Bushfire Protection Assessment

Yarrabilly Estate, Lot 4, DP 1092182 Cowra NSW

Prepared for
FRAISH Consulting

19 December 2016

DOCUMENT TRACKING

Item	Detail
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ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd.

Contents

1 Property and proposal

Street or property Name:	Yarrabilly Estate, Yarrabilly Drive		
Suburb, town or locality:	Cowra	**Postcode:**	2794
Lot/DP no:	Lot 4, DP 1092182		
Local Government Area:	Cowra		
Type of area:	R1 – General Residential		
Type of development:	Special Fire Protection Purposes Development – Independent Living		

1.1 The proposal

The subject land is located to the north-east of Cowra (**Figure 1**) and is near the historic Cowra Prisoner of War site and the Japanese Garden and Cultural Centre.

The concept masterplan is to create an estate consisting of six areas of independent living units, a residential care facility, rural residential lots and a recreation area (**Figure 2**) in the Cowra Shire Council Local Government Area. This report deals with Stage 1 of the masterplan, which is for Independent Living Units (ILU) on the western side of the subject land.

The subject land is in the Central Ranges NSW Fire Area with a Fire Danger Index (FDI) of 80 as identified in Table A2.3 of '*Planning for Bush Fire Protection* 2006' (RFS 2006), herein referred to as PBP.

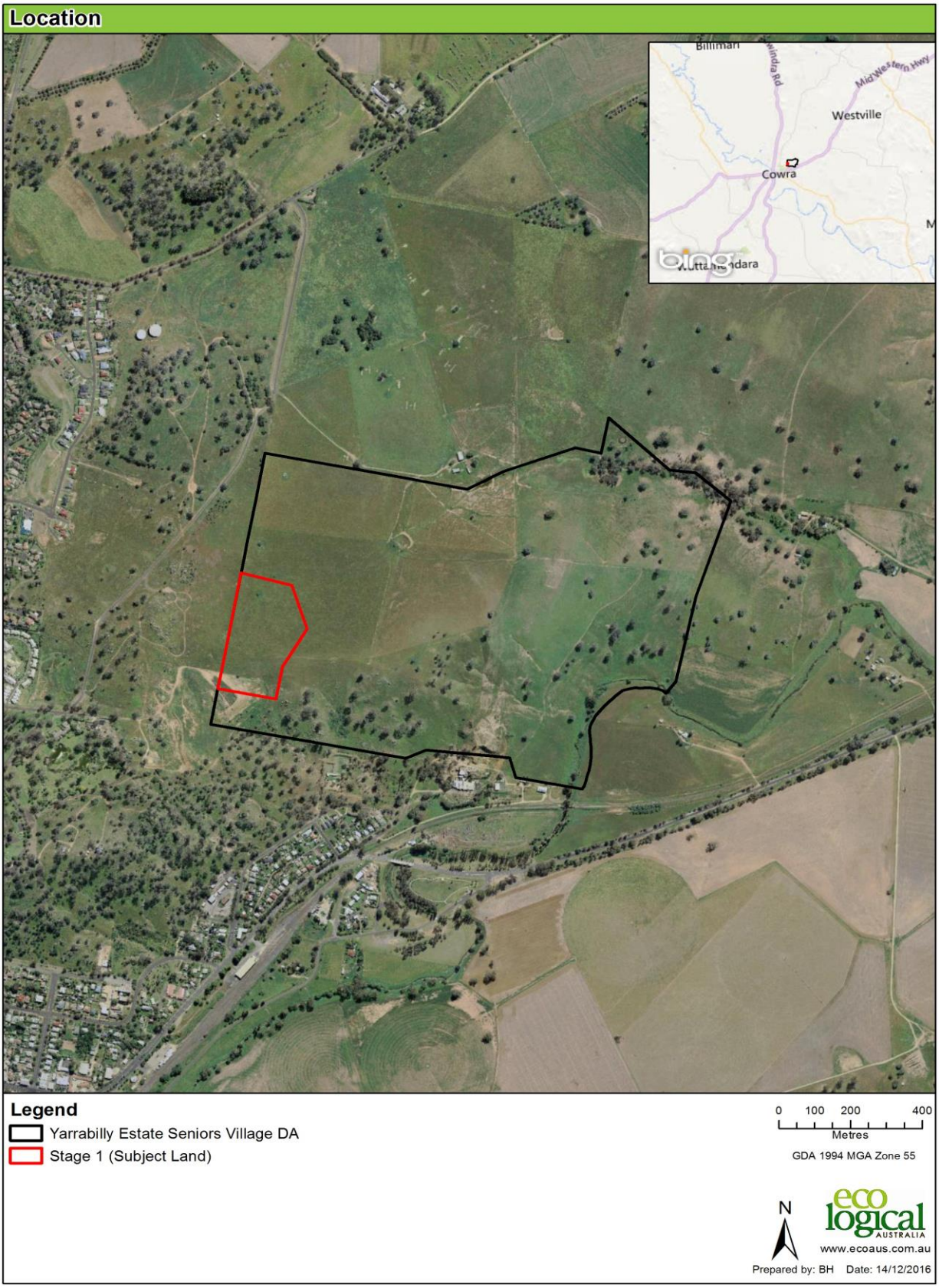

Figure 1: Subject site location and local context

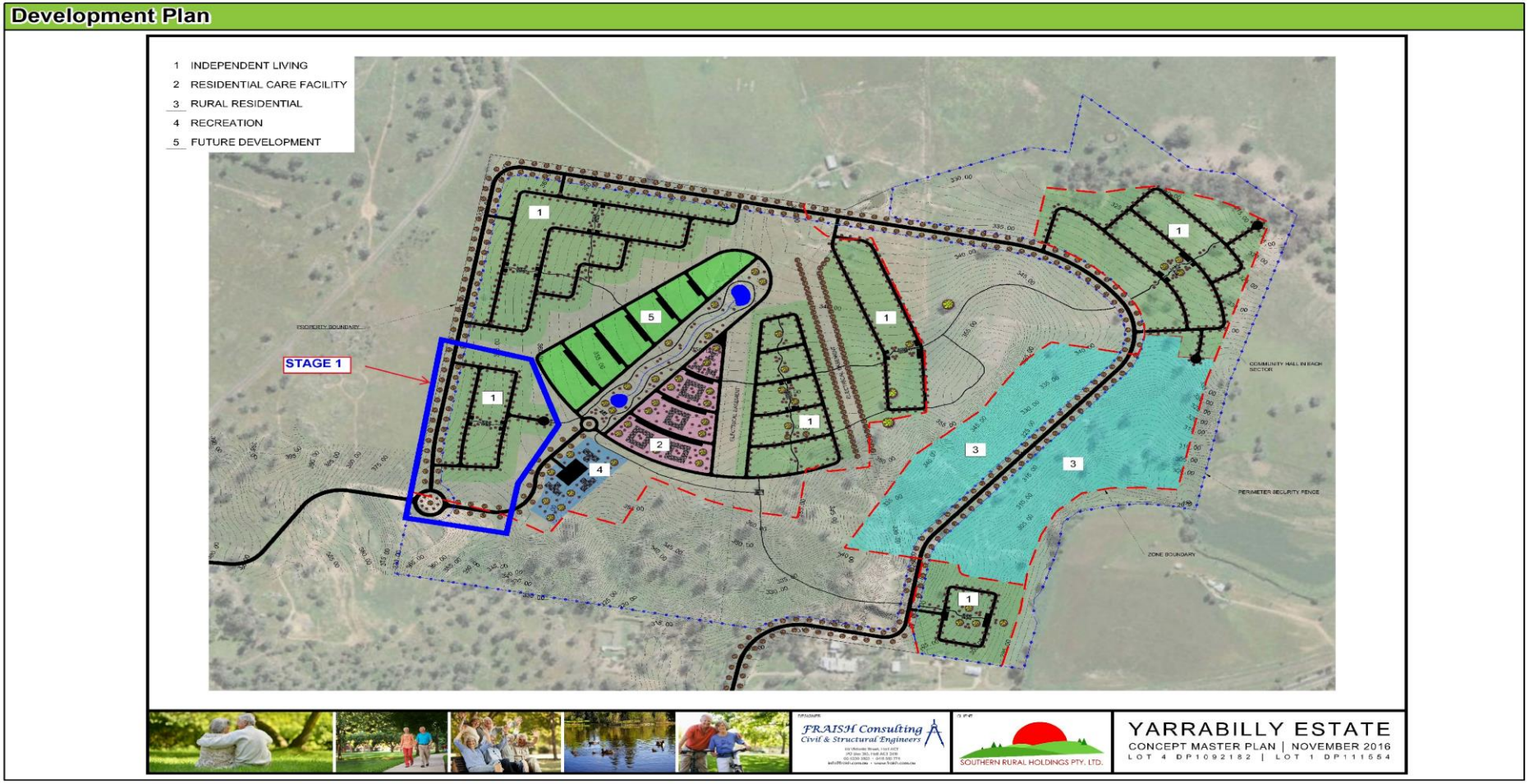

Figure 2: Proposed development concept master plan

2 Bushfire threat assessment

2.1 Bushfire protection assessment requirements

This assessment is prepared in accordance with Section 100B of the *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2008*, and PBP. The proposal is a Special Fire Protection Purpose (SFPP) – Seniors Living.

2.2 Vegetation types and slopes

The vegetation and slope have been assessed in all directions for proposed development. In accord with PBP the predominant vegetation class has been assessed for a distance of at least 140 m out from the proposed development and the slope class 'most significantly affecting fire behaviour having regard for vegetation found [on it]' determined for a distance of at least 100 m in all directions. The predominant vegetation and effective slope assessments are shown in **Table 1** and **Figure 3**.

The vegetation classification is derived from a site inspection undertaken on 13 December 2016.

3 Asset Protection Zones (APZ)

The Newcastle Bushfire Consulting (NBC) Bushfire Attack Assessor V2.1 (BFAA) has been used to determine the width of Asset Protection Zones (APZ) for the proposed Special Fire Protection Purpose (SFPP) development with fuel loads drawn from Table A2.1 in PBP. As PBP Table A2.6 does not provide APZ dimensions for sites located in areas with an FFDI of 80 nor grassland vegetation, the BFAA tool was used to quantify the APZs required.

The APZ performance criteria for SFPP development is '*radiant heat levels of greater than 10kW/m^2 will not be experienced by occupants or emergency service workers entering or exiting a building.*' Radiant heat flux modelling using the BFAA tool was undertaken to ensure compliance with this performance criteria and **Table 1** below details the proposed APZ, which is also illustrated in **Figure 3**. The outputs from the modelling using the Bushfire Attack Assessor V2.1 are included as **Appendix A**.

Table 1: Threat assessment, APZ and bushfire attack level

Direction	Slope[1]	Vegetation[2]	PBP Acceptable Solution APZ[3]	Proposed APZ[4]	AS 3959-2009 BAL[5]	Comment
INDEPENDENT LIVING UNITS (ILUs) - SFPP						
Stage 1 Immediate south, South-east	>15-18^o downslope	Woodland (Grassy)	75 m	71 m	BAL-12.5	APZ to be cleared areas within subject site on slopes < 18 degrees.
Stage 1 North, West	Upslope and flat land (0^o)	Grassland	Not identified in PBP	34 m	BAL-12.5	APZ along northern side of Stage 1 may be temporary until further development to the north is completed, at which time the APZ will be located along the northern boundary of the estate.
Stage 1 North-east, East	>0-5^o downslope	Grassland	Not identified in PBP	38 m	BAL-12.5	APZ may be temporary until future development to the north-east and east of Stage 1 is completed, at which time the APZ will be relocated as necessary.

[1] Slope most significantly influencing the fire behaviour according to PBP.
[2] Predominant vegetation is identified according to PBP.
[3] Assessment according to PBP Table A2.6.
[4] Assessment according to NBC Bushfire Attack Assessor V2.1.
[5] Assessment according to AS 3959-2009 Table 2.4.3.

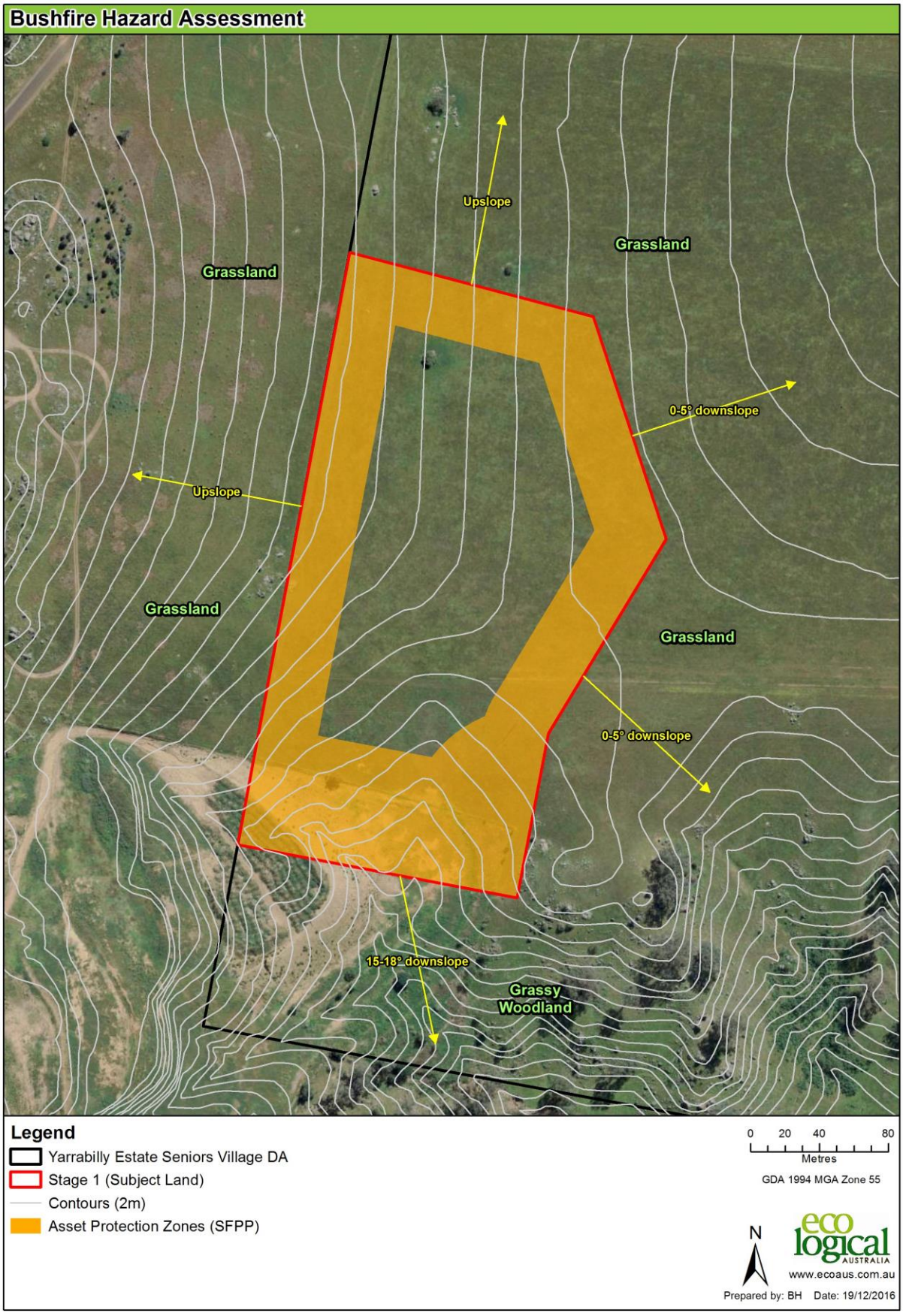

Figure 3: Bushfire Hazard Assessment

3.1 APZ maintenance plan

The proposed APZ identified in **Table 1** are to meet the Inner Protection Area standards as follows:

- No tree or tree canopy is to occur within 2 m of the building roofline;
- The presence of a few shrubs or trees in the APZ is acceptable provided that they:
  - Are well spread out and do not form a continuous canopy
  - Are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period
  - Are located far enough away from the building so that they will not ignite the building by direct flame contact or radiant heat emission
- Any landscaping or plantings should preferably be local endemic mesic species or other low flammability species;
- A minimal ground fuel is to be maintained to include less than 4 tonnes per hectare of fine fuel (fine fuel means ANY dead or living vegetation of <6 mm in diameter e.g. twigs less than a pencil in thickness. 4 t/ha is equivalent to a 1 cm thick layer of leaf litter); and
- Any structures storing combustible materials such as firewood (e.g. sheds) must be sealed to prevent entry of burning debris.

4 Construction standard

Method 1 of the AS 3959-2009 '*Construction of buildings in bushfire-prone areas'* has been used to determine the bushfire construction levels required for the development (Standards Australia 2009), in response to the predicted bushfire attack as indicated within **Table 1** above.

The proposed Stage 1 development has been classified as BAL-12.5 at the closest point (as per **Table 1**).

In this instance, all areas of external construction will require the implementation of construction standards under Australian Standard AS 3959-2009 '*Construction of buildings in bushfire-prone areas' (*Standards Australia 2009), and the additional ember protection requirements of PBP 2006 Addendum Appendix 3.

5 Water supply

The subject development will be serviced by reticulated water. The furthest point from future dwellings to a hydrant will be less than 70 m. To achieve PBP acceptable solutions compliance for reticulated water supplies **Table 2** applies.

Table 2: Performance criteria for reticulated water supplies (PBP page 27)

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
• water supplies are easily accessible and located at regular intervals	• reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. • fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. • hyrdrants 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. • the provisions of parking on public roads are met.

6 Gas and electrical supplies

Electricity supply to / within the subject land should be located underground where practical. Where overhead electrical transmission lines are proposed:

- Lines are installed with short pole spacing (30 metres);
- 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 accordance with the specifications in *'ISSC 3 Guideline for managing vegetation near powerlines*' issued by the Industry Safety Steering Committee (ISSC 2005).

Both of these options comply with PBP and are achievable.

Any gas services are to be installed and maintained in accordance with *Australian Standard AS/NZS 1596* '*The storage and handling of LP Gas'* (Standards Australia 2014).

7 Access

The subject land is accessed via an extension of the existing Yarrabilly Drive as indicated in **Figure 2**, showing the proposed roading within Yarrabilly Estate. There are no dead-end roads of greater than 200 m in Stage 1. Proposed internal access roads are required to comply with standards contained within section 4.2.7 of PBP for the design and construction of roads within SFPP developments, as listed in **Table 3**.

A permanent perimeter road is located along the western boundary (running north-south) and will connect to the northern stages as development progresses. A temporary perimeter access road (fire trail) is to be established along the northern and eastern boundaries of Stage 1 which connects to the permanent perimeter road. The standard for fire trails are shown in **Table 4**. The compliance with the acceptable solutions within PBP are identified within **Table 3** and **Table 4**.

Table 3: Performance criteria for Internal Access Roads[1]

Performance Criteria	Acceptable Solutions	Compliance
The intent may be achieved where:		
▪ internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle.	▪ internal roads are two-wheel drive, sealed, all-weather roads; ▪ internal perimeter roads are provided with at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions; ▪ roads are through roads. Dead end roads are not more than 100 metres in length from a through road, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end; ▪ traffic management devices are constructed to facilitate access by emergency services vehicles. ▪ a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided. ▪ curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress. ▪ the minimum distance between inner and outer curves is six metres. ▪ maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees. ▪ crossfall of the pavement is not more than 10 degrees. ▪ roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge). ▪ roads are clearly sign-posted and bridges clearly indicate load ratings. ▪ the internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).	Complies

[1] PBP page 35

Table 4: Performance criteria for proposed fire trail[2]

Performance Criteria	Acceptable Solutions	Compliance
The intent may be achieved where:		
▪ the width and design of the fire trails enables safe and ready access for firefighting vehicles	▪ a minimum carriageway width of four metres with an additional one metre wide strip on each side of the trail (clear of bushes and long grass is provided. ▪ the trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed. ▪ a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided. ▪ the crossfall of the trail is not more than 10 degrees. ▪ the trail has the capacity for passing by: ▪ reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with an inner minimum turning radius of six metres and outer minimum radius of 12 metres; and/or ▪ a passing bay every 200 metres, 20 metres long by three metres wide, making a minimum trafficable width of seven metres at the passing bay. ▪ *Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m) and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed.*	Complies Complies Complies Complies Complies Complies
▪ Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non-authorised persons	▪ the fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land. ▪ appropriate drainage and erosion controls are provided. ▪ the fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200 metres or less. ▪ fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge). ▪ gates for fire trails are provided and locked	Complies Complies Complies Complies Complies
▪ Fire trails designed to prevent weed infestation, soil erosion and other land degradation	▪ fire trail design does not adversely impact on natural hydrological flows. ▪ fire trail design acts as an effective barrier to the spread of weeds and nutrients. ▪ fire trail construction does not expose acid-sulphate soils.	Complies Complies Complies

[2] PBP page 25

8 Bushfire maintenance plans and fire emergency procedures

The APZs / defendable space areas will be managed by either the development owners or management. In these instances, the role of the responsible party is to manage not only the APZs around the proposed senior living buildings, but also all landscaped areas throughout the facility.

A Bushfire Emergency Response and Evacuation Plan is to be prepared prior to occupation of Stage 1 and is recommended as a condition of consent.

9 Assessment of environmental issues

All environmental issues resulting from the bushfire protection measures raised in this report will be assessed in detail by specialists for the relevant issue. Cowra Shire Council is the determining authority for this proposed subdivision and they will assess these potential environmental issues.

10 Summary of development requirements

The following primary bushfire protection measures have been identified as required by this assessment report:

1. APZs in accord with **Table 1** and **Figure 3** (see **Section 3**);
2. Construction to comply with BAL-12.5 (AS3959-2009) and the additional ember protection requirements of PBP 2006 Addendum Appendix 3 (see **Section 4**);
3. Reticulated water supply in accordance with **Section 5**;
4. Gas and electrical services in accordance with **Section 6**;
5. Access in accord with **Section 7**;
6. Bushfire maintenance plans and fire emergency procedures in accordance with **Section 8**.

In the author's professional opinion, the bushfire protection requirements listed in this assessment provide an adequate standard of bushfire protection for the proposed development, a standard that is consistent with the SFPP requirements of '*Planning for Bush Fire Protection'* (RFS 2006) and appropriate for the issue of a Bush Fire Safety Authority.

Mick George

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11 References

Industry Safety Steering Committee (ISSC). 2005. *ISSC 3 Guideline for managing vegetation near powerlines*. NSW.

NSW Rural Fire Service (RFS). 2006. *Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners* including the 2010 Appendix 3 Addendum. Australian Government Publishing Service, Canberra.

Standards Australia. 2005. *Fire hydrant installations - System design, installation and commissioning*, AS2419.1, Fourth edition 2005, SAI Global, Sydney.

Standards Australia. 2009. *Construction of buildings in bushfire-prone areas*, AS 3959-2009. SAI Global, Sydney.

Standards Australia. 2014. *The storage and handling of LP Gas*, AS/NZS 1596:2014. SAI Global, Sydney.

Appendix A

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Print Date: 19/12/2016 **Assessment Date:** 19/12/2016

Site Street Address: Yarrabilly Estate Seniors Village, Cowra

Assessor: ; Ecological Australia

Local Government Area: Cowra **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: Stage 1 Immediate South South East

Vegetation Information

Vegetation Type:	Woodland	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	18 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	15

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	71

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1200

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	80

Program Outputs

Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	11.3
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	25761
Radiant Heat(kW/m2):	9.8	**Flame Angle (degrees):**	75
Flame Length(m):	23.41	**Maximum View Factor:**	0.116
Rate Of Spread (km/h):	3.32	**Inner Protection Area(m):**	71
Transmissivity:	0.758	**Outer Protection Area(m):**	0

Run Description: Stage 1 North, West

Vegetation Information

Vegetation Type:	Grassland	**Vegetation Group:**	Grassland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	6	**Overall Fuel Load(t/ha):**	6

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	34

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1200

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	110

Program Outputs

Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	3.93
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	44330
Radiant Heat(kW/m2):	9.65	**Flame Angle (degrees):**	82
Flame Length(m):	7.94	**Maximum View Factor:**	0.107
Rate Of Spread (km/h):	14.3	**Inner Protection Area(m):**	34
Transmissivity:	0.806	**Outer Protection Area(m):**	0

Run Description: Stage 1 North-east, East

Vegetation Information

Vegetation Type:	Grassland	**Vegetation Group:**	Grassland
Vegetation Slope:	5 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	6	**Overall Fuel Load(t/ha):**	6

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	38

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1200

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	110

Program Outputs

Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	4.66
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	62594
Radiant Heat(kW/m2):	9.92	**Flame Angle (degrees):**	81
Flame Length(m):	9.43	**Maximum View Factor:**	0.111
Rate Of Spread (km/h):	20.19	**Inner Protection Area(m):**	38
Transmissivity:	0.799	**Outer Protection Area(m):**	0

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