Travers

bushfire & ecology

Bushfire Protection Assessment

Seniors living development

Lot 2A DP 158064 & Lot 1 DP 230172
No. 3 Quarry Road & No. 4 Vineys Road
Dural

March 2019
(Ref: 18IREA02BF)

Bushfire Protection Assessment

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No. 3 Quarry Road & No. 4 Vineys Road, Dural

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The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the proposed seniors living development involving the construction of independent living units (ILU's) and residential aged care beds within Lot 2A DP 158064 & Lot 1 DP 230172, No. 3 Quarry Road & 4 Vineys Road, Dural.

By way of background a bushfire threat assessment for the site was prepared by *RPS* dated 6th April 2018. This report was based on the original development design consisting of a residential aged care facility with a capacity of 74 beds as well as 145 self-care housing units contained within eight (8) x three (3) storey buildings.

On 21 September 2018, the NSW Rural Fire Service (RFS) requested the submission of additional information to address the requirement for buildings to achieve adequate asset protection zone to allow for <10kW/m^2 of radiant heat exposure to buildings.

The applicant has since amended the development design to address the Statement of Facts and Contentions (inclusive of the bushfire related contentions) filed on 29 October 2018 (Case no: 2018/00292092). This report has been prepared for the updated development design, our specific response to the bushfire related facts and contentions are provided within Table A1.

This type of development is categorised by the NSW Rural Fire Service (RFS) as being a special fire protection purpose (SFPP) development. This classification requires the RFS to issue a bushfire safety authority (BSA) in accordance with *Planning for Bush Fire Protection 2006 (PBP).*

PBP dictates that the subsequent extent of bushfire attack that can potentially impact a SFPP building must not exceed a radiant heat flux of 10kW/m^2. This rating assists in determining the size of the asset protection zone (APZ) which provides the necessary defendable space between hazardous vegetation and a building.

This assessment has been undertaken to take into account the methodology outlined in the *Pre-release PBP 2018*. It is anticipated that *PBP 2018* will become legislated by mid – 2019, to coincide with the enactment of the National Construction Code 2019. Until then, *PBP 2018* is in a 'pre-release' stage, also known as the transitionary period.

Until *PBP 2018* becomes legislated, *PBP 2006* is the legally referenced document, however *PBP 2018* can be used on a performance basis, as proposed with this application (i.e. Clause A1.10 Low threat vegetation – exclusions) for the small parcel of plated vegetation to the west of the site. It is considered that PBP 2018 is current and a relevant consideration for assessment purposes

The assessment has found that bushfire can potentially affect the proposed development from the narrow parcel of Blackbutt Gully Forest vegetation located within the eastern portion of the site resulting in possible ember and radiant heat attack.

This assessment has concluded that the proposed development will provide:

- Asset protection zones (APZ's) in accordance with the performance requirements of *PBP.* An alternative solution approach was used based on the narrow width of vegetation and fuel loads in accordance with PBP 2006.

- Landscaping in compliance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005) and Appendix 5 of *PBP*.

- Adoption of Clause A1.10 Low threat vegetation – exclusion as allowable under *Pre-release PBP 2018*. This is a performance based solution which excludes the remnant plantation vegetation to the west of the site from being considered as a bushfire hazard.

- Construction of new works (within 100m of the bushfire hazard) in accordance with *Australian Standard AS3959 Construction of buildings in bushfire-prone areas 2009 (AS3959)* - Bushfire Attack Level (BAL) 12.5.

- Road evacuation capability as required by PBP 2006

- Road access capability as required with the performance requirements of PBP.

- Emergency management and evacuation in compliance with the PBP and *RFS* guidelines for the *Preparation of Emergency / Evacuation Plan*.

Table A1 – Response to Statement of Facts and Contentions (bushfire)

STATEMENT OF FACTS AND CONTENTIONS	
MATTER	**RESPONSE**
Contention 15: Bushfire Protection and NSW Rural Fire Service ***The Development Application should be refused as it has not demonstrated compliance with the requirements of Planning for Bush Fire Protection, prepared by the NSW Rural Fire Service and has not received General Terms of Approval from the NSW Rural Fire Service.***	
PARTICULARS	
(a) The development application is also 'integrated development' in accordance with section 4.46(1) of the Environmental Planning and Assessment Act 1979 as the site is bushfire prone and requires an approval from the NSW Rural Fire Services under Section 100B in respect of bush fire safety for a special fire protection purpose.	This bushfire report has been prepared for the new development layout in compliance with *Planning for Bushfire Protection* (PBP) and will address the additional information request from the NSW RFS. This assessment seeks to obtain the general terms of approval from the NSW RFS.
(b) On 21 September 2018, the NSW Rural Fire Service requested the submission of additional information to address the following: ***i. Information to demonstrate all Buildings on site except the Wellness Centre can achieve a separation distance to allow for 10kW/m^2 of radiant heat exposure surrounding the building. This especially relates to the buildings located along the western boundary of the property, due to the vegetation to the west of the site being assessed as a Remnant as per the RFS Fast Sheet 03/16 'Remnant Vegetation'.***	This assessment demonstrates that the development can achieve a separation distance to allow for 10kW/m^2 of radiant heat exposure for all buildings. We can advise that the wellness centre has now been removed from the development design. The previous bushfire threat assessment prepared by RPS correctly excluded the vegetation to the west as being classified as a bushfire threat. This is based on the vegetation not being mapped as bushfire prone by a *certified bushfire prone map* prepared by Hornsby Council and duly authorised by the RFS. As outlined in further detail within Section 2.1 of this report *Pre-release PBP 2018* (Clause A1.10 Low threat vegetation – exclusions) states that single areas of vegetation less than 1 hectare in area and greater than 100 metres separation from other areas of Category 1 or Category 2 vegetation are not required to be considered for the purposes of PBP. Therefore in accordance with the RPS report, the land to the west does not constitute bushfire prone land and as a result no asset protection zones are required to be applied from the western site boundary nor were they required in accord with Section 100B of the Rural Fires Act.

STATEMENT OF FACTS AND CONTENTIONS	
MATTER	**RESPONSE**
ii. Modelling can be undertaken, but a 1200K Flame Temperature shall be utilised since the development is being assessed as a Special Fire Purpose Development as per Section 100B of the 'Rural Fires Act 1997'.	*Travers bushfire & ecology* have undertaken a performance based assessment (i.e. modelling) to determine the minimum asset protection zones required for the special fire protection purpose development. This modelling is based on a 1200k flame temperature as required under PBP.
(c) The Applicant has failed to submit additional information to address the issues raised by the RFS.	The report has been prepared for the amended development design and to address the additional information request.
(d) The approval of the development application would be inappropriate in circumstances the General Terms of Approval from the NSW Rural Fire Service has not been provided.	*Travers bushfire & ecology* has prepared a bushfire report for the new development layout. This report will be prepared in compliance with *Planning for Bushfire Protection* (PBP) and will address the additional information request from the NSW RFS. This assessment will seek to obtain the general terms of approval from the NSW RFS.
Contention 2.7– Site Compatibility Certificate	
(d) Concern is also raised about the quality and character of landscaping that can be provided in the available deep soil area, as a large part of this area is nominated as an Asset Protection Zone, or includes a below ground (OSD) Tank. It is likely that the deep soil areas are not being used as intended to support the growth of trees and shrubs.	The revised development plan allows for the retention of the existing bushland vegetation within the north-eastern corner of the site. It also allows for the retention of several important trees throughout the remainder of the site. The landscape plan has been developed to include the planting of further trees, shrubs and groundcovers throughout the site therefore improving the quality and character of the landscaping whilst also complying the standards for an asset protection zone.

GLOSSARY OF TERMS

APZ	Asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EEC	Endangered ecological community
EP&A Act	*Environmental Planning & Assessment Act 1979*
FDI	Fire danger index
ha	Hectare
IPA	Inner protection area
m	Metres
OPA	Outer protection area
PBP	*Planning for Bush Fire Protection 2006*
RF Act	*Rural Fires Act 1997*
RMS	Roads & Maritime Services
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose
TSC Act	*Threatened Species Conservation Act 1995*

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Introduction 1

Travers bushfire & ecology (TBE) has been requested to undertake a bushfire protection assessment for the proposed amended development design for the seniors living development within Lot 2A DP 158064 & Lot 1 DP 230172, No. 3 Quarry Road & 4 Vineys Road, Dural.

The proposed development is located on land mapped by *Hornsby Shire Council* as being bushfire prone. This triggers a formal assessment by Council in respect of the NSW Rural Fire Service (RFS) policy against the provisions of *Planning for Bush Fire Protection 2006 (PBP).*

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- Address the NSW RFS request for additional information and the Statement of Facts and Contentions.
- Review the bushfire threat to the landscape
- Undertake a bushfire attack assessment in accordance with *PBP*
- Provide advice on mitigation measures, including the provision of asset protection zones (APZs), construction standards and other specific fire management issues
- Review the potential to carry out hazard management over the landscape

1.2 Project synopsis

The current proposal involves the development of Lot 2A DP 158064 & Lot 1 DP 230172 to create a seniors living facility comprising of ninety one (91) independent living units (ILU's) contained within seven (7) buildings and seventy-four (74) residential aged care beds contained within a single RAC building (refer Figure 1.1).

The buildings will be two (2) to three (3) stories with two (2) levels of basement car parking. Public access to the site will be restricted with the internal network extending from Quarry Road in the south and Vineys Road in the north to the underground car parking facility.

Firefighting access will be provided via an internal access road way which runs parallel to the western site boundary and part of the eastern boundary with a number of turning head options and passing bays.

Access is gained to the site from both Quarry Rd and Vineys Road. Vineys Road is not being relied upon for day to day operational access or egress however it is available as either a primary emergency access and or egress link for all emergency services; and for deliveries as necessary. Visitor access is via the basement.

The main access will be from Quarry Road and this will enable a drive through access on the western aspect and link with Vineys Road. This has been designed to accommodate RFS PBP especially for large firefighting trucks. Additional perimeter access is available on

the eastern aspect but this road is not proposed to then exit to Vineys Road. A separate access road from Vineys Road will provide sufficient access but again not enable a through connection. Both these easterly roads will provide a turn-around capability that achieves the RFS specifications.

Expert advice from Brett Maynard Traffic Engineer GTA Consultants 1 March 2019 advises;

Western Access Road

- An internal access road is proposed on the north-western side of the site between the Quarry Road and Vineys Road driveway to facilitate access for removalist vehicles (up to 8.8 metre MRVs) and emergency vehicles (up to 10.1m fire appliances).

- This access road would have a minimum width of 5.5 metres, with wider areas and removalist vehicle bays that can be used for passing and turn-around when required. Including the adjacent low plantings/ landscaping, there is an 8 metre-wide zone available for emergency vehicle access.

- In the event of an emergency, the western access road would provide a two-way connection for fire appliances in particular between Quarry Road and Vineys Road that is not currently available. This has the potential to reduce travel distances for emergency vehicle movements and provide operational flexibility.

Eastern Access Road

- An internal access road is also proposed on the south-eastern side of the site, which is accessed from Quarry Road and terminates near Building F.

- A turning area is provided at the end of the access road, which allows removalist vehicles (up to 8.8 metre MRVs) and emergency vehicles (up to 10.1m fire appliances) to turn around and exit via Quarry Road in a forward direction.

- The eastern access road has a minimum width of 5.5 metres, with a passing/ parking bay provided adjacent to Building G.

Access Road Surface Treatment and Operation

- It is proposed that the eastern and western access roads have a reinforced (structural) grass surface capable of providing all-weather access for the above heavy vehicles, as detailed further in the landscape and civil engineering documentation. Bridge structures are provided over the drainage swale and would also have an appropriate heavy vehicle load rating.

- A paved footpath with a suitable subgrade to also accommodate heavy vehicle loads would also be provided within the access road cross-section for internal site permeability and recreational purposes. These roads would be an informal low-speed shared environment with low vehicle usage.

Access to these internal roads would be controlled by boom gate to limit vehicle movements. On-site management would operate the boom gates, with bookings required for day-to-day operation (i.e. removalist vehicles). In the event of an emergency, on-site management would open the boom gates upon request and leave them open for the duration of the incident.

Figure 1.1 – Site plan
(source: Marchese Partners, Revision X)

1.3 Information collation

To achieve the aims of this report, a review of the information relevant to the property was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Site, level and elevation plans prepared by *Marchese Partners* dated 4/3/2019, Revision X.
- Landscape Plans prepared by *Site Design + Studios 2* March 2019, Drawing No. 1173
- Bushfire Threat Assessment prepared by *RPS* dated 2 March 2019 (ref: 139898)
- Statement of Facts and Contentions, *Land & Environment Court of NSW*, Case No. 2018/00292092, Filed : 29 October 2018
- Request for additional information – Development Application No. DA/668/2018 prepared by *Hornsby Shire Council*, dated 24 September 2018
- *Nearmap* aerial photography
- Topographical maps DLPI of NSW 1:25,000
- Australian Standard 3959 *Construction of buildings in bushfire-prone areas (AS3959)*
- *Planning for Bush Fire Protection 2006 (PBP)(RFS)*
- *PBP Pre Release – August 2018 (RFS)*

An inspection of the proposed development site and surrounds was undertaken by John Travers on 15 January 2019 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

1.4 Site description

The site is located between Quarry Road and Vineys Road, Dural, within the local government area (LGA) of Hornsby (refer Figure 1.2).

The site currently supports vacant residential dwellings / outbuildings and is bound by managed rural residential land to the north and south and managed green house complex and managed ovals associated with Pacific Hills Christian School to the south-east.

The land within the north-eastern extent of the site and extending further to the north-east supports vegetation mapped by Cumberland Ecology (2018) as Blackbutt Gully Forest. A portion of this vegetation within the site will be retained as part of the development. The current weeds within will be rehabilitated in order that a consistent forest width of 35m will be present in the future. The required bushfire asset protection zone has been put in place to ensure no radiant heat above 10k/Wm^2 affects the buildings.

A remnant parcel of plantation vegetation is located to the immediate west of the proposed development. This vegetation has an area of less than 1ha in size and is low threat vegetation and this is well explained in Section 2.1 of this report.

A vegetation management plan will be prepared noting the APZ and enable ongoing funding and day to day management of the landscaped zones and APZ in particular. Close liaison has occurred with the landscape architects for the design of the proposed landscape environment.

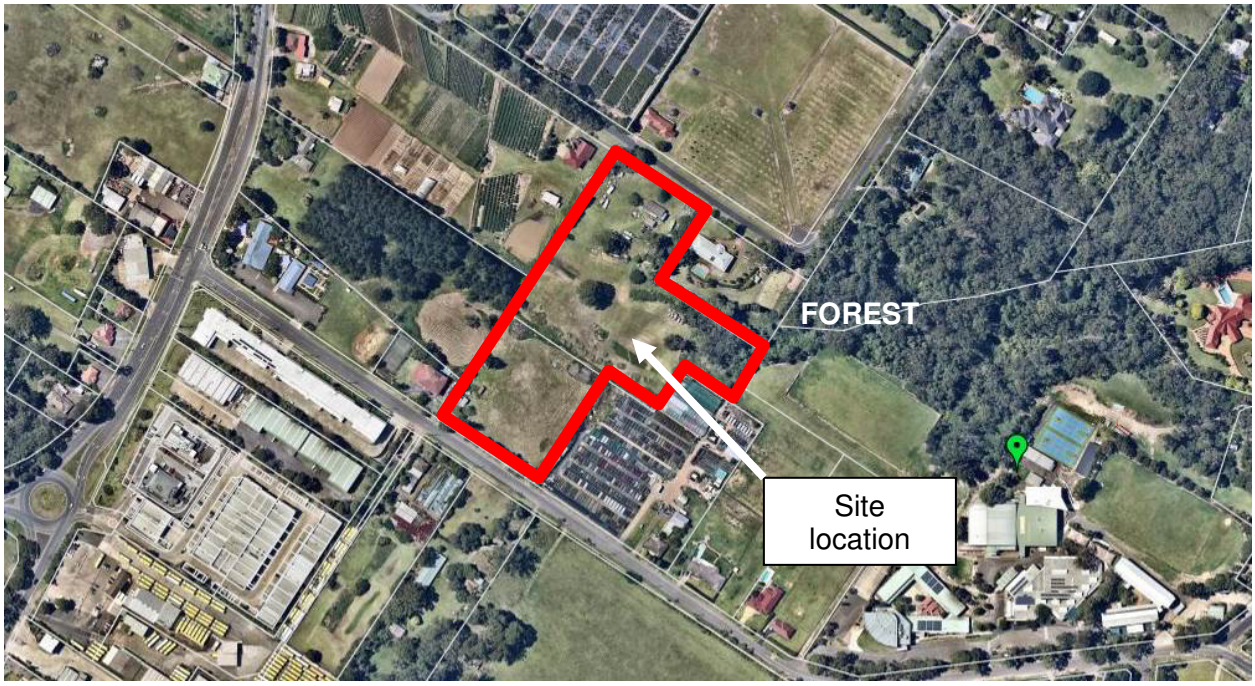


Figure 1.2 – Aerial appraisal
(source: Nearmap, dated 29 December 2018)

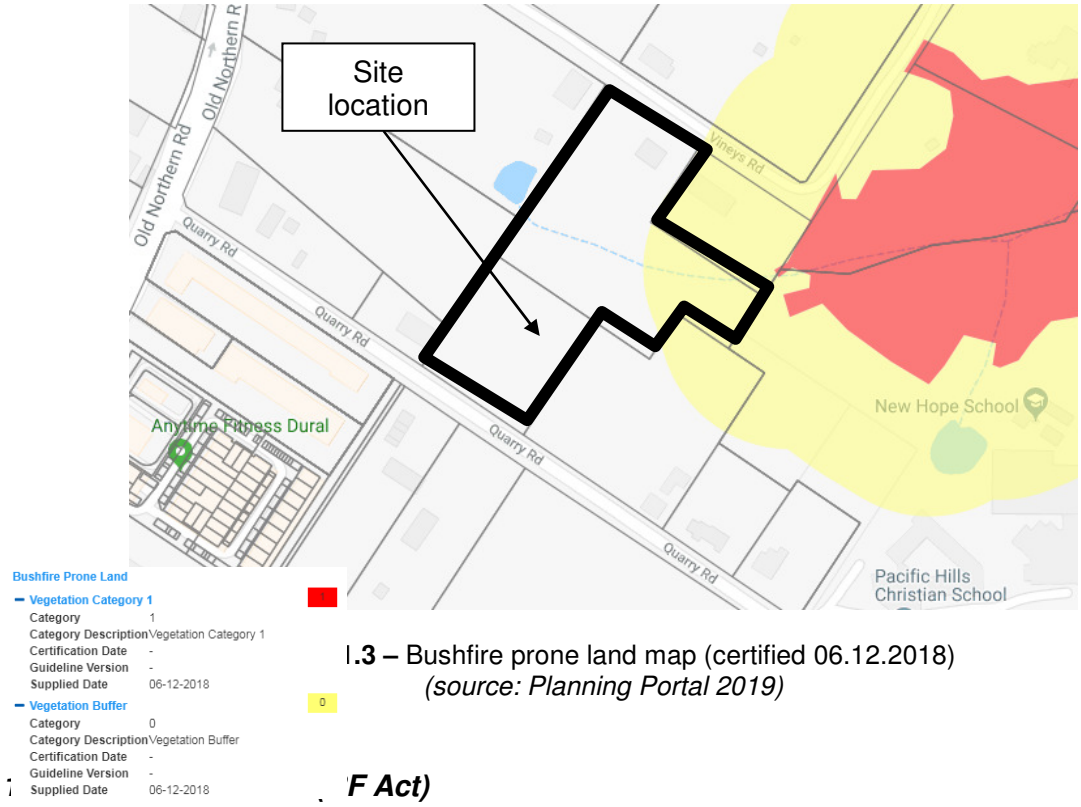
1.5 Legislation and planning instruments

1.5.1 Environmental Planning and Assessment Act (EP&A Act)

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *BCA*. The identification of bushfire prone land is required under Section 10.3 of the *EP&A Act*.

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed development is located on land that is partly mapped by *Hornsby Shire Council* as being bushfire prone (refer Figure 1.3). The remnant parcel of vegetation to the immediate west of the site is not mapped as bushfire prone due to its size, location from other vegetation parcels and peripheral management of neighbouring properties.



I.3 – Bushfire prone land map (certified 06.12.2018)
(source: Planning Portal 2019)

F Act)

This legislation is concerned with the prevention and control of bushfire, hazard reduction and administration. Section 100B of the *RF Act* states that the Commissioner may issue a BSA for a special fire protection purpose (SFPP) development on bushfire prone land.

1.5.4 Local environmental plan (LEP)

A LEP provides for a range of zonings which list development that is permissible, or not permissible, as well as the objectives for development within a zone. The site, and adjoining lands, is zoned under the Hornsby LEP (2013) as RU2 – Rural Landscape. The proposal is permissible as a result of a SCC issued to the Applicant. The provision of asset protection zones is consistent with the objectives of the zoning.

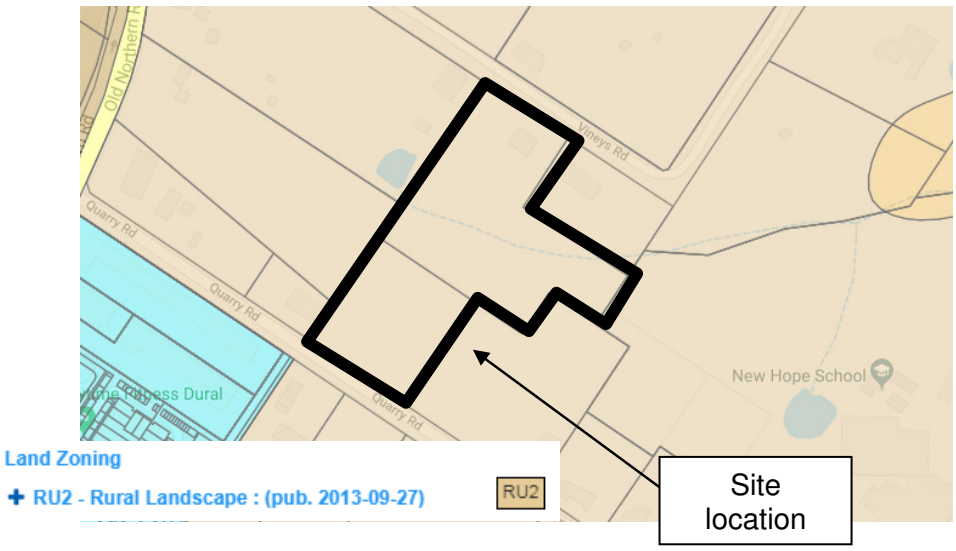


Figure 1.4 – Zoning map *(source: Hornsby LEP, 2013)*

1.5.5 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires consideration of the RFS planning document entitled *PBP. PBP* provides planning controls for building in bushfire prone areas as well as guidance on effective bushfire protection measures.

The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment. More specifically, the aims and objectives for all development located on bushfire prone land should:

1. Afford occupants of any building adequate protection from exposure to a bushfire.

2. Provide for a defendable space to be located around buildings.

3. Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition.

4. Ensure that safe operational access and egress for emergency service personnel and residents is available.

5. Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the APZ.

6. Ensure that utility services are adequate to meet the needs of fire fighters (and others who may assist in bushfire fighting).

As the development is a type of development regarded by the RFS as a SFPP development, *PBP* requires additional objectives to be considered. These include the need to:

7. Provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and fire fighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated.

8. Provide for safe emergency evacuation procedures. SFPP developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bushfire threats. During emergencies, the risk to fire fighters and other emergency services personnel can be high through prolonged exposure, where door to door warnings are being given and exposure to the bushfire is imminent.

The nature of SFPPs means that occupants may be more vulnerable to bushfire attack for one or more of the following reasons:

- they may be less educated in relation to bushfire impacts
- they may have reduced capacity to evaluate risk and to respond adequately to the bushfire threat
- they may present organisational difficulties for evacuation and / or management
- they may be more vulnerable through stress, anxiety and smoke impacts arising from bushfire threat
- there may be significant communication barriers

- supervision during a bushfire may be difficult
- logistical arrangements for the numbers of residents may be complicated in terms of alternate accommodation, transport, healthcare and food supplies

In addition, *PBP* outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas. The proposal has been assessed in compliance with the following measures:

- asset protection zones
- building construction and design
- access arrangements
- water supply and utilities
- landscaping, and
- emergency management arrangements.

1.5.6 Building Code of Australia (BCA) and the Australian Standard AS3959 Construction of buildings in bushfire-prone areas 2009 (AS3959)

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions. In NSW, construction in bushfire prone areas applies to Classes 2, 3, 4 and 9b buildings or a Class 10a associated with Classes 2, 3, 4 and 9b buildings. The construction manual for the deemed to satisfy requirements is the *AS3959*.

1.6 Environmental and cultural constraints

- An ecological assessment has been prepared by *Cumberland Ecology*.
    - Their vegetation mapping depicts vegetation to be retained as being the Blackbutt Gully forest remnant – see Figure 2.1 below and the blue coloured portions.
    - The width of the Blackbutt Gully forest remnant will be 35m.

- A basic search was conducted on the Aboriginal Heritage Information System (AHIMS). The results show that there are no identified Aboriginal sites of significance within Lot 2A DP 158064 & Lot 1 DP 230172 or within 50m of the site.

Bushfire Threat Assessment

2

To assess the bushfire threat and to determine the required width of an APZ for a development, a review of the elements that comprise the overall threat needs to be completed.

PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

2.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation formation in accordance with David Keith (2004) to determine APZ distances for SFPP developments. The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

The hazardous vegetation posing a threat to the proposed development consists of the Blackbutt Gully Forest located within the north-eastern portion of the site (refer Photo 1 & 2). The ecological consultants *Cumberland Ecology* advised in their report dated February 2019 the forest remnant will be retained at 35m in width and this is used as the flame width in the following calculations - refer Schedule 1 attached.

Figure 2.1 – Vegetation communities
(source: Cumberland Ecology, 2018)

Photo 1 & 2 – Blackbutt Gully Forest located within the north-eastern portion of the site

A fuel load of 20/25 t/ha has been used in the calculations to determine the expected bushfire behaviour for a special fire protection development. This is consistent with fuel loads provided in PBP 2006.

Photo 3 – Exotic vegetation associate within creek line.

Low threat vegetation - Exclusion

The land immediately to the west of the proposed development supports a remnant parcel of plantation vegetation (refer Photo 4). This single area of vegetation has an area of 9,565m^2 and is located over 100m from other areas of Category 1 or Category 2 vegetation.

Based on the site visit and review of the *Nearmaps* aerial photography historical imagery clearly depicts ongoing management of this adjoining land and there is no doubt that the non-mapping of this land as being 'bushfire prone' was due to the ongoing land management being undertaken by the owner.

- The tree area has also been consistently managed as can be noticed by the separation between the stands – see Figure 2.2 and Figure 2.3. The remaining trees measure 35m in width and amongst that there is managed mown land such that the effective width of that assemblage is 25m in width for a distance into that lot for some 50m before widening to 37m.

- The grassy portion is mown regularly. Aerial photography and site inspections supports that view and shows very clearly the grass was mowed just prior to Christmas 2018 as can be seen in the imagery below in Figure 2.3.

Notwithstanding the ongoing land management of this adjoining lot and its low hazard capability it is the case that a small area of bushland exists on Lot 1 DP 656029. However *Pre-release PBP 2018* (Appendix 1: Site Assessment Methodology (A1.10 Low threat vegetation – exclusions) deals with this where it states on Page 96.

Non-hazard and non-vegetated area exclusions of AS 3959 apply, and are not required to be considered for the purposes of PBP, as detailed below:

> *1. Single areas of vegetation less than 1 hectare in area and greater than 100 metres separation from other areas of Category 1 or Category 2 vegetation.*

In addition the RFS in PBP 2018 and the Australian Standards *AS3959 Construction of buildings in bushfire prone areas* both state that vegetation less than 20m in width is not a hazard. Although the width of this vegetation parcel (25m) is slightly over the 20m it adds no significance to the bushfire threat due to it small area (<1ha).

Indeed this parcel is located over 100m from other areas of Category 1 or Category 2 vegetation – see Figure 2.4 below. As a result, this parcel of vegetation does not pose a bushfire threat to the proposed development.

Therefore in accordance with the original RPS report, the land to the west does not constitute bushfire prone land and as a result no asset protection zones were applied from the western site boundary nor were they required in accord with Section 100B of the Rural Fires Act.

Figure 2.2 - 2009 aerial image by *Nearmaps*

Figure 2.3 - 2018 aerial image by Nearmaps

Figure 2.4 - A broader perspective – *Nearmaps* image

Importantly the RFS are not required to issue a bushfire safety authority that relates to lands not mapped as bushfire prone on a duly certified bushfire prone map.

For example in accordance with Section 100B (b) of the Rural Fires Act the Commissioner of the RFS may issue a *bush fire safety authority* for development of bush fire prone land for a special fire protection purpose. As the land to the west is not classified as bushfire prone land the RFS, the Court or Council are not required to apply this section.

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The RFS Fast Fact

The NSW RFS has referenced Fast Fact 03/16 'Remnant Vegetation' in their request for additional information. As at 24th January 2019 the Fast Fact is not operative in NSW as the RFS deleted this from their Fast Fact list on their website.

When this Fast Fact was applicable to bushfire prone lands it aimed to clarify the term 'remnant'. Both PBP 2006 and PBP 2006 apply the same meaning – for example;

PBP 2006 states on page 51

> *"Remnant vegetation is a parcel of vegetation with a size of less than 1 ha or a shape that provides a potential fire run directly toward buildings not exceeding 50m. These remnants are considered a low hazard and APZ setbacks and building construction standards for these will be the same as for rainforests"*

PBP 2018 states on page 96

> *"Remnant vegetation is a parcel of vegetation with a size of less than 1 ha or a shape that provides a potential fire run directly toward buildings not exceeding 50m. These remnants are considered a low hazard and APZ setbacks and building construction standards for these will be the same as for rainforests"*

In accordance with the *Pre-release PBP 2018* (Appendix 1: Site Assessment Methodology (A1.10 Low threat vegetation – exclusions) this vegetation is considered a non-hazard and is therefore not considered for the purposes of *PBP.*

Despite the above an APZ of 10 metres width has been provided on that aspect – see Schedule 1.

Photo 4 – Remnant plantation to the immediate west (no bushfire risk)

2.2 Effective slope

The effective slope is determined by reviewing the slopes within 100m of the development boundary. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined.

The effective slope within the hazardous Blackbutt Gully Forest to the north-east is level and has been assessed on site using a Saunto hand held clinometer. Contours on topographical plans are not correct in this specific 50m projection.

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site using an FDI 100 based on the sites location within the Greater Sydney region.

Table 2.1 provides a summary of the bushfire attack assessment. Column 4 identify the minimum required APZs in accordance with *PBP 2006.* Column 5 provides the APZ distances measured from the proposed building footprints, as shown within Schedule 1, based on current management regimes. The radiant heat impact on the buildings is identified in Column 6.

Table 2.2 – Bushfire attack assessment

Aspect	Vegetation within 140m of development (refer Note 1)	Effective slope of land	RESULTS	
			APZ provided (metres)	Radiant heat exposure
North, south, east & west	Managed land	N/A	>100	N/A
North-east	Forest (20/25t/ha) ***Flame width 35m***	Level	42 (refer Note 1)	9.88kW/m^2

*Notes: * Slope is either 'U' meaning up slope or 'C' meaning cross slope or 'D' meaning down slope*

Note 1: A performance based assessment using Appendix B of *AS3959* was undertaken to determine the radiant heat impact on the buildings based on forest vegetation.

- Inputs included a flame width of 35m and fuel loads consistent with PBP 2006 (20 / 25 t/ha) on a level slope.
- The results of the assessment, provided below, were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting.*

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 19/02/2019 **Assessment Date:** 16/01/2019

Site Street Address:	3 Quarry Road, Dural		
Assessor:	Mr Admin; admin		
Local Government Area:	Hornsby	**Alpine Area:**	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: A North-east

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	42

Fire Inputs

Veg./Flame Width(m):	35	**Flame Temp(K)**	1200

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

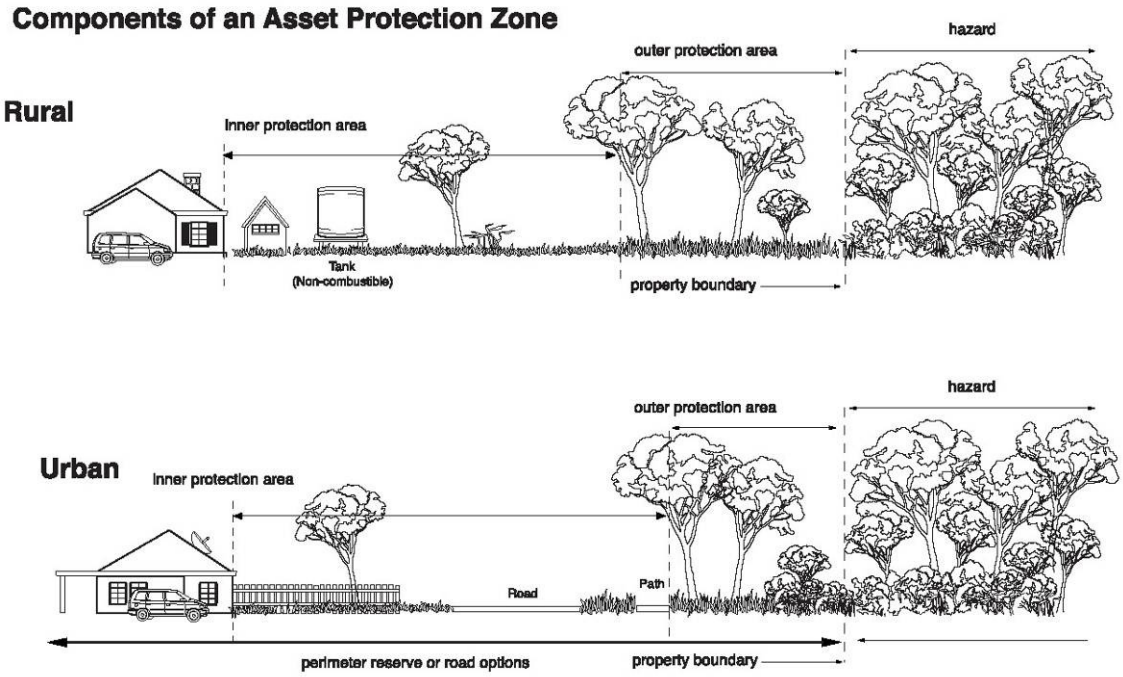
Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	8.62
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	31000
Radiant Heat(kW/m2):	9.88	**Flame Angle (degrees):**	68
Flame Length(m):	18.6	**Maximum View Factor:**	0.111
Rate Of Spread (km/h):	2.4	**Inner Protection Area(m):**	42
Transmissivity:	0.797	**Outer Protection Area(m):**	0

Specific Protection Issues

3

3.1 Asset protection zones

APZs are areas of defendable space separating hazardous vegetation from buildings. The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. The IPA cannot be used for habitable dwellings but can be used for all external non-habitable structures such as pools, sheds, non-attached garages, cabanas, etc. A typical APZ, and therefore defendable space, is graphically represented below:



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the RFS performance criteria.

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of 10kW/m^2 for SFPP developments. This rating assists in determining the size of the APZ in compliance with Appendix 2 of *PBP* to provide the necessary defendable space between hazardous vegetation and a building. Table 3.1 outlines the proposal's compliance with the performance criteria for APZs.

Table 3.1 – Performance criteria for asset protection zones (*PBP* guidelines pg. 19)

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Radiant heat levels of greater than 10kW/m^2 will not be experience by occupants or emergency services workers entering or exiting a building.	An APZ is provided in accordance with the relevant tables and figures in Appendix 2 of *PBP.* Exits are located away from the hazard side of the building. The APZ is wholly within the boundaries of the development.	☐	☑	Refer Section 2.3. Radiant heat level exposure on the buildings is less than 10kW/m^2.
Applicant demonstrates that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fire is negated.	Mechanisms are in place to provide for the maintenance of the APZ over the life of the development. The APZ is not located on land with a slope exceeding 18^o.	☑	☐	The APZ is not located on slopes exceeding 0-5^o.
APZs are managed and maintained to prevent the spread of a fire towards the building.	In accordance with the requirements of *Standards for Asset Protection Zones* (*RFS* 2005).	☑	☐	A review of the landscape plan prepared by *Site Design + Studios* (Drawing No.1173) confirms that the site (outside of the retained vegetation area) will be managed in accordance with the acceptable solutions.

3.2 Building protection

The construction classification system is based on five (5) bushfire attack levels (BALs). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 *AS3959.* The lowest level, BAL 12.5, has the longest APZ distance while BAL – FZ has the shortest APZ distance. These allow for varying levels of building design and use of appropriate materials.

All new construction within 100m of the bushfire prone vegetation (refer Schedule 1 attached) is to comply with BAL 12.5 rating as outlined in *AS3959 (2009)* Construction of buildings in bushfire prone areas with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 *PBP*.

3.3 Hazard management

The ongoing management of the site as an APZ is to occur in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with general landscaping design principles to comply with Appendix 5 of *PBP*.

In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out by normal means (e.g. mowing).

Landscaping within the site is to comply with the principles of Appendix 5 of *PBP 2006.* A summary of the guidelines for managing APZs (including landscaping guidelines) is attached as Appendix 2 to this report.

The undersigned worked with the landscape architects *Site Design + Studios* to ensure consistency with PBP 2006 and PBP 2018 and as a result *Travers bushfire & ecology* can confirm that the development portion of the site will be managed in accordance with the standards for asset protection zones and Appendix 2 of this report.

3.4 Access for fire fighting operations

Access is gained to the site from both Quarry Rd and Vineys Road – see Figure 3.1 below.

Vineys Road is not being relied upon for day to day operational access or egress however it is available as either a primary emergency access and or egress link for all emergency services.

The main access will be from Quarry Road and this will enable a drive through access on the western aspect and link with Vineys Road. This has been designed to accommodate RFS PBP especially for large firefighting trucks.

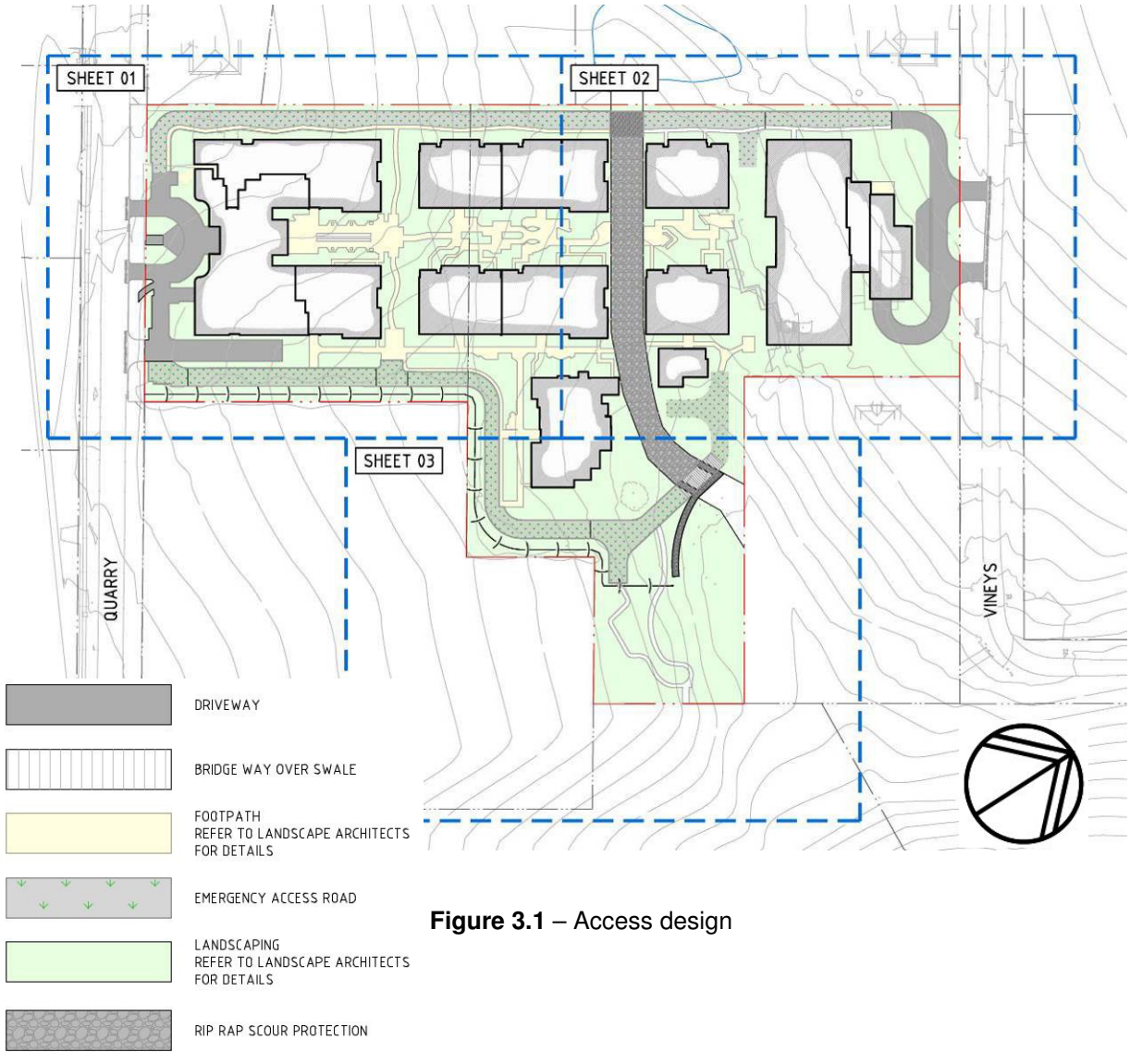


Figure 3.1 – Access design

A second perimeter access road is proposed on the southern side of the development and ends near the internal swale.

Public access to the development is proposed via two (2) access driveways off Vineys Road in the north and Quarry Road in the south. These access points are one-way only with the proposed entry / exit from street level to ground floor basement parking (refer Figure 3.1 below).

Firefighting access will be provided via an emergency access road which runs parallel to the western site boundary and part eastern boundary with a number of turning head options. The easterly access from Quarry Rd and the westerly access from Vineys Rd will provide a turn-around capability that achieves the RFS specifications.

Expert advice from Brett Maynard Traffic Engineer GTA Consultants 1 March 2019 advises;

Western Access Road

- An internal access road is proposed on the north-western side of the site between the Quarry Road and Vineys Road driveway to facilitate access for removalist vehicles (up to 8.8 metre MRVs) and emergency vehicles (up to 10.1m fire appliances).

- This access road would have a minimum width of 5.5 metres, with wider areas and removalist vehicle bays that can be used for passing and turn-around when required. Including the adjacent low plantings/ landscaping, there is an 8 metre-wide zone available for emergency vehicle access.

- In the event of an emergency, the western access road would provide a two-way connection for fire appliances in particular between Quarry Road and Vineys Road that is not currently available. This has the potential to reduce travel distances for emergency vehicle movements and provide operational flexibility.

Eastern Access Road

- An internal access road is also proposed on the south-eastern side of the site, which is accessed from Quarry Road and terminates near Building F.

- A turning area is provided at the end of the access road, which allows removalist vehicles (up to 8.8 metre MRVs) and emergency vehicles (up to 10.1m fire appliances) to turn around and exit via Quarry Road in a forward direction.

- The eastern access road has a minimum width of 5.5 metres, with a passing/ parking bay provided adjacent to Building G.

Access Road Surface Treatment and Operation

- It is proposed that the eastern and western access roads have a reinforced (structural) grass surface capable of providing all-weather access for the above heavy vehicles, as detailed further in the landscape and civil engineering documentation. Bridge structures are provided over the drainage swale and would also have an appropriate heavy vehicle load rating.

- A paved footpath with a suitable subgrade to also accommodate heavy vehicle loads would also be provided within the access road cross-section for internal site

permeability and recreational purposes. These roads would be an informal low-speed shared environment with low vehicle usage.

Access to these internal roads would be controlled by boom gate to limit vehicle movements. On-site management would operate the boom gates, with bookings required for day-to-day operation (i.e. removalist vehicles). In the event of an emergency, on-site management would open the boom gates upon request and leave them open for the duration of the incident.

Performance criteria for internal roads

The proposal's compliance with Section 4.2.7 of *PBP* is detailed in Table 3.2 below.

The intent of measures required by the RFS for internal roads is "*to provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area*".

Table 3.2 – Performance criteria for internal roads (*PBP* guidelines pg. 35)

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle.	Internal roads are two-wheel drive, sealed, all weather roads.	☑		Complies
	Internal perimeter roads are provided with at least two traffic lane widths (carriageway 8m minimum curb to curb) and shoulders on each side, allowing traffic to pass in opposite directions.	☑	☑	Complies as a performance solution. The site provides a perimeter access road for emergency services. This road will be restricted to emergency services only and will be accessed via locked gates (key compatible with the local NSW RFS lock). Occupant and visitor traffic will utilise the underground car park and direct access to Quarry Rd.
	Roads are through roads. Dead end roads are not more than 100m in length from a through road, incorporate a minimum 12m outer radius turning circle, and are clearly sign posted as a dead end.	☑	☑	Complies as a performance solution. The internal emergency access road to the west is longer than 100m and is provided with a turning 'Y' head in compliance with Figure 3.2. The majority of this road is adjoined by managed land and therefore allows for safe firefighting access / egress.
	Traffic management devices are constructed to facilitate access by emergency services vehicles.	☑		Complies. Road shoulders are to facilitate passing vehicles and appropriate signage is to be erected indicating a dead end road and no parking.

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☑		Complies
	Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.	☑		Complies
	The minimum distance between inner and outer curves is 6m.	☑		Complies
	Maximum grades do not exceed 15° and average grades are not more than 10°.	☑		Complies
	Cross fall of the pavement is not more than 10°.	☑		Complies
	Roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than storm surge).	☑		Complies
	Roads are clearly sign-posted and bridges clearly indicate load ratings.	☑		Complies
	The internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).	☑		Complies

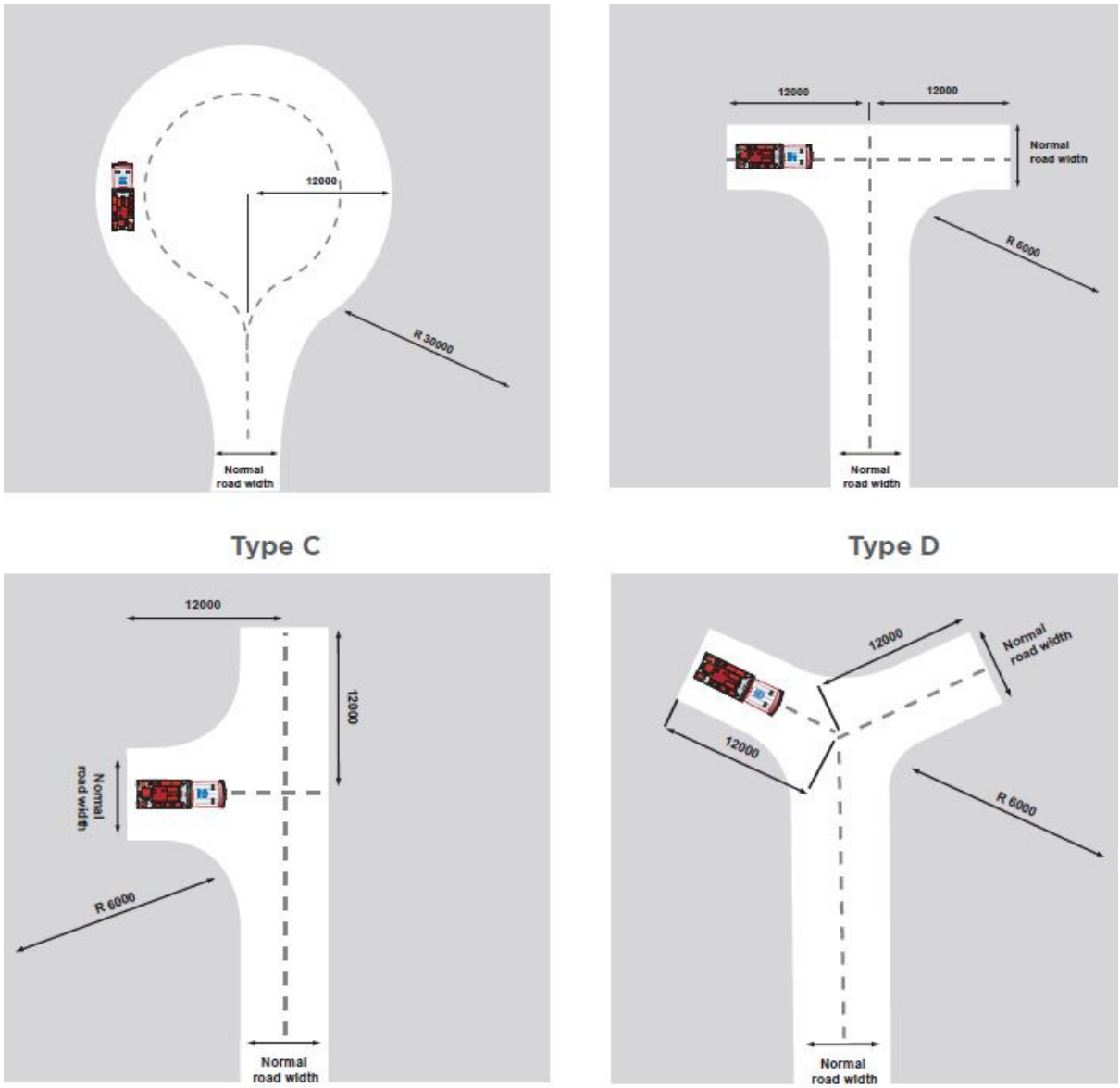


Figure 3.2 – Cul-de-sac design

3.5 Water supplies

Town reticulated water supply is conformed from Sydney Water that services are available to the proposed development in the form of an underground reticulated water system.

Table 3.3 outlines the proposals compliance with the performance criteria for reticulated water supply.

Table 3.3 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 37)

Performance criteria	Acceptable solutions	Complies
Water supplies are easily accessible and located at regular intervals.	Access points for reticulated water supply to SFPP developments incorporate a ring main system for all internal roads.	Complies - can be made a condition of consent.

Performance criteria	Acceptable solutions	Complies
	Fire hydrant spacing, sizing and pressures comply with *AS2419.1*. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. The provisions of public roads in Section 4.1.3 of *PBP* in relation to parking are met.	

3.6 Gas

Table 3.4 outlines the required performance criteria for the proposals gas supply.

Table 3.4 – Performance criteria for gas supplies (*PBP* guidelines pg. 37)

Performance criteria	Acceptable solutions	Complies
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings.	Reticulated or bottled gas bottles are to be installed and maintained in accordance with *AS1596* and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials and located on the non hazard side of the development. If gas cylinders are to be kept close to the building the release valves must be directed away from the building and away from any combustible material, so that they do not act as a catalyst to combustion. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.	Complies - can be made a condition of consent.

3.7 Emergency and evacuation planning

Table 3.5 outlines the required performance criteria for the proposal's emergency procedures

The development has been designed to comply with PBP, adequate APZ's have been provided and the buildings will be constructed to the relevant standards. As a result the primary action for evacuation will be to shelter in place with the assembly points being either within the RAC building or the central foyer area of Building A & D. Evacuation will only occur in the event that occupants are ordered to evacuate by emergency services.

Comments from traffic expert Brett Maynard have been utilised in this assessment – see Section 3.4 above.

The following has been entered into the Operational Plan of Management in regard to evacuation

> *Travers Bushfire & Ecology has been engaged as a Bushfire consultant for the proposed development, and has advised on the design development of the project.*
>
> *Travers's recommendation for a bushfire emergency is for residents to "shelter in place", unless ordered to evacuate by authorities.*
>
> *In the event of a bushfire, residents will be instructed to move to the communal facilities building to shelter in place.*
>
> *Onsite management staff will co-ordinate this and assist any residents to move to the communal facility building. The basement can be utilized to travel from all ILU buildings to the communal building if needed due to outside conditions.*
>
> *Prior to the retirement village becoming operational, a detailed Bush Fire Emergency Management and Evacuation Plan (prepared in accordance with the RFS Document - DEVELOPMENT PLANNING - A guide to developing a Bush Fire Emergency Management and Evacuation Plan) will be prepared by the village operator, in conjunction with a bushfire consultant, and all staff will be providing training on what to do in the event of a bushfire.*
>
> *A bushfire emergency plan briefing will be provided to all residents by the onsite management team prior to them taking up occupancy in the development.*

Table 3.5 – Performance criteria for emergency and evacuation planning (*PBP* guidelines pg.39)

Performance criteria	Acceptable solutions	Complies
An emergency and evacuation management plan is approved by the relevant fire authority for the area.	An emergency / evacuation plan is prepared consistent with the *RFS* Guidelines for the Preparation of Emergency / Evacuation Plan. *Note: The applicant should provide a copy of the above document to the local Bush Fire Management Committee for their information prior to the occupation of any accommodation of a SFPP.*	Complies - can be made a condition of consent.
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	An emergency planning committee is established to consult with staff in developing and implementing and emergency procedures manual. Detailed plans of all emergency assembly areas including onsite and offsite arrangements as stated within *AS3745* are clearly displayed, and an annual trial emergency evacuation is conducted.	Complies - can be made a condition of consent.

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the proposed seniors living development involving the construction of independent living units (ILU's) and residential aged care beds within Lot 2A DP 158064 & Lot 1 DP 230172, No. 3 Quarry Road & 4 Vineys Road, Dural.

The assessment has found that bushfire can potentially affect the proposed development from the narrow parcel of Blackbutt Gully Forest vegetation located within the eastern portion of the site resulting in possible ember and radiant heat attack.

This assessment has concluded that the proposed development will provide:

- Asset protection zones (APZ's) in accordance with the performance requirements of *PBP.* An alternative solution approach was used based on the narrow width of vegetation and fuel loads in accordance with PBP 2006.

- The proposed landscaping design (as per plans attached in Appendix 2) are in compliance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005) and Appendix 5 of *PBP*.

- Adoption of Clause A1.10 Low threat vegetation – exclusion as allowable under *Pre-release PBP 2018*. This is a performance based solution which excludes the remnant plantation vegetation to the west of the site from being considered as a bushfire hazard.

- Construction of new works (within 100m of the bushfire hazard) in accordance with *Australian Standard AS3959 Construction of buildings in bushfire-prone areas 2009 (AS3959)* - Bushfire Attack Level (BAL) 12.5.

- Road evacuation capability as required by PBP 2006

- Road access capability as required with the performance requirements of PBP.

- Emergency management and evacuation in compliance with the PBP and *RFS* guidelines for the *Preparation of Emergency / Evacuation Plan*.

The following recommendations are provided to ensure that the development is in accordance with, or greater than, the requirements of *PBP.*

4.2 Recommendations

Recommendation 1 - The development is as generally indicated on the attached Schedule 1 – Plan of Bushfire Protection Measures.

Recommendation 2 - The property (not inclusive of the retained Blackbutt Gully Forest) is to be managed as an APZ. A summary of the guidelines for managing APZs are attached as Appendix 2.

Recommendation 3 – Building E, F, G & the RAC building is to comply with BAL 12.5 as outlined in *AS3959 (2009)* Construction of buildings in bushfire prone areas with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 *PBP*.

Recommendation 4 - Access is to comply with performance criteria as outlined in Section 4.2.7 of *PBP*.

Recommendation 5 - Gas and water supply is to comply with Section 4.2.7 of *PBP*.

Recommendation 6 - An emergency / evacuation plan is to be prepared / upgraded consistent with the RFS *Guidelines for the Preparation of Emergency / Evacuation Plans.*

REFERENCES

Australian Building Codes Board (2010) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2

Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bushfire-prone areas*

Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change

Rural Fire Service (2006) - *Planning for bushfire protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service

Rural Fire Service (2006) - Bushfire Attack Software on RFS web site

Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack.* RFS Development Control Service

Plan of Bushfire Protection Measures

S1

Legend

- Study area (source: CAD)
- Contours 1m (source: LiDAR)
- Locked gate

Access

- Emergency access
- Public access to underground carpark

- Asset Protection Zone (APZ)

Bushfire Construction Standards AS3959 (2009)*

- BAL 12.5

* Please refer to additional construction requirements for BAL levels which are contained in Addendum Appendix 3 of *'Planning for Bushfire Protection'* (2006).

Vegetation Communities (source: Cumberland Ecology 2018)

- Blackbutt Gully Forest
- Exotic Dominated Grassland
- Exotic Vegetation
- Sydney Turpentine-Ironbark Forest
- Urban Native/Exotic

Aerial source: Nearmap

0 25 50 m

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
3 Quarry Rd, Dural 18IREA02_BF001	21/02/2019 Issue 1 ATS	1:1,500 @A3 GDA 1994 MGA Zone 56

TITLE

Schedule 1 - Bushfire Protection Measures

Travers bushfire & ecology
www.traversecology.com.au

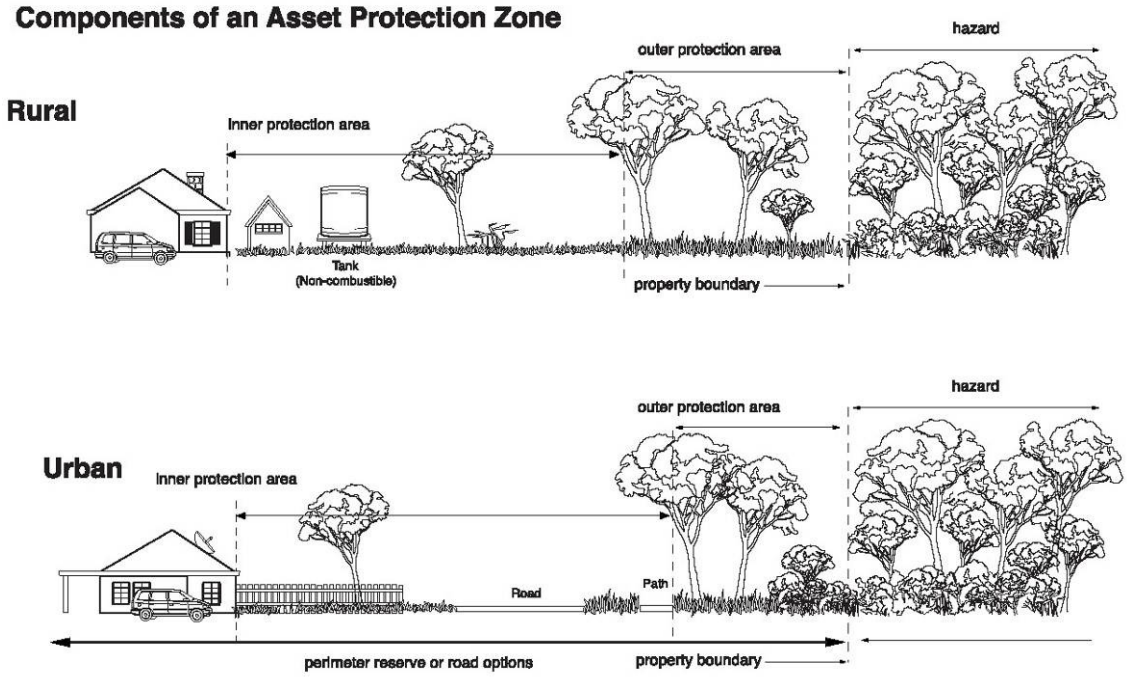
Document Path: N:\GIS STORAGE\N Drive\18IREA02_QuarryRd_Dural\MXDs\18IREA02_BF001.mxd

Management of Asset Protection Zones

A1

The RFS provides basic advice in respect of managing APZs through documents such as, *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. The property is to be managed to IPA standards only. A typical APZ is graphically represented below:



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the RFS performance criteria.

The following provides maintenance advice for vegetation within the IPA and OPA.

Inner Protection Area (IPA)
Fuel loads within the IPA are to be maintained so it does not exceed 4t/ha.

Trees are to be maintained to ensure;

- Canopy cover does not exceed 15%
- Trees (at maturity) do not touch or overhang the building

- Tree canopies (at maturity) should be well spread out and not form a continuous canopy
- Lower limbs should be removed up to a height of 2m above ground
- Preference should be given to smooth barked and evergreen trees.

Shrubs are to be maintained to ensure;

- Large discontinuities or gaps in vegetation
- Shrubs should not be located under trees
- Shrubs should not form more than 10% of ground cover
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of vegetation.

Grass is to be maintained to ensure:

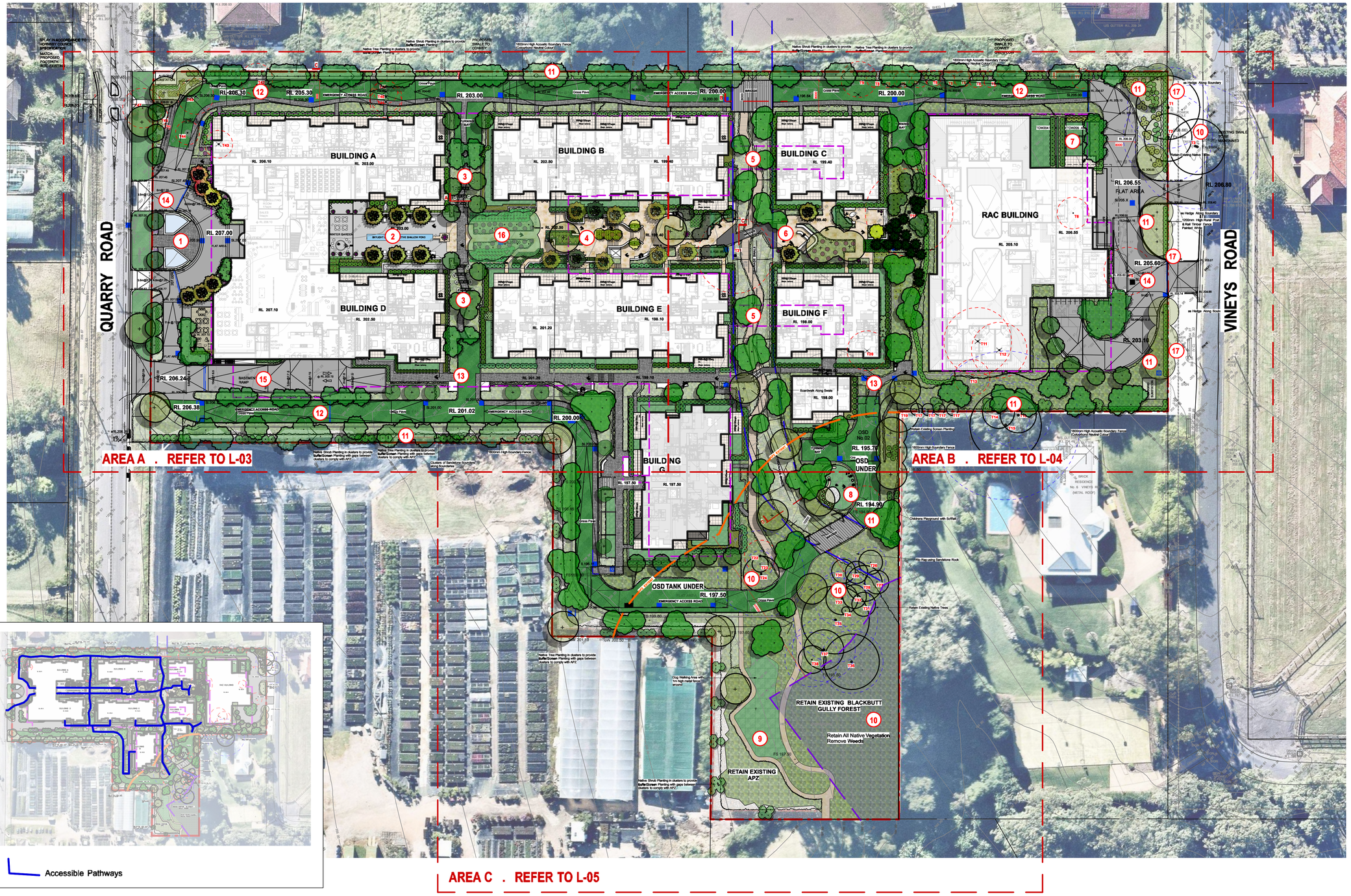
- A height of 10cm or less
- Leaves and debris is removed.

Landscaping to the site is to comply with the principles of Appendix 5 of PBP. In this regard the following landscaping principles are to be incorporated into the development:

- Suitable impervious areas being provided immediately surrounding the building such as courtyards, paths and driveways;
- Restrict planting in the immediate vicinity of the building which may over time and if not properly maintained come in contact with the building;
- When considering landscape species consideration needs to be given to estimated size of the plant at maturity;
- Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies;
- Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown;
- Avoid planting of deciduous species that may increase fuel at surface/ ground level (i.e. leaf litter);
- Avoid climbing species to walls and pergolas;
- Locate combustible materials such as woodchips/mulch, flammable fuel stores away from the building;
- Locate combustible structures such as garden sheds, pergolas and materials such timber garden furniture way from the building; and
- Use of low flammability vegetation species.

Landscape plan

A2



LEGEND :

1. MAIN ENTRANCE WITH REFLECTING POND
2. POND WITH SKYLIGHT TO THE POOL UNDER
3. ROSE ARBOR WALK
4. FORMAL MAIN COURTYARD
5. BOARDWALK WITH BALUSTRADE OVER SWALE
6. INFORMAL SEATING COURTYARD
7. LAWN AREA
8. CHILDRENS PLAYGROUND
9. DOG WALKING AREA (FENCED)
10. RETAIN ENDEMIC TREES
11. NATIVE TREE BUFFER PLANTING
12. EMERGENCY ACCESS ROAD 'Grass Pave'
13. CRAZY PAVE PEDESTRIAN LINK
14. DRIVEWAY ACCESS
15. CARPARK RAMP
16. MANCHURIAN PEAR WALK
17. 1200mm POST & RAIL WHITE TIMBER FENCE

TREES LEGEND :

TPZ
T1 — EXISTING TREE TO BE RETAINED (refer to Arborist Report)

EXISTING TREE TO BE REMOVED

LEGEND

- BITUMEN DRIVEWAY
- TURF AREAS 'T'
- GRASS PAVED
- LANDSCAPED GARDENS
- PROPOSED BUILDING
- MAIN WALKWAY PAVING
- CRAZY PAVE
- DECK AREA
- PRIVATE COURTYARD - TILES
- STEEL BRIDGE OVER SWALE
- FEATURE POTS & URNS
- BOUNDARY
- BASEMENT LINE
- SWALE DRAINAGE LINE
- DRAINAGE PIT

ISSUE	DATE	COMMENT
D	2/3/19	DA ISSUE FOR REVIEW

AMENDMENTS

creating places to live in and enjoy

LANDSCAPE ARCHITECTS

SITEDESIGN +STUDIOS

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Project	DA LANDSCAPE PLAN		
Address	3 QUARRY RD, DURAL	Scale.	1:500@A1
Drawing Title	LANDSCAPE MASTERPLAN		
Client	Zhiva Living	Drawing No.	1173

Page **L-01 D**