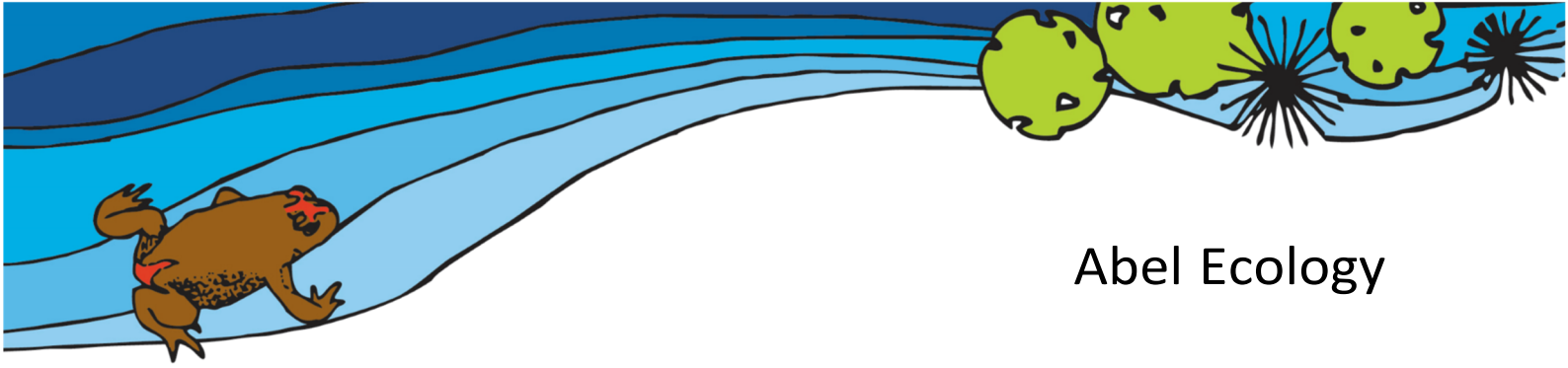

Abel Ecology

Bushfire Assessment Report

Address: 171 Forest Way, Belrose, NSW
Lot 9, DP 737255

Proposed construction of Seniors Housing development.

Prepared for:	Belrose RB1 Pty Ltd
Report No:	AE21-2272-REP-ISS-1
Prepared by:	Abel Ecology
Date:	22 October 2021

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This report has been prepared in accordance with the scope of services described in agreement between Abel Ecology and the Client.

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The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points.

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I confirm that I have read the NSW Land and Environment Court Practice Note commencing on 14 May 2007, Division 2, Part 31 of the Uniform Civil Procedure Rules 2005 and the Expert Witness Code of Conduct in Schedule 7 to the Uniform Civil Procedure Rules 2005. I have prepared this advice in accordance with the requirements of the Practice Note and Code of Conduct and believe this report is consistent with the requirements of the Practice Note and the Code of Conduct. I agree to be bound by the Practice Note and Code of Conduct.

Document History

Report	Version	Prepared by	Proofread by	Technical Review by	Submission	
					Method	Date
Report	Draft A	Damien Cartwright	Jane Bonwick	Mark Mackinnon	Dropbox	02 September 2021
Report	Issue 1	Damien Cartwright	Jane Bonwick	Mark Mackinnon 	Dropbox	21 October 2021

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22 October 2021

List of Abbreviations

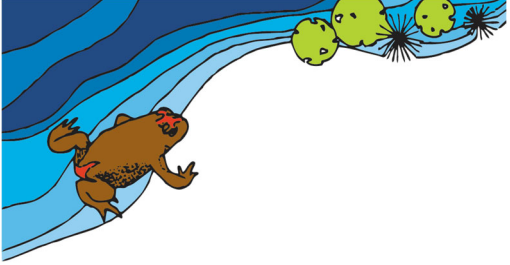
AHIM	*Aboriginal Heritage Information Management System*

APZ	Asset Protection Zone
BAL	Bushfire Attack Level
NCC	*National Construction Code*
BC Act 2016	*Biodiversity Conservation Act 2016*
BFMC	Bushfire Management Committee
DCP	Development Control Plan
DP	Deposited Plan
DPIE	Department of Planning, Industry and Environment
DTS	Deemed-To-Satisfy
EP&A Act 1979	*Environmental Planning and Assessment Act 1979*
EP&A Regulation 2000	*Environmental Planning and Assessment Regulation 2000*
EPBC Act 1999	*Environmental Protection and Biodiversity Conservation Act 1999*
IPA	Inner Protection Area
kW/m^2	kilowatts per square m (being a measure of radiant heat)
LEP	Local Environment Plan
LGA	Local Government Area
LLS Act 2013	*Local Land Services Act 2013*
NP&W Act 1974	*National Parks and Wildlife Act 1974*
OEH	Office of Environment and Heritage (old State department name)
OPA	Outer Protection Area
PDA	Principal Development Area
PBP 2019	*Planning for Bushfire Protection 2019*
RFS	Rural Fire Service
RF Act 1997	*Rural Fires Act 1997*
RF Regulation 2013	*Rural Fires Regulation 2013*
RHF	Radiant Heat Flux
SEPP	*State Environmental Planning Policy*
SFPP	Special Fire Protection Purpose

Note regarding maps in this report

The diagram/site maps used in this report have been supplied by and are used with the permission of the Steve Horrell.

With regard to maps provided by NSW Spatial Services and Nearmap Ltd. Topographic maps and aerial imagery are used with the permission of © NSW Spatial Services, NSW and © Nearmap Ltd.



Executive Summary

This Bushfire Assessment has been prepared by an Accredited BPAD Practitioner using the Simplified Procedure (Method 1) as detailed in Appendix 1 of *Planning for Bushfire Protection 2019*.

This proposal has been prepared in accordance with *Planning for Bushfire Protection 2019* in its entirety and the development can comply with most Acceptable Solutions in PBP 2019 with modifications made to the design. Section 100B of the *Rural Fires Act 1997* provides that the consent authority may issue consent for the development, after it has consulted with the Commissioner of the NSW Rural Fire Service (NSW RFS).

Abel Ecology makes no warranties as to the accuracy of the information provided in the report. All enquiries related to the information and conclusions presented in this report must be made to the Practitioner.

A bushfire assessment of the proposed development site at Lot 9, DP 737255, 171 Forest Way, Belrose, NSW (the 'site') was undertaken on 2nd July 2021. The 1.1 ha (approx.) allotment has an existing dwelling and associated infrastructure. The associated infrastructure includes two sheds. The proposal is to construct a seniors housing development.

The aim of the assessment was to ascertain the potential fire hazard and establish the site capability for an Asset Protection Zone (APZ) while complying with Council's requirements and relevant legislation. The report will be used to ensure the proposal satisfies the performance requirements of the *National Construction Code* (NCC) and *Planning for Bushfire Protection 2019*.

The access road to the building footprint is from Belrose Way. Belrose Way is a state owned (bitumen) road, of suitable grades, six traffic lanes wide and is regularly maintained.

Regarding any clearing of native vegetation on the property, it is the responsibility of the landowner to check whether all required permissions from local and statutory authorities are in place. This may include Parts 3, 4 and 5 of the *EP&A Act 1979*; s.4.46 and s.4.53 licences; licence or conservation agreement under the *NP&W Act 1974*; or approvals under the *Local Land Services Act 2013* and or the *Biodiversity Conservation Act 2016*.

The vegetation hazard which will most significantly influence fire behaviour is the forest to the east of the proposal footprint.

1. Introduction

Abel Ecology was engaged by Steve Horrell to prepare a bushfire assessment for a proposed development. The report will be used to supplement a development application to Northern Beaches Council. The report will be used to ensure the proposed development satisfies the performance requirements of the *National Construction Code* (NCC) and *Planning for Bushfire Protection 2019* (PBP).

We have considered the details sent to us and completed a detailed inspection of the site on 2nd July 2021. This report serves to:

a) Identify the site and proposed development,
b) Determine the bushfire threat, and
c) Identify work to be completed to improve the chances of building survival in the event of a bushfire. These works will satisfy the Performance Requirements of the *National Construction Code* (NCC) and achieve compliance with *Planning for Bushfire Protection 2019* (PBP 2019).

The Bushfire Assessment Report concludes the proposal is sterilised by the bushfire threat and the owners may not be able to construct the development. This report concludes that the proposed development cannot comply with PBP 2019 in its current form.

1.1. Planning relationships

1.1.1. Legislation

a) Section 100B *Rural Fires Act 1997*
b) *Clause 44 Rural Fires Regulation 2013*
c) *Clause 45 Rural Fires Regulation 2013*
d) *Clause 46 Rural Fires Regulation 2013*
e) *Section 4.46 Environmental Planning and Assessment Act 1979 1979 (Previously s.91 EP & A Act 1979)*
f) *Section 10.3 Environmental Planning and Assessment Act 1979* (Previously EP & A Act 1979 s 146)
g) *Section 4.15(1)(a) & (c) Environmental Planning and Assessment Act 1979* (Previously EP & A Act 1979 s 79C(1)(c))
h) *Clause 272 Environmental Planning and Assessment Regulation 2000*
i) *Clause 273A Environmental Planning and Assessment Regulation 2000*
j) *Section 63(1) & 63(2) Rural Fires Act 1997*

1.1.2. Planning policies

a) *Planning for Bushfire Protection 2019*
b) *Warringah DCP 2011*
c) *Warringah LEP 2000*
d) Adjacent land is controlled by the Warringah Pittwater Bushfire Risk Management Plan 2010

This report is prepared using PBP 2019 and Section 100B of the *Rural Fires Act 1997* provides that the consent authority may issue consent for the development, after it has consulted with the Commissioner of the NSW Rural Fire Service (NSW RFS).

2. The site and proposed development

2.1. Site Description

The site description is required as per A2.1 submission requirements for a Bush Fire Safety Authority.

The site is identified as Lot 9, DP 737255, at 171 Forest Way, Belrose, NSW (Figure 1).

The site is approximately 1.1 ha in area and is zoned:

a) Bush Fire Prone Land, Vegetation Buffer 100 m (Figure 2)
b) (DM) Council Deferred Matter (Figure 3)

The site is regularly shaped with a frontage of 72 m to Forest Way and depths of 189 m and 192 m to the north and south boundaries respectively (Figure 4). The site has an existing dwelling close to the west boundary with two associated infrastructure buildings to the east. The land is approximately half cleared of vegetation. The landform is dominated by steep sandstone escarpment formations. The forested areas are part of the landscaped formations within the curtilage of the building. There is a small, forested area on the east boundary that is dominated by exotic flora. (Figure 5)

The access road to the building footprint is from Belrose Way. Belrose Way is a state owned (bitumen) road, of suitable grades, six traffic lanes wide and is regularly maintained. Turning points for mediumrigid vehicles include Forest Way and associated intersection nearby. (Figure 6).

Figure 1: Topographical Map Location

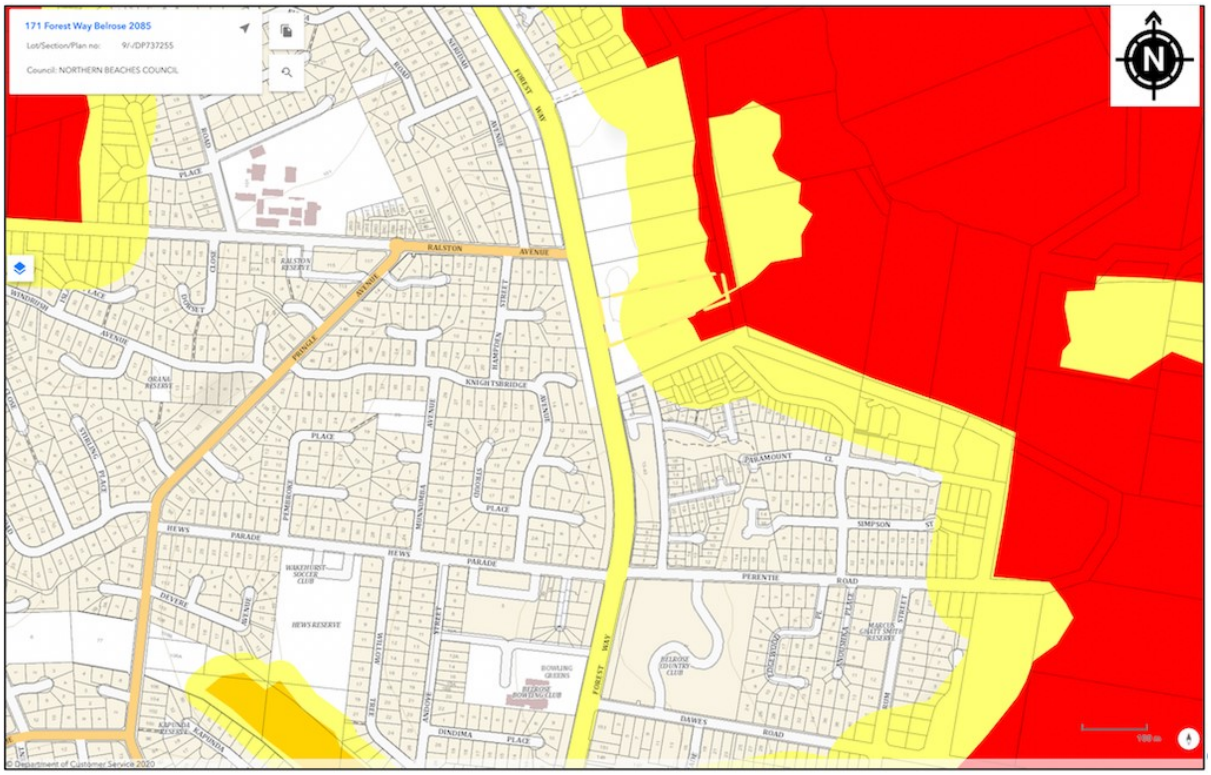


Figure 2: Bushfire Prone Land Map

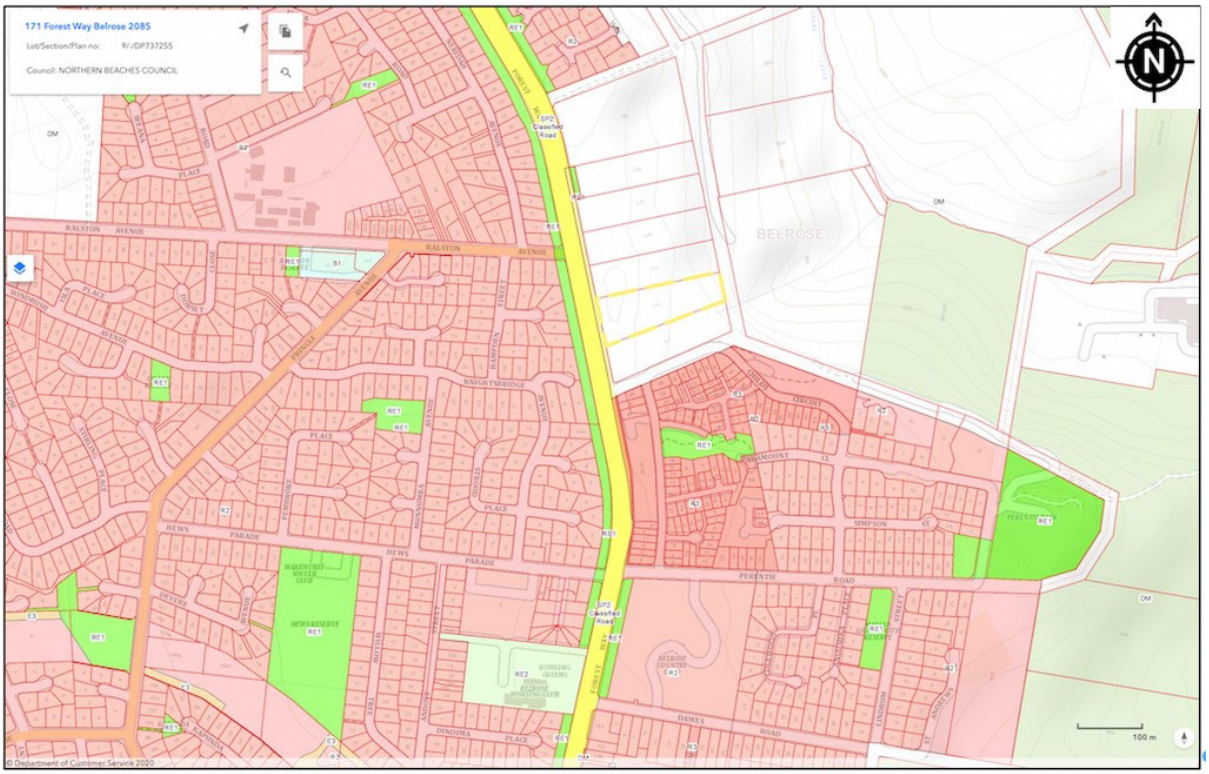


Figure 3: Land Use Zoning

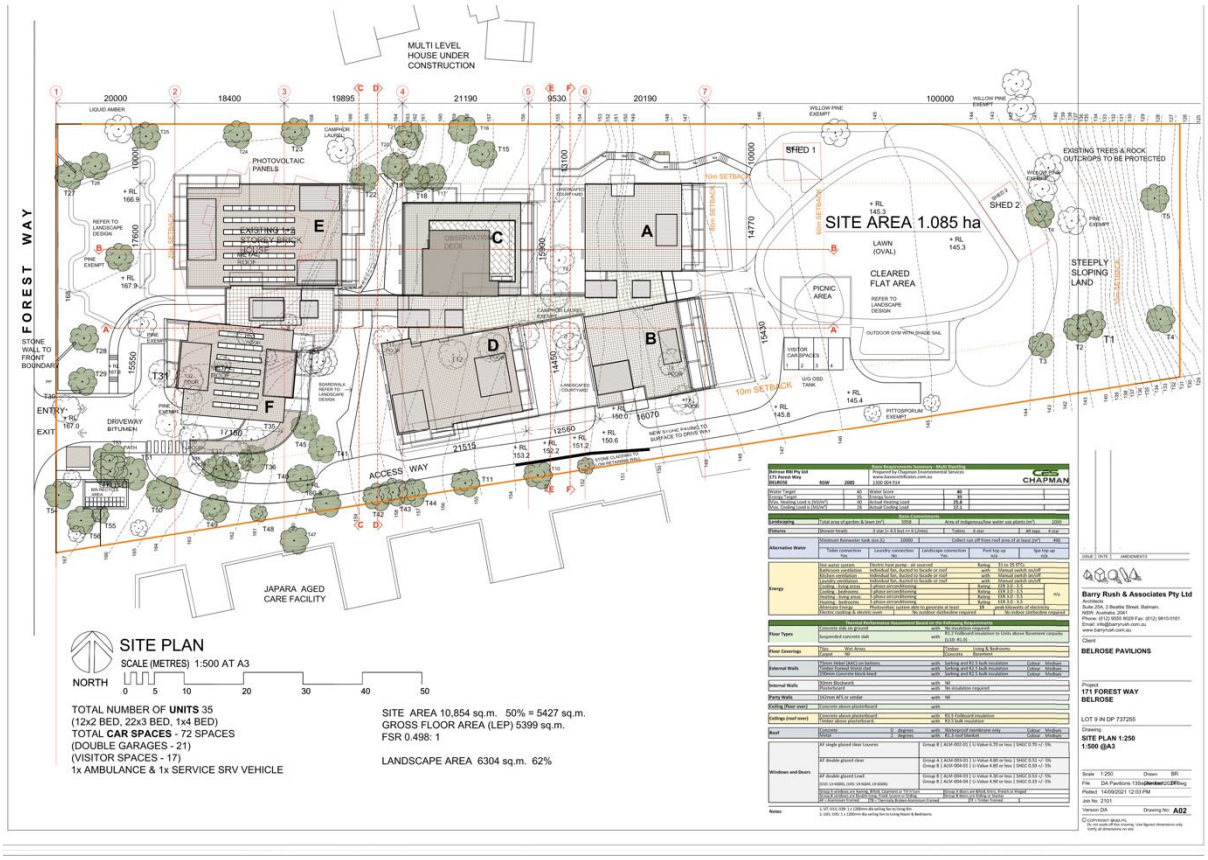


Figure 4: Site Plan

Figure 5: Site Aerial

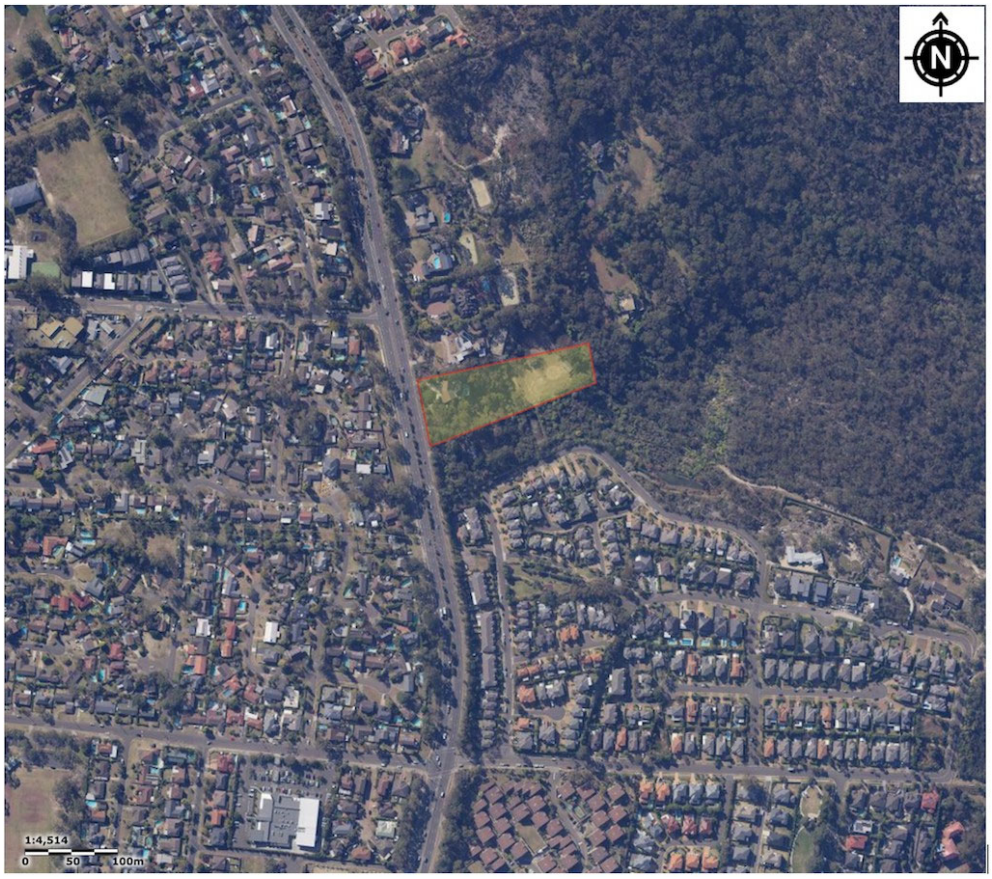


Figure 6: Location Aerial

2.2. The proposal

The proposal is to demolish the existing structures and construct a seniors housing development with the appropriate level of bushfire protection measures to meet the required performance criteria of *Planning for Bushfire Protection 2019* (PBP 2019). This includes the clearance / maintenance of an Asset Protection Zone (APZ) within the Principal Development Area (PDA) of the site. The PDA is approximately three quarters of the total site area (Figure 7).

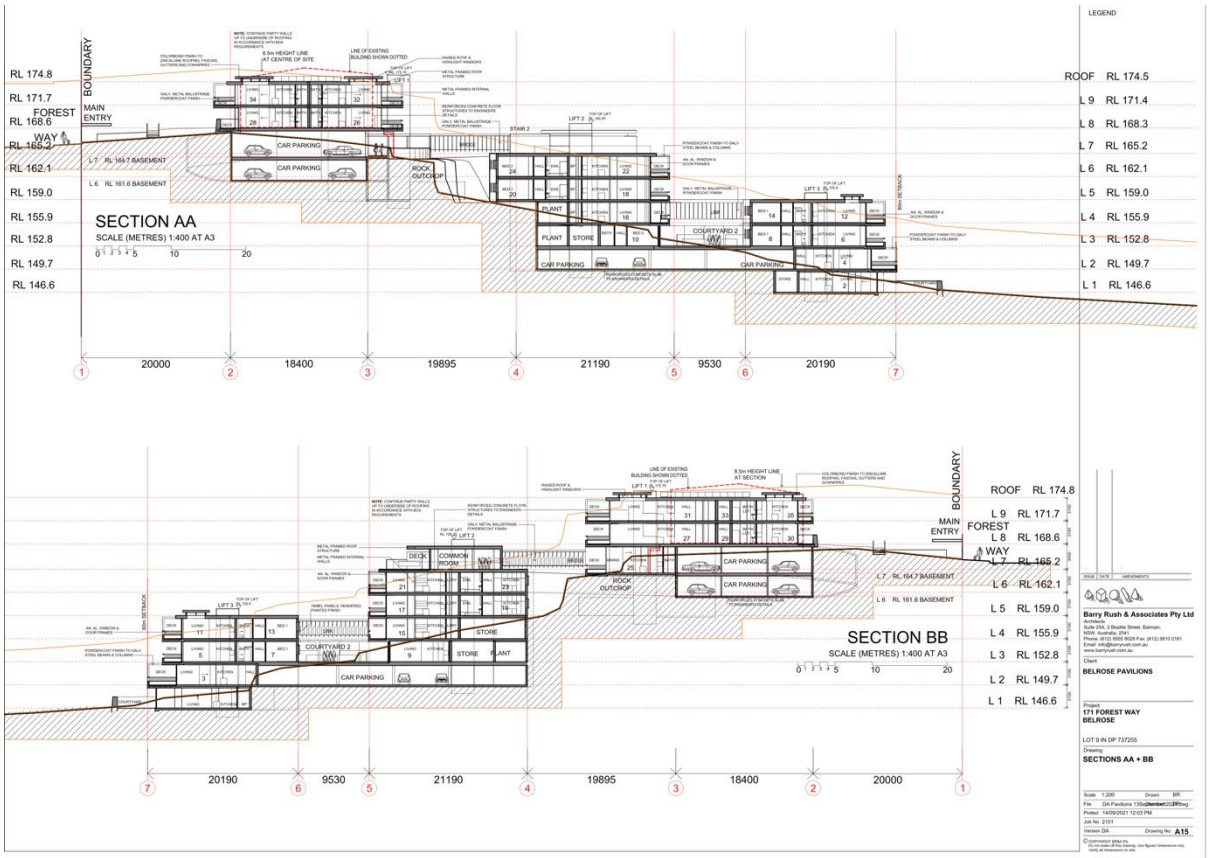


Figure 7: Conceptual Diagram

3. Existing vegetation

The vegetation description is according to Figures A1.2 in PBP 2019 based on Keith (2004). The classification assessment of the vegetation on and surrounding the property is out to 140 m from the proposal development outer wall (Figure 8).

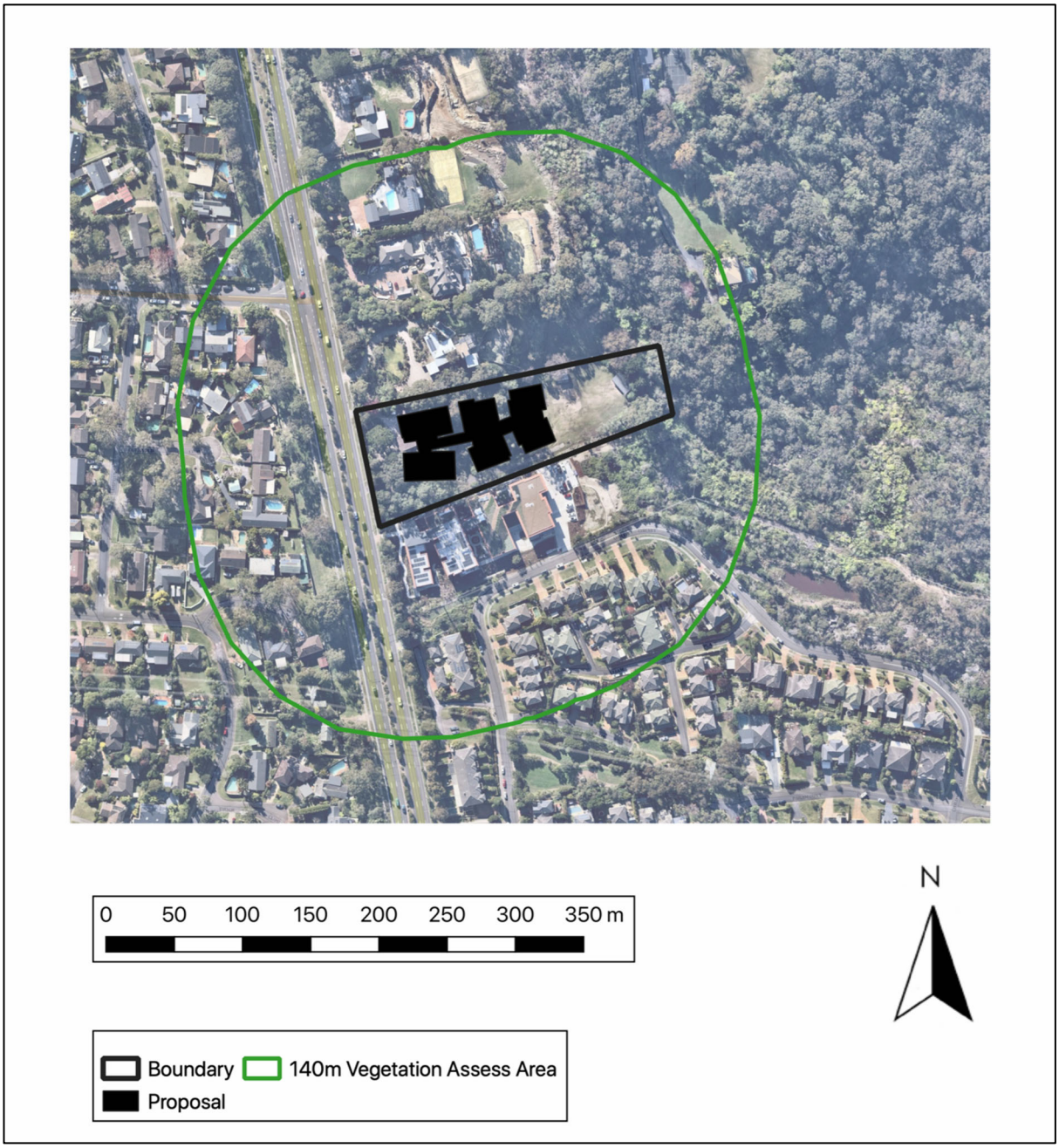


Figure 8: Vegetation Assessment Area

The vegetation on and surrounding the property is dominated by PCT 1250 'Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion (Sydney Coastal Dry Sclerophyll Forest).

3.1. North

The vegetation within the assessment area of 140 m to the north, as per PBP2019 and Keith (2004) is consistent with a Forest hazard (Figure 9). The separation distance from the proposal to unmanaged

vegetation is 76 m. There is a proposed VMP on adjacent land to create separation from the forest to the east. The remaining vegetation that is within 100 m of the proposal is considered low threat as per s. A1.10 Low Threat Vegetation – Exclusions PBP 2019. This vegetation is less than 0.25 ha and of exotic and landscaped features.

3.2. East

The vegetation within the assessment area of 140 m to the east, as per PBP2019 and Keith (2004) is consistent with Dry Sclerophyll Forest (Figure 10). The separation distance from the proposal to unmanaged vegetation is 85m.

3.3. South

The vegetation within the assessment area of 140 m to the south, as per PBP2019 and Keith (2004) is consistent with Managed Land (Figure 11). The separation distance from the proposal to unmanaged vegetation is >140 m. There is a freshwater wetland in the adjoining lot however, it is the dry sclerophyll forest to the east that poses the more significant threat. This wetland is also further (26 m) than the required distance for separation required for SFPP buildings of 22 m.

3.4. West

The vegetation within the assessment area of 140 m to the west, as per PBP2019 and Keith (2004) is consistent with Managed Land (Figure 12). The separation distance from the proposal to unmanaged vegetation is >140 m.

Figure 9: North Vegetation (proposed VMP area)

Figure 10: East Vegetation

Figure 11: South Vegetation

Figure 12: West Vegetation

3.5. Vegetation Summary

Table 1: Vegetation Assessment Summary

Assessment Direction	Vegetation Classification	Separation Distance from Unmanaged Land
North	Remnant Forest	76 m
East	Forest	85 m
South	Managed Land	>140 m
West	Managed Land	>140 m

4. Slope Assessment

As per A1.5 Determine Effective Slope in PBP 2019, a slope assessment is required when determining the BAL. The assessment is made of the slopes and aspects of any bush fire prone land within 100 m on and surrounding the site. The effective slope is calculated perpendicular to the slope towards the site. The effective slope is the slope under the vegetation that will most significantly influence the bush fire behaviour. ELVIS DEM spatial data was used to create contour mapping. A trained consultant also used a slope meter on-site to gain the effective slope angle used in the site analysis. The site has very steep sections, but this was mainly due to the escarpments that are not easily identifiable with the LIDAR data as the vegetation was very dense creating error. Measuring the slope on site was difficult to determine due to the escarpments. Due to these factors, it has been determined that a maximum measurable slope range of 15-20 degrees be used. Determining BAL calculations outside of this range is not as accurate and a conservative approach will be adopted (PBP 2019) (Figure 13).

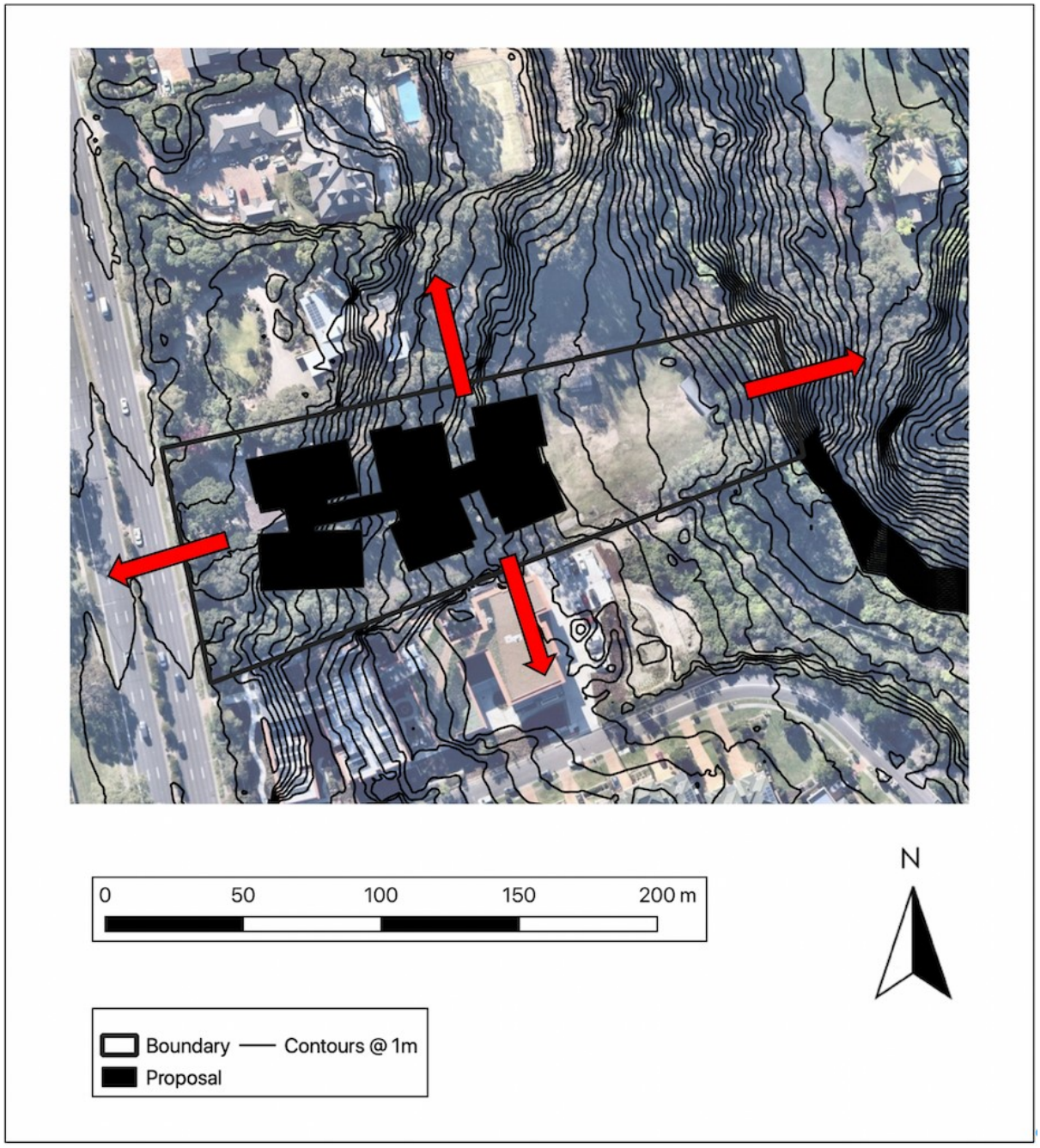


Figure 13: Contours @ 1 m (LIDAR Derived) with Slope Assessment Directions

Table 2: Slope Assessment Summary

Direction	Slope Bias	Slope (%)	Slope (°)	Slope Range (°)
North	Upslope/Level	n/a	n/a	Upslope/Level
East	Downslope	52	27.5	15-20
South	Upslope/Level	n/a	n/a	Upslope/Level
West	Upslope/Level	n/a	n/a	Upslope/Level

5. Adjoining Features

The escarpments to the east may have a mitigating effect on the rate of spread of fire travel up towards the proposal and thus lower the fire intensity. This ultimately could reduce the separation distance to achieve a 10 KW/m^2 exposure on the proposal. The separation distance currently stands at 85 m but PBP2019 requires 100 m for a Deemed to Satisfy solution.

The property to the south is a seniors housing development. This building is also within 85 m of the vegetation to the east. This has some performance solutions applied to enhance its bushfire protection measures and increased survivability in instance of a major bushfire event. The building also has a wetland area to the rear, between the structure and the forest to the east. The wetland will have an influence on bushfire behaviour from this direction due to its location in relation to the proposal. It is essentially an APZ due to its inherent nature and being part of a managed environment within the curtilage of the neighbouring building. The wetland vegetation has been dismissed as a fuel hazard due to active vegetation management by the adjoining property owner and thus is not included as assessable vegetation in this assessment. All other adjoining properties to the south of the proposal are developed residential blocks with managed gardens. There is no bushfire hazard in this direction that could be noted.

The area to the north is dominated by extensive landscaped gardens and recreational areas of substantial lots (approximately 1 ha or larger) not unlike the proposal lot. The transition between the unmanaged forest and the landscape and managed garden areas is not easily defined. However, the client is developing and acquiring Vegetation Management Plans for these properties to help mitigate the effect of bushfire on all of these properties. (The property to the south is also part of the VMP proposal for these properties.) This VMP will create a substantial separation from the forest to the east thus negating any unmanaged garden areas as a bushfire hazard threat. With VMP approval, adjoining native vegetation they will be treated as a remnant forest and assessed as such.

6. Environmental Impacts

6.1. Significant Environmental Features

The site has a section that occurs on the NSW Biodiversity Values Map. The Plant Community within this biodiversity catchment is mapped by the NSW Office of Environment and Heritage (now the NSW Department of Planning, Industry and Environment) as ‘Red Bloodwood –Silvertop Ash – Stringybark open forest on ironstone of the Sydney region’ and this is listed as an Endangered Ecological Community (EEC). They note that this assignment is made from aerial imagery and not on-ground inspection. A biodiversity assessment completed by Able Ecology (AE21 2261 LET 19May2021) states that the strongest vegetation match is PCT 1250 ‘Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion’. This is not an EEC and also concurs with the 2017 Flora and Fauna Impact assessment by Niche Environment and Heritage (Figure 14).

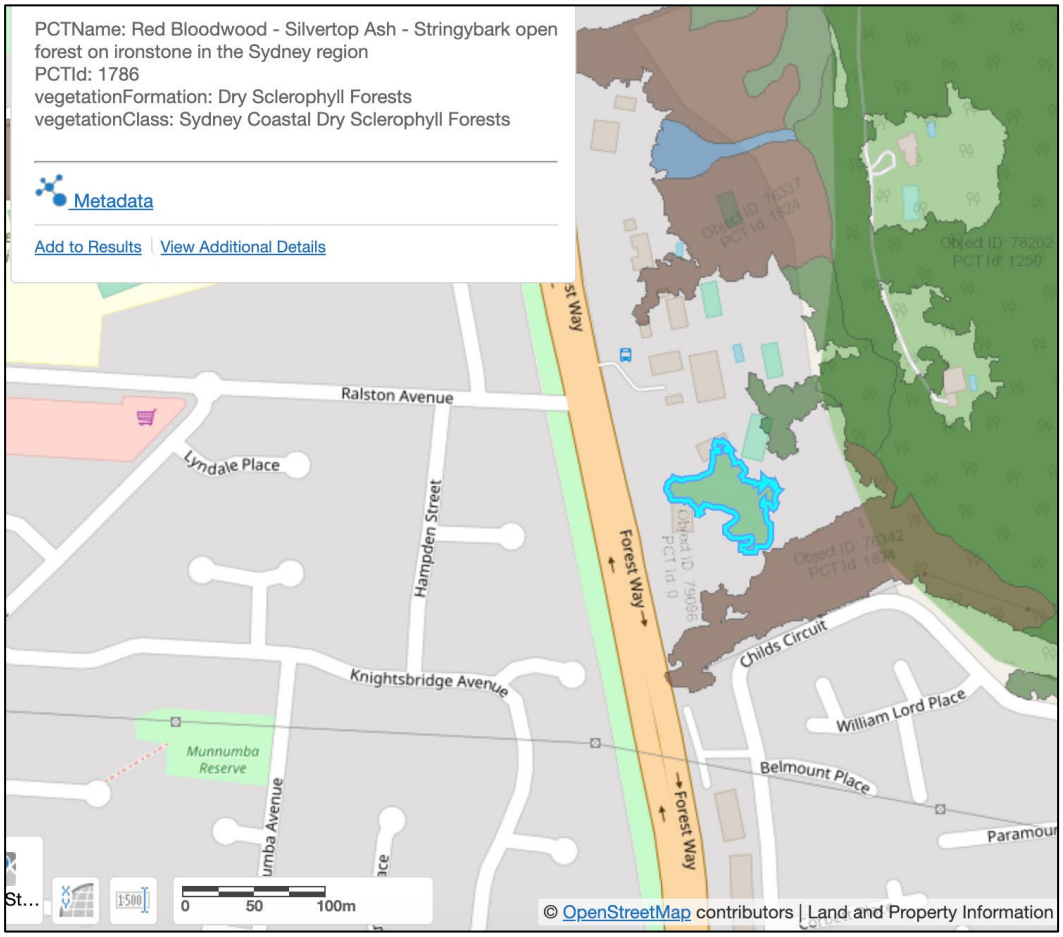


Figure 14: Biodiversity Value Mapping (highlighted by Blue) Possible Endangered Ecological Community

6.2. Threatened Flora and Fauna

No part of the site has been identified as critical habitat for threatened species. No 'Areas of Outstanding Biodiversity Value' were discovered upon site inspection.

6.3. Archaeological and Heritage Significant sites

Abel Ecology is not aware of Heritage Significant sites on the land. Databases have not been searched.

Abel Ecology is not aware of the details and location of any Aboriginal object (within the meaning of the National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) that is not aware to the applicant to be situated on the property. Databases have not been searched.

7. Bushfire Protection Measures

The design of Bushfire Protection Measures (BPMs) must be incorporated at the earliest stages of development. Acceptable bush fire protection proposals will involve a combination of different BPMs

depending on their suitability and importance to the particular type of development and different levels of potential bush fire attack on the site.

Appropriate combinations of BPMs not only depend on geographic location and site circumstances but also on the nature of the proposed use, distinguishing between the following development types:

- residential and rural-residential subdivision with a dwelling entitlement;
- Special Fire Protection Purpose (SFPP) development (relevant to this proposal);
- infill development; and
- other developments (i.e. commercial community and other uses which are not classified as residential or SFPP).

Each development type is required to achieve specific objectives which relate to particular circumstances and the level of acceptable risk for each development type. The acceptable solutions and performance criteria in PBP 2019 acknowledge that the measures work in combination to improve the capacity for bush fire protection.

Research on bush fire behavior under a range of location, weather, vegetation and slope conditions has demonstrated the significance of reduced fuel loads and separation distance in limiting the bush fire threat from ember attack through to direct flame contact.

7.1. Asset Protection Zones

An Asset Protection Zone (APZ) is a buffer zone between a bush fire hazard and buildings. The APZ is managed to minimise fuel loads and reduce potential radiant heat levels, flame, localised smoke and ember attack. The appropriate APZ distance is based on vegetation type, slope and the nature of the development.

In the proposal's current footprint, there is inadequate space on the allotment to clear existing vegetation and permit a deemed-to-satisfy separation distance for estimated exposure to radiant heat of less than 10 kW/m^2 for the building. Part of the proposed APZ is located on lands with a slope exceeding 18° and is not wholly within the boundaries of the development site. This does not meet the acceptable solutions in Table 6.8a of PBP 2019 for SFPP development proposals. The historical landscaped features of adjacent land to the north and south of the site, and the proposed VMPs (Figure 15) for these properties in perpetuity, could allow for the inclusive areas to be considered managed land and thus provide adequate separation from unmanaged vegetation that would present a hazard. By doing so, would allow for compliance with PBP 2019 by not exceeding the 10 kW/m^2 radiant heat threshold.

Table 3: Onsite Inner Protection Area zone requirements

Aspect	IPA Requirement (m)
North	10
East	100
South	10
West	20

The onsite APZ IPA is required to be the entire lot (Table 3). The adjacent property proposed VMPs (created to remain in perpetuity) would assist in creating a suitable separation from the hazardous

vegetation and the proposal. The Northern Beaches Council are unlikely to approve a larger APZ as this would further encroach on adjoining land such as the roadway easement to the east, and impose increased management on neighbouring land owners. The LEP states, the unnecessary clearance of vegetation must be avoided and as such, the minimum clearance needed to create separation between the vegetation to create an effective APZ must be adhered to onsite (Refer to Table 3). Because the slope to the north is upslope/level in orientation, the separation distance required is reduced (67 m) to the imposed separation distance required (100 m) to the east. The separation distances attained are 76 m to the north and 85 m to the east respectively. An additional 20 m of APZ IPA is required to reach compliance with 100 m of separation (Table A1.12.1 of PBP 2019) on the east aspect of the proposal (Refer to Figure 16).

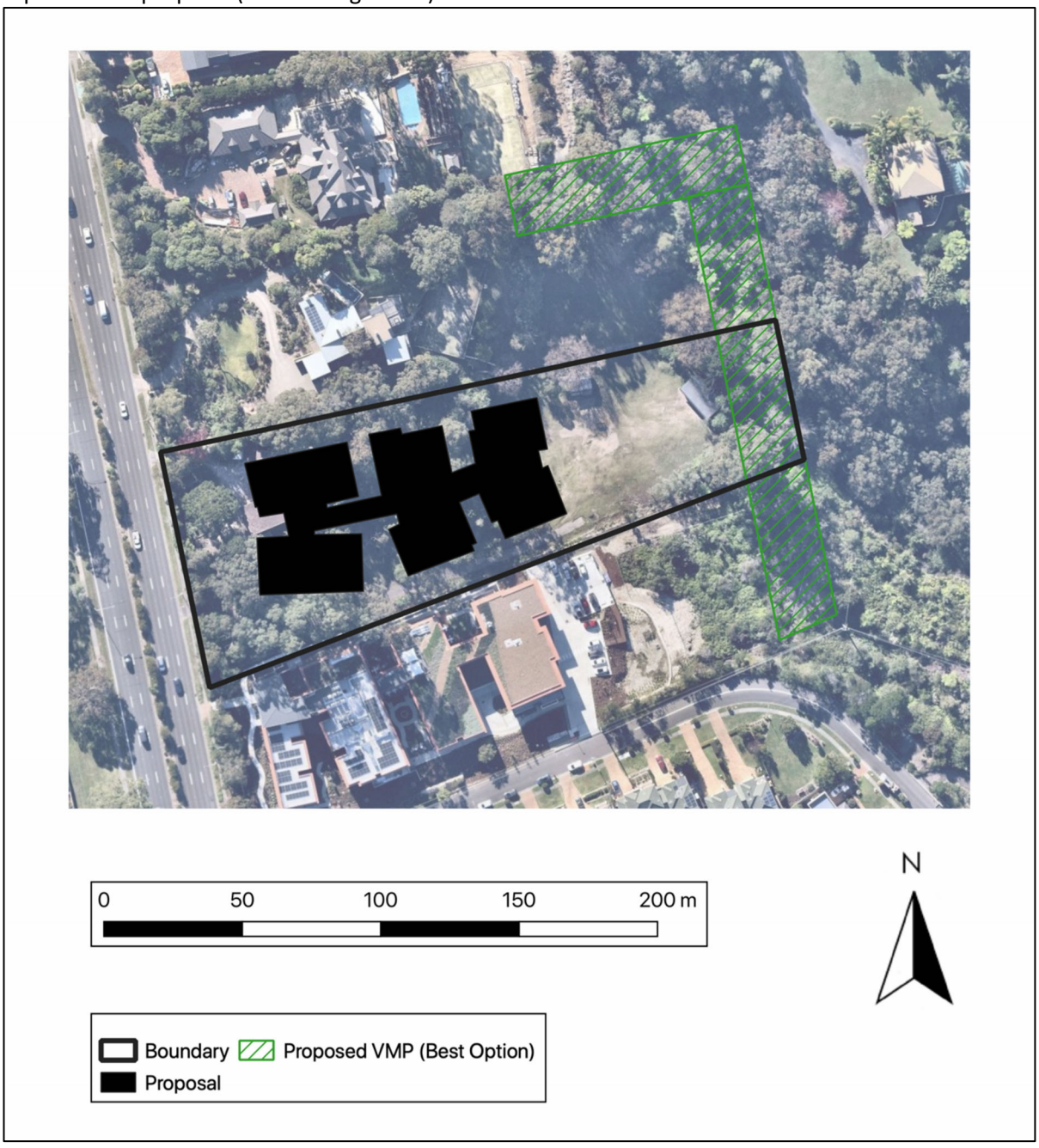


Figure 15: VMP Proposal

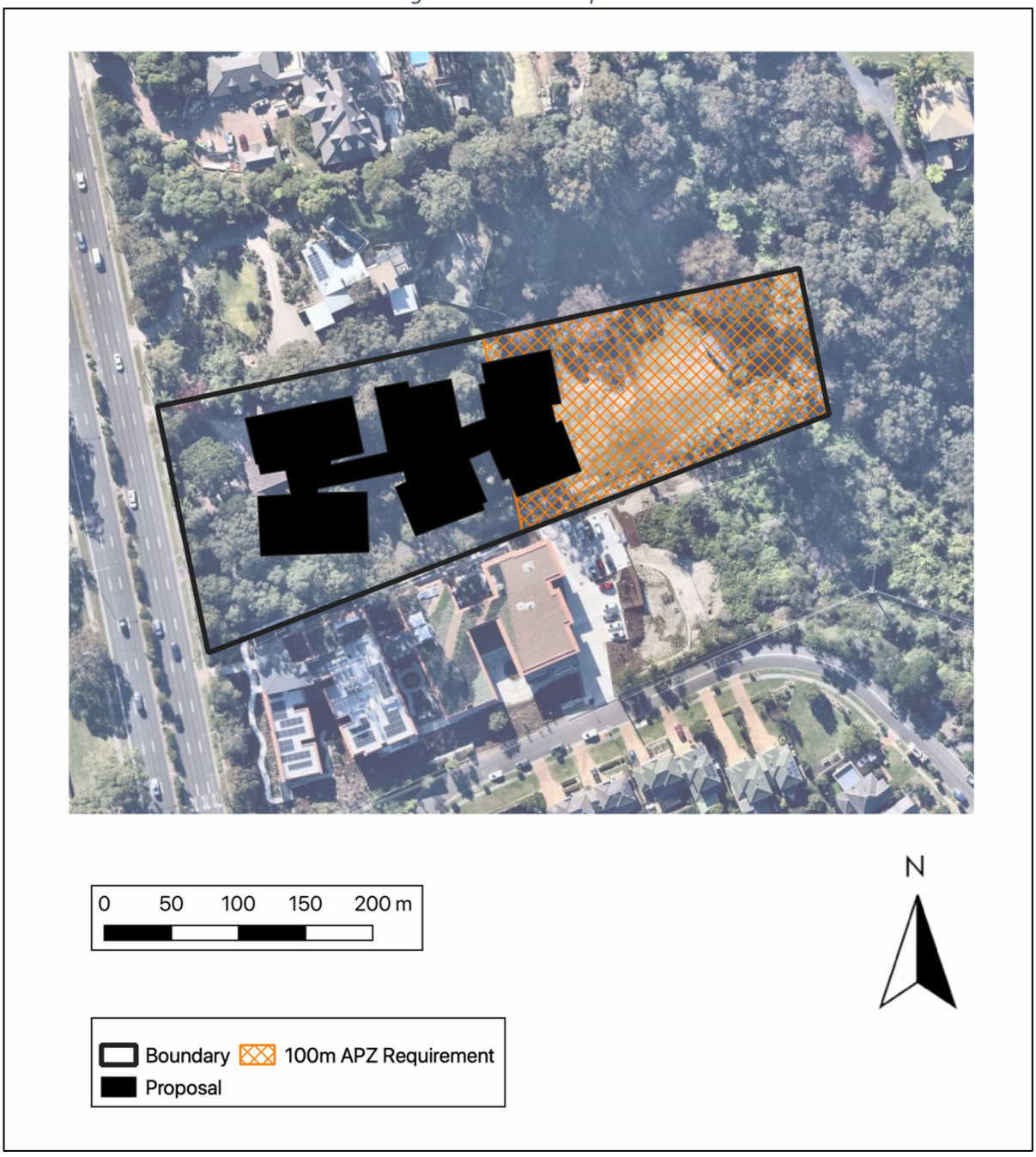


Figure 16: Required APZ of 100m from Vegetation Hazard

The APZ must be maintained to Inner Protection Area condition as per Appendix 4 of PBP 2019 and the RFS document *Standards for Asset Protection Zones* (Appendix 2 and see www.rfs.nsw.gov.au). Individual tree canopies must have at least two metre gaps between them, but close standing trees are allowed to form clumps if the tree canopy cover threshold is not exceeded for 15 % for IPA.

7.1.1. Defendable Space

The APZ must provide a defendable space. A defendable space is an area within the Inner Protection Area (IPA) of an APZ adjoining a building. This space provides a safe working environment in which efforts can be undertaken to defend the structure, *before and after* the passage of a bush fire. The time frames of before and after the passage of the bushfire are when the heat exposure experienced by fire fighters is at a lower fire intensity. Thus, this proposal satisfies the defendable space DTS performance criteria as the defendable space is substantial (minimum 10 m setbacks on the north and south boundaries and 80 m on the east boundary). Vegetation within the defendable space must be kept to an absolute minimum and the area must be free from combustible item and obstructions. For the purposes of defendable space, this proposal meets the acceptable solution in PBP 2019.

7.2. Construction, Siting and Design

The appropriate design and construction of buildings enhance their survivability from bush fires. Construction measures must not be applied as a stand-alone mitigation solution but must form part of a suite of BPMs. This must also include defendable space, APZs, adequate access, water supply, landscaping and emergency management arrangements. Building design needs to ensure adequate protection of vulnerable building elements. Construction standards are outlined in AS 3959 and the NASH Standard to provide various levels of protection for different building elements.

The level of building construction standard required (Table 4) is based on the Forest Fire Danger Index (FFDI), type of vegetation, the effective slope and the size of APZ (separation distance). PBP 2019 Appendix 1 provides the required methodology for assessing the building construction standards referred to in AS 3959 and the NASH Standard as BALs.

The required building construction requirements for SFPP developments is BAL-12.5 and radiant heat exposure of £10 kW/m^2, however, as has been previously shown, this proposal does not currently meet the separation of 100 m from the hazardous vegetation.

Table 4: Construction Requirements for the Proposal with 100m of separation from hazardous vegetation to the east of the proposal.

Aspect of Proposal	Bushfire Attack Level	Construction Standard (AS3959:2018)
North	BAL – 12.5	s.3 and s.5
East	BAL – 12.5	s.3 and s.5
South	BAL – 12.5	s.3 and s.5
West	BAL – 12.5	s.3 and s.5

7.3. Access and Egress

Design of access roads shall enable safe access and egress for residents attempting to leave the area at the same time that emergency service personnel are arriving to undertake firefighting operations.

In a bush fire prone area, the purpose of the road system is to:

- provide firefighters with access to structures, allowing more efficient use of firefighting resources;
- provide evacuation routes for firefighters and the public; and
- provide access to areas of bush fire hazard for firefighting and hazard mitigation purposes.

7.3.1. Perimeter Roads

In this instance a perimeter road in the meaning of PBP 2019 is not a requirement of this development. Forest Way at the front of the proposal has three lanes each way in a 32 m road corridor. Forest Way is satisfactory and meets the acceptable solutions of PBP Table 6.8b.

7.3.2. Non-Perimeter Roads

These roads form a link for firefighting operations by providing access for emergency vehicles, a safe space for conducting property protection, and a suitable road network for the egress of residents. The proposal has two access and egress points with a single access road to the rear of the site. The proposed access road (Figure 4) on the south aspect of the building shall comply with *Table 6.8b of PBP 2019* in the following ways:

- The site driveway carriageway / swept path (excluding drainage and edging) is a minimum 5.5 metres wide. We measure the current width of the access road to be three (3) metres and does not comply with *Table 6.8b of PBP 2019*.
- Parking is provided outside of the carriageway width;
- Fire hydrant spacing, design and sizing comply with the relevant clauses of Australian Standard AS 2419.1:2005 - *Fire hydrant installations System design, installation and commissioning*;
- Hydrants are not to be located within any road carriageway or parking bay; and should be located on the side of the road away from the bushfire threat where possible;
- Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500 m. The current access road is a dead-end of approx. 125 m in length, this design will comply with PBP 2019 if a suitable turning area for is provided in accordance with Appendix 3 of PBP 2019;
- Curves of roads have a minimum inner radius of six (6) metres;
- The road crossfall does not exceed 3°;
- All kerbs constructed around access lanes should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang of RFS vehicles;
- A minimum vertical clearance of four (4) metres to any overhanging obstructions, including tree branches, is provided, and
- Designed to carry fully loaded fire fighting vehicles (up to 23 tonnes), and bridges/causeways clearly indicate load rating,

7.3.3. Property Access Roads

Property access is any access from private land onto the public road system. As a result, the location and standards of property access roads must be carefully considered.

The site driveway (Figure 4) servicing the PDA must comply with the performance criteria and acceptable solutions in *Table 6.8b of PBP 2019* in the following ways. These are:

- Access is provided to all structures;
- The site driveway carriageway / swept path (excluding drainage and edging) is a minimum 5.5 metres wide;
- Clearly sign-posted, two-wheel drive, all-weather road;
- Some short constrictions in the access may be accepted where they are not less than 3.5 metres wide, extend for no more than 30 m and where the obstruction cannot be reasonably avoided or removed;
- The dead end, incorporates a minimum 12 m outer radius turning circle / Y turning head compliant with Figure A3.3 Type A, B, C, D of PBP 2019;
- Is less than 200 m in length. The proposed driveway on-site is 145 m long;
- Crossfall of the pavement is not more than 10 degrees;
- Maximum grades for sealed roads / the site driveway do not exceed 15 degrees and average grades are not more than 10 degrees;
- Curves have a minimum inner radius of six (6) metres and are minimal in number to allow for rapid access and egress;
- The minimum distance between inner and outer curves is six (6) metres;
- A minimum vertical clearance of four (4) metres to any overhanging obstructions, including tree branches;
- Traffic management devices are constructed to facilitate access by emergency services vehicles;
- The site driveway does not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge);
- The internal road surfaces have a capacity to carry fully-loaded fire fighting vehicles (23 tonnes), bridges and causeways are to clearly indicate load rating;
- There is suitable access for a Category 1 fire appliance to within four (4) metres of the static water supply where no reticulated supply is available; and • Is regularly maintained.

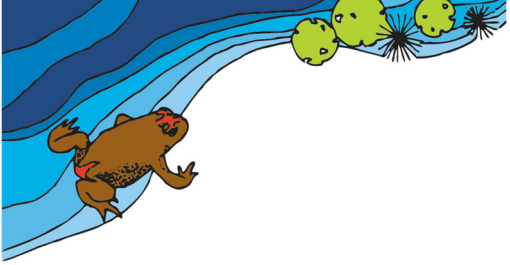
7.3.4. Fire Trails

Fire trails are not required for compliance with PBP 2019. However, where fire trails are proposed they are to comply with the NSW RFS *Fire Trail Standards*.

7.4. Water Supply

An adequate supply of water is essential for firefighting purposes. There is a 500 mm and 750 mm water main running the length of Forest Way on the opposite side of the roadway to the proposal lot. A hydrant is located directly opposite to the lot (approximately 35 m distance from the lot) connected to the 500 mm water main. A second hydrant is located 50m further down the roadway to the south opposite 169 Forest Way (Figure 17). Suitable water supply arrangements shall be provided for firefighting that meet PBP 2019 requirements.

The site fire hydrants and reticulated water supply to the site is to be installed compliant with the following:



- Fire hydrant spacing, design and sizing comply with the relevant clauses of Australian Standard AS 2419.1:2005 - *Fire hydrant installations System design, installation and commissioning*;
- Hydrants are not to be located within any road carriageway or parking bay, unobstructed access is to be provided at all times;
- Fire hydrant flows and pressures are to comply with AS 2419.1:2005; and
- All above-ground water service pipes external to the building are metal, including and up to any taps.

Where no reticulated water is available:

- a 10,000 litre minimum static concrete or metal water supply dedicated for fire fighting purposes shall be provided for each occupied building,
- If an underground tank is to be installed it shall have an access hole of 200 mm to allow tankers to refill direct from the tank and must be clearly marked / identified.
- Raised tanks have their stands constructed from non-combustible material or bushfireresisting timber (see Appendix F AS 3959(2018)).
- Tanks on the hazard side of a building are provided with adequate shielding for the protection of fire fighters.
- A hardened ground surface for truck access is supplied within four (4) m of the tank or standpipe with access the static water supply;
- Unobstructed access is to be provided at all times;
- A suitable accessible connection located within the IPA or non-hazard side and away from the building is to be provided for RFS purposes in the form of a 65 mm ball valve and storz fitting;
- The ball valve, pipes and tank penetration must be adequate for full 50 mm inner diameter water flow through the Storz fitting and are metal.
- Supply pipes from tank to ball valve have the same bore size to ensure flow volume; • Ball valve and pipes are adequate for water flow and are metal.
- All associated fittings to the tank shall be non-combustible / metal.
- All above-ground water service pipes or fittings external to the building/s are metal, including and up to any taps.
- Standpipes / hydrants are not to be located within any road carriageway;
- A minimum 5 hp or 3 kW petrol- or diesel-powered pump shall be made available to the water supply.
- A 19 mm (internal diameter) fire hose and reel shall be connected to the pump. The fire hose reel must be capable of reaching all extremities of the proposed buildings. Should the hose not reach all extremities of the building an additional hose reel/s shall be installed to cover those areas that are not covered.
- Access to the water supply (i.e. pump and hose reel) is to be shielded from radiant heat.
- Fire hose reels are constructed in accordance with *AS/NZS 1221:1997 Fire hose reels*, and installed in accordance with *AS 2441:2005 Installation of Fire hose reels*; and
- The property owner is encouraged to place a 'SWS' (static water supply) sign in a visible location on the street/road front and at any access point / standpipe for site static water supplies.

Figure 17: Hydrant Locations

7.5. Gas and electricity services

Gas and electricity services are to be located so as to not contribute to the risk of fire to the building in the following ways:

- Reticulated or bottled gas is installed and maintained in accordance with *AS/NZS 1596:2014 2014 – The storage and handling of LP Gas* and the requirements of relevant authorities. Metal piping is to be used;
- All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation;
- If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least two (2))metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal;
- Polymer sheathed flexible gas supply lines are not used;
- Gas service pipes are metal, including and up to any outlets;
- The location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings;
- Where practicable, electrical transmission lines are underground;
- Where overhead, electrical transmission lines are proposed, the lines must comply with the following:
- Lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas;
- No part of a tree is closer to a power line than the distance set out in accordance with the specifications in *ISSC3 Guideline for Managing Vegetation Near Power Lines*.

7.6. Bushfire Maintenance Plans and Emergency Procedures

Bushfire Emergency Management and Evacuation Plan is a prescriptive measure of Special Fire Protection Purpose (SFPP) developments.

A site Bushfire Emergency Management and Evacuation Plan is to be prepared consistent with the:

- The NSW RFS document: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*,
- Australian Standard AS 3745:2010 *Planning for emergencies in facilities*, and
- Australian Standard AS 4083:2010 *Planning for emergencies – Health care facilities* (where applicable), and

The emergency and evacuation management plan should include a mechanism for the early relocation of occupants.

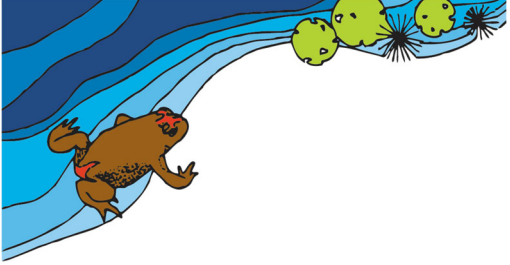
Stable management arrangements must be established for consultation and implementation of the bushfire emergency and evacuation management plan. An Emergency Planning Committee must be established to consult with residents (and their families in the case of aged care accommodation) and staff in developing and implementing an Emergency Procedures Manual. Detailed plans of all emergency assembly areas including 'on-site' and 'off-site' arrangements as stated in AS 3745 are clearly displayed, and an annual (as a minimum) trial emergency evacuation must be conducted.

Note: A copy of the bushfire emergency management plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.

7.7. Landscaping

The Vegetation Management Plan within the asset protection zone is to comply with the principles of Appendix 4 of PBP 2019. For example, this means:

- Landscaping is not to abut the building/s as this may cause a direct fire path to combustible building elements. Suitable impervious areas are provided immediately surrounding the building such as courtyards, paths and driveways. A pathway or non-combustible ground finish is to adjoin the building/s for a distance of at least 1.0 metre.
- Total clearance of all vegetation is not acceptable especially in mapped Slope Constraint areas. Vegetation management undertaken to establish the required Asset Protection zone shall be minimised while still complying with PBP guidelines. Where APZ and area mapped as Council slope constraint overlap, priority will need to be made to retain native vegetation cover within the slope constraint area that will mitigate adverse impacts of erosion.
- Grassed areas, mowed lawns or ground cover plantings are provided in close proximity to the building. Garden beds of flammable shrubs are not to be located under trees and must be no closer than 10 metres from an exposed window or door.
- Planting of trees and shrubs are restricted in the immediate vicinity of the building, which over time, if not properly maintained, can come in contact with or overhang the building.
- Retained or planted trees and shrubs do not form a continuous stand from the hazard to the asset and will not over time compromise the asset protection zone.



- Local plant species that are of low flammability (low volatile oil levels, high moisture content in leaves and low levels of retained dead material) are selected or retained for use within the asset protection zone.
- The Vegetation Management Plan is to accommodate emergency vehicle access to the rear of the building and turning circle requirements.
  - Fire hazard management for the subject site needs to take into account hollow-bearing trees.

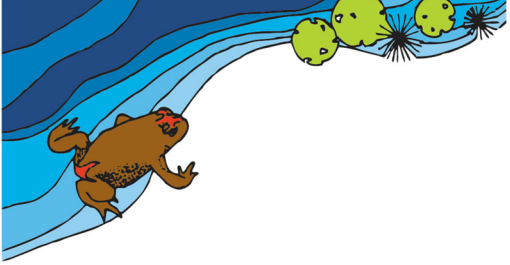
A full list of landscaping requirements can be found Appendix 4 of PBP 2019 and the RFS document *Standards for Asset Protection Zones* must also be consulted.

7.8. Conform with or deviates from the performance criteria and acceptable solutions set out in Chapter 6 of PBP

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIANCE
The intent may be achieved where:			
Asset Protection Zones	• radiant heat levels of greater than 10kW/m^2 (calculated at 1200K) will not be experienced on any part of the building.	• an APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1.	Non-compliant East aspect
	• APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	• APZs are located on lands with a slope less than 18 degrees.	Non-compliant East aspect
	• APZs are managed and maintained to prevent the spread of a fire towards the building.	• APZs are managed in accordance with the requirements of Appendix 4 of PBP.	Implement site Vegetation Management Plan for APZ maintenance
	• the APZs is provided in perpetuity.	• APZs are wholly within the boundaries of the development site. • other structures located within the APZ need to be located further than 6m from the refuge building.	Compliant VMPs are being put in place on neighbouring properties and managed in perpetuity.
Landscaping	landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions	• • landscaping is in accordance with Appendix 4; fencing is constructed in accordance with section 7.6.	Compliant
Construction Standards	• the proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.	• A construction level of BAL-12.5 under AS3959 or NASH Standard and section 7.5 of PBP is applied.	Non-compliant due to not meeting APZ separation distance of 100m on the east aspect.

Access	• firefighting vehicles are provided with safe, allweather access to structures and hazard vegetation.	• property access roads are two-wheel drive, all-weather roads. • • access is provided to all structures traffic management devices are constructed to not prohibit access • by emergency services vehicles; access roads must provide suitable turning areas in accordance with • Appendix 3; and one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.	Compliant Compliant Compliant Non-compliant Compliance yet to be demonstrated

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIANCE
	• the capacity of access roads is adequate for firefighting vehicles	• the capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges/causeways are to clearly indicate load rating	Compliant
	• there is appropriate access to water supply.	• Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression; • hydrants are provided in accordance with the relevant clauses of *AS 2419.1:2005 - Fire hydrant installations System design, installation and commissioning*; and • there is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	Compliance yet to be demonstrated Compliance yet to be demonstrated Compliance yet to be demonstrated



	• perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	• • there are two-way sealed roads; minimum 8m carriageway width kerb • to kerb; parking is provided outside of the • carriageway width; hydrants are to be located clear of • parking areas; there are through roads, and these are linked to the internal road system at • an interval of no greater than 500m; curves of roads have a minimum inner • radius of 6m; the maximum grade road is 15 degrees and average grade of not more than • 10 degrees; the road crossfall does not exceed 3 • degrees; and a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	Compliant (Forest Way)
	• non-perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating.	• The site driveway carriageway / swept path (excluding drainage and edging) is a minimum 5.5 metres wide. • Parking is provided outside of the carriageway width; • Fire hydrant spacing, design and sizing comply with the relevant clauses of Australian Standard AS 2419.1:2005 - *Fire hydrant installations System design, installation and commissioning*; • Hydrants are not to be located within any road carriageway or parking bay; and should be located on the side of the road away from the bushfire threat where possible; • Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500 metres.; • Curves of roads have a minimum inner radius of 6 metres; • The road crossfall does not exceed 3°;	Non-compliant Compliant Compliance yet to be demonstrated Compliance yet to be demonstrated N/A Non-compliant Compliant

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIANCE

		• All kerbs constructed around access lanes should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang of RFS vehicles; • A minimum vertical clearance of 4 metres to any overhanging obstructions, including tree branches, is provided, and • Designed to carry fully loaded fire fighting vehicles (up to 23 tonnes), and bridges/causeways clearly indicate load rating,	Compliant Compliant Compliant
Water Supplies	• an adequate water supply for firefighting purposes is installed and maintained.	• reticulated water is to be provided to the development where available; and • a 10,000 litres minimum static water supply for firefighting purposes is provided for each occupied building where no reticulated water is available.	Compliance yet to be demonstrated
	• water supplies are located at regular intervals; and the • water supply is accessible and reliable for firefighting operations	• fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2005; • hydrants are not located within any road carriageway; and • reticulated water supply to urban SFPP uses a ring main system for areas with perimeter roads.	Compliance yet to be demonstrated
	• flows and pressure are appropriate.	• fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.	Compliance yet to be demonstrated
	• the integrity of the water supply is maintained.	• all above-ground water service pipes are metal, including and up to any taps.	Compliant

	• water supplies are adequate in areas where reticulated water is not available	• a connection for firefighting purposes is located within the IPA or non hazard side and away from the structure; a 65mm Storz outlet with a ball valve is fitted to the outlet; • ball valve and pipes are adequate for water flow and are metal; supply • pipes from tank to ball valve have the same bore size to ensure flow volume; underground tanks have an access • hole of 200mm to allow tankers to refill direct from the tank; a hardened ground surface for truck • access is supplied within 4m of the access hole; above-ground tanks are manufactured • from concrete or metal; raised tanks have their stands constructed • from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959); unobstructed access is provided at all • times;	Not applicable as reticulated water supply available.

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIANCE
		• tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; and • underground tanks are clearly marked, • all exposed water pipes external to the building are metal, including any fittings; • where pumps are provided, they are a minimum 5 hp or 3 kW petrol or dieselpowered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19 mm internal diameter; and • fire hose reels are constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005.	

Electricity Services	• location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings	• where practicable, electrical transmission lines are underground; • where overhead, electrical transmission lines are proposed as follows: ▪ lines are installed with short pole spacing of 30 m, unless crossing gullies, gorges or riparian areas; and ▪ no part of a tree is closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.	Compliant
Gas Services	• location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	• reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 - The storage and handling of LP Gas, the requirements of relevant authorities, and metal piping is used; • all fixed gas cylinders are kept clear of all flammable materials to a distance of 10 m and shielded on the hazard • side; connections to and from gas cylinders are metal; • polymer-sheathed flexible gas supply lines are not used; and • above-ground gas service pipes are metal, including and up to any outlets.	Compliant
	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIANCE
Emergency Management	A bush fire emergency and evacuation management plan is prepared.	• a Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the: • NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* • Australian Standards *AS 3745:2010 Planning for Emergencies in Facilities*; and • Australian Standards *AS 3745:2010 Planning for Emergencies – Health Care Facilities* (Where Applicable) • The Bushfire Emergency Management and Evacuation Plan should include planning for the early relocation of occupants. *Note:* A copy of the Bush Fire Emergency Management and Evacuation Plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.	Once the proposal has been constructed a plan will be established.

	Appropriate and adequate management arrangements are established for consultation and implementation of the Bush Fire Emergency Management and Evacuation Plan.	• An Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual; and • detailed plans of all emergency assembly areas including on site and off-site arrangements as stated in AS 3745:2010 are clearly displayed, and an annually emergency evacuation is conducted.	Once the proposal has been constructed a plan will be established.

7.9. Conform with Aim and Objectives PBP 2019

This development proposal falls under the special requirements of Special Fire Protection Purpose. There is a requirement to comply with PBP 2019 Ch. 1.1 Aim and Objectives. Not all of the following objectives have been met:

Ch. 1.1. Aim and Objectives	Compliance
• *afford buildings and their occupants protection from exposure to a bush fire;*	Non-Compliant
Comment: The proposal does not have a sufficient separation from hazard vegetation to achieve radiant heat levels of 10kW/m^2 or less	
• *provide for a defendable space to be located around buildings;*	Compliant
Comment: There is a 10 m set back on the north and south boundaries, a 20 m setback on the west boundary and an 80 m setback on the east boundary.	
• *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;*	Non-Compliant
Comment: As above, per the first objective, the separation distances between building and hazards does not meet the prescribed distances set by PBP 2019	
• *ensure that appropriate operational access and egress for emergency service personnel and occupants is available;*	Non-Compliant
Comment: The access road along the southern boundary does not have the required width, nor vehicle turning arrangements to comply with acceptable solutions provided by Table 6.8b and Appendix 3 of PBP 2019.	
• *provide for ongoing management and maintenance of BPM;*	Compliant
• *and ensure that utility services are adequate to meet the needs of firefighters.*	Compliance yet to be demonstrated
Comment: A plan of water hydrant and hose reel placement has not yet been provided for assessment.	

7.10. Conform with Specific Objectives SFPP development

There is a requirement to comply to PBP 2019 Ch. 6.2 Specific Objectives. These following conditions must be met.

Ch. 6.2. Specific Objectives	Compliance
• *minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting;*	Non-compliant
Comment: The proposal does not have a sufficient separation from hazard vegetation to achieve radiant heat levels of 10 kW/m^2 or less	
• *provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;*	Non-compliant
Comment: The proposal has not demonstrated a plan of water hydrant and hose reel placement onsite, nor does the most eastern end of the proposal (Buildings A & B) comply with the radiant heat maximum working exposure limit of firefighters being 10 kW/m^2.	
• *ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies as a result of the development; and*	Compliant
Comment: Major arterial roads and infrastructure in place.	
• *ensure emergency evacuation procedures and* Solution – *management which provides for the special needs of occupants.*	see comment *characteristics and*
Comment: A Bushfire Emergency Management and Evacuation Plan for site is a mandatory recommendation of this report to be included as a condition of consent for the development approval.	

7.11. Summary of Bushfire Assessment

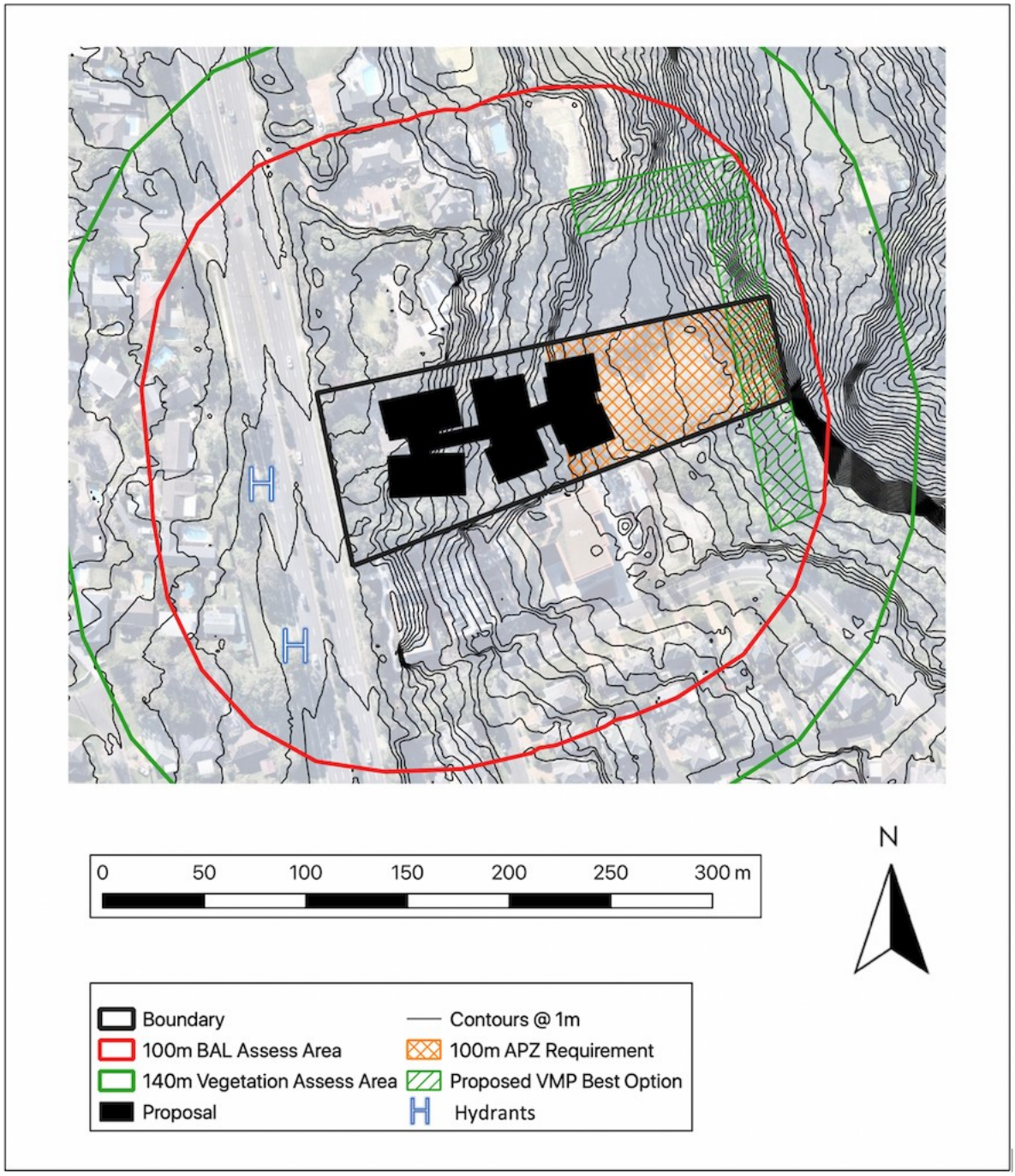
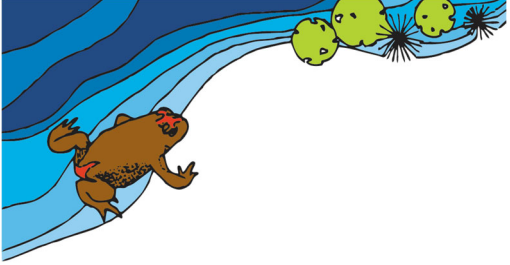


Figure 18: Assessment Summary

8. Bush Fire Management Plan

A Bush Fire Management Plan (BFMP) is recommended for developments in bush fire prone areas.

A BFMP must detail bush fire safety aspects of the proposed development similar to the Bush Fire Protection Measures included as part of this assessment.



8.1. Asset Protection Zones (APZ)

An APZ is a buffer zone between a bush fire hazard and buildings. The APZ is managed to minimise fuel loads and reduce potential radiant heat levels, flame, localised smoke and ember attack. The appropriate APZ distance is based on vegetation type, slope and the nature of the development.

The APZ can include roads or properties managed to be consistent with APZ standards set out in Appendix 4 and the NSW RFS document *Standards for Asset Protection Zones*. A fuel-reduced, physical separation between buildings and bush fire hazards is a key element in the suite of bush fire measures and has a major influence on the type of construction necessary to mitigate bush fire attack.

Appendix 1 PBP2019 provides the required methodology for determining the APZ based on vegetation type, slope and FFDI. Section 7.1. Asset Protection Zones of this report illustrates site specific requirements for the APZ.

For many SFPPs, larger APZs are required because of the characteristics of occupants. This means a lower radiant heat threshold is required in order to allow for evacuation of occupants and emergency services to operate in support of the most at-risk members of the community.

For all new SFPP developments, 10 kW/m² (calculated on a flame temperature of 1200 Kelvin) is the maximum exposure at any point of the building wall or façade and where emergency services may be supporting or evacuating occupants from the building.

This is to ensure there is an area for firefighters to defend the property and allow access to and from the building by firefighters, and residents evacuating. Chapter 6 of PBP 2019 identifies the performance criteria and acceptable solutions for APZs for SFPP developments.

Defendable space

Defendable space is an area within the Inner Protection Area (IPA) of an APZ adjoining a building. This space provides a safe working environment in which efforts can be undertaken to defend the structure, before and after the passage of a bush fire.

The physical size of the development will determine whether the defendable space is provided as pedestrian access or will require sufficient space for vehicular movements. Vegetation within the defendable space must be kept to an absolute minimum and the area must be free from combustible item and obstructions.

8.2. Landscaping

The type, location and ongoing maintenance of landscaping is considered a necessary component of the BFMP.

For information about appropriate landscaping, refer to the NSW RFS document *Standards for Asset Protection Zones*, from the NSW RFS website: www.rfs.nsw.gov.au. and Appendix 4 PBP2019.

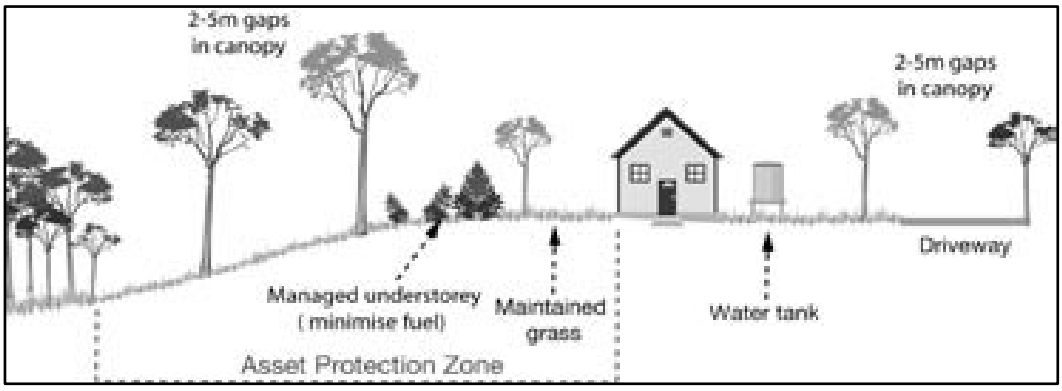
8.2.1. Ongoing Management and Landscaping

The building and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time. To provide an effective APZ, you need to plan the layout of your garden to include features such as fire resistant plants, radiant heat barriers and windbreaks.

8.2.2. Layout of gardens in an APZ

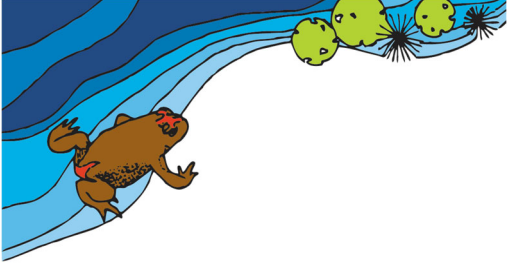
When creating and maintaining a garden that is part of an APZ you must:

- ensure that vegetation does not provide a continuous path to the building;
- remove all noxious and environmental weeds;
- plant or clear vegetation into clumps rather than continuous rows;
- prune low branches two metres from the ground to prevent a ground fire from spreading into trees;
- locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission;
- plant and maintain short green grass around the building as this will slow the fire and reduce fire intensity. Alternatively, provide non-flammable pathways directly around the building;
- ensure that shrubs and other plants do not directly abut the building. Where this does occur, gardens must contain low-flammability plants and non flammable ground cover such as pebbles and crush tile; and
- avoid erecting brush type fencing and planting “pencil pine” type trees next to buildings, as these are highly flammable.



8.2.3. Removal of other materials

Woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. must be located away from the building. These items must



preferably be located in a designated cleared location with no direct contact with bush fire hazard vegetation.

8.2.4. Other protective features

You can also take advantage of existing or proposed protective features such as fire trails, gravel paths, rows of trees, dam, creeks, swimming pools, tennis courts and vegetable gardens as part of the property's APZ.

8.2.5. Plants for Bush Fire Prone Gardens

When designing your garden it is important to consider the type of plant species and their flammability as well as their placement and arrangement.

Given the right conditions, all plants will burn. However, some plants are less flammable than others.

Trees with loose, fibrous or stringy bark must be avoided. These trees can easily ignite and encourage the ground fire to spread up to, and then through, the crown of the trees.

Plants that are less flammable, have the following features:

- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without "ribbons" hanging from branches or trunks; and
- dense crown and elevated branches.

When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into your garden that can cause greater long-term environmental damage.

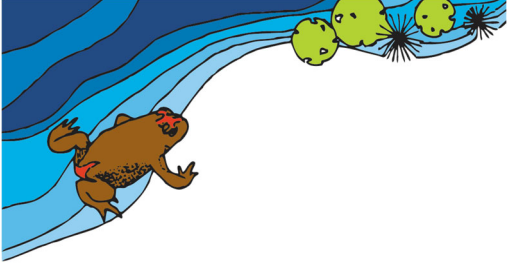
For further information on appropriate plant species for your locality, contact your local council, plant nurseries or plant society.

If you require information on how to care for fire damaged trees, refer to the Firewise brochure - Trees and Fire Resistance; Regeneration and care of fire damaged trees.

8.2.6. Wind Breaks

Rows of trees can provide a wind break to trap embers and flying debris that could otherwise reach the building or asset.

You need to be aware of local wind conditions associated with bush fires and position the wind break accordingly. Your local RFS Fire Control Centre can provide you with further advice.



When choosing trees and shrubs, make sure you seek advice as to their maximum height. Their height may vary depending on location of planting and local conditions. As a general rule, plant trees at the same distance away from the asset as their maximum height.

When creating a wind break, remember that the object is to slow the wind and to catch embers rather than trying to block the wind. In trying to block the wind, turbulence is created on both sides of the wind break making fire behaviour erratic.

8.3. Access arrangements

Design of access roads shall enable safe access and egress for residents attempting to leave the area at the same time that emergency service personnel are arriving to undertake firefighting operations.

Specific access design principles are included in Sec 7.3 of this report. Detailed performance criteria and acceptable solutions for access arrangements, relevant to the development type are outlined in Sec 7.8 of this report.

In a bush fire prone area, the purpose of the road system is to:

- provide firefighters with access to structures, allowing more efficient use of firefighting resources;
- provide evacuation routes for firefighters and the public; and
- provide access to areas of bush fire hazard for firefighting and hazard mitigation purposes.

Roads shall provide sufficient width and other dimensions to ensure safe unobstructed access and allow firefighting crews to operate equipment around the vehicle. Road width is defined as the trafficable width from kerb to kerb or the inside edge of the table drain.

Dead-end roads must be avoided. However, where they are present, they must incorporate a sufficient turn-around area to minimise the need for vehicles to make multipoint turns.

8.3.1. Perimeter roads

A perimeter road should be provided to separate bush land from urban areas, allowing more efficient use of firefighting resources. A perimeter road is located on the outer extremity of a local area or subdivision and usually runs parallel to the bush land interface.

The perimeter road provides space to conduct active firefighting operations and hazard reduction activities. In developments where no perimeter road exists, property defence in a bush fire event may be more difficult.

8.3.2. Non-perimeter roads

Non-perimeter roads are the interconnecting roads between the perimeter roads and the existing and/ or broader road network. These roads form a link for firefighting operations by providing access for emergency vehicles, a safe space for conducting property protection, and a suitable road network for egress of residents.

8.3.3. Property access roads

Property access is any access from private land onto the public road system. In rural areas, in particular isolated rural properties, operational difficulties can be experienced in accessing buildings. Examples include water crossings and roads which may be cut off by fire or other hazardous conditions. As a result, the location and standards of property access roads must be carefully considered.

8.3.4. Fire trails

Fire trails are used as access for firefighters in operational situations, as fire containment lines and for APZ maintenance.

Fire trails are not required for compliance with PBP. A fire trail is not a substitute for a road, nor is it considered an appropriate trade-off for the provision of perimeter, non-perimeter or property road access requirements.

The *Rural Fires Act 1997* pt.3B provides for the establishment, maintenance, protection, certification and registration of fire trails by the NSW RFS Commissioner outside of the DA process.

Where fire trails are incorporated into a development, they must be designed, constructed and maintained in accordance with the NSW RFS Fire Trail Standards and the NSW RFS *Fire Trail Design, Construction and Maintenance Manual* to ensure that firefighter safety is not compromised. The responsibility and mechanism for the ongoing management of the fire trail must be clearly identified within the DA. Where the responsibility for fire trail maintenance is placed on a third party, this must be subject to a written agreement from the third party in question.

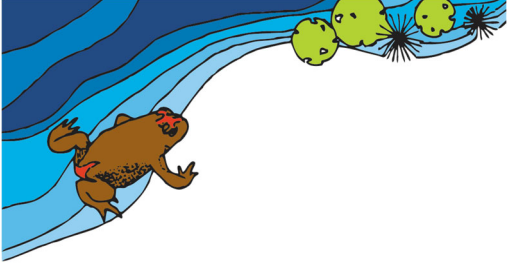
Where a Registered Fire Trail exists on a property, the function and overall access through the landscape must be carefully considered. These trails have been identified by the local BFMC and are considered of strategic importance for fire access in the area. At the time of development, the NSW RFS will need to consider any impacts the proposed development will have on the current and/or proposed fire trail network.

Importantly, if a fire trail is adopted as part of a development design, it may not necessarily mean that it is a Strategic Fire Trail for the purposes of the NSW RFS Fire Trail Standards.

8.4. Water supply and utilities

An adequate supply of water is essential for firefighting purposes. In addition, gas and electricity must be located so as not to contribute to the risk of fire or impede the firefighting effort.

Suitable water supply arrangements shall be provided for firefighting that meet the NSW RFS requirements in PBP 2019 for the development type. It is essential to ensure that any water sources are maintained at the appropriate capacity.



Where a non-reticulated water supply is provided or the reticulated water supply is deemed inadequate, an additional on-site stored supply of water for firefighting will be required. Nonreticulated water is a supply that is not piped by council or a water authority and includes rainwater, ground water or surface water.

From a firefighting point of view, any source of available water may be used during a bush fire event and tanks are not always the most practical option. In light of the above, and the increasing demand for sustainable and efficient use of our water resources, the NSW RFS prefers that water is solely dedicated for firefighting purposes. As such, water holding structures such as tanks, swimming pools and dam can be considered as long as they are accessible, reliable and adequate. Nevertheless, where a water supply is provided it must be available for the life time of the development.

Water capacities, access for firefighters (tanker or pedestrian) and the provision of appropriate connections must also be considered when determining if a proposed water source is suitable.

Where a Static Water Supply (SWS) is provided, a SWS sign must be installed in a visible location on the street front. Regular testing of firefighting equipment must also occur to ensure that it is maintained in working order.

8.5. Schedule of the BAL requirements

A schedule of the BAL requirements for construction in a bush fire prone area must include the building footprints and any other specific building requirements such as bush fire shutters.

To ensure the performance criteria for construction standards given in the appropriate section of PBP2019 can be met, PBP adopts additional measures over and above *AS 3959* and *NASH Standard* as follows:

- construction measures for ember protection at BAL-12.5 and BAL-19 provided by AS 3959;
- construction measures for development in BAL-FZ; and
- requirements over and above the performance criteria contained within AS 1530.8.1 and AS 1530.8.2 apply in regard to flaming.

8.6. Bush Fire Emergency Management and Evacuation Plan

SFPP developments are identified as being more vulnerable to the effects of bush fire. This is because the occupants may have a mental or physical impairment, may experience language difficulties, may be unaware of their surroundings or the bush fire risk and may be unable to self-evacuate.

Due to their vulnerability, a higher degree of planning and emphasis on emergency management is required for all SFPP developments. It is imperative that emergency management arrangements are identified at the development planning phase for these developments. An indication of proposed

emergency management arrangements must be provided with the DA. A Bush Fire Emergency Evacuation and Management Plan must be prepared for any SFPP development.

Emergency planning arrangements are not required for residential developments. However, anyone living in a bush fire prone area must prepare a Bush Fire Survival Plan, which is available on the NSW RFS website: www.rfs.nsw.gov.au.

8.7. Other essential bush fire safety requirements

8.7.1. Bush Fire Risk Management Plan

The preparation of a Bush Fire Risk Management Plan (BFRMP) is the responsibility of the Bush Fire Management Committee (BFMC).

The objectives of the local BFRMP are to:

- reduce the number of human-induced bush fire ignitions that cause damage to life, property and the environment;
- manage fuel to reduce the rate of spread and intensity of bush fires while minimising environmental/ecological impacts;
- reduce the community's vulnerability to bush fires by improving its preparedness; and
- effectively contain fires with the potential to cause damage to life, property or the environment.

Enquiries concerning BFRMPs can be directed to the appropriate NSW RFS Fire Control Centre.

8.7.2. Hazard Reduction Certificates

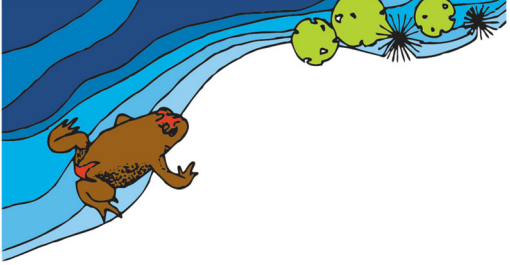
A Bush Fire Hazard Reduction Certificate (HRC) provides environmental approval to carry out bush fire hazard reduction works. The HRC must be consistent with the Bush Fire Environmental Assessment Code and the BFRMP. The HRC details the conditions that are to be adhered to when implementing the bush fire hazard reduction works.

Enquiries on HRCs can be directed to the appropriate NSW RFS Fire Control Centre.

8.7.3. Community Protection Plans

The aim of the Community Protection Plan (CPP) program is to improve the community and firefighters' capacity to prepare for, act during, and survive bush fires. A CPP requires a detailed analysis of communities considered to be exposed to a significant bush fire risk, and ensures that the bush fire risks can be fully understood and adequately treated.

Enquiries on CPPs can be directed to a NSW RFS Planning and Environment Service Centre on 1300 679 737.



8.7.4. Neighbourhood Safer Places

A Neighbourhood Safer Place (NSP) is a location where people facing an immediate threat to their personal safety or property can gather and seek shelter from the impact of a bush fire. They are the last resort option for those in bush fire situations.

Enquiries on NSPs can be directed to the NSW RFS Planning and Environment Service Centres on 1300 679 737.

8.7.5. Bush Fire Survival Plans

People living in a Bush Fire Prone Area must prepare a Bush Fire Survival Plan which is revised annually prior to the bush fire season.

A Guide to Making a Bush Fire Survival Plan has been developed by the NSW RFS to assist residents in the preparation of their plan and can be found at the NSW RFS website.

The Guide provides information on bush fire risk and suggests simple steps as to how individuals and families can protect themselves and their property in the event of a bush fire. On days of catastrophic fire weather, the NSW RFS recommends leaving early as the only safe option.

8.7.6. Private Bushfire Shelter

Under the NCC, a private bush fire shelter is a Class 10c structure “associated with, but not attached to, or part of a Class 1a dwelling that may, as a last resort, provide shelter for occupants from immediate life-threatening effects of a bush fire” (NCC 2019).

9. Recommendations

The Applicant will be able to construct a new seniors housing development on Lot 9, DP 737255, 171 Forest Way, Belrose, NSW with the following measures included:

a) Building construction for the proposed building must comply with the appropriate section of the *Australian Standards 3959:2018 Construction of buildings in bushfire-prone areas* and Table 6.8a of PBP 2019 and as modified by Section 7.5, 7.5.1, 7.5.2, 7.5.3, and 7.5.4 (where applicable) of *Planning for Bush Fire Protection 2019*.

   i. The position of the proposed buildings must be able to demonstrate a 100 m separation from hazardous vegetation to the east of the lot.

   ii. Building construction for all aspects of a proposed building must comply with section 3 and 5 (BAL – 12.5) of *Australian Standard 3959 (2018) Construction of buildings in bushfire-prone areas* and Table 6.8a of PBP 2019 and as modified by Section 7.5, 7.5.1,

   7.5.2, 7.5.3, and 7.5.4 (where applicable) of *Planning for Bush Fire Protection 2019.*

   - Proposed Class 10 buildings are to comply with:
   - Class 10a: Sheds – s.8.3.2 of PBP 2019
   - Class 10b: fences and gates – Section 7.6 of PBP 2019.

b) We recommend a site Vegetation Management Plan (VMP) be produced for the on-going management and maintenance of the site asset protection zone. The APZ will be maintained to Inner Protection Area condition as per Appendix 4 of PBP 2019 and the RFS *Standards for Asset Protection Zones* (see www.rfs.nsw.gov.au).

c) In accordance with a site Vegetation Management Plan, an asset protection zone is to be maintained permanently on the north aspect:

   i. To IPA condition (15% tree canopy cover) for a distance of 10 m from the external wall of the proposed building to the north boundary.

   ii. Trees will need to be removed to achieve this requirement.

d) In accordance with a site Vegetation Management Plan, an asset protection zone is to be maintained permanently on the east aspect:

   i. To IPA condition (15% tree canopy cover) for a distance of 100 m from the external wall of the proposed building to the east boundary. ii. Trees will need to be removed to achieve this requirement.

e) In accordance with a site Vegetation Management Plan, an asset protection zone is to be maintained permanently on the south aspect:

   i. To IPA condition (15% tree canopy cover) for a distance of 10 m from the external wall of the proposed building to the south boundary.

   ii. Trees will need to be removed to achieve this requirement.

f) In accordance with a site Vegetation Management Plan, an asset protection zone is to be maintained permanently on the west aspect:

   i. To IPA condition (15% tree canopy cover) for a distance of 20 m from the external wall of the proposed building to the west boundary.

ii. Trees will need to be removed to achieve this requirement.

g) Forest Way offer adequate access and egress to firefighters, emergency workers, and those involved in evacuation and complies with the performance criteria in Table 6.8b of PBP 2019.

h) All weather access to the site must be provided in recognition of the risk to fire fighters and / or evacuating occupants. There must be access to the rear of the building for operational activities.

i) The site access driveway does not currently comply with the acceptable solutions in Table 6.8b of PBP 2019 and needs to be modified.

j) Utility services along Forest Way are adequate to meet the needs of firefighters and others assisting in bush firefighting.

k) Gas and electricity services are to be located so as to not contribute to the risk of fire to the building. Gas and electricity services are to be installed as per Table 6.8c of PBP 2019.

l) Water supply is to be installed in accordance with Table 6.8c of PBP 2019.

m) A site Bushfire Emergency Management and Evacuation Plan is to be prepared consistent with Sec. 7.6 of this report.

n) Fire hazard management for the subject site needs to take into account hollow-bearing trees.

References

Planning for Bush Fire Protection: A guide for councils, planners, fire authorities and developers (2019),
NSW Rural Fire Service, New South Wales

Keith, D. (2004). *Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT.* Department of Environment and Conservation (NSW), Hurstville.

Standards Australia (2018) AS 3959. *Construction of buildings in bushfire-prone areas.* Standards Australia, Sydney.

Tozer, M.G. Turner, K., Keith, D.A., Tindall, D., Pennay, C., Simpson, C., MacKenzie, B., Beukers, P. and Cox, S. (2010). *Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands.* Cunninghamia, 11(3): 359-406.

