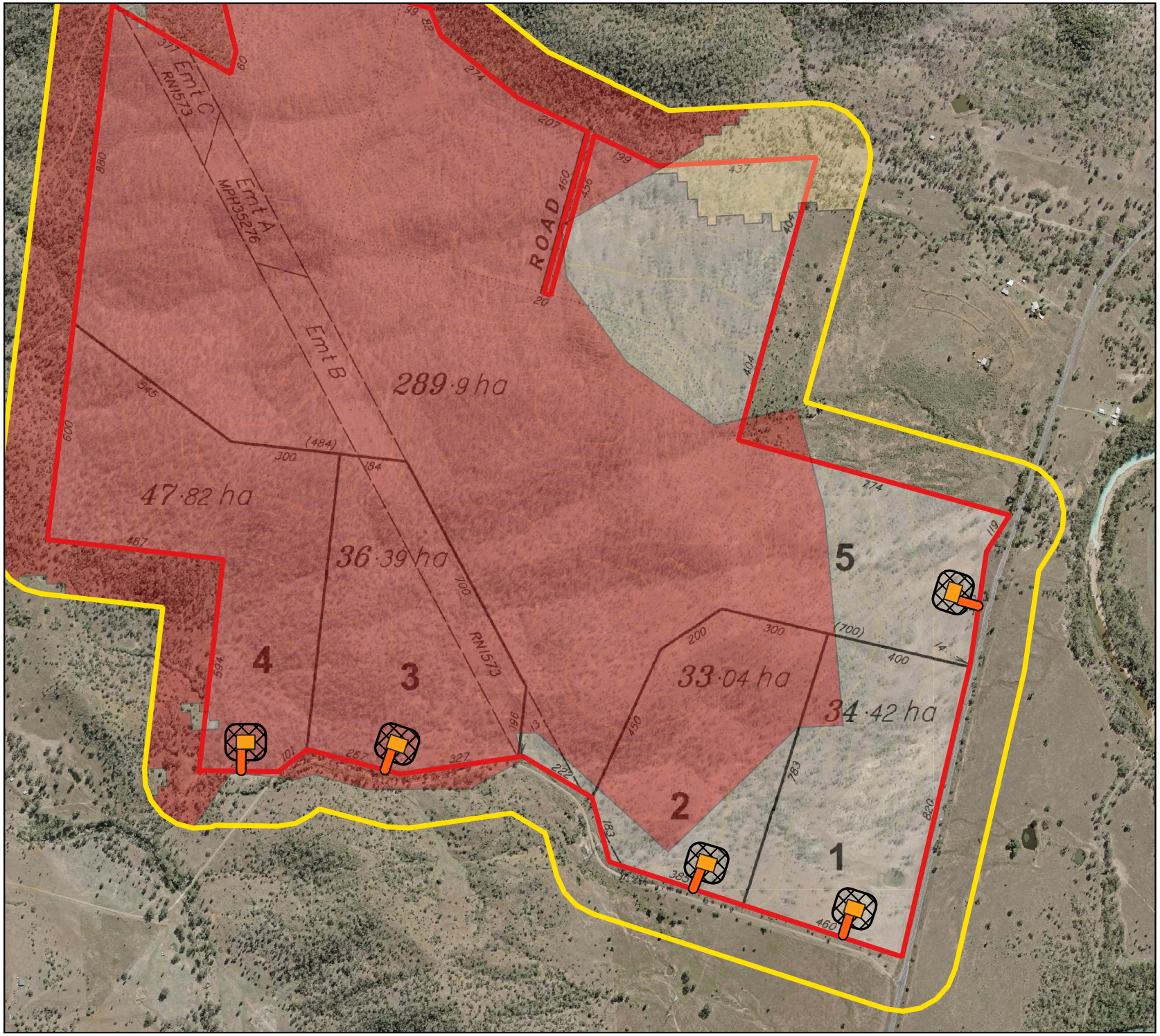

Figure 6: Asset Protection Zones

Project: PR23290_49600 Burnett Highway, Oakey Creek

- Lot Boundary
- Hazard Assessment Area
- Asset Protection Zone (30m)
- Building Location Envelope (2000sqm)
- Proposed Driveway (60m)

Hazardous Vegetation

- 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
- 16.2 Eucalyptus dominated woodland on drainage lines and alluvial plains

Notes:
- Survey Data by Green Tape Solutions
- Site Infrastructure and Impact Areas from Client
- Base map Copyright (c) Qld Globe and its data suppliers.

Created By: MM
Date: 12/12/2023
Version: 1

0 100 200 m

Green Tape SOLUTIONS

4 Bushfire Management Plan

The SPP requires that where it is not possible to avoid a bushfire prone area, development mitigates bushfire risk to people and property to an acceptable or tolerable level. This can be achieved through development design and siting, hazard reduction practices and emergency mitigation measures for any buildings bordering potentially bushfire-susceptible vegetation. These practices and measures include fuel reduction and management, road infrastructure to provide safe access and egress, appropriate building design and construction standards, procedures for fighting bushfires and fire intensity reduction management measures.

The development does not seek to mitigate bushfire hazard through additional vegetation clearing beyond the development area boundary and shall contain all bushfire management and mitigation measures within the development area.

4.1 Agencies / Persons Responsible

The responsible fire authority is the QFES. It is the responsibility of the proponent to ensure that the relevant measures required by this plan are in place prior to inspection by the Council and the building certifier, and to ensure that the measures are in place prior to enacting the approval. Furthermore, it is the responsibility of the proponent to ensure that a copy of this report is always on hand at the site.

4.2 Owner / Occupier Responsibilities

It is the responsibility of the relevant lot owner to maintain each lot in accordance with the conditions outlined in this report. The owner / occupier responsibilities include:

- An Asset Protection Zone (APZ) is to be established and maintained between buildings and bushfire-prone vegetation. The APZ is to be managed in accordance with the measures outlined in Section 4.5.
- All access routes are to remain clear of obstacles to enable effective emergency vehicle access and egress; and
- No burning is to be undertaken on-site without a Permit to Burn as issued by the local Fire Warden (and approval if required, in writing, from Council).
- The storage or handling of hazardous chemicals on the premises must not result in an unacceptable risk to people, property and the environment. Hazardous chemicals should not present a risk to or impose upon emergency services when responding to an emergency or evacuation.

4.3 Reporting and Auditing

This bushfire report is a controlled working document that is to be updated and revised to reflect adaptive management and constructive feedback. Some sections of the plan may be modified, new procedures may be implemented, and responsibilities altered, depending on feedback and application.

This bushfire report will only ever be modified with the agreement of Rockhampton Regional Council. This agreement allows for changes to the plan scope, as determined through consultation and the acceptance of the proponent. That is, where further actions are deemed necessary or where actions can be reduced in scope.

4.4 Siting of Buildings

In accordance with the SPP 2017 (and associated guidance material) and the Rockhampton Planning Scheme 2015 (version 4.4), the proposed design has considered the key principles when siting development. The relevant clauses that have been considered are:

- Utilising land that is predominantly cleared to minimise ecological impacts to native vegetation;
- Maximising where practicable building frontage setbacks from any hazardous vegetation; and
- Siting of buildings so that elements of the development that are least susceptible to fire are situated closest to the bushfire hazard (e.g. driveways, parking areas and protective landscape treatments).

4.5 Asset Protection Zones

The use of an APZ is the most effective defence against flame and radiant heat and to a lesser extent, ember attack. The APZ incorporates defendable space and allows for managing heat intensities at the building surface. Appropriate vegetation management measures shall be required to manage fine fuels, which have the greatest influence on the spread of a conventional flame front-driven bushfire (Queensland Government and CSIRO, 2020).

The Rockhampton Planning Scheme 2015 specifies that buildings are to be separated from hazardous vegetation such that they achieve a radiant heat flux of 29 kW/m^2 (BAL-29) or lower. An Asset Protection Zone (APZ) will be established between proposed dwellings and hazardous vegetation, to ensure that the dwellings will be able to achieve and maintain a BAL-29 construction rating. This APZ will have the following characteristics:

- **Inner Protection Area (IPA): 0 – 15 m** from the edge of the dwelling. This area is to be maintained as an area that is effectively free of flammable material to provide defendable space and for managing heat intensities at the building surface. The IPA is to be managed as follows:
    - Removal of all canopy trees and shrubs within the IPA. New trees are not to be planted in the IPA.
    - Landscaping treatments within the IPA shall comprise low threat vegetation, including lawn areas managed in a minimal fuel condition (i.e. ≤ 100 mm nominal height as specified in AS3959:2018) and landscape garden plant species that are of low combustibility (i.e. species with high leaf moisture content, low volatile oil content, absence of shedding bark, low production of leaf litter etc.). Flammable plants are not permitted.
    - Plants must be arranged to minimise vertical and horizonal connectivity of plant material.
    - Plants must be no closer than 10 metres from an exposed window or door.
    - Mulches within any landscaped areas are to be non-combustible.
    - Non-habitable structures such as sheds are permitted in the IPA, as long as they are made from non-combustible materials and are located greater than 6m from any habitable dwellings.

- In-ground swimming pools are permitted in the IPA, as long as they are made from non-combustible materials (including associated landscaping/paving etc).
- Any fencing is to be constructed from non-combustible materials.

- **Outer Protection Area (OPA): 15 – 30m** measured from the edge of the dwelling. This area is to be maintained in low/reduced fuel load state to deprive an advancing fire front of fuel continuity. The OPA is to be managed as follows:
  - To minimise clearing of native canopy vegetation, removal of existing trees is not proposed within the OPA. These trees are to be retained. However, removal of sub-canopy trees and understorey vegetation (shrub layer) is required to remove continuous and ladder fuels.
  - Landscaping treatments within the OPA shall comprise low threat vegetation, including lawn/grassed areas managed in a minimal fuel condition (i.e. ≤ 100 mm nominal height as specified in AS3959:2018) and plant species that are of low combustibility (i.e. species with high leaf moisture content, low volatile oil content, absence of shedding bark, low production of leaf litter etc.). Plants should also be arranged to minimise vertical and horizonal connectivity of plant material.
  - Garden beds and shrubs are not to be located under trees.
  - All trees are to have lower limbs removed up to a height of 2 metres above the ground.
  - Mulches within any landscaped garden areas are to be of non-combustible materials (e.g. pebbles).
  - Non-habitable structures such as sheds are permitted in the OPA, as long as they are made from non-combustible materials and are located greater than 6m from any habitable dwellings.
  - Any fencing is to be constructed from non-combustible materials.
  - The proposed dwelling on **new lot 3 shall have an OPA separation distance from hazardous vegetation of 38 metres to achieve BAL 12.5**.
  - Similar APZ separation distances are recommended for new lots 1 and 5 due to the rural nature of the site even though these are in Low BAL area.

Regular maintenance of the APZ should be undertaken to remove fuels and debris, particularly prior to and during the fire season (i.e. late Winter to early Summer). This must include regular vegetation management and maintenance where necessary and practicable (e.g. grass slashing, weed removal etc.) and removal of debris and rubbish.

4.6 Access Roads

Access to future dwellings on the site will be provided via new driveways. These driveways shall provide safe and effective access and egress for emergency vehicles and occupants away from the direction of an approaching bushfire and be no longer than 60m and under 12.5% gradient as per the Rockhampton Region Planning Scheme 2015.

4.7 Electricity Supply

The proposed development will have access to mains electricity supply. Where practicable, electrical transmission lines will be installed underground.

4.8 Water Supply

The new lots will not have access to a reticulated water supply. As each new lot exceeds one hectare, the proposed dwellings will have the required minimum level of stored, dedicated, on-site water supply for fire-fighting purposes, in the form of a 20,000-litre non-flammable tank. Tanks will be located within ten (10) metres of the building or structure, and the water tank has:

- a take-off connection from the building to the tank which is at a level that provides on-site water storage of not less than the water requirement outlined in Table 8.2.4.3.3;
- a hardstand area allowing heavy rigid fire appliance access within six (6) metres of a tank; and
- fire brigade tank fittings consisting of:
    - for above ground tanks,
        - fifty (50) millimetre ball valve and male camlock coupling; and
        - above ground water pipe fittings that are metal; or
    - for underground tanks, an access hole of 200-millimetre diameter (minimum) to allow access for suction lines.

The total capacity of stored water on site for fire-fighting purposes will exceed 20,000 litres per lot, therefore complying with the Rockhampton Planning Scheme 2015.

4.9 Climate Change and Fire Weather – Projections for 2050

Climate change can act in two ways to affect fire behaviour. First, it is likely to exacerbate the fire-weather risk on any given day, leading to increased frequency or intensity of extreme and very extreme fire-weather days particularly within the fire season. Secondly, an increase in the accumulated fire risk over a year might represent a longer fire season and a reduction in the number of days suitable for prescribed burning.

It is recommended to review this document and associated bushfire procedures at the site over the coming decades in response to any potential increases of bushfire risk from climate change.

4.10 Emergency Response Procedures

An onsite fire management and evacuation strategy should be developed and available to implement in the event of an emergency. In the event of a pending fire emergency, assistance is to be obtained by contacting dialling 000.

Queensland Fire and Emergency Services provide guidelines for response to bushfires at Prepare for bushfire season | Queensland Fire and Emergency Services (qfes.qld.gov.au). It is recommended that

the occupier of the new residence prepare and implement emergency response procedures during bushfire season. These plans should be revised annually.

5 Assessment Against the Bushfire Hazard Overlay Code

The site is mapped with the Rockhampton Planning scheme 2015 (version 4.4) Bushfire Hazard Overlay, which triggers a response to the Bushfire Hazard Overlay Code. An assessment against this code is provided in **Table 7. Table 8** provides an assessment against the State Planning Policy state interest guidance material - Natural hazards, risk and resilience - Bushfire ('SPP guidance') (DSDMIP, 2019).

Table 7: Assessment against the Rockhampton Region Planning Scheme 2015 (Version 4.4) Bushfire Hazard Overlay Code.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
Table 8.2.4.3.1 Development outcomes for assessable development				
Access				
PO1	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; and (c) enables safe evacuation of the site during a bushfire for site occupants.	**AO1.1** AO1.1.1 OR AO1.1.2	Where the development is located in an urban area, the development: (a) has direct access to a constructed, all-weather, public road capable of carrying emergency service vehicles; (b) has a maximum single access driveway length of sixty (60) metres from the street to the development; and (c) access driveways have a maximum gradient of 12.5 per cent. Where the development is located in a non-urban area, the development:	**Complies with AO1.1.2** The site is a rural lot located outside an urban area All lots have direct access to a constructed, all-weather road (Burnett highway & Oakey Creak Road). Oakey Creek road is an 'all weather' gravel public road. The road is capable of supporting emergency vehicles, and is suitable for safe access and egress from the site. New driveways for each lot will be less than 60m long and under a 12.5% gradient.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			(a) has direct access to a constructed, all-weather, public road capable of carrying emergency service vehicles; (b) is separated from hazardous vegetation by a public road or fire trail with a minimum width of four (4) metres and at least six (6) metres clear of vegetation, with a minimum of 4.8 metres vertical clearance and a maximum gradient of 12.5 per cent; and (c) has: (i) a maximum single access driveway length of sixty (60) metres from the street to the development; or (ii) access driveways that are greater than sixty (60) metres from the street to the dwelling provides a turning circle with a minimum radius of eight (8) metres every sixty (60) metres	

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
Water supply for fire fighting purposes				
PO2		AO2.1 AO2.1.1	In a reticulated water supply area fire hydrants in: (a) residential areas are above ground single outlet fire hydrants and provided at not less than eighty (80) metre intervals and at each street intersection; and Editor's note—To remove any doubt, these intervals also apply to common access ways within a common private title. (b) commercial and industrial areas are above or below ground fire hydrants and provided at not less than ninety (90) metre intervals and at each street intersection. Above ground fire hydrants are to be fitted with dual valve outlets in these areas.	**AO2.1 – Not Applicable** **Complies with AO2.1.2** The site is located in a rural area without a reticulated water supply. The site is located in a rural area that does not have access to a reticulated water supply. Each proposed new lot will have the required minimum level of stored, dedicated, on-site water supply for fire-fighting purposes, in the form of a 20,000 litre water tank. The water tank shall be fire resistant or buried to prevent fire attack and shall have: (a) a take-off connection from the building to the tank which is at a level that provides on-site water storage of not less than the water requirement outlined in Table 8.2.4.3.3; (b) a hardstand area allowing heavy rigid fire appliance access within six (6) metres of a tank; and (c) fire brigade tank fittings consisting
		OR AO2.1.2	Where a reticulated water supply is not available or the development is not within eighty (80) metres of a hydrant, a water tank is provided within ten (10) metres of the building or structure, and the water tank has: (a) a take-off connection from the building to the tank which is at a level that provides	

			on-site water storage of not less than the water requirement outlined in Table 8.2.4.3.3 (20, 000 Litres) (b) a hardstand area allowing heavy rigid fire appliance access within six (6) metres of a tank; and (c) fire brigade tank fittings consisting of: (i) for above ground tanks, (A) fifty (50) millimetre ball valve and male camlock coupling; and (B) above ground water pipe fittings that are metal; or (C) for underground tanks, an access hole of 200 millimetre diameter (minimum) to allow access for suction lines. Note—Plastic tanks are not recommended, however if they are fully submerged with above ground access points they are acceptable. Note—Where water tanks are required, swimming pools, creeks and dams should not be used as a substitute for a dedicated static supply as these sources of water are not reliable during drought conditions.	of: i. for above ground tanks, (A) fifty (50) millimetre ball valve and male camlock coupling; and (B) above ground water pipe fittings that are metal; or ii. for underground tanks, an access hole of 200-millimetre diameter (minimum) to allow access for suction lines.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
Activities involving hazardous materials				
PO3	Public safety and the environment are not adversely affected by the impacts of bushfire on hazardous materials.	AO3.1	Development does not involve the manufacture or storage of hazardous materials within a bushfire hazard area. Editor's note—Refer to the *Work Health and Safety Act 2011* and associated regulation, the *Environmental Protection Act 1994* and the relevant building assessment provisions under the *Building Act 1975* for requirements related to the manufacture and storage of hazardous substances.	**Complies with PO3** The development will not involve the manufacture or storage of hazardous materials.
Development within the high and very high bushfire hazard areas				
PO4	The development is compatible with the level of risk associated with the bushfire hazard.	AO4.1	The development has a Bushfire Attack Level (BAL) of less than 12.5. Editor's note—The Bushfire Attack Level is calculated in accordance with the methodology described in the Australian Standard AS 3959 — Construction of buildings in bushfire prone areas.	**Complies with AO4.1** All proposed building envelopes are assessed to be within a Medium or lower bushfire hazard area. All building envelopes can achieve a BAL of 12.5. To achieve a BAL of less than 12.5 for the development there must be a separation distance of at least the values shown in **Table 6,** namely: Lot 2 – 24 metres; Lot 3 – 38 metres, and Lot 4 – 29 metres.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
				Lots 1 and 5 are in Low BAL areas and more than 200m from hazardous vegetation and no separation distances are required. However, a separation distance is recommended for all building envelopes given the rural nature of the site. This is described in **Section 4.5** of the management plan.
Land use				
PO5	Essential community infrastructure and community facilities are highly vulnerable development are located, designed and sited to: (a) protect the safety of people during a bushfire; (b) not increase the exposure of people to the risk from a bushfire event; (c) minimise the risk to vulnerable populations; and (d) ensure essential community infrastructure can function effectively during and	AO5.1	The following uses are not located in high or very high bushfire hazard areas: (a) childcare centre; (b) detention facility; (c) educational establishment; (d) emergency services; (e) hospital; (f) industrial use involving manufacture or storage of hazardous materials; (g) multiple dwelling; (h) outstation; (i) relocatable home park;	**Complies with PO5** The development does not involve essential community infrastructure or community facilities.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
	immediately after bushfire events.		(j) residential care facility; (k) retirement facility; (l) rooming accommodation; (m) shopping centre; (n) short-term accommodation; (o) telecommunications facility; (p) tourist park; (q) tourist attraction; (r) transport depot; and (s) utility installation.	
Reconfiguring a lot (General)				
PO6	Where reconfiguration is undertaken a separation distance from hazardous vegetation is provided. Editor's note—The preparation of a bushfire management plan in accordance with SC6.5 — Bushfire management planning scheme policy can assist in demonstrating compliance with this performance outcome.	AO6.1 OR AO6.2	In urban areas lots are separated from hazardous vegetation by a distance: (a) that achieves a Bushfire Attack Level of twenty-nine (29) or less at all boundaries; and (b) is contained wholly within the development site. In non-urban areas a building envelope of reasonable dimensions is provided on each lot	**Complies with AO6.2** See section 3 for the bushfire hazard assessment conducted for each lot. The separation distances stipulated in Table 6 and the Asset protection zone defined in section 4.5 will ensure the BLEs on new lots will achieve a minimum of a BAL 12.5.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			which achieves a Bushfire Attack Level of twenty-nine (29) or less at all boundaries Editor's note—Where a separation distance is proposed to be achieved by utilising existing cleared developed areas external to the site, certainty must be established (through tenure or other means) that the land will remain cleared of hazardous vegetation. For staged developments, temporary separation distances, perimeter roads or fire trails may be absorbed as part of subsequent stages.	
PO7	In urban areas development includes a constructed perimeter road between the lots and hazardous vegetation with reticulated water supply. The access is available for both fire fighting and maintenance works.	AO7.1	In urban areas lot boundaries are separated from hazardous vegetation by a public road which: (a) has a two lane sealed carriageway; (b) contains a reticulated water supply; (c) is connected to other public roads at both ends and at intervals of no more than 500 metres; (d) accommodates geometry and turning radii in accordance with Queensland Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines; (e) has a minimum of 4.8 metres vertical clearance above the road;	**Not Applicable.** Development is outside an urban area.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			(f) is designed to ensure hydrants and water access points are not located within parking bay allocations; and (g) incorporates roll-over kerbing.	
PO8	In non-urban areas development includes a perimeter road or an all-weather fire access trail which is available for both fire fighting and maintenance/hazard reduction works.	AO8.1	In non-urban areas the development includes a perimeter road or an all-weather fire access trail which: (a) separates the development from the hazardous vegetation with a width of at least twenty (20) metres; (b) with a minimum formed width of four (4) metres; (c) a minimum of 4.8 metres vertical clearance above the road; (d) has a turning circle with a minimum radius of eight (8) metres every sixty (60) metres; (e) has adequate drainage and erosion control devices; (f) has a gradient no greater than 12.5 per cent and a cross fall of no greater than ten (10) degrees;	**Complies with AO8.1** Development will be separated from hazardous vegetation by a 30m APZ for lots 2 and 4. Lot 3 will have and APZ of 38m. • with a minimum formed width of four (4) metres; • a minimum of 4.8 metres vertical clearance above the road; • has a turning circle with a minimum radius of eight (8) metres every sixty (60) metres; • has adequate drainage and erosion control devices; • has a gradient no greater than 12.5 per cent and a cross fall of no greater than ten (10) degrees; • has access at each end of the perimeter road or the fire trail from a public road;

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			(g) has access at each end of the perimeter road or the fire trail from a public road; (h) has the access point signed and direction of travel identified; and (i) has a suitable arrangement in place to ensure maintenance in perpetuity.	• has the access point signed and direction of travel identified; and • has a suitable arrangement in place to ensure maintenance in perpetuity.
PO9	Road widths and construction within the development are adequate for fire emergency vehicles.		No acceptable outcome is nominated.	**Complies with PO9** New roads and driveways will be wide enough to support emergency vehicles including turning areas. Refer to PO10.1
Reconfiguring a lot – Emergency services access				
PO10	Development facilitates the safe and efficient access and egress of emergency services during a bushfire event.	AO10.1	The development includes a perimeter road or a fire access trail which: (a) separates the development from the hazardous vegetation; (b) is a minimum of ten (10) metres in width, with a minimum formed width of four (4) metres; (c) is a minimum of six (6) metres clear of standing flammable vegetation;	**Complies with PO10** The development includes a perimeter road or a fire access trail which: (a) separates the development from the hazardous vegetation; (b) is a minimum of ten (10) metres in width, with a minimum formed width of four (4) metres; (c) is a minimum of six (6) metres clear of standing flammable vegetation;

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			(d) has passing bays twenty (20) metres long by three (3) metres extra trail width, or turning facilities every 200 metres; (e) has adequate drainage and erosion control devices; (f) has a gradient no greater than 12.5 per cent and a cross fall of no greater than ten (10) degrees; (g) has access at each end of the perimeter road or the fire trail from a public road; (h) has the access point signed and direction of travel identified; and (i) has suitable arrangements in place to ensure maintenance in perpetuity.	(d) has passing bays twenty (20) metres long by three (3) metres extra trail width, or turning facilities every 200 metres; (e) has adequate drainage and erosion control devices; (f) has a gradient no greater than 12.5 per cent and a cross fall of no greater than ten (10) degrees; (g) has access at each end of the perimeter road or the fire trail from a public road; (h) has the access point signed and direction of travel identified; and has suitable arrangements in place to ensure maintenance in perpetuity.
Reconfiguring a lot – Avoiding the hazard				
PO11	Road widths and construction within the development are adequate for fire emergency vehicles to gain access to a safe working area close to dwellings and near water supplies whether or not on-street parking spaces are occupied.	AO11.1	Road access minimum clearances of 3.5 metres wide and 4.8 metres high are provided for safe passage of emergency vehicles. Editor's note—For further information on how to address the above criteria please see Queensland Fire and Emergency Service: Fire	**Complies with AO11.1** Proposed access tracks will comply with AO11.1 with minimum clearances of 3.5 metres wide and 4.8 metres high provided for safe passage of emergency vehicles.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			hydrant and vehicle access guidelines for residential, commercial and industrial lots.	
PO12	Hydrants are suitably identified so that fire services can locate them at all hours.	AO12.1	Hydrants are identified as specified in Queensland Fire and Emergency Service: Fire hydrant and vehicle access guidelines for residential, commercial and industrial lots. Editor's note—Fire hydrants are designed and installed in accordance with Australian Standard 2419.1 Fire hydrant installations – system design, installation and commissioning, unless specified by the relevant water entity.	**Not applicable** Development does not incorporate fire hydrants due to its rural location.

Table 8 - Assessment against the State Planning Policy Natural hazards, risk and resilience benchmarks.

Performance Outcomes	Acceptable Outcomes	Compliance Assessment
Assessment benchmark 1		
Erosion prone areas within a coastal management district		
Development does not occur in an erosion prone area within a coastal management district unless the development cannot feasibly be located elsewhere and is:	No acceptable outcome is nominated.	**Not applicable** This assessment benchmark is not applicable to bushfire hazard considerations.

Performance Outcomes	Acceptable Outcomes	Compliance Assessment
(a) coastal-dependent development; or (b) temporary, readily relocatable or able to be abandoned development; or (c) essential community infrastructure; or (d) minor redevelopment of an existing permanent building or structure that cannot be relocated or abandoned.to bushfire hazard, unless there is an overriding community need or the development is located in the specialised centre zone.		
Assessment benchmark 2		
Erosion prone areas within a coastal management district		
Development permitted in (1) above, mitigates the risks to people and property to an acceptable or tolerable level.	No acceptable outcome is nominated.	**Not applicable** This assessment benchmark is not applicable to bushfire hazard considerations.
Assessment benchmark 3		
Bushfire, flood, landslide, storm tide inundation, and erosion prone areas outside the coastal management district		

Performance Outcomes	Acceptable Outcomes	Compliance Assessment
Development other than that assessed against (1) above, avoids natural hazard areas, or where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level.	No acceptable outcome is nominated.	**Complies with Assessment benchmark 3** The proposed development does not involve any vulnerable uses (e.g., residential care facilities or child care centres) and therefore will not result in a higher concentration of people living on the lot. The proposed development is not for community infrastructure (e.g., hospital or school).
Assessment benchmark 4		
All natural hazard areas		
Development supports, and does not hinder, disaster management response or recovery capacity or capabilities.	No acceptable outcome is nominated.	**Complies with Assessment Benchmark 4** Development incorporates new roads and driveways that are fully capable of supporting emergency vehicles and does not inhibit their ability to respond to an emergency on site.
Assessment benchmark 5		

Performance Outcomes	Acceptable Outcomes	Compliance Assessment
All natural hazard areas		
Development directly, indirectly and cumulatively avoids an increase in the severity of the natural hazard and the potential for damage on the site or to other properties.	No acceptable outcome is nominated.	**Complies with Assessment benchmark 5** The proposed development layout (**Appendix One**) contributes directly to an increase in the severity of the natural hazard and the potential for damage on the site. This increase is unavoidable however the risks are manageable. To achieve a BAL of less than 12.5 for the development there must be a separation distance of at least the values in **Table 6**, namely: Lot 2 – 24 metres; Lot 3 – 38 metres, and Lot 4 – 29 metres. Lots 1 and 5 are in Low BAL however a 30m separation distances consistent with the APZ values in **Section 4.5** are recommended. To achieve a BAL 29 a separation distance of 10.7-18.9 meters is required depending on the lot. A BAL-29 is considered to allow a manageable amount of increased risk for

Performance Outcomes	Acceptable Outcomes	Compliance Assessment
		damage to the site and properties.
Assessment benchmark 6		
All natural hazard areas		
Risks to public safety and the environment from the location of hazardous materials and the release of these materials as a result of a natural hazard are avoided.	No acceptable outcome is nominated.	**Complies with Assessment benchmark 6** The proposed development does not include the storage of hazardous materials.
Assessment benchmark 7		
All natural hazard areas		
The natural processes and the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard are maintained or enhanced.	No acceptable outcome is nominated.	**Complies with Assessment benchmark 7** The proposed development will not affect natural processes with clearing or impact to landforms and vegetation to be minimal and unlikely to degrade the mitigation of natural hazards.

6 Conclusion

This report has been prepared to provide a site-specific bushfire hazard assessment and management plan for a proposed new dwelling at 4960 Burnett Highway, Oakey Creek. The results of the assessment show that vegetation associated with the eucalypt woodland across the site (VHC 13.2) has a potential bushfire hazard class of 'Medium'. All other vegetation within 150 m of the development site is not classified as bushfire-prone and therefore, calculation of radiant heat flux/BAL is not applicable. New Lots 2, 3 and 4 will require an APZ as these lots are within a 'Medium' bushfire hazard area. New Lots 1 and 5 are assessed as being within a Low BAL area and while no APZ is required for these lots, it is recommended that an APZ as described in **Section 4.5** is applied.

The Rockhampton Planning Scheme 2015 specifies that building envelopes are to be separated from hazardous vegetation such that they achieve a maximum radiant heat flux of 29 kW/m^2 (BAL-29). To achieve this outcome, the proposed buildings will need to be sited according to Table 6. A bushfire Asset Protection Zone (APZ) with these dimensions has been proposed on the lots to achieve this outcome. Regular fuel maintenance within the APZ will be required by the occupants of the dwellings to ensure ongoing protection. A BAL 12.5 is possible on Lots 2, 3 and 4 with the proposed APZ.

Direct access to the new lots will be provided via new driveways from either the Burnett highway or Oakey Creek Road. These driveways will be less than 60m long and be under a 12.5% gradient. These driveways will provide for the egress of dwelling occupants in the event of an approaching bushfire. The driveway surface is capable of supporting Rural Fire Service vehicles.

The bushfire assessment has been undertaken in accordance with a contemporary methodology i.e. the methodology outlined in the QFES BRC Technical Reference Guide (QFES, 2019) and utilises QFES-published inputs (FFDI and fuel loads) for hazardous vegetation classified in accordance with the QFES vegetation hazard classification system. The proposed development complies with *State Planning Policy 2017* Natural Hazards, Risk and Resilience Assessment Benchmarks and the *Rockhampton Planning Scheme 2015* Bushfire Hazard Overlay Code.

7 References

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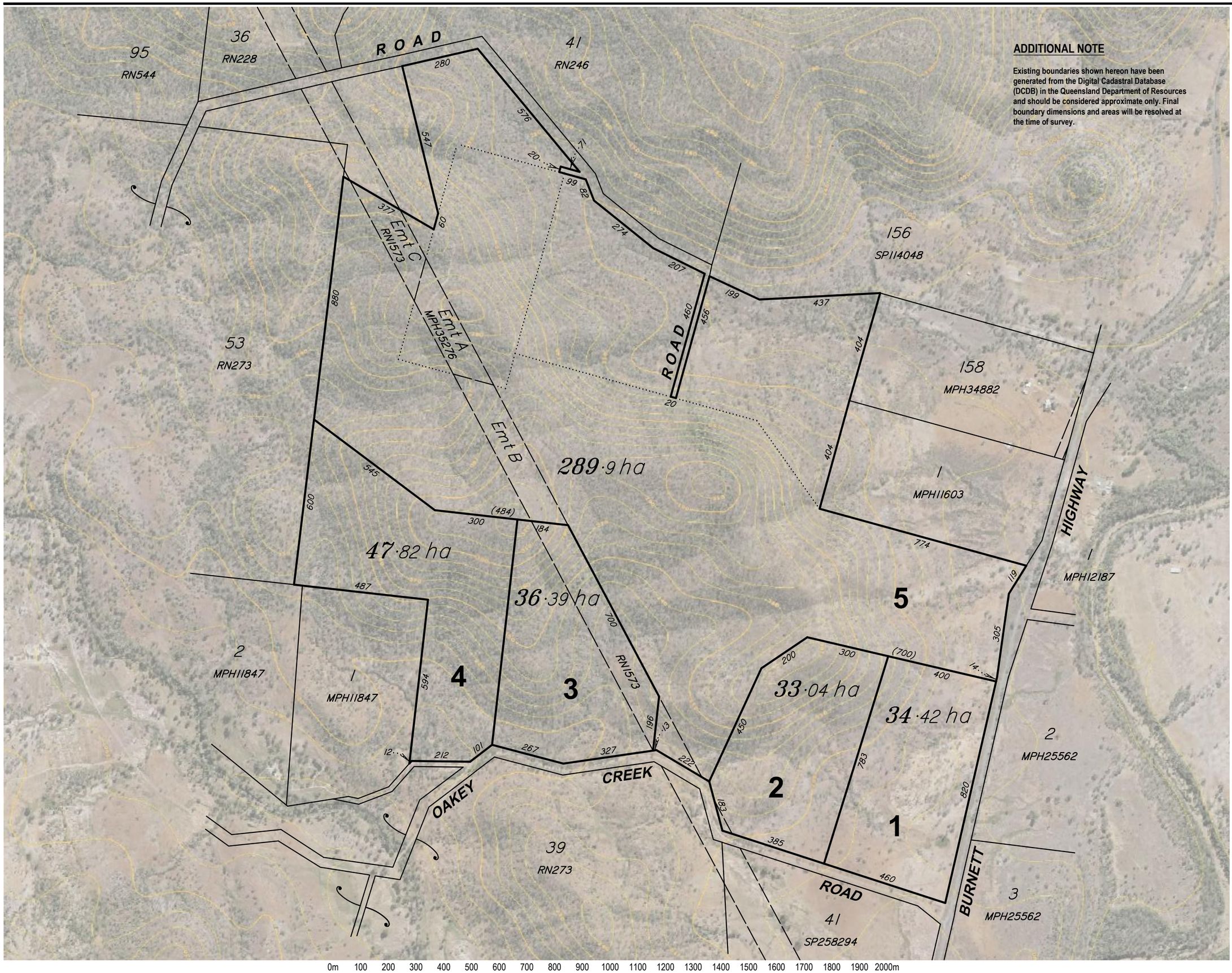
Appendix 1

Proposed Development Layout



ADDITIONAL NOTE

Existing boundaries shown hereon have been generated from the Digital Cadastral Database (DCDB) in the Queensland Department of Resources and should be considered approximate only. Final boundary dimensions and areas will be resolved at the time of survey.

IMPORTANT NOTE

This plan was prepared to accompany an application to Rockhampton Regional Council and should not be used for any other purpose.

The dimensions and areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

In particular, no reliance should be placed on the information on this plan for any financial dealings involving the land.

This note is an integral part of this plan.

client

Bronsan Pty Ltd

project

49600 Burnett Highway, Oakey Creek

plan of

Reconfiguration Plan
5 Lots into 5 Lots Realignment
(With QLD Globe Underlay)

rpd

Lot 1 on MPH11602, Lot 1 on MPH11649, Lot 1 on MPH11791, Lot 1 on MPH11839 & Lot 40 on RN228

lga

Rockhampton Regional Council

issue	date	details	authorised
A	25-08-2023	Initial Issue	RJKF

created

capricornsurveygroupcq
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07 4927 5199 | reception@csgcq.com.au | 132 Victoria Parade, Rockhampton QLD 4700

scale: **1:12500 @ A3**
datum: **AHD 10m Contours**
sheet no.: **1 of 1**
cad file: **9106-01-ROL-A**
plan no.: **9106-01-ROL**
issue: **A**

Appendix 2

Flamesol Method 2 Minimum Distance Calculations

Calculated December 13, 2023, 11:57 am (MDc v.4.9)

Lot 2 north-west

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	69	Rate of spread	0.71 km/h
Vegetation classification	Woodland	Flame length	6.37 m
Understorey fuel load	12.8 t/ha	Flame angle	65 °, 72 °, 77 °, 80 °, 82 ° & 85 °
Total fuel load	14.4 t/ha	Elevation of receiver	3.02 m, 3.21 m, 3.38 m, 3.54 m, 3.64 m & 4.44 m
Vegetation height	n/a	Fire intensity	5,317 kW/m
Effective slope	-5.71 °	Transmissivity	0.882, 0.871, 0.853, 0.831, 0.819 & 0.752
Site slope	-1 °	Viewfactor	0.4005, 0.2956, 0.1989, 0.1339, 0.109 & 0.0297
Flame width	100 m	Minimum distance to < 40 kW/m²	7.9 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	10.7 m

Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	15.8 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	23.1 m
		Minimum distance to < 10 kW/m²	27.8 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated December 13, 2023, 12:58 pm (MDc v.4.9)

3 east

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	69	Rate of spread	0.48 km/h
Vegetation classification	Woodland	Flame length	4.88 m
Understorey fuel load	12.8 t/ha	Flame angle	65 °, 72 °, 77 °, 81 °, 82 ° & 86 °
Total fuel load	14.4 t/ha	Elevation of receiver	2.32 m, 2.46 m, 2.59 m, 2.72 m, 2.8 m & 3.52 m
Vegetation height	n/a	Fire intensity	3,613 kW/m
Effective slope	-11.31 °	Transmissivity	0.888, 0.878, 0.863, 0.844, 0.833 & 0.763
Site slope	-1 °	Viewfactor	0.4028, 0.2917, 0.1965, 0.1322, 0.107 & 0.0292
Flame width	100 m	Minimum distance to < 40 kW/m²	6 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	8.300000000000001 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	12.3 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	18.1 m
		Minimum distance to <	22.2 m

10 kW/m²	

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated December 13, 2023, 12:00 pm (MDc v.4.9)

3 north

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	69	Rate of spread	0.77 km/h
Vegetation classification	Woodland	Flame length	6.75 m
Understorey fuel load	12.8 t/ha	Flame angle	65 °, 72 °, 77 °, 80 °, 81 ° & 85 °
Total fuel load	14.4 t/ha	Elevation of receiver	3.2 m, 3.41 m, 3.58 m, 3.74 m, 3.84 m & 4.68 m
Vegetation height	n/a	Fire intensity	5,752 kW/m
Effective slope	-4.57 °	Transmissivity	0.881, 0.869, 0.85, 0.828, 0.8159999999999999 & 0.75
Site slope	-1 °	Viewfactor	0.4041, 0.2966, 0.1991, 0.1349, 0.1092 & 0.0297
Flame width	100 m	Minimum distance to < 40 kW/m²	8.300000000000001 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	11.3 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	16.7 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	24.2 m

Minimum distance to < 10 kW/m²	29.2 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated December 13, 2023, 1:43 pm (MDc v.4.9)

3 west

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	69	Rate of spread	1.54 km/h
Vegetation classification	Woodland	Flame length	11.79 m
Understorey fuel load	12.8 t/ha	Flame angle	66 °, 72 °, 77 °, 80 °, 81 ° & 85 °
Total fuel load	14.4 t/ha	Elevation of receiver	5.14 m, 5.27 m, 5.27 m, 5.14 m, 5.04 m & 4.06 m
Vegetation height	n/a	Fire intensity	11,524 kW/m
Effective slope	5.5 °	Transmissivity	0.864, 0.847, 0.823, 0.799, 0.787 & 0.731
Site slope	1 °	Viewfactor	0.4132, 0.3056, 0.2062, 0.1398, 0.1134 & 0.0305
Flame width	100 m	Minimum distance to < 40 kW/m²	14 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	18.9 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	27.2 m

Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	37.8 m
		Minimum distance to < 10 kW/m²	44.5 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated December 13, 2023, 1:48 pm (MDc v.4.9)

4 east

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	69	Rate of spread	0.98 km/h
Vegetation classification	Woodland	Flame length	8.15 m
Understorey fuel load	12.8 t/ha	Flame angle	65 °, 71 °, 77 °, 80 °, 81 ° & 84 °
Total fuel load	14.4 t/ha	Elevation of receiver	3.87 m, 4.09 m, 4.32 m, 4.51 m, 4.62 m & 5.52 m
Vegetation height	n/a	Fire intensity	7,359 kW/m
Effective slope	-1 °	Transmissivity	0.876, 0.862, 0.841, 0.8179999999999999, 0.806 & 0.744
Site slope	-1 °	Viewfactor	0.4056, 0.2995, 0.2015, 0.1364, 0.1108 & 0.03
Flame width	100 m	Minimum distance to < 40 kW/m²	10 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	13.5 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	19.9 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	28.4 m
		Minimum distance to < 10 kW/m²	33.9 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated December 13, 2023, 1:46 pm (MDc v.4.9)

4 north

Minimum Distance Calculator - AS3959-2018 (Method 2)

Inputs		Outputs	
Fire Danger Index	69	Rate of spread	0.71 km/h
Vegetation classification	Woodland	Flame length	6.37 m
Understorey fuel load	12.8 t/ha	Flame angle	65 °, 72 °, 77 °, 80 °, 82 ° & 85 °
Total fuel load	14.4 t/ha	Elevation of receiver	3.02 m, 3.21 m, 3.38 m, 3.54 m, 3.64 m & 4.44 m
Vegetation height	n/a	Fire intensity	5,317 kW/m
Effective slope	-5.71 °	Transmissivity	0.882, 0.871, 0.853, 0.831, 0.819 & 0.752
Site slope	-1 °	Viewfactor	0.4005, 0.2956, 0.1989, 0.1339, 0.109 & 0.0297
Flame width	100 m	Minimum distance to < 40 kW/m²	7.9 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	10.7 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	15.8 m

Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	23.1 m
		Minimum distance to < 10 kW/m²	27.8 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005