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bushfire protection assessment

Proposed extension of walkways & decks
(6 buildings)

Fred Hutley Retirement Village

Lot 2610 DP 752038

183 Allambie Road, Allambie Heights

Under Section 100B of the Rural Fires Act (1997)

September 2018
(Ref: A17186B)

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bushfire & ecology

Bushfire Protection Assessment

**Proposed extension of walkways & deck (7 buildings)
Fred Hutley Retirement Village
Lot 2610 DP 752038
183 Allambie Road, Allambie Heights**

Report Authors:	Nicole van Dorst BPAD Level 2 23610
Plans prepared:	Emma Buxton
Checked by:	John Travers BPAD Level 3 15195 
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File:	A17186B

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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.

EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the proposed minor improvements to six (6) existing buildings (Blocks 7-12) within the Fred Hutley Retirement Village, located at 183 Allambie Road, Allambie Heights. The works include extensions to the existing decking, proposed walkways and new stairs.

Due to the existing nature of the development the proposed additions / improvements are categorised by the NSW Rural Fire Service (RFS) as being an infill special fire protection purpose (SFPP) development and as a result the proposal is to comply with *Planning for Bush Fire Protection 2006 (PBP)*. The key objective for infill developments is to achieve an improved bushfire protection outcome for the overall development than if the proposed redevelopment did not proceed. This includes proposed buildings not being positioned any closer to the bushfire hazard than the existing buildings and to ensure all new buildings comply with the relevant construction standard applicable based on the level of radiant heat exposure.

The assessment found that bushfire can potentially affect the retirement village from the remnant forest vegetation to the south-east and north-west as well as from the forest located to the south resulting in possible ember, radiant heat and potentially flame attack.

However, the bushfire risk posed to the buildings will be reduced if an appropriate combination of bushfire protection measures is applied to the development in accordance with *PBP*.

The assessment has concluded that the proposed SFPP infill development will provide:

- Defendable space in accordance with the performance requirements of *PBP*.
- Construction of minor works in accordance with *Australian Standard AS3959 Construction of buildings in bushfire-prone areas 2009 (AS3959)* – BAL FZ (Block 10 & 12), BAL 29 (Block 8) and BAL 19 (Block 7, 9 & 11).
- Additional management of vegetation within the site in compliance with the requirements of an inner protection area (IPA).
- Provision of additional fire hydrants within the property
- Preparation of a bushfire emergency evacuation plan

GLOSSARY OF TERMS

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

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Introduction

1

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed minor improvements to six (6) blocks within the Fred Hutley Retirement Village located at 183 Allambie Road, Allambie Heights.

The site is located on land mapped by Northern Beaches 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:

- 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 proposed improvements include the following works to Blocks 7, 8, 9, 10, 11 & 12:

- New decking and associated hand rails
- Existing walkway extensions and stairs
- Upgrade to landscaping (new paved and turfed areas)

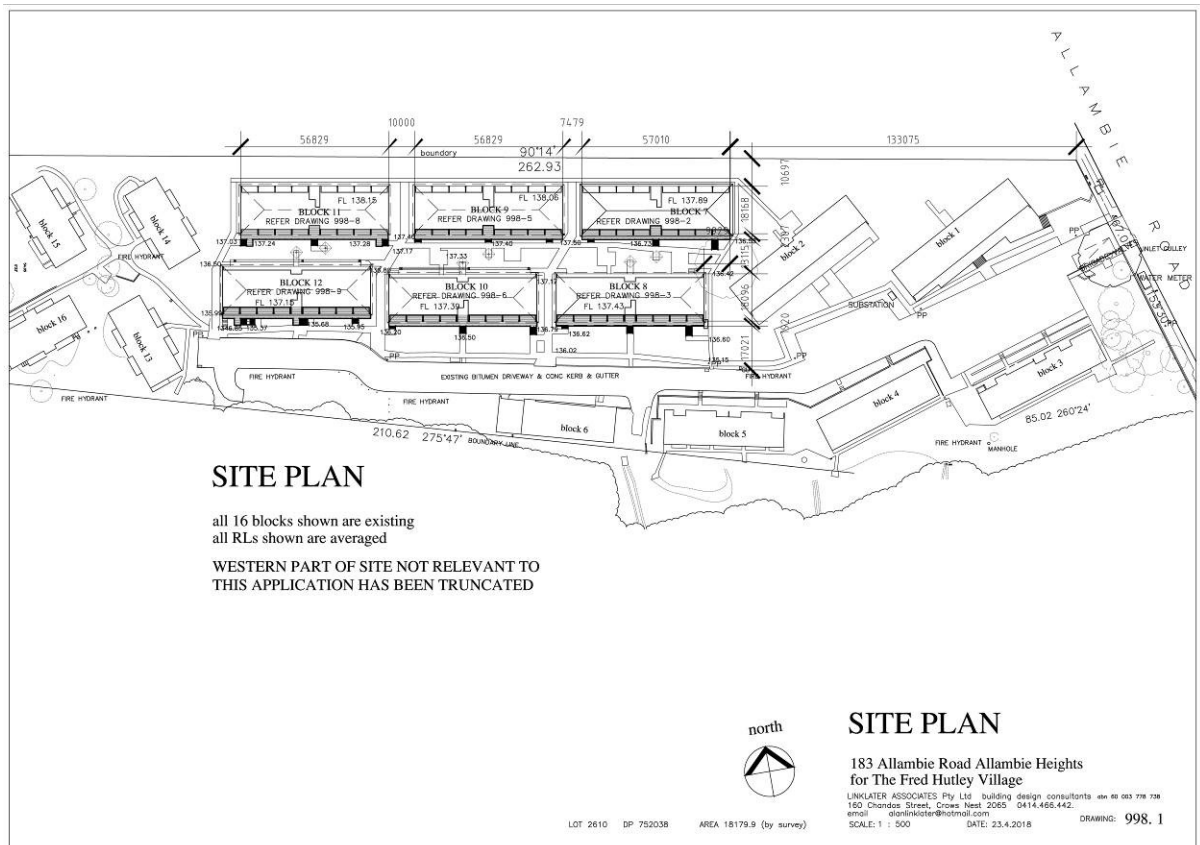


Figure 1.1 – Site Plan

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 plan prepared by *Linklater Associates* dated 24/11/2017
- *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)*.

An inspection of the proposed development site and surrounds was undertaken by Nicole van Dorst 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 Fred Hutley Retirement Village (self-care units) is located within Lot 2610 DP 752038, 183 Allambie Road, Allambie Heights within the local government area (LGA) of the Northern Beaches. This bushfire assessment has been prepared for six (6) self-care units (as highlighted in yellow - refer Figure 1.2)



Figure 1.2 – Aerial appraisal

1.5 Legislation and planning instruments

Is the site mapped as bushfire prone?	Yes
Proposed development type	Infill (SFPP)
Is the development considered integrated for the purposes of Section 100B of the <i>Rural Fires Act 1997</i>	Yes – referral and approval by the NSW RFS is required
Significant environmental features	No
Details of any Aboriginal heritage	No
Does the proposal rely on an alternative solution	Yes – Method 2 of AS3959 to determine BAL rating



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 the proposed development.

The vegetation posing a bushfire threat to the site is the:

- Remnant forest to the north-west of Block 11 & 12 (refer Photo 1)
- Remnant forest to the south-east. This vegetation has a fire run of less than 50m and is separated by the existing sewer easement and associated 5-15m track. The parcel of vegetation (refer Schedule 1 for location) is heavily infested by weeds ((as supported by the Sydney Metropolitan Vegetation's classification of exotic (OEH, 2013) and therefore has a reduced ability to sustain a bushfire (refer to Photo 2 & 3).
- Forest vegetation to the south and south-west of Blocks 8, 10 & 12 (refer to Photos 4 & 5).



Photo 1 – Remnant forest vegetation located to the north-west (Block 11 & 12)



Photo 2 & 3 – Remnant / exotic vegetation to the south-east.



Photo 4 & 5 – Forest vegetation located to the south & south-west

The remaining vegetation within 140m of the proposed development is considered managed.



Photo 6 & 7 – Managed land to the west



Photo 7– Managed land to the south-east

The above photos depict the portion of managed land (external to the site) to the south of Blocks 3-6.

2.2 Effective slope

The effective slope is assessed for a distance of up to 100m. 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 vegetation can be summarised as:

- 0-5° down slope within the remnant forest to the south-east
- 6° down slope within the forest to the south
- Level to up slope within the remnant forest vegetation to the north-west

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, the separation distances provided and the BAL level applicable.

Table 2.1 – Bushfire attack assessment

Block no.	Aspect	Vegetation formation within 140m of development	Effective slope of land	APZ provided	Building construction standard
Block 10,12	North, east & west	Managed land	N/A	>100m	N/A
	South	Forest	6° ^D	20 - 22m	BAL FZ
	North-west	Remnant forest (refer Note 1)	Level to upslope	40m	
Block 8	North, east & west	Managed land	N/A	>100m	N/A
	South-west	Forest	5° ^D	34m	BAL 29 (refer Note 2)
Block 7, 9 & 11	North, east & west	Managed land	N/A	>100	N/A
	South	Forest	6° ^D	43 - 54m	BAL 19 (refer Note 2)
	North-west	Remnant forest (refer Note 1)	Level to upslope	25m	

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

Note 1: PBP describes remnant vegetation as a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards a building not exceeding 50m. The vegetation to the north-west of Block 11 exhibits these qualities and therefore the threat posed is considered low and APZ setbacks for this aspect are the same as for the rainforest category outlined in PBP.

Note 2: A performance based assessment using Appendix B of AS3959 was undertaken to determine the required BAL level based on forest (fuel load 20/25 t/ha in accordance with Appendix 2 of PBP) to the south (slope of 6 degrees). The results of the assessment, provided within Appendix 2, were prepared using the bushfire attack assessor (BFAA) developed by Newcastle Bushfire Consulting.



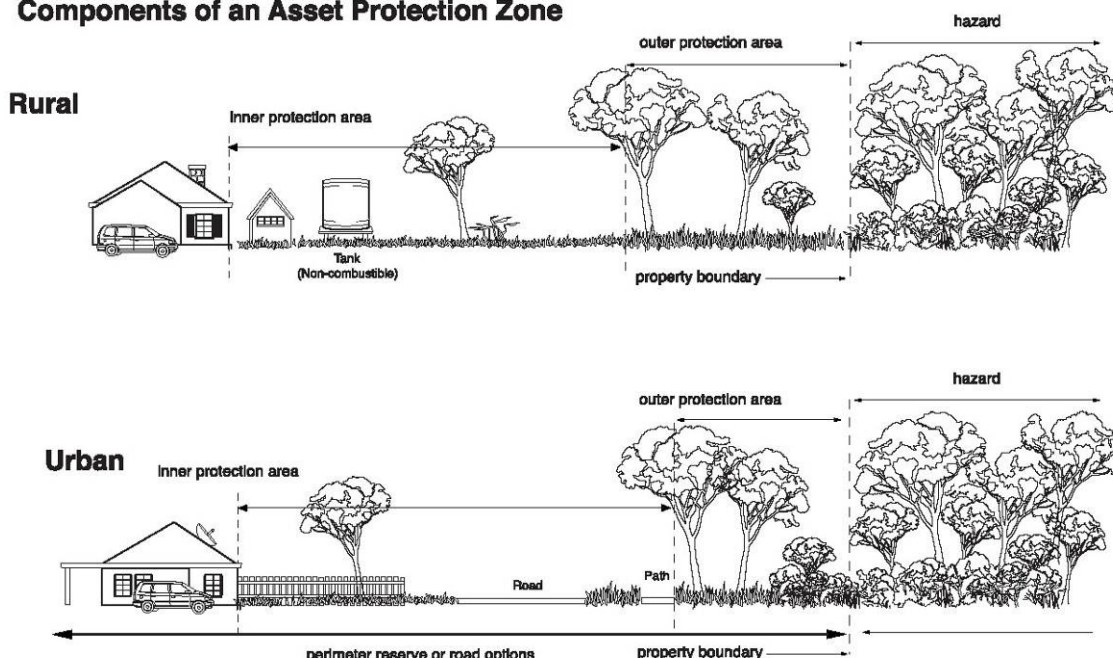
Specific Protection Issues

3

3.1 Asset protection zones

APZs are areas of defensible 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 defensible space, is graphically represented below:

Components of an Asset Protection Zone



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 defensible space between hazardous vegetation and a building

The proposal however is considered an 'infill' development and therefore seeks to provide an overall improved bushfire outcome. The entire site is to be managed as an APZ and will consist of landscaped gardens.

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	Complies
Radiant heat levels of greater than 10kW/m ² will not be experienced 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 <i>PBP</i>. Exits are located away from the hazard side of the building. The APZ is wholly within the boundaries of the development.	Non-compliance. The retirement village was constructed prior to the introduction of bushfire guidelines and most buildings within the site are exposed to a radiant threshold of >10kW/m². Other measures will be implemented to provide for an improved outcome as allowable for infill developments. The APZ / setback utilised in the assessment includes the existing managed lands / parking area and does not extend beyond the existing clearing.
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°.	Complies The APZ is not located on slopes exceeding 18°.
APZs are managed and maintained to prevent the spread of a fire towards the building	In accordance with the requirements of <i>Standards for Asset Protection Zones</i> (RFS 2005)	The property is be maintained in accordance with this condition.

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.

The proposed development is infill, specifically associated with alterations and additions. The proposal will therefore achieve a better outcome and will not add to the overall bushfire risk.

The proposed balcony (deck / walkway and associated stairs) extensions are to comply with the following BAL levels;

- BAL FZ – Block 10 & 12
- BAL 29 - Block 8
- BAL 19 - Block 7, 9 & 11

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*.

The proposed landscaping is to comply with the principles of Appendix 5 of Planning for Bushfire Protection 2006 (refer Appendix 1 of this report). Any landscaping within close proximity to the buildings are to comply with the following:

- Shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- A non-combustible mulch is used in garden beds abutting the building and the proposed deck.

It is recommended that the entire site is managed as an asset protection zone (refer Appendix 1). In particular the vegetation adjacent to the western boundary (refer Photos 8 & 9 below). No trees require removal, however slashing of the grass and maintenance of the shrub layer is recommended to ensure no shrubs are not located under trees and they are maintained in small clumps of 1-3m diameter.



Photo 8 & 9 – Vegetation requiring further maintenance

3.4 Access for firefighting operations

The primary public access to the development is via Allambie Road directly to the east. No changes are proposed to the current roadway system.

3.5 Water supplies

There are no hydrants currently located on site. Based on the extreme bushfire risk posed to the site the client will be providing additional six (6) fire hydrants in locations identified below

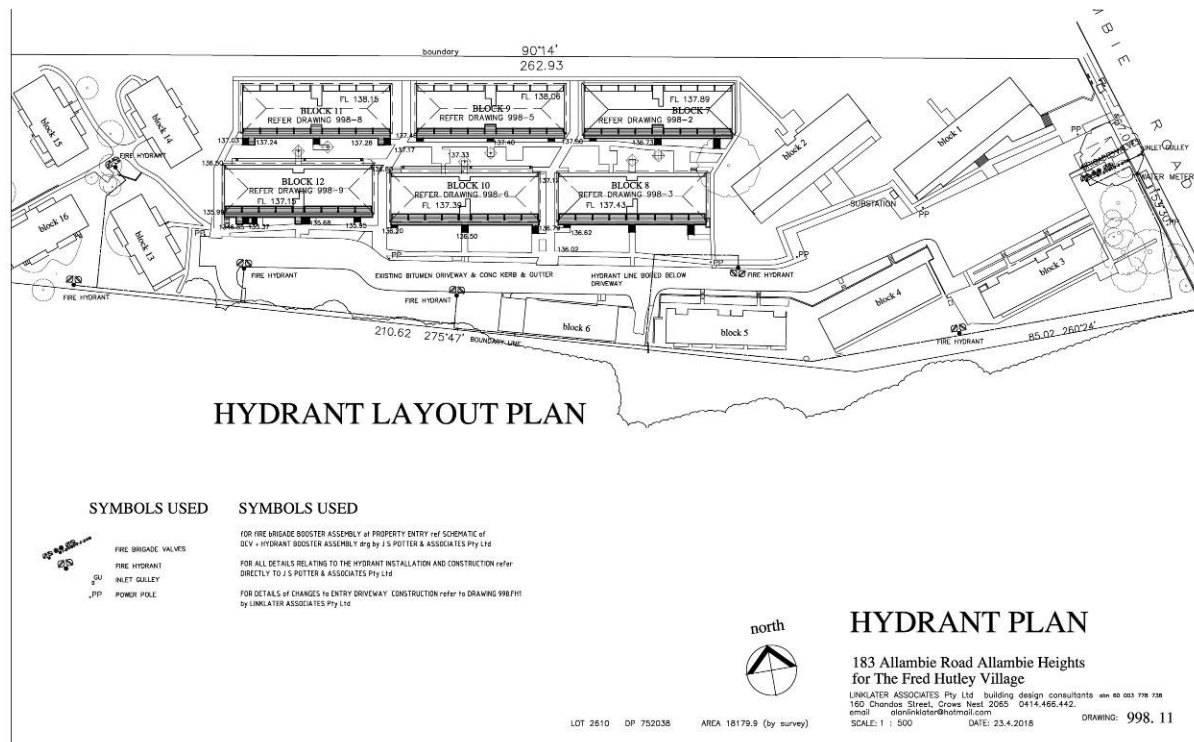


Figure 3.1 – Hydrant layout plan

The hydrant design is to comply with the following:

- Fire hydrant spacing, sizing and pressures comply with AS2419.1 - 2005. 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.
- Hydrants are not located within any road carriageway
- All above ground water and gas service pipes external to the building are metal, including and up to any taps.

3.6 Gas

No changes are proposed to the current gas supply.

3.7 Emergency and evacuation planning

A bushfire emergency evacuation plan is to be prepared in accordance with the following guidelines.

https://www.rfs.nsw.gov.au/_data/assets/pdf_file/0003/29271/DPP1079-Emergency-management-and-evacuation-plan-FORM.pdf

Table 3.2 outlines the required performance criteria for the proposal's emergency procedures

Table 3.2 – 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 <i>RFS</i> Guidelines for the Preparation of Emergency / Evacuation Plan. <i>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.</i>	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 <i>AS3745</i> 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 minor improvements to six (6) existing buildings within the Fred Hutley Retirement Village. The works include extensions to the existing decking, proposed walkways and new stairs.

The assessment found that bushfire can potentially affect the retirement village from the remnant forest vegetation to the north-west as well as from the forest located to the south resulting in possible ember, radiant heat and potentially flame attack.

However, the bushfire risk posed to the buildings will be reduced as an appropriate combination of bushfire protection measures is applied to the development in accordance with *PBP*.

The assessment has concluded that the proposed SFPP infill development will provide:

- Defendable space in accordance with the performance requirements of *PBP*.
- Construction of minor works in accordance with *Australian Standard AS3959 Construction of buildings in bushfire-prone areas 2009 (AS3959)* – BAL FZ (Block 10 & 12), BAL 29 (Block 8) and BAL 19 (Block 7, 9 & 11).
- Additional management of vegetation within the site in compliance with the requirements of an inner protection area (IPA).
- Provision of additional fire hydrants within the property
- Preparation of a bushfire emergency evacuation plan

As a result the proposal complies with the specific objectives for SFPP infill development.

4.2 Recommendations

Recommendation 1 – The entire property (including proposed landscaping works) is to be maintained as an asset protection zone to ensure compliance with Appendix 5 of *PBP*. A summary of the guidelines for managing APZs are attached as Appendix 1 to this report.

In particular the vegetation adjacent to the western boundary will require the slashing of the grass and maintenance of the shrub layer to ensure no shrubs are located under trees and they are maintained in small clumps of 1-3m diameter. No trees require removal.

Recommendation 2 - The proposed minor improvements / additions are to comply with *AS3959 - 2009* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 (*PBP*).

The proposed balcony (deck / walkway and associated stairs) extensions are to comply with the following BAL levels;

- BAL FZ – Block 10 & 12 (i.e. non-combustible material, fibre-cement sheet or a system complying with AS1530.8.2).

- BAL 29 - Block 8
- BAL 19 - Block 7, 9 & 11

Recommendation 3 – The proposed hydrant design plan is to comply with the following:

- Fire hydrant spacing, sizing and pressures comply with AS2419.1 - 2005. 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.
- Hydrants are not located within any road carriageway
- All above ground water and gas service pipes external to the building are metal, including and up to any taps.

Recommendation 4– An emergency / evacuation plan is to be prepared 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
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- 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



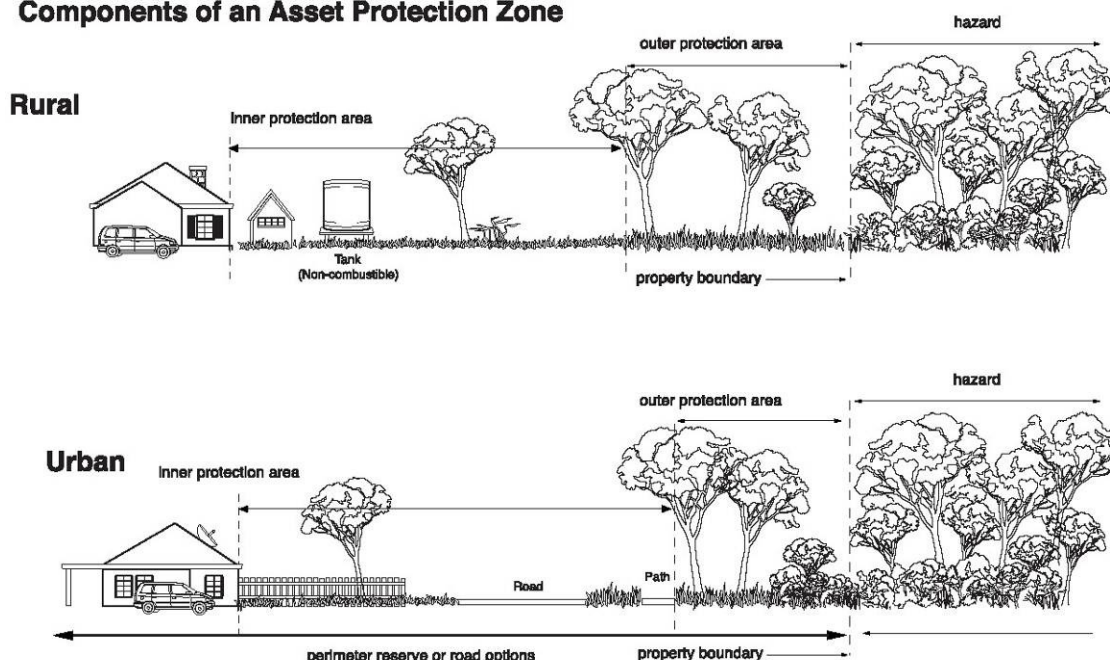
Management of Asset Protection Zones

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. A typical APZ is graphically represented below:

Components of an Asset Protection Zone



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.

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

- There should be no unmanaged vegetation within 10m of windows, doorways, eaves and gutters
- Lower limbs should be removed up to a height of 2m above ground

Shrubs are to be maintained to ensure;

- Large discontinuities or gaps in vegetation
- Shrubs should not be located under trees
- Shrubs should be in clumps no greater than 5m²
- Shrubs should be no closer than 10 metres from an exposed window or door.

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.



Performance based assessment

A2

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 9/09/2018 Assessment Date: 1/11/2017

Site Street Address: 183 Allambie Road, Allambie Heights

Assessor: Mr Admin; admin

Local Government Area: Warringah

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 Block 10 & 12

Vegetation Information

Vegetation Type: Forest

Vegetation Group: Forest and Woodland

Vegetation Slope: 6 Degrees

Vegetation Slope Type: Downslope

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): 20

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

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: FLAME ZONE

Peak Elevation of Receiver(m): 9.88

Level of Construction: BAL FZ

Fire Intensity(kW/m): 46899

Radiant Heat(kW/m2): 43.23

Flame Angle (degrees): 48

Flame Length(m): 26.6

Maximum View Factor: 0.661

Rate Of Spread (km/h): 3.63

Inner Protection Area(m): 20

Transmissivity: 0.86

Outer Protection Area(m): 0

Run Description: B Block 8 (south-west)	
<u>Vegetation Information</u>	
Vegetation Type: Forest	Vegetation Group: Forest and Woodland
Vegetation Slope: 5 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 20	Overall Fuel Load(t/ha): 25
<u>Site Information</u>	
Site Slope 0 Degrees	Site Slope Type: Level
Elevation of Receiver(m) Default	APZ/Separation(m): 34
<u>Fire Inputs</u>	
Veg./Flame Width(m): 100	Flame Temp(K) 1090
<u>Calculation Parameters</u>	
Flame Emissivity: 95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg) 18600	Ambient Temp(K): 308
Moisture Factor: 5	FDI: 100
<u>Program Outputs</u>	
Category of Attack: HIGH	Peak Elevation of Receiver(m): 11.34
Level of Construction: BAL 29	Fire Intensity(kW/m): 43772
Radiant Heat(kW/m2): 21.21	Flame Angle (degrees): 65
Flame Length(m): 25.03	Maximum View Factor: 0.345
Rate Of Spread (km/h): 3.39	Inner Protection Area(m): 34
Transmissivity: 0.808	Outer Protection Area(m): 0
Run Description: C Block 7 & 9	
<u>Vegetation Information</u>	
Vegetation Type: Forest	Vegetation Group: Forest and Woodland
Vegetation Slope: 6 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 20	Overall Fuel Load(t/ha): 25
<u>Site Information</u>	
Site Slope 0 Degrees	Site Slope Type: Level
Elevation of Receiver(m) Default	APZ/Separation(m): 43
<u>Fire Inputs</u>	
Veg./Flame Width(m): 100	Flame Temp(K) 1090
<u>Calculation Parameters</u>	
Flame Emissivity: 95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg) 18600	Ambient Temp(K): 308
Moisture Factor: 5	FDI: 100
<u>Program Outputs</u>	
Category of Attack: MODERATE	Peak Elevation of Receiver(m): 12.24
Level of Construction: BAL 19	Fire Intensity(kW/m): 46899
Radiant Heat(kW/m2): 16.44	Flame Angle (degrees): 67
Flame Length(m): 26.6	Maximum View Factor: 0.274
Rate Of Spread (km/h): 3.63	Inner Protection Area(m): 43
Transmissivity: 0.788	Outer Protection Area(m): 0