ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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

Development Permit No.: D/90-2015

Dated: 30 August 2018

Bushfire Hazard Assessment and Management Plan

St Luke's Healing Foundation

342-350 Holt Street, Frenchville

Unit 1 / Studio 4
304 Montague Road
WEST END QLD 4101

Issue Date: 18 June 2018

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Document Management

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Definitions

Term	Definition
Disturbance footprint	The entire area to be impacted by the proposed project.
The project	St Luke's Healing Foundation - 342-350 Holt Street, Frenchville
The site	Lot 153 on RP866052

Abbreviations

Abbreviation	Description
AS 3959-2009	Australian Standard: Construction of buildings in bushfire prone areas
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BHAMP	Bushfire Hazard Assessment and Management Plan
City Plan	Rockhampton City Plan 2005
DA	Development Application
DILGP	Department of Infrastructure, Local Government and Planning)
E2M	E2M Pty Ltd
GIS	Geographic Information Systems
GPS	Global Positioning System
MCU	Material change of use
Planning Act	*Planning Act 2016*
Planning Regulation	*Planning Regulation 2017*
RRC	Rockhampton Regional Council
RRPS	Rockhampton Regional Planning Scheme 2015
SPP	State Planning Policy (July 2017)
VC	Vegetation community
RE	Regional Ecosystem
sp.	Singular species. For example, *Eucalyptus* sp. refers to a single species of *Eucalyptus*
spp.	Multiple species. For example, *Eucalyptus* spp. refers to multiple species of *Eucalyptus*

1 Introduction

1.1 Project background

E2M Pty Ltd (E2M) has published a Bushfire Hazard Assessment (BHA) (E2M, rev. A, dated 8/06/16) and BHA Addendum Report (E2M, rev. 0, dated 27/10/16) for St Luke's Healing Foundation. These documents relate to a proposed development at 342-350 Holt Street (Lot 153 on RP866052), Frenchville, herein referred to as 'the site'. Specifically, a material change of use (MCU) (single dwelling) development approval is being sought for the site from Rockhampton Regional Council (RRC). The site is zoned as Environmental Management and Conservation areas under the Rockhampton Regional Planning Scheme (RRPS).

The BHA (E2M, Rev. B, dated 3/11/16) concluded a *High* Bushfire Hazard Rating for the proposed Building Location Envelope (BLE). Subsequently, Rockhampton Regional Council requested E2M to undertake further investigations with the intent of mitigating unacceptable bushfire risks associated with the proposed development. It should be noted that whilst current at the time of assessment, the Development Application (DA), BHA and associated recommendations (E2M, Rev. B, dated 8/06/16) were based on the now superseded *Rockhampton City Plan 2005* (City Plan 2005) and associated *Planning Policy No. 12 Assessment of Bushfire Hazard and Preparation of Bushfire Management Plans* (PP No. 12).

The BHA Addendum Report (E2M, Rev. 0, dated 27/10/16) concluded a *Medium* Bushfire Hazard Rating for the Building Location Envelope. This assessment of bushfire hazard risk in accordance with current methodologies was undertaken in response to Rockhampton Regional Council's concerns. This included assessment against the:

- State Planning Policy - state interest guideline: Natural hazards, risk and resilience 2016 (SPP); and
- Rockhampton Region Planning Scheme (RRPS) 2015 and associated Bushfire Management Planning Scheme Policy.

The current SPP utilises a quantitative methodology developed by Leonard *et al.* (2014) which provides an estimate of fire behaviour via the prediction of potential fire-line intensity. This method was developed to overcome the limitations included in the superseded *State Planning Policy 1/03:* Mitigating *the Adverse Impacts of Flooding, Bushfires and Landslides* (SPP 1/03) to which PP No. 12 (City Plan 2005) was developed. The current SPP is also consistent with the *Australian Standard 3959 2009 Construction of buildings in bushfire-prone areas* (AS3959-2009) which regulates and specifies requirements for the construction of buildings in *bushfire-prone areas*[1].

In response to further concerns from RRC, an assessment of Bushfire Attack Level's (BAL) utilising Method 2 (AS3959-2009) has been undertaken and provided within this document. A BAL rating for a proposed development can be ascertained using either Method 1 (Clause 2.2, AS 3959-2009) or Method 2 (Appendix B, AS 3959-2009). Method 1 is a simplified procedure and has been utilised in the previous assessments. Method 1 satisfies the requirements detailed in the City Plan 2005 and RRPS 2015. Method 2 is more detailed and is utilised when a more specific result is required. Method 2 has been adopted at the request of RRC.

Furthermore, this BHA (Rev. D) has been updated with a conservative approach regarding hazardous vegetation on site. Additional details regarding site access and Asset Protection Zones (APZ) have been updated in this report.

[1] Pursuant to s. 12, *Building Regulation 2006* (Qld)

1.2 Scope and objectives

E2M Pty Ltd (E2M) has been engaged by St Luke's Healing Foundation to undertake a BHAMP to accompany a DA for the site. The objectives of this assessment are to:

- identify bushfire related risk factors associated with the placement of the development footprint, including likely direction of bushfire attack, hazard scores associated with existing and proposed (where relevant) vegetation on and surrounding the site, and planning separation from potential hazards; and
- recommend appropriate measures of protection to mitigate the risk posed by the assessed BAL in accordance with the SPP, Australian Standard (AS) 3959-2009 (Standards Australia Committee FP-020 2011) and Bushfire Hazard Overlay Code (RRPS 2015).

This BHAMP addresses relevant State and Local regulatory requirements and has been undertaken in accordance with the requirements of the Bushfire Management Planning Scheme Policy (RRPS 2015).

1.3 Site description

The site is located in the suburb of Frenchville, Rockhampton. The site is bounded by large, vegetated, undeveloped freehold lots to the north, south and east. Approximately 1.1 kilometres to the east is the boundary of Mt Archer National Park, a heavily vegetated reserve of approximately 4250 ha. To the west of the site is a vegetated public reserve and further west is dominated by suburban residential properties, generally between 600 m^2 to 1200 m^2 in area (refer to Figure 1).

A Stream Order 1 watercourse has been mapped under the Geoscience Australia Ordered Drainage 1:100,000 mapping and generally traverses the centre of the site from east to west.

The terrain on the site is steeply undulating and vegetated with remnant Eucalypt woodland vegetation communities. Past land use management has resulted in the introduction and proliferation of introduced/non-native pest plant species in the understorey. There are no dwellings or structures within the site of any kind. An unsealed track currently provides vehicle access to the site from the end of Woodland Drive.

Generally, mature vegetation communities in the surrounding landscape to the north, east and south are continuous. Surrounding vegetation is similar to that within in the site, with canopy cover open and individual tree canopies not often overlapping, representing grassy woodland vegetation communities.

1.4 Site bushfire history

E2M ecologists investigated any known bushfire behaviour on the development site. The following formal information regarding past bushfire activity was available at the time of writing this report.

2009

The Rockhampton area was affected by bushfires in October 2009, where bushland was burning in nearby Mt Archer national park for over three weeks. Residents from Frenchville, Koongal and Lakes Creek were evacuated, and one property was destroyed[2]. The fire was moderate and travelling west-north-westerly.

[2] *How the Rocky bushfires unfolded,* The Morning Bulletin https://www.themorningbulletin.com.au/news/how-rocky-bushfires-unfolded/387245/

Firebreaks in the Frenchville area prevented the fire impacting on residents in the northern part of Frenchville Drive, the southern side of Sunset Drive and residents in Guthrie Street.

2015

The Mount Archer area was affected by bushfires in July 2015[3], where a bushfire burned for several days. Backburning operations were conducted in the area with smoke and ash drifting over the Frenchville, North Rockhampton and Kalka areas. There was no threat to property.

Rockhampton Regional Council Bushfire Management Strategy

The Mount Archer area has a high frequency of fire as recorded by fire scar data. The very high fire hazard levels alongside urban residential areas made this a key location in the fire strategy. The fire scar data only records major fires in 2009. However, Queensland Parks and Wildlife Services have documented frequent fires in the years preceding this date.

1.5 Proposed development

The proposed development consists of a single dwelling located in the north-western area of the site. Specifically, a material change of use (MCU) (single dwelling). The proposed dwelling location has been depicted in Figure 1.

1.6 Legislative context

1.6.1 State Planning Policy (July 2017)

Supporting the *Planning Act 2016* (Planning Act) (Qld), the purpose of the SPP is to guide State and Local government in land-use planning and development by defining the Queensland Government's polices about matters of state interest, to which there are 17 arranged under five themes:

- liveable communities
- mining and extractive resources
- water quality
- natural hazards, risk and resilience; and
- strategic airports and aviation facilities.

Local governments must consider the state interest and reflect appropriately when amending local planning schemes and in some cases, assessing development applications.

Under the safety and resilience to hazards theme, the state's interest is to ensure that natural hazards are properly considered in all levels of the planning system. This includes the avoidance of natural hazard areas or the mitigation of risks to an acceptable or tolerable level. The SPP is supported by the *SPP – State interest guideline – Natural hazards, risk and resilience* (April 2016), *Technical manual – Evaluation report: Bushfire Hazards* (April 2016) and *Technical manual – A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments* (April 2016) (Department of Infrastructure, Local Government and Planning) which identify the outcomes sought by the State and application when planning

[3] Mount Archer – bushfire as at 2.30pm Sun 19 Jul, Queensland Government Fire and Emergency Services Newsroom https://newsroom.psba.qld.gov.au/Content/Home/02-Home/Article/Mount-Archer-near-Rockhampton-bushfire-as-at-2-30pm-Sun-19-Jul/-2/-2/8591

development within a bushfire hazard area (bushfire prone area)[4]. Furthermore, the SPP Interactive Mapping System includes bushfire hazard area (bushfire prone area) mapping which is based on the methodologies outlined in Leonard *et al*. (2014).

1.6.2 National Construction Code 2016: Building Code of Australia

The *National Construction Code 2016: Building Code of Australia* (BCA) details technical provisions pertaining to the design and construction of buildings and other structures throughout Australia (The Australian Building Codes Board). Ten primary building classes, including several sub-classes, are defined within the BCA. Part G5 of the BCA identifies that where a building is going to be constructed within a designated bushfire prone area, it must *be designed and constructed to reduce the risk of ignition from a bushfire*. This, however, is only applicable to:

- Class 1[5], Class 2[6] or Class 3[7] buildings; or
- a Class 10a[8] building or deck associated with Class 1-3 buildings.

Beyond these classes, there are some instances where the BCA identifies provisions for special use buildings such as public transport buildings, farm buildings and farm sheds.

1.6.3 Australian Standard: Construction of buildings in bushfire-prone areas (AS 3959-2009)

Where development is proposed within bushfire prone areas, AS 3959-2009 specifies construction requirements to improve resistance to bushfire attack. Construction specifications are based on heat flux exposure thresholds which have been categorised into six Bushfire Attack Levels[9] (BAL):

- BAL-LOW
- BAL-12.5
- BAL-19
- BAL-29
- BAL-40; and
- BAL-Flame Zone (FZ).

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[4] *is land that is potentially affected by significant bushfires, including: vegetation likely to support a significant bushfire; and adjacent land that could be subject to impacts from a significant bushfire (i.e. potential impact buffer)* (Part G, SPP).

[5] *A single dwelling being a detached house, or one or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit; A boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300m², and where not more than 12 reside, and is not located above or below another dwelling or another Class of building other than a private garage* (Queensland Building and Construction Commission).

[6] *A building containing two or more sole-occupancy units each being a separate dwelling* (Queensland Building and Construction Commission).

[7] *A residential building, other than a Class 1 or 2 building, which is a common place of long term or transient living for a number of unrelated persons* (Queensland Building and Construction Commission).

[8] *A private garage, carport, shed or the like* (Queensland Building and Construction Commission).

[9] *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* (AS 3959-2009).

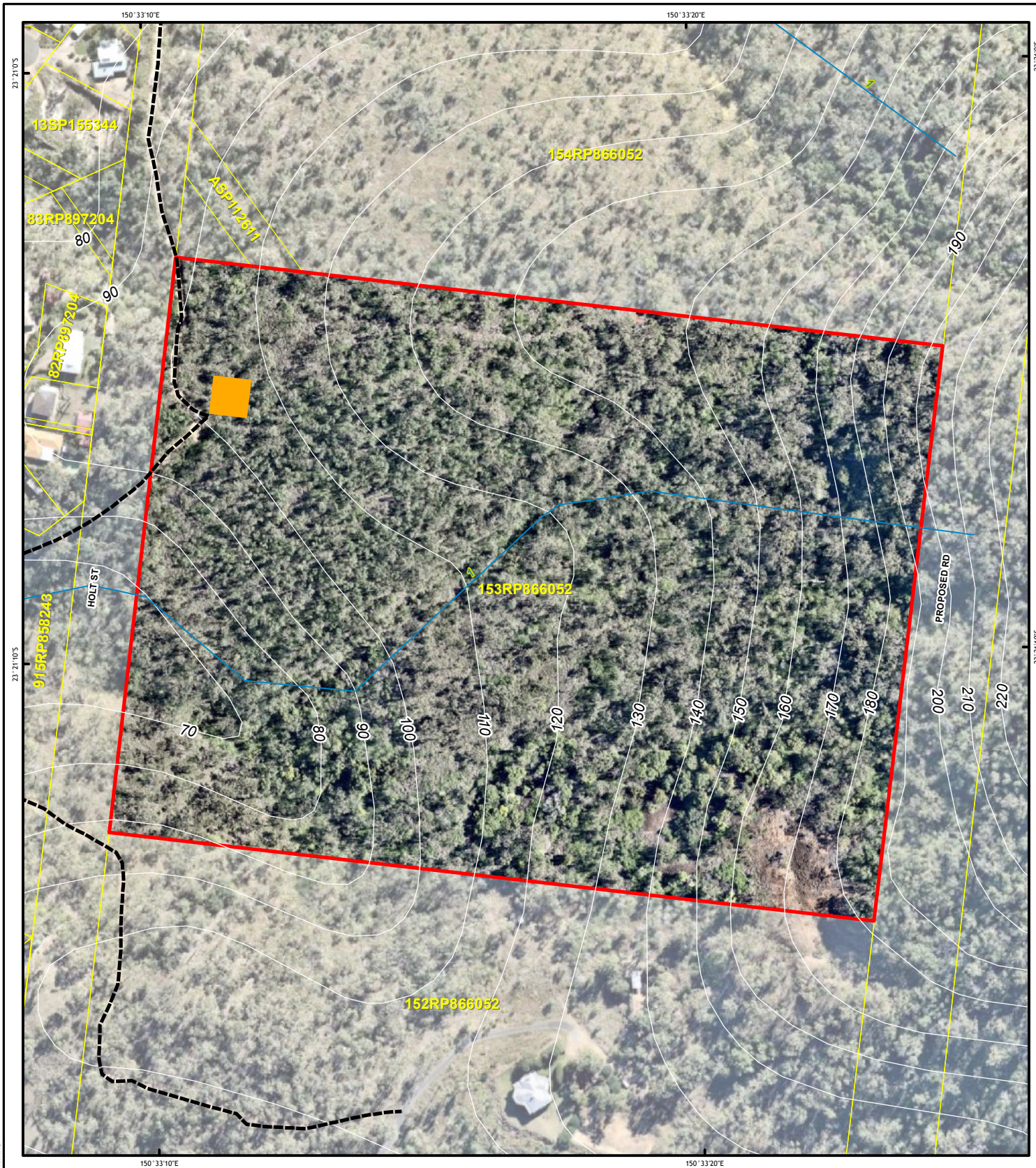
These categories are expressed in kW/m^2, as such, the lower the category value the lower the radiant heat. The highest level of bushfire attack is BAL-FZ, which indicates direct exposure to flames. Determining a BAL rating for a proposed development can be ascertained using either Method 1 (Clause 2.2, AS 3959-2009) or Method 2 (Appendix B, AS 3959-2009). Method 1 is a simplified procedure, whereas Method 2 is more detailed and is utilised when a more specific result is required.

As identified within Section 1.6.2, construction requirements identified within AS 3959-2009 are only applicable to Class 1, Class 2 or Class 3 buildings, or a Class 10a building or deck associated with Class 1-3 buildings.

1.6.4 Rockhampton Region Planning Scheme 2015

The Bushfire Hazard Overlay, under the RRPS 2015, reflects SPP State and Local level interests by identifying designated bushfire hazard areas. Where assessable development is proposed on land mapped as containing bushfire hazard areas, a site-specific bushfire hazard assessment prepared in accordance with the Bushfire management planning scheme policy (Bushfire Management PSP) is required.

The Bushfire Management PSP reflects the current SPP methodology (see Section 1.1). This assessment of bushfire hazard risk was undertaken in accordance with current methodologies.



Legend

- Contour
- Track
- Ordered Drainage 100k (SO)
- Proposed Dwelling
- Site Extent
- Cadastre

ROCKHAMPTON REGIONAL COUNCIL

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Dated: 30 August 2018

Scale 1:2,750 (A4)

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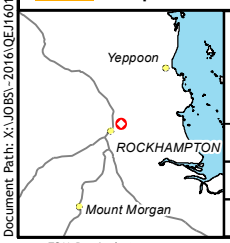
Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator



Notes:
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1	Updated	CD	CB	15/06/2018
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FIGURE 1: SITE LOCATION

Bushfire Assessment
342-350 Holt Street, Frenchville

Map Number	Job Number	Rev
1 of 1	QEJ16019	1

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2 Methods

2.1 Desktop assessment and legislative review

A desktop assessment and legislative review was undertaken to identify overlay mapping and code requirements under the SPP and RRPS 2015. The review included:

- *Planning Act 2016* (Planning Act) (Qld)
  - *Planning Regulation 2017* (Planning Regulation) (Qld)
  - SPP (July 2017)
  - State Assessment and Referral Agency (SARA) mapping (Department of Infrastructure, Local Government and Planning)
- Rockhampton Region Planning Scheme 2015 (Rockhampton Regional Council)
  - Bushfire Hazard Overlay Code
  - Bushfire Management Planning Scheme Policy (Bushfire Management PSP)
  - Rockhampton Region Planning Scheme 2017 interactive mapping
- *Australian Standard: Construction of buildings in bushfire-prone areas* (AS 3959-2009)

2.2 Field assessment

A field survey of the site was conducted by E2M ecologist, Leah Hattendorff, on 31 May 2016. The survey included:

- recording the floristic structure, composition and condition of vegetation communities located within and adjacent to the site (i.e. 100 m assessment buffer)
- assessment of slope
- determination of the aspect of the site; and
- identification of waterway and wetland features within the site (if applicable).

A Trimble Nomad Global Positioning System (GPS) device was utilised to delineate the extent of vegetation communities and record local attributes within and adjacent to the site. Captured data was validated, mapped and assessed using a geographical information system, whereby the development footprint and observed features and extents were overlaid on the relevant regulatory mapping (GDA94/MGA zone 56).

2.3 Bushfire hazard assessment

Utilising the recorded outcomes of the field assessment, a Bushfire Hazard Assessment and subsequent BAL review was carried out in accordance with the method and provisions of the Bushfire planning scheme policy (Bushfire Management PSP) (RRPS 2015), SPP and associated technical manual[10].

[10] *Technical Manual: A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments* (April 2016)

2.4 Bushfire Attack Level

Determination of the BAL associated with the development footprint and classified vegetation was undertaken in accordance with AS 3959-2009, specifically Method 2 (AS 3959-2009 - Appendix B). This includes identification of the following input values:

- relevant Fire Danger Index (FDI)
- vegetation classification
- surface and overall fuel load
- distance of the development footprint from classified vegetation
- effective slope of land under classified vegetation; and
- site slope of land under the development footprint.

AS 3959-2009 defines BAL as *being 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*. As such, the outcomes of the assessment and associated BAL construction requirements are only applicable to proposed buildings and/or assets; not the entire development footprint.

This assessment has utilised Method 2, whereas, the previous assessment utilised Method 1. Method 1 is a simplified procedure subject to limitations. However, the site conditions were within the scope of this simplified procedure and fulfilled the requirements detailed in the City Plan 2005 and RRPS 2015. Method 2 is more detailed and is utilised when a more specific result is required. This method was adopted at the request of RRC.

3 Results

3.1 Desktop assessment and legislative review

3.1.1 State Planning Policy (July 2017)

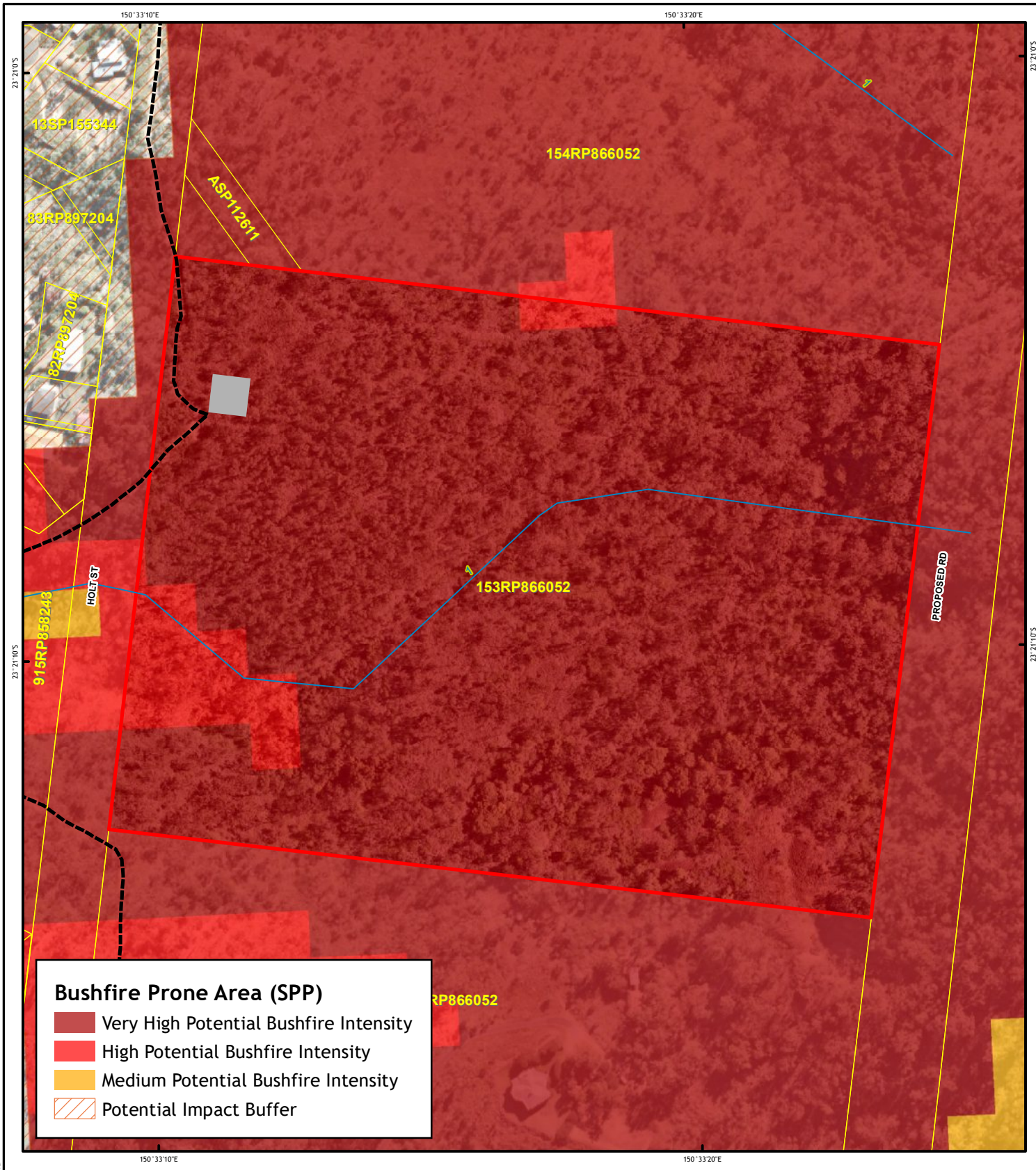
The SPP Interactive Mapping System mapping indicated that the site contains the following sub-categories of bushfire hazard area (bushfire prone area):

- Very High Potential Bushfire Intensity; and
- High Potential Bushfire Intensity.

Very High Potential bushfire intensity areas cover the majority of the site, with a small area of High Potential bushfire intensity area in the south west of the site. The SPP mapping has been indicated in Figure 2.

3.1.2 Rockhampton Region Planning Scheme 2015

The RRPS 2017 interactive mapping tool identified that Very High bushfire hazard areas cover the site. The RRPS mapping has been indicated in Figure 3.



Legend

- Track
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- Proposed Dwelling
- Site Extent
- Cadastre

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Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator

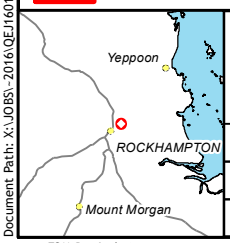

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FIGURE 2: SPP BUSHFIRE PRONE AREA

Bushfire Assessment
342-350 Holt Street, Frenchville

Map Number	Job Number	Rev
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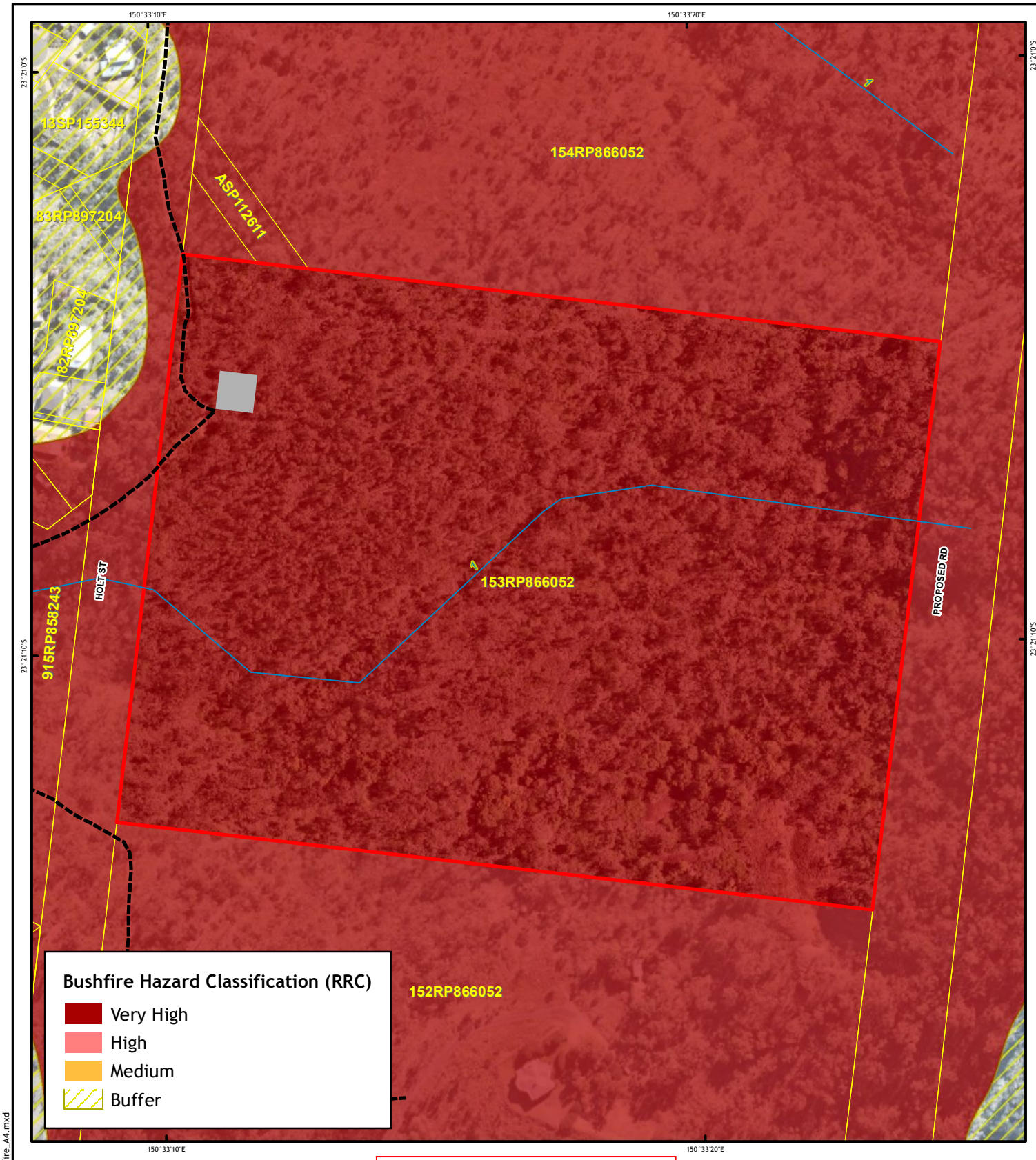

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Scale 1:2,750 (A4)

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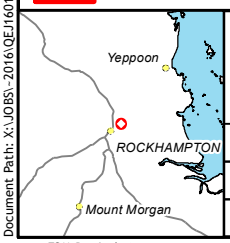

Notes:
Aerial Imagery: © Nearmap 2017
Cadastre: © DNRME 2017
Ordered Drainage: © DNRME 2017
Road: © PSMA 2014
Bushfire Hazard Classification: © RRC 2018

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FIGURE 3: ROCKHAMPTON REGIONAL COUNCIL - BUSHFIRE OVERLAY

Bushfire Assessment
342-350 Holt Street, Frenchville

Map Number	Job Number	Rev
1 of 1	QEJ16019	1

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3.2 Field assessment

3.2.1 Vegetation communities

Vegetation on site was assessed to determine composition and structure in accordance with Leonard *et al.* (2014) (i.e. vegetation hazard classes (VHCs)) and AS 3959-2009. The outcomes of the field survey identified five sub-units of differing vegetation composition and structure (refer to Figure 4). The following provides a brief description of these vegetation communities (VCs):

3.2.1.1 VC 1 – Sub-unit 1

Woodland consisting of narrow-leaved ironbark (*Eucalyptus crebra*) and forest red gum (*Eucalyptus tereticornis*), with pink bloodwood (*Corymbia intermedia*) was recorded on site (for example, refer to Photo Plates 1 to 5).

To align with the technical manual and AS 3959-2009, VC 1 can be described as dry eucalypt woodland on sandstone and shallow soils (i.e. VHC 12.2; vegetation classification B, AS 3959-2009).

The proposed building pad is located within sub-unit 1 and the boundaries of the proposed pad were investigated in more detail to assess the bushfire risk at that interface (refer to Photo Plates 2 to 5). Vegetation structure and hazard class was consistent at these locations.

Photo Plate 1 – VC 1 - Sub-unit 1 was characterised by remnant eucalypt woodland with a grassy understorey – location A (left) and location B (right).

Photo Plate 2 – VC 1 - Sub-unit 1: View south (left) and north (right) along the western boundary of the proposed building location pad (location C). This boundary was adjacent to the unformed access track leading up to the site.

Photo Plate 3 – VC 1 - Sub-unit 1: View west (left) and east (right) along the southern boundary of the proposed building location pad (location D).

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Photo Plate 4 – VC 1 - Sub-unit 1: View north (left) and south (right) along the eastern boundary of the proposed building location pad (location E).

Photo Plate 5 – VC 1 - Sub-unit 1: View east along the northern boundary of the proposed building location pad (location F).

3.2.1.2 VC 2 – Sub-unit 2

Woodland consisting of narrow-leaved ironbark (*Eucalyptus crebra*) and forest red gum (*Eucalyptus tereticornis*), with pink bloodwood (*Corymbia intermedia*) was recorded on site. Sub-unit 2 was similar in vegetation classification and species composition to sub-unit 1, however, the density of the shrub layer fuels increased in this sub-unit, with higher proportions of lantana present (refer to Photo Plate 6).

To align with the technical manual and AS 3959-2009, VC 2 can be described as dry eucalypt woodland on sandstone and shallow soils (i.e. VHC 12.2; vegetation classification B, AS 3959-2009).

Photo Plate 6 – VC 2 - - Sub-unit 2 was characterised by remnant eucalypt woodland with a grassy understorey and moderate shrub-level ladder fuels (location G).

3.2.1.3 VC 3 – Sub-unit 3

Sub-unit 3 was characterised by a steep riparian gully. The sub-unit was similar in vegetation classification and species composition to sub-unit 1, with the dominance changing to forest red gum (*Eucalyptus tereticornis*). The density of the shrub layer fuels increased in this sub-unit, with higher proportions of lantana present than that of sub-unit 1(for example, refer to Photo Plate 7).

To align with the technical manual and AS 3959-2009, VC 2 can be described as dry eucalypt open forest on sandstone and shallow soils (i.e. VHC 12.1; vegetation classification B, AS 3959-2009).

Photo Plate 7 – VC3 - Sub-unit 3 was characterised by a riparian gully containing remnant eucalypt woodland with a grassy understorey and moderate shrub-level ladder fuels (location H).

3.2.1.4 VC 4 – Sub-unit 4

Sub-unit 4 was located in the south-western corner of the site and was not accessible, however, vegetation was clearly viewed from areas to the north. Vegetation present in this sub-unit was similar in vegetation classification and species composition to sub-unit 1, with shrub layer fuels once again becoming sparse (i.e. VHC 12.2 - dry eucalypt woodland on sandstone and shallow soils, vegetation classification B, AS 3959-2009).

3.2.1.5 VC 5 – Sub-unit 5

Sub-unit 5 was located in the south-eastern portion of the site and was not accessible, however, vegetation was clearly viewed from areas to the north. Vegetation present in this sub-unit was similar in vegetation classification and species composition to sub-unit 1, with shrub layer fuels increasing in density, and lantana becoming the dominant shrub species.

Adjacent Lands – North

Adjacent Lands to the north of the site and immediately north of the building location pad, consisted of a vegetated freehold lot which was clearly observed from the access track leading to the site. Vegetation within this area was similar in vegetation classification and species composition to sub-unit 1, with shrub layer fuels once again becoming sparse.

Adjacent Lands – East

Adjacent Lands to the west of the site consisted of a vegetated freehold lot. Vegetation within this area could not be accessed or observed directly, however aerial photography indicates a similar vegetation classification to sub-unit 1 and was of the same aspect.

Adjacent Lands – South

Adjacent Lands to the south of the site consisted of a vegetated freehold lot. Vegetation within this area could not be accessed or observed directly, however aerial photography indicates a similar vegetation classification to sub-units within the site, with a single dwelling located in the centre of the lot, which is surrounded by a cleared and maintained lawn area.

Adjacent Lands – West

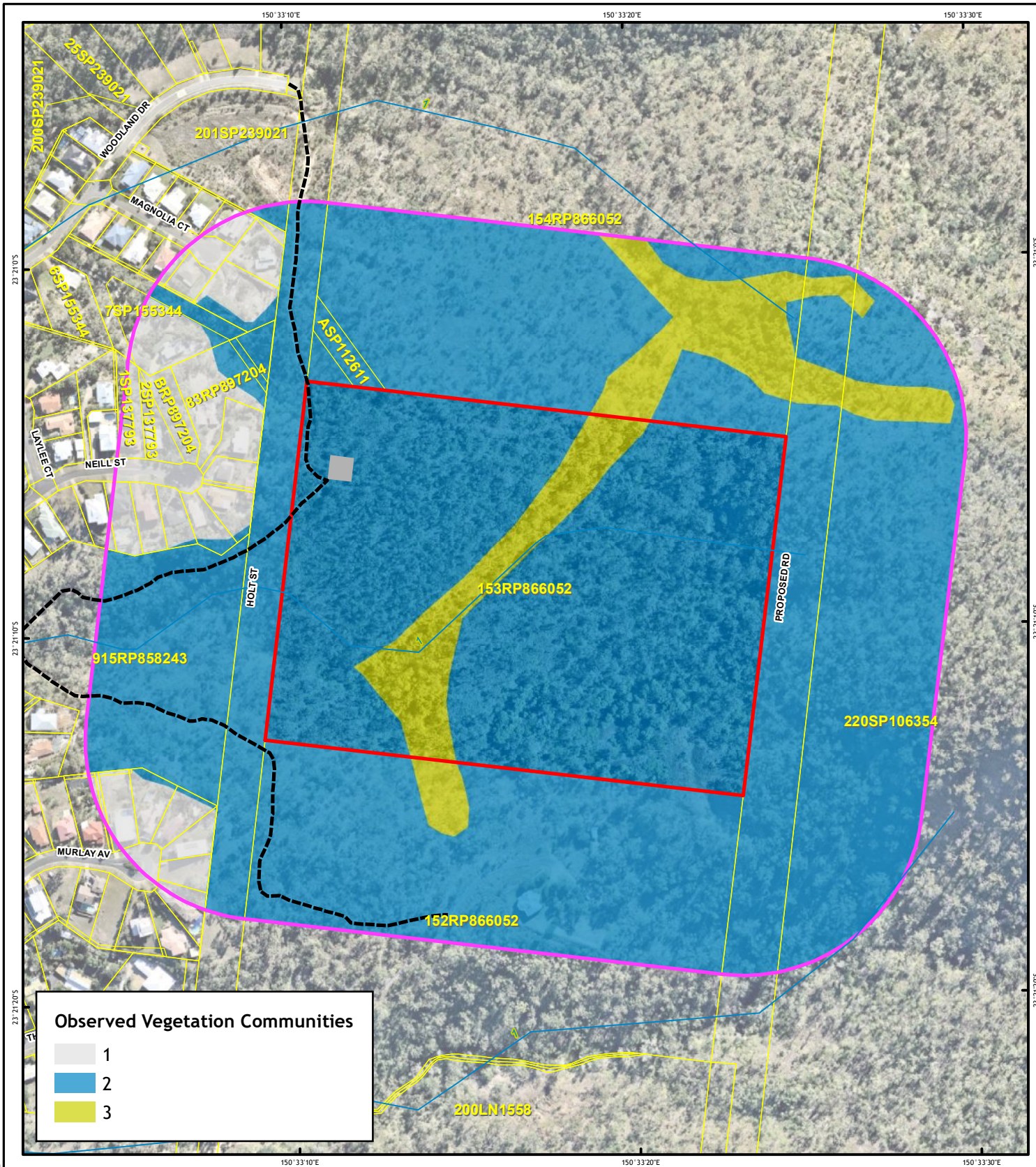
Adjacent Lands to the west of the site consisted vegetated public reserve characterised by a riparian gully and further east is dominated by suburban residential properties, containing residences and landscape. Native vegetation communities in this area consisted of narrow-leaved ironbark (*Eucalyptus crebra*) and pink bloodwood (*Corymbia intermedia*). The shrub layer was dominated with dominated by red ash (*Alphitonia excelsa*) and lantana (*Lantana camara*) with occasional acacia species. Groundcover was dominated Kangaroo grass (*Themeda triandra*) and red natal grass (*Melinis repens*) (refer to Photo Plate 8).

Photo Plate 8 – Adjacent lands west of the site were characterised by a riparian gully containing remnant Eucalypt woodland with a grassy understorey and moderate shrub-level ladder fuels (location I).

3.2.2 Slope and aspect

The landform of the site consists of steep riparian gullies, having a high relief (~77 m south-west to ~104 m north-east) with a steeply inclined slope (36.4 % average) (Speight 2009). Aspect within the site is largely influenced by the southern riparian corridor, the aspect of the site is south-west facing.

Access tracks within the site were limited, thereby cutting off safe walking access to much of the southern portion of the site. Access to adjacent freehold lots was outside the scope of this study and therefore some areas could not be reached to verify local slope and vegetation variations. Where this is the case, contour mapping has been relied upon for calculation of slope percentages. However, vegetation within inaccessible sub-units was easily viewed from the northern side of the gully and was similar in both species composition and structure to those areas already verified within the site.



Legend

- Track
- Ordered Drainage 100k (SO)
- Proposed Dwelling
- Site Extent
- Bushfire Buffer (150m)
- Cadastre

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Dated: 30 August 2018

N

Scale 1:4,400 (A4)

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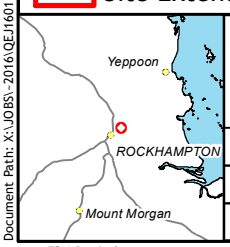
Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator



Notes:
Aerial Imagery: © Nearmap 2017
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1	Updated	CD	CB	15/06/2018
0	Issued for Use	CD	CB	15/11/2017

FIGURE 4: VEGETATION HAZARD CLASSIFICATION

Bushfire Assessment
342-350 Holt Street, Frenchville

Map Number	Job Number	Rev
1 of 1	QEJ16019	1

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3.3 Bushfire hazard assessment

3.3.1 Pre-development scenario

A 'pre-development scenario' bushfire hazard assessment (BHA) was undertaken to determine the existing bushfire prone (i.e. bushfire hazard) areas within the site and confirm, or otherwise, SPP mapping. The outcomes of the assessment identified that the site contains classified vegetation, including Very High potential bushfire intensity, High potential bushfire intensity, Medium potential bushfire intensity and Potential impact buffer areas. This result is generally in accordance with SPP mapping.

3.3.2 Post-development scenario

As the 'pre-development' scenario BHA identified Very High potential bushfire intensity, High potential bushfire intensity, Medium potential bushfire intensity and Potential impact buffer areas within and adjacent to the site, a 'post-development' BHA was undertaken to determine the level of bushfire risk to the proposed development footprint. This assessment was based on the assumptions that vegetation will be cleared or managed in a low-fuel state where impacted by the siting of the development footprint and land will be generally levelled through associated earthworks.

The outcomes of the 'post-development' scenario identified that sections of the development footprint are located within the potential impact buffer area (refer to Figure 5). As such, the development footprint and buildings located within will require consideration regarding construction requirements, set-backs, Asset Protection Zones and bushfire hazard mitigation requirements.

3.3.3 Vegetation hazard classifications

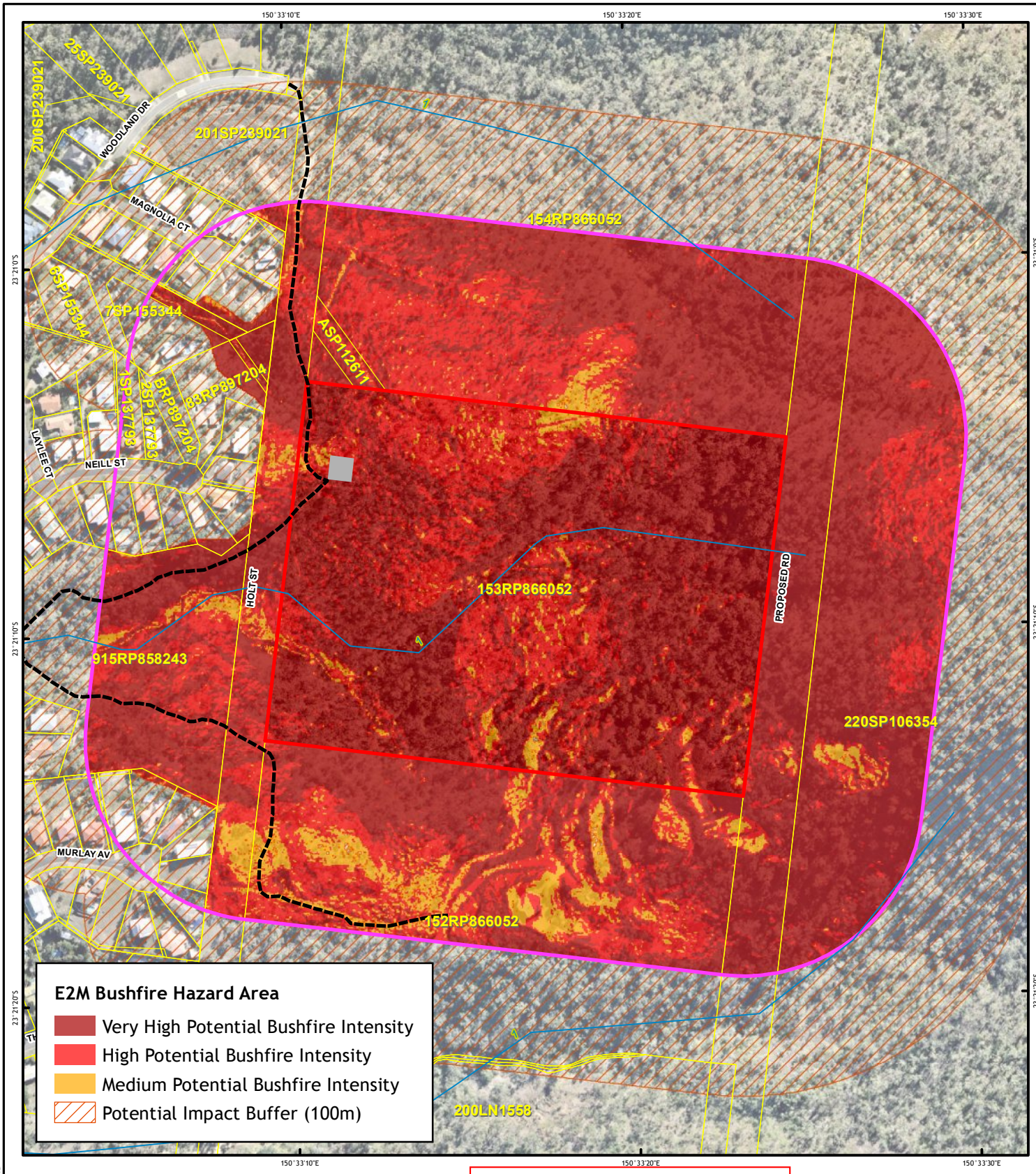
Bushfire hazards are assumed under unmanaged conditions to represent the worst case scenario over the lifetime of the proposed development. In this instance the main potential threat is from the area of unmanaged vegetation to the south and east of the proposed dwelling site. The determined Vegetation Hazard Classifications are displayed in Table 1 and Figure 4.

3.3.4 Slope assessment

Slope assessment has been undertaken as follow:

- Aerial photography
- Digital Elevation Model (Queensland Government Spatial Catalogue); and
- Site inspection.

The effective slope was calculated under the classified vegetation in accordance with AS3959-2009. The topography of the site has been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the site. The downslope leading away to the south from the proposed dwelling site has been determined as the gradient which will most significantly influence the fire behaviour of the site.



Legend

- Track
- Ordered Drainage 100k (SO)
- Proposed Dwelling
- Site Extent
- Bushfire Buffer (150m)
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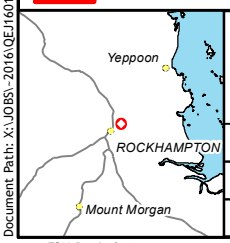

Notes:
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1	Updated	CD	CB	15/06/2018
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FIGURE 5: 'POST-DEVELOPMENT' BUSHFIRE HAZARD AREA

Bushfire Assessment
342-350 Holt Street, Frenchville

Map Number	Job Number	Rev
1 of 1	QEJ16019	1

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Table 1: Vegetation Classification

VC - Sub-unit	Direction of Hazard	Description of Landscape	Vegetation Classification		Slope	Fuel Load (VHC - as adjusted to site)
			AS3959-2009	Vegetation Hazard Classification (VHC)		
VC 1	East (proposed dwelling within this sub-unit)	Woodland consisting of narrow-leaved ironbark and forest red gum with pink bloodwood.	Woodland (Class B Hazard)	12.2 dry eucalypt woodland on sandstone and shallow soils	Upslope	17.3
VC 2	South	Woodland consisting of narrow-leaved ironbark and forest red gum with pink bloodwood. The shrub layer fuels increased in this sub-unit, with higher proportions of lantana present than that of sub-unit 1.	Woodland (Class B Hazard)	12.2 dry eucalypt woodland on sandstone and shallow soils	Across slope (variable, with areas upslope to the east and downslope to the south)	17.3
VC 3	South	Steep riparian gully of woodland consisting of forest red gum with narrow-leaved ironbark and pink bloodwood. The shrub layer fuels increased in this sub-unit, with higher proportions of lantana present than that of sub-unit 1.	Woodland (Class B Hazard)	12.1 dry eucalypt open forest on sandstone and shallow soils	Downslope	21.0
VC 4	South	Woodland consisting of narrow-leaved ironbark and forest red gum with pink bloodwood.	Woodland (Class B Hazard)	12.2 dry eucalypt woodland on sandstone and shallow soils	Downslope	17.3
VC 5	East	Woodland consisting of narrow-leaved ironbark and forest red gum with pink bloodwood. The shrub layer fuels increased in this sub-unit, with higher proportions of lantana present than that of sub-unit 1.	Woodland (Class B Hazard)	12.2 dry eucalypt woodland on sandstone and shallow soils	Upslope	17.3

3.4 Bushfire Attack Level

The Flamesol Bushfire Attack Level Calculator was used to calculate the radiant heat exposure based on the methodology detailed under Method 2 by AS 3959-2009 (refer to Appendix B). The major transect was selected based on the slope and vegetation that would have greatest influence of fire behaviour. This transect extends downslope to the south of the proposed development site. Although several fire runs do not expose the site to the entire width of the fire front, the calculations assume the site is exposed to a 100m flame width with the fire run approaching perpendicular to the site.

AS3959-2009 allocates a Forest Fire Danger Index (FFDI) of 40 to the entire state of Queensland. Notwithstanding, the Queensland Government have indicated support to adopt the site specific FFDI (fire weather) data available at the Queensland Spatial Data Catalogue. In this instance, the FFDI for the site was shown to be equivalent to 68. Accordingly, for the purpose of determining the Bushfire Attack Level (BAL), FFDI-68 was adopted.

The outcomes of the BAL assessment are identified in Table 2.

Table 2: BAL assessment

Fire Danger Index (AS 3959-2009)	Vegetation Classification (observed)	Vegetation Classification (Bushfire PSP)	Vegetation Classification (AS 3959-2009)	Effective Slope (AS 3959-2009)	Setback from hazard (m)	BAL (AS 3959-2009)
68 (Queensland Spatial Data Catalogue)	Mature remnant Eucalypt woodland dominated by *Eucalyptus crebra*, and *E. tereticornis* with a grassy understory and exotic shrub layer	12.2 dry eucalypt woodland on sandstone and shallow soils	Class B - Woodland	20°	<23	FZ
					23-<32	40
					32-<44	29
					44-<59	19
					59-<100	12.5
					>100	LOW

4 Management and mitigation strategies

As it has been identified that the proposed development is subject to bushfire hazards, the following management and mitigation measures have been included to ensure that the risk is reduced to an acceptable or tolerable level. These have been described in accordance with the Bushfire Hazard Overlay Code (RRPS 2015), AS 3959-2009 and SPP Bushfire Hazard Model Code provisions. Bushfire protection measures have also been adapted from *Planning for bushfire protection: a guide for councils, planners, fire authorities and developers* developed by the Rural Fire Service (2017a).

4.1 Separation from bushfire hazard areas

It is important to note that wildfires can break out at any time, however within Queensland, weather supporting critical fire hazard periods occur from late winter to early summer (Department of National Parks, Sport and Racing). As such, it is important to undertake management measures to reduce the risk of fire to assets such as buildings. The Asset Protection Zone (APZ) is an area surrounding a building that is managed to reduce bushfire hazard to an acceptable or tolerable level to mitigate the risk of life and property. The APZ can be separated into two management zones:

- Inner 10 m - Fuel Free Inner Zone (FFIZ); and
- Fuel Reduced Outer Zone (FROZ) (refer to Figure 6 and Figure 7).

For the development to achieve a BAL of 12.5 (refer to Section 3.4), the edge of the development footprint must be setback at least 59 m from hazardous vegetation. The inner 10 m and residual distance of 49 m respectively form the FFIZ and FROZ of the APZ (refer to Figure 8). Both to be retained and planted vegetation within the APZ is required to be sparse to very sparse[11] to ensure that the canopy is discontinuous. Furthermore, if possible, design features such as paths, swimming pools, lawns or even vegetable gardens should be incorporated to reduce the potential continuity (i.e. spread) of a fire.

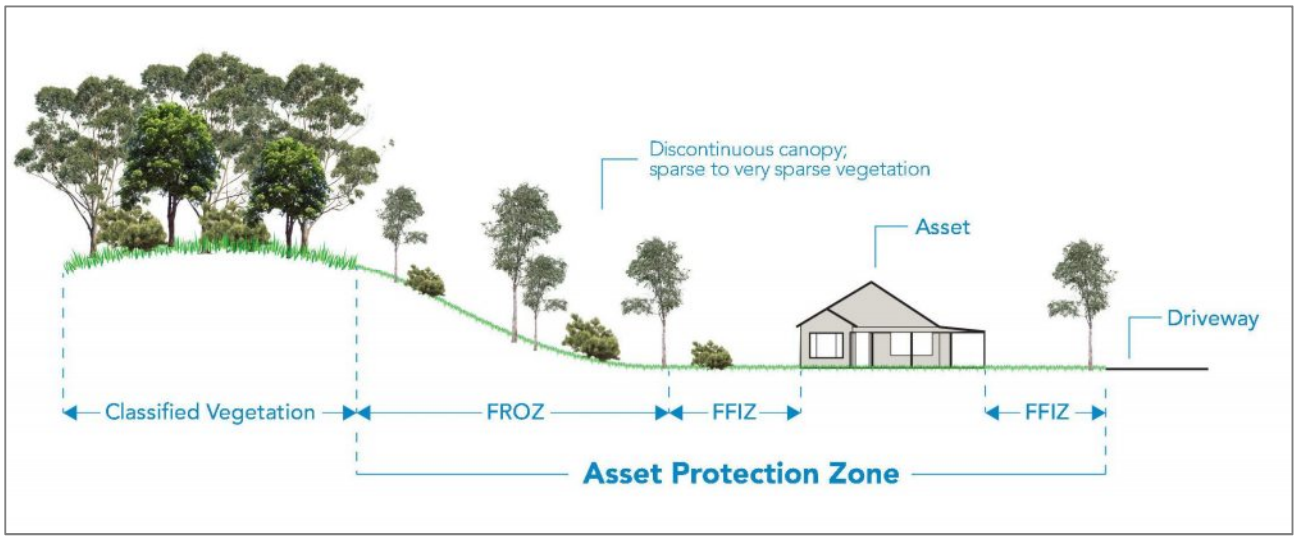


Figure 6: Asset Protection Zone

[11] As defined by Hnatuik *et al.* 2009. Foliage cover for sparse to very sparse is 10-30% and 0.2-10% respectively.

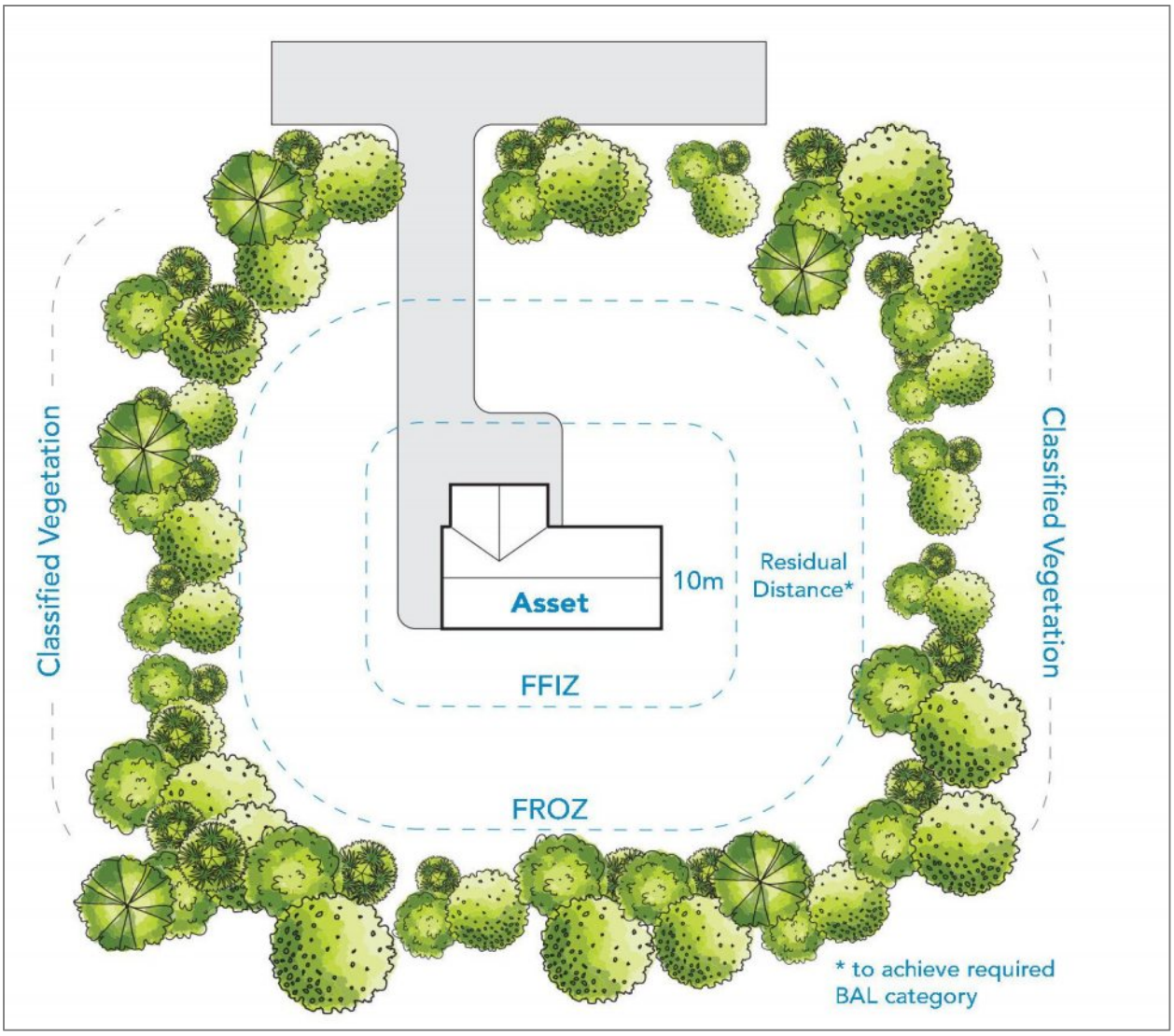


Figure 7: Requirements for Asset Protection Zones

4.1.1 Fuel Free Inner Zone

The FFIZ is known as the defendable space, which serves as an area immediately surrounding a building where vegetation is modified and maintained to ensure a low fuel state. This reduces the effects of direct flame contact, fuel continuity and radiant heat associated with a bushfire. The area should be free of combustible items and obstructions.

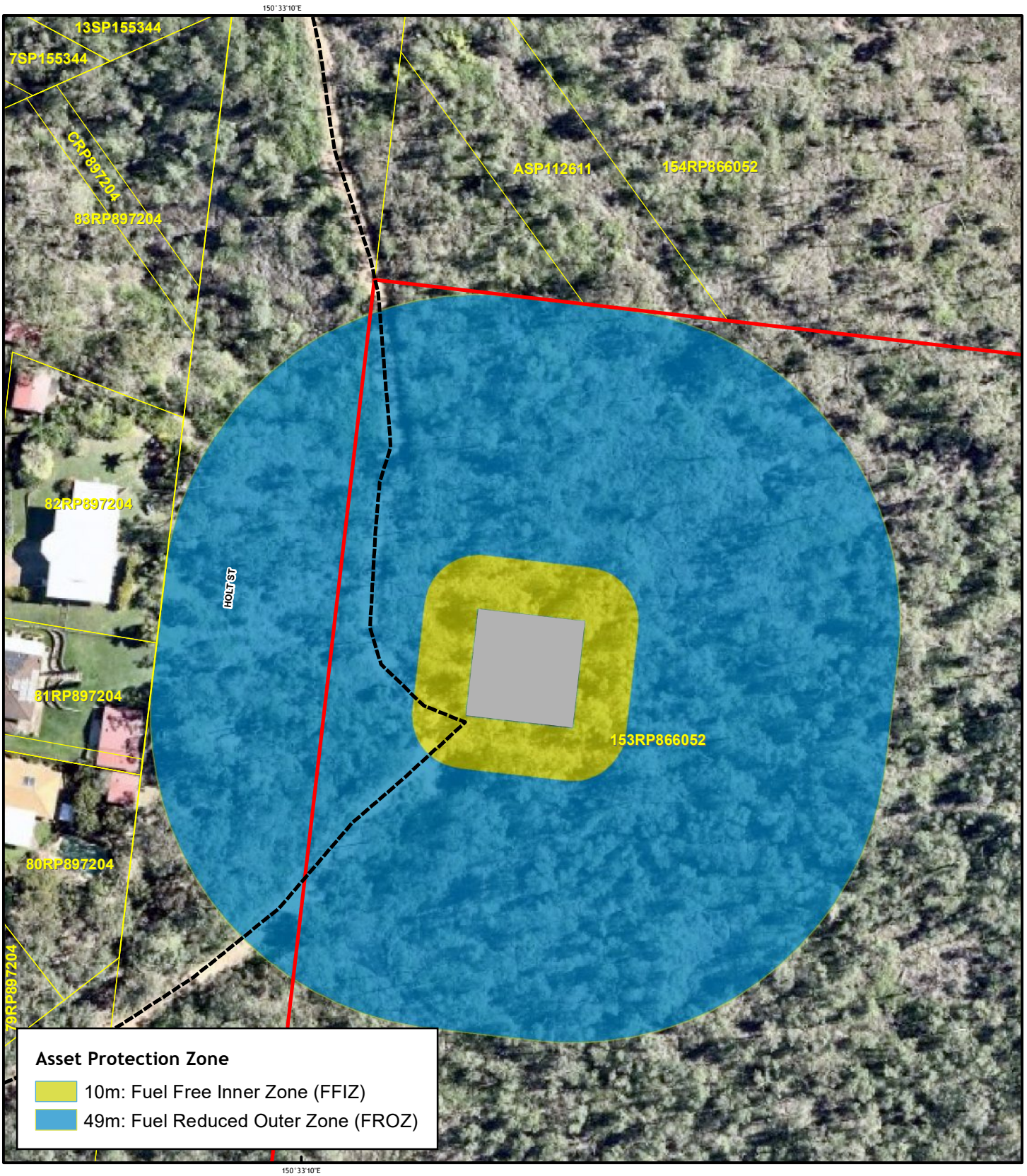
The FFIZ should be regularly maintained to prevent the build-up of fuels. Examples of fuel control include:

- Raking or manual removal of leaf litter and bark (i.e. fine fuels).
- Mowing or slashing grass (including removal of cuttings).
- Removal or pruning of trees, shrubs and the understorey to ensure that:
  - vegetation is not located in front of vulnerable sections of the asset(s) such as window features; and
  - canopies do not overhang the asset(s).

4.1.2 Fuel Reduced Outer Zone

Similarly to the FFIZ, the FROZ is to be regularly maintained to ensure a reduced fuel state. The purpose of this area is to reduce the intensity of a bushfire, shield buildings from radiant heat and reduce ember attack. Tree retention or planting is beneficial within the FROZ as selectively retained vegetation can absorb radiant heat, filter embers and reduce wind speed (Country Fire Authority 2011), however, it must be ensured that the trees and shrubs do not form a continuous canopy. Consequently, tree branches within two metres from the ground should be removed and shrubs retention at the base of trees should be minimised so to prevent the transfer of flames from ground fuels to the canopy.

The storage of flammable and combustible material within this area is to be managed to reduce the risk of providing additional fuel to a fire. Some examples of hazardous materials include woodpiles, garden mulch/ grass clipping stockpiles, flammable building materials and wooden sheds. If possible, these items should be stored in a cleared location away from any classified vegetation.



Legend

- Track
- Ordered Drainage 100k (SO)
- Proposed Dwelling
- Site Extent
- Bushfire Buffer (150m)
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Metres

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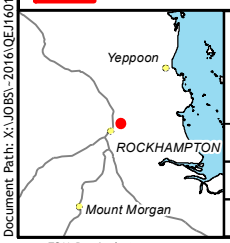

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FIGURE 8: PROPOSED SITE ASSET PROTECTION ZONE MAP

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342-350 Holt Street, Frenchville

Map Number	Job Number	Rev
1 of 1	QEJ16019	1

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4.2 Construction standards

The outcomes of the BAL assessment identified that the development footprint is to be located within a BAL-12.5 zone (refer to Section 3.4). As such, the development is to be constructed in accordance with Section 5 of AS 3959-2009. This is a requirement of the Bushfire Hazard Overlay Code (RRPS 2015).

Reduction in construction requirements for the next lower BAL may be applied due to shielding provisions. An elevation of the building where the elevation is not directly exposed to the source of bushfire attack (i.e. all straight lines between that elevation and the source of the bushfire attack are obstructed by another part of the building (Figure 9). Shielding provisions may not be less than that required for BAL- 12.5, except where exposed elevations have been determined as BAL-LOW.

In addition to AS 3959-2009 construction standards, it should be ensured that gas and electricity utilities do not contribute to fire hazard risk or impede upon fire-fighting efforts. That is, the location or design of these services should not result in the potential ignition of vegetation or buildings (catalyst to combustion). Where practicable, electrical transmission and gas lines are to be located underground and metal piping should exclusively be used. If the use of reticulated or bottled gas is proposed, these should be installed and maintained in accordance with Australian / New Zealand Standard (AS/NZS) 1596:2014, shielded from any classified vegetation, kept clear of flammable materials and the safety valves should be directed away from the building.

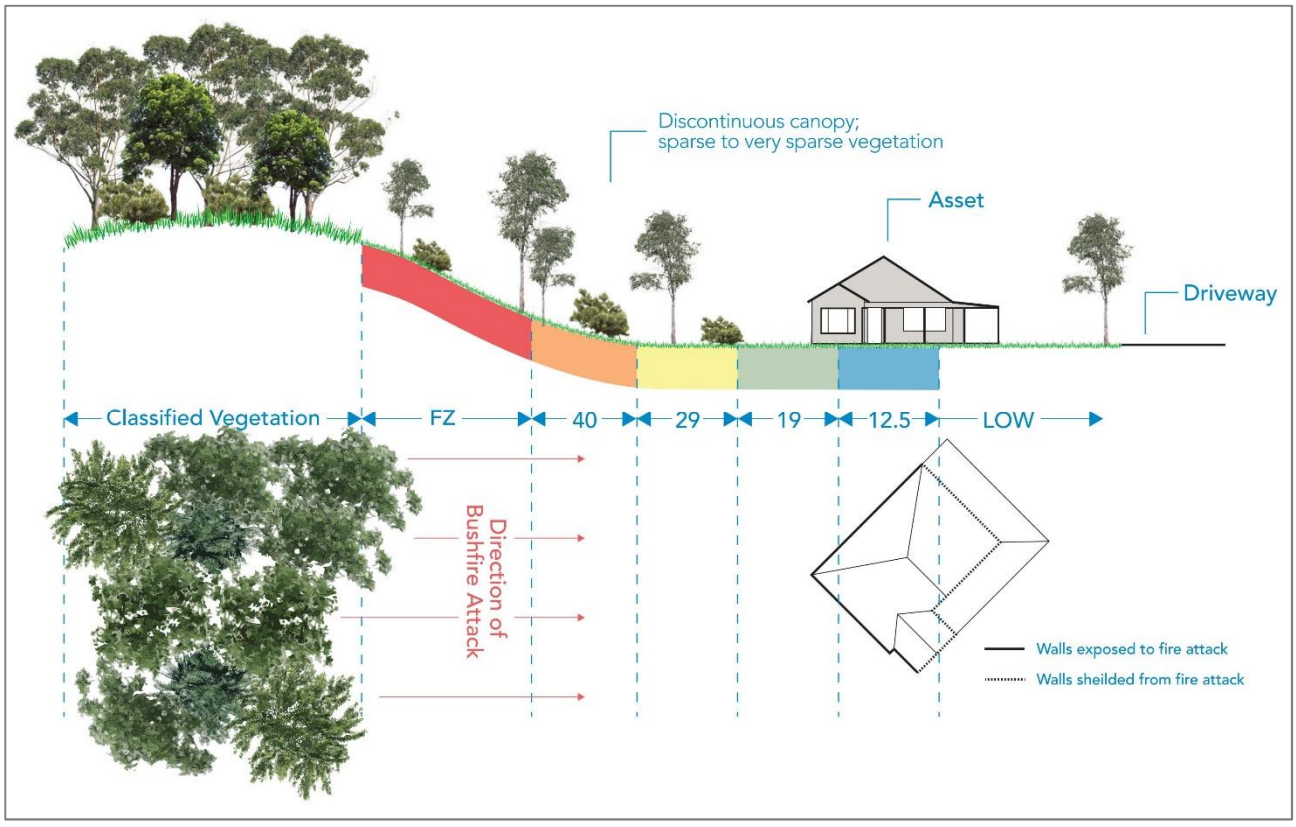

Figure 9: Bushfire Attack Level buffers and Shielding provisions

4.3 Roads and fire maintenance trails

Access roads are to be developed in accordance with the Bushfire Hazard Overlay Code (RRPS 2015) and any other relevant development codes to allow for the safe and efficient access and egress of emergency services and evacuating residents. The maintenance and availability of the proposed access roads or fire

maintenance trails must be ongoing. For example, overhanging vegetation should be trimmed back, gate access should be unrestricted, the capacity of road surfaces and any bridge / causeways need to be sufficient to support firefighting vehicles, roads are to be all-weather graded and two-wheel drive accessible (Rural Fire Service 2017b).

4.4 Fire-fighting requirements

In addition to the abovementioned access and egress requirements, adequate infrastructure to support fire-fighting must be provided. This includes the provision of an adequate water supply and fire hydrants as specified within the Bushfire Hazard Overlay Code (RRPS 2015). Examples of fire-fighting requirements include:

- Unhindered access to a fire-fighting water supply which must be located away from classified vegetation and hazardous materials (e.g. gas bottles). Further, a suitable hardstand area must be located next to the water supply
- Where a reticulated water supply is not available or not within eighty (80) metres of a hydrant, a water tank is provided within 100 metres of the building or structure and meets the requirements within the Bushfire Hazard Overlay Code Table 8.2.4.3.3 (refer to Appendix B)
- Underground and above-ground tanks need to incorporate relevant access holes and outlet pipes which meet standard rural fire brigade fitting requirements
- Above-ground tanks must be manufactured using either concrete or metal and metal piping should exclusively be used
- Fire hydrant design, spacing, sizing, flow and pressure is to be in accordance with the requirements of AS 2419.1:2005 and Queensland Urban Utilities standards; and
- Fire hydrants must be located clear of parking areas / bay allocations / road carriageways.

4.5 Storage or handling of hazardous chemicals

The storage or handling of hazardous chemicals within the site must not result in an unacceptable risk to people, property and/or the environment. Furthermore, hazardous chemicals should not impose upon emergency services when responding to an emergency or evacuation.

4.6 Landscaping

Landscaping is to be guided by the requirements of this BHAMP, with particular regard to Section 4.1 which requires the incorporation of two vegetation management zones surrounding the asset(s) (i.e. FFIZ and FROZ). Appropriately managed, retained and planted vegetation, can provide many benefits in bushfire prone areas including a reduction in fire intensity, wind speed, deflection and filtering of embers and sheltering from radiant heat. Conversely, improper management or landscaping could increase the risk of asset damage or loss from a bushfire event.

In addition to the fuel management examples listed in Section 4.1, the following fuel management strategies should be considered when developing a landscape plan:

- Avoidance of plants that are combustible or produce fine fuels (e.g. trees with fibrous or paper bark, produce ribbon bark, leaves with a high oil content, plants with fine foliage or branches (thickness ~1-2 mm) etc.)
- Ensure that vegetation placement is not located directly against an asset or near vulnerable sections such as window features, doors or decks.

- Ensure that vegetation is discontinuous vertically and horizontally. For example:
  - Vegetation should be planted/ retained in groups or islands which are to be broken up by design features such as paths or maintained lawns.
  - Minimise the retention or planting of shrubs beneath trees so to restrict the laddering of fire from ground fuels to the canopy.
- All materials against and around the asset(s) should be non-combustible.
- Ground covers should incorporate the use of succulents or herbaceous plants that are shade- or drought-tolerant perennials which maintain a high moisture content and have a low-growing habit.
- Use of shade-tolerant evergreen shrubs that have a moderately dense habit and retain little dead leaves or branches.
- Ensure that environmental or noxious weeds are actively managed and removed from the site.
- Development of a maintenance schedule which incorporates maintenance periods prior to and during the fire season (i.e. late winter to early summer).

5 Conclusions

The outcomes of the bushfire hazard assessment identified that the development footprint is located adjacent to classified vegetation categorised as having ***VERY HIGH*** severity in accordance with the *Technical manual – A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments* (April 2016) (DILGP). In order to achieve an acceptable or tolerable level of bushfire risk, it is recommended that bushfire setbacks and construction of the development be undertaken to achieve BAL-12.5 (AS3959-2009) as per Section 2.4 of this report. An asset required to be constructed to BAL-12.5 is to comply with Section 3 and Section 5 of AS3959-2009, with minimum setback distances detailed in Table 2 (refer to Section 3.4) of this report.

Achieving the recommended separation buffers for BAL-12.5 is the preferred outcome to minimise and mitigate bushfire risk. Additional considerations within Asset Protection Zones (APZ) can refine specific requirements of these buffer areas.

The APZ is to allow for maximum separation from the vegetation and a defensible area around structures, while reducing fuel loads and maintaining the amenity and environmental values of surrounding mature vegetation where appropriate. An APZ can include cleared areas, managed verges and open space.

The APZ extends from the edge of the asset out to the classified vegetation. The APZ provides a defensible area around structures and allows for maximum separation from classified vegetation, while reducing fuel loads and maintaining the amenity and environmental values of surrounding mature vegetation where appropriate. The performance of the APZ must be such that:

- there is minimal fine fuel at ground level which could be set alight by a bushfire; and
- any vegetation in the APZ does not provide a path for the transfer of fire to the development – that is, the fuels are discontinuous.

It is recommended that APZs be consistent with the associated BAL rating buffer distance around the proposed lots. This includes a Fuel Free Inner Zone of no less than 10 metres, which is to be maintained around any proposed structure and a Fuel Reduced Outer Zone (achieving the balance of the BAL buffer distance).

Assumptions and Limitations

The following assumptions and limitations have been made in compiling this assessment:

- All recommendations are in reference to the indicative proposed development location as indicated in the figures provided
- It has been assumed that vegetation located within the site (outside of the Asset Protect Zones) will remain in the current state
- Areas of vegetation assumed to be cleared or managed in a low-fuel state must be treated in this way in perpetuity
- Any proposed Vegetation Management Plans, Rehabilitation Management Plans and landscaping treatments are to adhere to requirements of the BHAMP; and.
- It is not the role of a Bushfire Planning and Design consultant to approve or make determinations on whether a building plan complies with AS 3959-2009 or BCA. This is the responsibility of the building surveyor.

This assessment has been made based on bushfire hazards within and adjacent to the site as the time of the assessment (May 2016).

The recommendations provided within this BHAMP incorporate appropriate actions to reduce the potential risk to life and risk of damage and/or harm to property in the event of a bushfire on or near the proposed development. However, these recommendations do not and cannot guarantee that the area will not be affected by bushfire.

6 References

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Appendix A Flamesol BAL Calculator Method 2 Results

FPA AUSTRALIA | FLAMESOL

Calculated November 1, 2017, 11:21 am (MDc v.4.7)

Frenchville

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	68	Rate of spread	4.86 km/h
Vegetation classification	Woodland	Flame length	34.62 m
Surface fuel load	15 t/ha	Flame angle	63 °, 73 °, 81 °, 86 °, 88 ° & 98 °
Overall fuel load	25 t/ha	Elevation of receiver	6.94 m, 5.23 m, 1.22 m, 0 m, 0 m & 0 m
Vegetation height	n/a	Fire intensity	62,843 kW/m
Effective slope	20 °	Transmissivity	0.845, 0.814, 0.782, 0.758, 0.748 & 0.695
Site slope	20 °	Viewfactor	0.6222, 0.4672, 0.3187, 0.2163, 0.1753 & 0.0471
Flame width	100 m	Minimum distance to < 40 kW/m²	23.3 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	31.1 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	43.6 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	58.2 m
		Minimum distance to < 10 kW/m²	66.8 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

Appendix B RRPS – Bushfire Hazard Overlay Code Response

Code response - Rockhampton Regional Planning Scheme - Bushfire Hazard Overlay Code

Table 8.2.4.3.1 Development outcomes for assessable development and requirements for accepted development

Performance Outcome	Acceptable Outcome	Response
Development within the buffer and medium bushfire hazard areas		
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 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 seventy (70) metres from the street to the development; and c. Access driveways have a maximum gradient of 12.5 per cent. OR AO1.1.2 Where the development is located in a non-urban area, the development:	N/A Development within Very High and High bushfire hazard area (see below).

Performance Outcome	Acceptable Outcome	Response
	a. Has direct access to a constructed, all-weather, public road capable of carrying emergency service vehicles; b. Has a maximum gradient of 12.5 per cent; and c. Has either: i. A maximum single access driveway length of 200 metres from the street to the development; or ii. Access driveways that are greater than 200 metres from the street to the dwelling provide passing bays and turning areas for fire fighting appliances at frequent intervals (every 200 metres or where practical).	
Water supply for fire fighting purposes		
PO2 Development provides adequate and accessible water supply for fire fighting purposes which is safely located and freely accessible for fire fighting.	**AO2.1** AO2.1.1 The development is within eighty (80) metres of a hydrant with a reticulated water supply. OR AO2.1.2 Where a reticulated water supply is not available or not within eighty (80) metres of a	N/A Development within Very High and High bushfire hazard area (see below).

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Performance Outcome	Acceptable Outcome	Response
	hydrant, a water tank is provided within 100 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; 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 ii. 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.	

Performance Outcome	Acceptable Outcome	Response
	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.	
Development within the high and very high bushfire hazard areas		
Avoiding the hazard		
PO3 The development is compatible with the level of risk associated with the bushfire hazard.	**AO3.1** AO3.1.1 Development is located on the part of the land that is not subject to a high or very high bushfire hazard area as identified on the bushfire hazard overlay map OM-4 (refer to Figure 3). OR AO3.1.2 Development has a bushfire mapping reliability assessment completed in accordance with SC6.5 — Bushfire management planning scheme policy that shows that the development has a Bushfire Attack Level 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.	The Bushfire Hazard Assessment and Bushfire Management Plan (BHAMP) for the site, prepared by E2M (2017) identified and mapped the development within an area of **Very High** bushfire hazard, identified the relevant Bushfire Attack Level and associated Asset Protection Zone requirements (refer to Figure 8). The management and mitigation measures within the BHAMP have been included to ensure that the risk is reduced to an acceptable or tolerable level.

Performance Outcome	Acceptable Outcome	Response
Access		
PO4 Development ensures that the location, siting, and design of development and associated driveways and access routes: a. avoids the potential for entrapment during a bushfire; b. facilitates the safe and efficient access and egress of the site by emergency services during a bushfire; and c. enables safe evacuation of the site during a bushfire for site occupants. 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.	**AO4** AO4.1.1 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 seventy (70) metres from the street to the development; and c. access driveways have a maximum gradient of 12.5 per cent. OR AO4.1.2 Where the development is located in a non-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 gradient of 12.5 per cent; and c. has: i. a maximum single access driveway length of 200 metres from the street to the development; or	The Bushfire Hazard Assessment and Bushfire Management Plan for the site, prepared by E2M (2017) identified current access via un-sealed track from Woodland Drive. The development has been sited at the lowest possible elevation on the site that is closest to the current access road as this is the safest location within the site to place the development. This un-sealed track is to be upgraded to comply with emergency services vehicle access standards. The access road will have a gradient greater than 12.5 per cent in some places. Consultation with Queensland Fire and Emergency Services (QFES) are in progress to ensure an acceptable outcome. This can be conditioned by Council as a part of the development permit that the access roads must achieve compliance with QFES standards or have official approval signed off by QFES. The proposed access road will be greater than 200m (approximately 250 m). It is recommended that passing bays and turning areas be incorporated at 'pinch points' along the access road.

Performance Outcome	Acceptable Outcome	Response
	ii. access driveways that are greater than 200 metres from the street to the dwelling provide passing bays and turning areas for fire fighting appliances at frequent intervals (every 200 metres or where practical).	
Water supply for fire fighting purposes		
PO5 Development provides adequate and accessible water supply for fire fighting purposes which is safely located and freely accessible for fire fighting.	**AO5** AO5.1.1 The development is within eighty (80) metres of a hydrant with a reticulated water supply. OR AO5.1.2 Where a reticulated water supply is not available or not within eighty (80) metres of a hydrant, a water tank is provided within 100 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; b. a hardstand area allowing heavy rigid fire appliance access within six (6) metres of a tank; and d. fire brigade tank fittings consisting of:	The lot area is 12.11 ha, however the proposed development area is less than 1 ha but greater than 1,000 square metres. As per Table 8.2.4.3.3 it is recommended that a water storage tank of no less than 10,000 Litres is proposed as part of the development and that all connections and fittings are appropriate specifications for connection by emergency fire and rescue services.

Performance Outcome	Acceptable Outcome	Response
	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. 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.	
Activities involving hazardous materials		
PO6 Public safety and the environment are not adversely affected by the impacts of bushfire on hazardous materials.	**AO6** 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**	N/A. No hazardous materials are to be manufactured or stored on site.

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Performance Outcome	Acceptable Outcome	Response
	relevant building assessment provisions under the Building Act 1975 for requirements related to the manufacture and storage of hazardous substances.	

Table 8.2.4.3.2 Development outcomes for assessable development

Bushfire Management Plan		
PO7 Development responds to the risk of the bushfire hazard and minimises risk to people and property by not exposing them to unacceptable risk from bushfire. 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.	**AO7** No acceptable outcome is nominated.	The Bushfire Hazard Assessment and Bushfire Management Plan for the site, prepared by E2M (2017) identified and mapped the development within an area of **Very High** bushfire hazard, identified the relevant Bushfire Attack Level and associated Asset Protection Zone requirements.

Performance Outcome	Acceptable Outcome	Response
Land Use		
PO8 Community uses and 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 community infrastructure can function effectively during and immediately after bushfire events.	**AO8** The following uses are not located in high or very high bushfire hazard areas: a. child care 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; 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.	The proposal is for a single detached dwelling. The Bushfire Hazard Assessment and Bushfire Management Plan for the site, prepared by E2M (2017) identified and mapped the development within an area of **Very High** bushfire hazard, identified the relevant Bushfire Attack Level and associated Asset Protection Zone requirements.
Reconfiguring a lot		
Emergency services access		

Performance Outcome	Acceptable Outcome	Response
PO9 Development facilitates the safe and efficient access and egress of emergency services during a bushfire event.	**AO9.1** 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; 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.	N/A The proposal is for a single detached dwelling No reconfiguration of a lot is proposed.
Avoiding the hazard		
PO10 Development does not involve the creation of additional lots in areas mapped as medium, high or very high bushfire hazard unless the	**AO10** No acceptable outcome is nominated.	N/A

Performance Outcome	Acceptable Outcome	Response
bushfire risk can be mitigated by appropriate subdivision design and a bushfire management plan. 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.		The proposal is for a single detached dwelling No reconfiguration of a lot is proposed.
PO11 Hydrants are located in positions that will enable fire services to access water safely, effectively and efficiently	**AO11.1** Residential streets and common access ways within a common private title should have hydrants placed at intervals of no more than 120 metres and at each intersection. Hydrants may have a single outlet and be situated above or below ground. AND **AO11.2** Commercial and industrial streets and access ways within streets serving commercial properties such as factories, warehouses and offices should be provided with above or below ground fire hydrants at not more than ninety (90) metre intervals and at each street intersection. Above ground fire hydrants should have dual valved outlets. Editor's note—For further information on how to address the above criteria please see Queensland Fire and Emergency Service: Fire hydrant and	N/A The proposal is for a single detached dwelling No reconfiguration of a lot is proposed.

Performance Outcome	Acceptable Outcome	Response
	vehicle access guidelines for residential, commercial and industrial lots.	
PO12 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.	**AO12.1** 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 hydrant and vehicle access guidelines for residential, commercial and industrial lots.	N/A The proposal is for a single detached dwelling No reconfiguration of a lot is proposed.
PO13 Hydrants are suitably identified so that fire services can locate them at all hours.	**AO13.1** Hydrants are identified as specified in 'Identification of street hydrants for fire fighting purposes' available under 'Publications' on the Department of Transport and Main Roads website. www.tmr.qld.gov.au/~/media/busind/techstdpubs/trum/125Amend18.pdf Editor's note—For further information on how to address the above criteria please see Queensland Fire and Emergency Service: Fire hydrant and vehicle access guidelines for residential, commercial and industrial lots.	N/A The proposal is for a single detached dwelling No reconfiguration of a lot is proposed.

Table 8.2.4.3.3 Water storage requirements

Lot size / use type	Water requirement (per lot)
Lots less than 1,000 square metre	5,000 litres
Lots between 1,000 square metres and less than one (1) hectare	10,000 litres
Lots greater than one (1) hectare	20,000 litres