



Travers

bushfire & ecology

bushfire protection assessment

Proposed Cemetery – Macarthur Memorial Park
Lot 1 DP 218016, Lot B DP 370979
& Lot 22 DP 564065
166 - 176 St Andrews Road, Varroville

Under Section 79BA of the EP&A Act 1979

October 2017
(REF: A16228B)



Bushfire Protection Assessment

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Lot 1 DP 218016, Lot B DP 370979
& Lot 22 DP 564065
166-176 St Andrews Road, Varroville

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Date:	11 October 2017
File:	A16228B

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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

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed staged construction of Macarthur Memorial at 166-176 St Andrew Road, Varroville.

The proposal includes the construction of six (6) buildings, along with an integrated road network. The proposed multipurpose chapel and the existing outbuildings (barn and cottage) which will be used for educational purposes are Class 9b buildings under the Building Code of Australia and are considered 'assembly' buildings. The administration building, gatehouse, café, function centre and staff buildings are Class 5, 6 & 8 buildings.

The proposed development is categorised by the NSW Rural Fire Service (RFS) as infill development and must be assessed in accordance with *Planning for Bush Fire Protection 2006 (PBP)* under Section 79BA of the *Environmental Planning & Assessment Act (EP&A Act)*. Consideration of the specific objectives listed in Section 4.2.3 for special fire protection purpose developments (SFPP) are to be considered for the Class 9b buildings to ensure they comply with the aims and objectives of PBP.

As this assessment has used a performance based approach, this report must be submitted to the NSW RFS for assessment.

Our assessment found that bushfire can potentially affect future buildings on site from the woodland vegetation proposed to be retained and rehabilitated on site, resulting in possible ember attack, radiant heat and potentially flame attack.

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

The assessment has concluded that the proposed development will provide compliance with *Planning for Bushfire Protection (PBP) 2006* with the following proposed alternative solutions:

- Road carriageway widths of 6.5m (two-way) and 3.5m (one-way) for all roads regardless of curve radius as well as 2.1m wide grassed parking bays in accordance and in compliance with the pre-DA advice received from the NSW RFS (refer Appendix 3).
- The proposed water services will use a combination of reticulated and non-reticulated water supply. The proposed buildings will be provided with hydrants in accordance with the relevant Australian Standard. Hydrants are not proposed to be installed within the remainder of the road system. In compliance with the pre-DA advice received from the NSW RFS additional water supply is proposed and can be provided via the existing dams.

The bushfire attack assessment has been undertaken and will be applied in accordance with;

- Appendix B Method 2 (alternative solution) of *AS3959 Construction of buildings in bushfire prone areas* (2009) for the proposed function room and administration building; and,
- Table 2.4.3 (simplified procedure – Method 1) of *AS3959 Construction of buildings in bushfire prone areas* (2009) for the multipurpose chapel and ground staff facility.

Construction standards have not been recommended for the proposed reuse of the barn and cottage (educational facility) due to the surrounding managed land (>100m from bushfire prone land). Construction standards have not been applied to the gatehouse or café due to their proposed use (commercial) under the BCA and the ready availability of adequate access and managed lands.

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
<i>EP&A Act</i>	<i>Environmental Planning & Assessment Act 1979</i>
FDI	Fire danger index
IPA	Inner protection area
LGA	Local government area
m	Metres
OPA	Outer protection area
<i>PBP</i>	<i>Planning for Bush Fire Protection 2006</i>
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose

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Introduction

1

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed staged construction of Macarthur Memorial Park (cemetery) at 166-176 St Andrew Road, Varroville.

The property is located on land that is mapped by Campbelltown 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 proposal will be developed in five (5) stages. Stage one is located in the western portion of the site and the final stage, stage 5, in the eastern portion of the site near Varroville Homestead. The proposed development involves the construction of the following built facilities on site:

- A gatehouse;
- A multi-purpose chapel;
- A function room;
- A café and flower shop;
- An administration office;
- Ground staff facilities; and
- Reuse of the existing barn and cottage for an educational facility.

A road network has been designed to allow access to each of these facilities and access to the various burial and memorial sites throughout the development. Please refer to Figure 1.1 for an illustration of the proposed road network and built facilities.

Schedule 1 attached depicts the bushfire constraints and minimum APZs required for the proposed built assets on site.

In addition to these assets, the vision for the cemetery is to provide for the following:

- A distinctive landscaped cemetery providing concealed, private and low lying burial spaces (i.e. 148,000 burial sites) to minimise visual impact.
- A sculpture park, offering opportunities for local and Australian artists.
- An arboretum for future preservation and education of generations to come.



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:

- Overall site plan prepared by *Florence Jaquet Landscape Architect*, dated 18/09/2017
- Flora and Fauna Report prepared by *Travers bushfire & ecology*
- Civil Engineering Services Macarthur Memorial Park Proposed Road Design prepared by *Warren Smith & Partners*, dated 3rd March 2017
- Pre Development Application – Road Compliance prepared by *Travers bushfire & ecology*, dated 5th April 2017.
- Pre-DA Advice Summary prepared by the NSW RFS (ref: DOC17/38466) dated 21 April 2017.
- Local Environmental Plans
- *Nearmap* aerial photography
- topographical maps DLPI of NSW 1:25,000
- Australian Standard 3959 *Construction of buildings in bushfire-prone areas*
- *Planning for Bush Fire Protection 2006 (NSW RFS) (PBP)*

An assessment of the proposed development site and surrounds was undertaken 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 property is approximately 113 ha in size and is located between Camden Valley Way and the Hume Highway, south of Saint James Road within the local government area of Campbelltown. The property has been historically used for farmland and surrounds one private property known as “Varroville House” (refer Figure 1.2).

Cumberland Woodland vegetation is restricted to the northern boundary of the site and within the riparian corridors. The bushfire risk is further mitigated by the proposed establishment of approximately 148,000 burial spaces which will ensure that the majority of this land (outside of the proposed conservations areas) and surrounding the road network will consist of mown / landscaped / managed land (refer Figure 1.3).



Figure 1.2 – Aerial appraisal

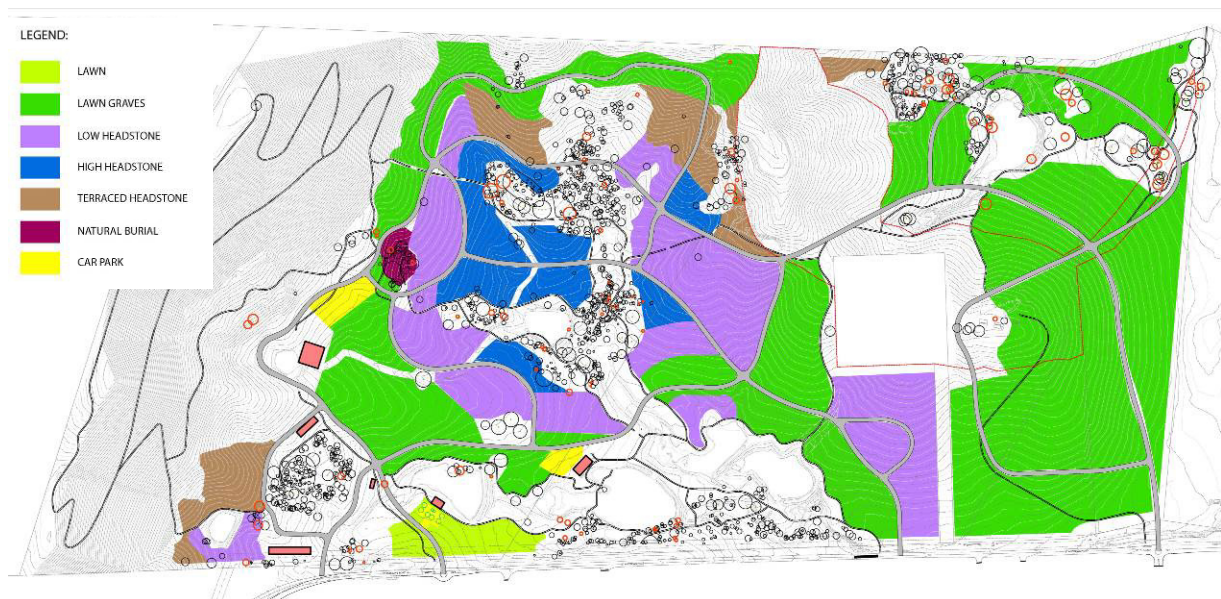


Figure 1.3 – Burial types (depicting land to be managed)

1.5 Legislation and planning instruments

1.5.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *Building Code*

of Australia (BCA). The identification of bushfire prone land is required under Section 146 of the *EP&A Act*.

Section 79BA of the *EP&A Act* states that development consent cannot be granted for the carrying out of development for any purpose on bushfire prone land unless the consent authority:

- is satisfied that the development conforms to the specifications and requirements of *PBP*
- has consulted with the Commissioner of the NSW RFS concerning measures to be taken with respect to the development to protect persons, property and the environment from danger that may arise from a bushfire.

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed development is located on land that is mapped by Campbelltown Council as being bushfire prone (refer Figure 1.4).

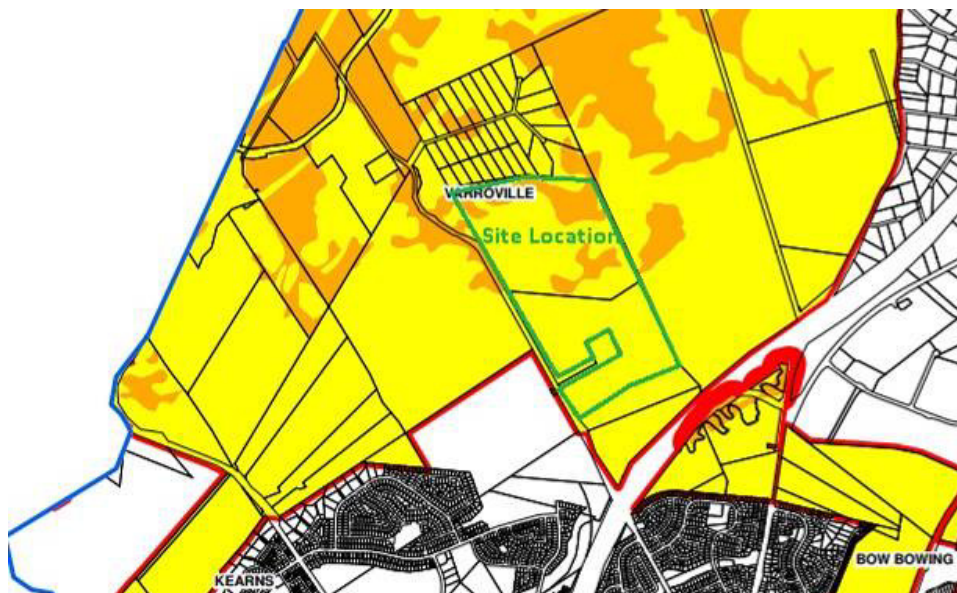


Figure 1.4 – Bushfire prone land map

1.5.3 Local Environmental Plan (LEP)

An LEP provides for a range of zonings and lists development that is permissible, or not permissible, as well as the objectives for development within a zone.

The site is zoned under the Campbelltown LEP 2015 as E3 Environmental Management and RE1 Public Recreation. The proposal, including the provision of APZs, is consistent with the objectives of the zoning.

1.5.4 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *PBP* published in 2006. *PBP* provides planning controls for building in bushfire prone areas as well as guidance on effective bushfire protection measures. The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on

property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment. *PBP* outlines the following specific objectives for infill development.

1. Ensure that the bushfire risk to adjoining properties is not increased.
2. Provide a minimum defensible space.
3. Provide better bushfire protection on a redevelopment site than the existing situation. This should not result in new works being exposed to a greater risk than the existing building.
4. Ensure that the footprint of the proposed building does not extend towards the hazard beyond existing buildings lines on neighbouring land.
5. Not result in an increased bushfire management and maintenance responsibility on adjoining lands, unless the owner has agreed to the development.
6. Ensure that building design and construction enhance the chances of occupant and building survival.

Although the multipurpose chapel, function centre and proposed repurposed outbuildings are not classified as a *Special Fire Protection Purpose Development* the following objectives are required to be considered;

7. Provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and fire fighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated.
8. Provide for safe emergency evacuation procedures. SFPP Developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bush fire threats. During emergencies, the risk to fire fighters and other emergency services personnel can be high through prolonged exposure, where door-to-door warnings are being given and exposure to the bush fire is imminent.

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

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

1.5.6 Building Code of Australia and the Australian Standard AS3959 – 2009

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions.

In NSW, the construction of buildings in bushfire prone areas relates to Classes 1, 2, 3, 4 and Class 9 buildings that are a special fire protection purpose (*SFPP*) or a Class 10a building or deck associated with the aforementioned building classes. The design and construction manual for the deemed to satisfy requirements is the Australian Standard AS3959 *Construction of buildings in bushfire-prone areas 2009* (AS3959). These classes of buildings must therefore be constructed in accordance with AS3959.

The *BCA* does not provide for any bushfire specific performance requirements for commercial and industrial buildings (Classes 5–8) and, as such, AS3959 does not apply as a set of deemed to satisfy provisions. The general fire safety construction provisions are taken as acceptable solutions.

Section 2.3 provides an assessment for each of these building classes. The proposed multi-purpose chapel is Class 9b building and is required to comply with AS3959. Although the function centre, administration building and ground staff facility are considered a Class 5, 6 & 8 building, the proposed use will involve gatherings to hold wakes and memorials (function centre) as well as staff (administration and ground staff facility). As a result *TBE* have undertaken a conservative approach and recommends compliance with the relevant construction standard under AS3959 to achieve the aims and objectives of PBP.

1.6 Environmental constraints

Travers bushfire & ecology prepared a Flora and Fauna Report for the proposal.

The report concluded that based on the concept plan the land is considered to be capable and suitable for the proposed memorial park based on the ecological constraints of the site.

The report recommends the preparation of a vegetation management plan (VMP) to mitigate the potential ecological impacts. These measure include:

- Progressively revegetate riparian corridors to provide connective habitat
- Revegetation works to utilise locally sourced material and plants of Cumberland Plain Woodland and Moist Shale Woodland origin.

The asset protection zones recommended in the report take into consider the proposed revegetation works and do not impact upon the ecological constraints.



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. The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

Hazardous fuels surrounding the buildings include;

- Coastal Valley Grassy Woodland approximately 60-100m north and north-west of the multi-purpose chapel.
- Remnant Coastal Valley Grassy Woodland located between the proposed chapel buildings and the administration building.
- Proposed revegetated / rehabilitated riparian corridors within the site and located within 100m of the café, function room, gatehouse and ground staff facility. These areas (as depicted in Schedule 1 attached) will be revegetated to either a Coastal Valley Grassy Woodland or with shrubs / ground covers (adjacent to dam areas) in accordance with the vegetation management plan prepared by this firm.

The remainder of the land (outside of the retained vegetation areas) will consist of managed land with the establishment of approximately 148,000 burial spaces as depicted in Figure 1.3.

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 is generally upslope in the north and 0 – 5 degrees downslope within the remainder of the property as detailed in Table 2.1 and 2.2 below.

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site using forest vegetation located within the Greater Sydney region. Table 2.1 provides a summary of the bushfire attack assessment for the multipurpose chapel, function room and repurposed outbuildings which have been assessed as a SFPP development.

Table 2.1 – Bushfire attack assessment (Class 9b buildings)

Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ required equivalent to 10kw/m ² (metres)	APZ provided (metres)	BAL construction standard
Multipurpose Chapel (Class 9b building)					
North, north-east & north-west	Woodland	Level to up slope	40	40	BAL 12.5
South-west	Remnant woodland (refer Note 1)	0-5 ^{OD}	40	40	
South & east	Managed land	N/A	N/A	>100	
Outbuildings (Educational facility)					
North, south, east & west	The land surrounding the existing outbuildings (barn and cottage) will be maintained as lawns and landscaped gardens. There is no bushfire prone vegetation within 100m of the buildings and therefore APZ and BAL standards do not apply.				
Function Centre (Class 6 - refer Note 2)					
South	Woodland	3 ^{OD}	28 (refer Note 3)	28	BAL 12.5
North & north-east	Woodland	0-5 ^{OD}	50	50	
North-west	Woodland	3 ^{OD}	33 (refer Note 3)	33	

Notes: * Slope is either 'u' meaning upslope or 'c' meaning cross slope or 'd' meaning downslope

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 this aspect 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: Although the function centre is considered a Class 6 building, its proposed use will involve gatherings to hold wakes and memorials following funerals held at the cemetery. As a result *TBE* have undertaken a conservative approach to apply asset protection zones and BAL construction standards required for a SFPP development to reduce radiant heat impact to <10kW/m².

Note 3: A performance based assessment using Appendix B of AS3959 was undertaken to determine the required APZ (equivalent to radiant heat impact $<10\text{kW/m}^2$) based on woodland vegetation (PBP fuel loads) on a downslope of 3° and flame width of 25m & 40m. The results of the assessment, provided within Appendix 2, were prepared using the bushfire attack assessor (BFAA) developed by Newcastle Bushfire Consulting.

There are no predetermined minimum APZ requirements for Class 5 – 8 buildings under PBP, however all development must meet the aims and objectives of PBP which includes preventing direct flame contact and material ignition. In addition the BCA does not provide for any bushfire specific performance requirements for Class 5 – 8 buildings and as a result AS3959 does not apply as a set of deemed to satisfy provisions.

The following assessment for the Class 5 – 8 buildings seeks to comply with the aims and objectives of PBP and to provide appropriate defendable space for the buildings. BAL levels have been applied to the administration building and ground staff facility due to its proposed use and occupancy.

Table 2.2 – Bushfire attack assessment (Class 5-8 buildings)

Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ required (29kW/m^2)	APZ provided (metres)	BAL construction standard recommended
Administration building (Class 5)					
South	Remnant woodland (refer Note 1)	4 ^{0D}	11 (refer Note 2)	11	BAL 29
North	Woodland	Level to upslope	16	>19 (includes proposed road)	BAL 19
East and west	Managed land	N/A	N/A	>100	BAL 29
Ground staff facility (Class 8)					
East	Remnant woodland	Level to upslope	11	20	BAL 19
West	Woodland	Level to upslope	16	32	
South	Woodland (proposed regeneration)	0-5 ^{0D}	21	30	
North	Managed land	N/A	N/A	>100	

Gatehouse (Class 5)
This Class 5 building will be used by minimal staff members to direct visitors around the site. Based on the APZ provided, via the proposed parking and road ways, the assessment has not recommended any building construction standards as it is accepted that staff have the capability of safely evacuating during a bushfire event.
Café & Flower Shop(Class 6)
This Class 6 commercial building has been provided with a 10m APZ to avoid flame contact to the building. Based on its commercial use the assessment has not recommended any building construction standards as the aims and objectives of PBP can be achieved through the provision of safe access and effective defendable space being provided.

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 this aspect 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 minimum required APZ based on remnant woodland vegetation (PBP fuel loads) on a downslope of 4°. The results of the assessment, provided within Appendix 2, were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting*.



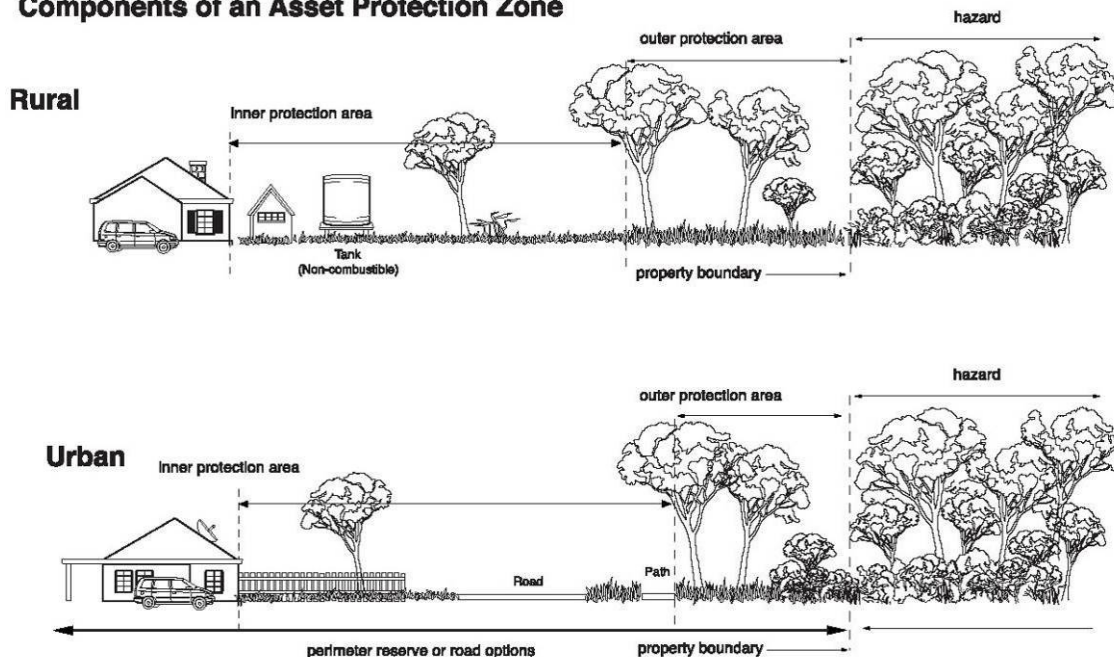
Specific Protection Issues

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.

Although the multipurpose chapel and function room are not considered a SFPP building it should consider the aims and objectives of PBP with the provision of sufficient APZ's to reduce radiant heat exposure to $<10\text{kWm}^2$. In addition the Class 5 – 8 buildings have been provided with adequate asset protection zones to fulfil the aims and objectives of PBP which includes the provision of defensible space and prevention of flame contact and material ignition.

Table 3.1 outlines the proposal's compliance with the performance criteria for APZs.

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.	Complies. The multipurpose chapel, function room and outbuildings are not exposed to radiant heat thresholds >10kWm ² .
Applicant demonstrates that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fire is negated.	Mechanisms are in place to provide for the maintenance of the APZ over the life of the development. The APZ is not located on land with a slope exceeding 18°.	Complies. The APZ's will be maintained by grounds staff.
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 (RFS 2005)</i> .	Complies - to be made a condition of consent.

3.2 Building protection

The BCA does not provide any bushfire specific requirements for Classes 5-8 industrial / commercial buildings. The general fire safety construction provisions are taken as acceptable solutions.

PBP recommends that bushfire construction standards for Classes 5-8 buildings should be considered on a case by case basis. Bushfire construction recommendations are dependent on the level of bushfire risk and the provision of adequate access opportunities.

Based on the proposed use, sufficient APZ and adequate access to the café, gatehouse and proposed re-purposed outbuildings will not require compliance with AS3959.

As outlined in Tables 2.1 & 2.2 the following BAL levels will apply to the remainder of the buildings

- Multipurpose Chapel (Class 9b) – BAL 12.5
- Function room (Class 6) – BAL 12.5
- Administration building (Class 5) – BAL 29 (southern and western elevation) and BAL 19 (northern and eastern elevation)
- Ground staff facility (Class 8)– BAL 19

3.3 Hazard management

Should the development be approved, the owner of the property (or grounds maintenance staff) will be required to manage the APZ in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005) with landscaping to comply with Appendix 5 of *PBP*. In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing / grazing). A summary of the guidelines for managing APZs is attached as Appendix 1 to this report.

It is recommended that a plan of management is prepared for the site which identifies the staging of the development, areas where vegetation is to be retained / rehabilitated as well as the implementation and ongoing maintenance requirements of the asset protection zones.

3.4 Access for fire fighting operations

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

The proposed road network has been designed to allow access to each of the built facilities and various burial and memorial sites throughout the development. All two-way roads are proposed to have parallel parking on both sides and one-way roads to have parallel parking on one side. The primary access point to the development will be provided at the western boundary to provide direct access to the café and gatehouse.

It is proposed to establish a service entry north the main entry point for maintenance purposes (i.e. soil deliveries etc.) only.

The following Figure depicts the road network.

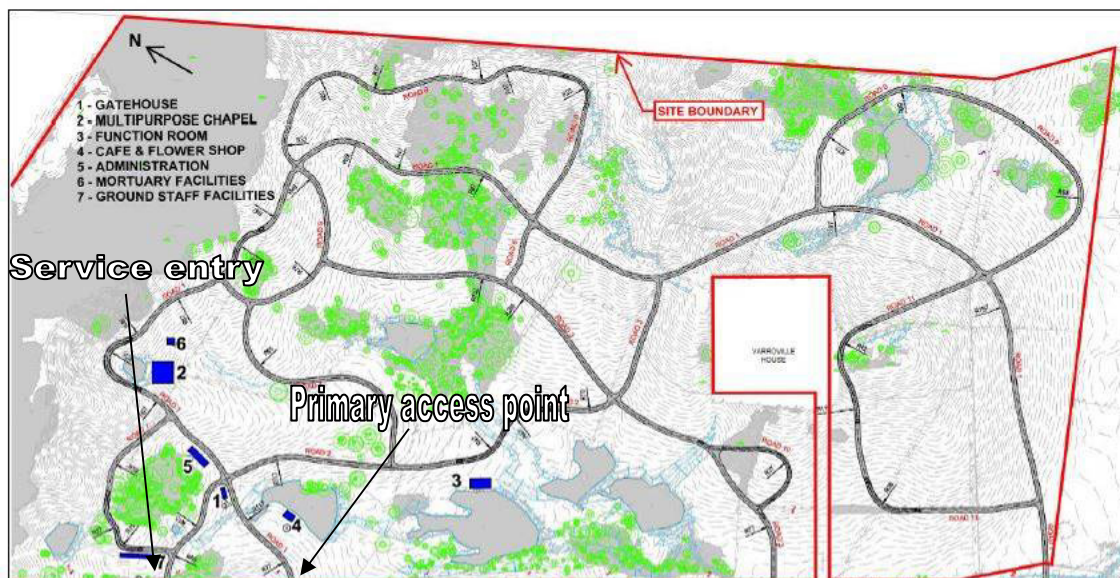


Figure 3.1 – Road Access

Table 3.2 below outlines the proposal's compliance with the performance criteria for public roads.

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

Performance criteria	Acceptable solutions	Complies
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.	Yes
	Internal perimeter roads are provided with at least two traffic lane widths (carriageway 8m minimum curb to curb) and shoulders on each side, allowing traffic to pass in opposite directions.	Yes. An alternative solution has been proposed as detailed below.
	Roads are through roads. Dead end roads are not more than 100m in length from a through road, incorporate a minimum 12m outer radius turning circle, and are clearly sign posted as a dead end.	Yes. All roads are through roads
	Traffic management devices are constructed to facilitate access by emergency services vehicles.	Yes. Can be a condition of consent
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	Yes
	Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.	Yes
	The minimum distance between inner and outer curves is 6m.	Yes
	Maximum grades do not exceed 15° and average grades are not more than 10°.	Yes
	Cross fall of the pavement is not more than 10°.	Yes
	Roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than storm surge).	Yes
	Roads are clearly sign-posted and bridges clearly indicate load ratings.	Yes
	The internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).	Yes

A perimeter road has been identified between the multi-purpose chapel and bushland vegetation in the north. This portion of road will comply with the acceptable solutions (i.e. 8m pavement width with additional provision for parking).

Warren Smith & Partners, consulting engineers have prepared a swept path analysis as part of the pre-DA package submitted to the NSW RFS in April 2017 to determine whether the proposed road widths and curve radii will allow unrestricted firetruck access throughout the site. This information confirmed the proposed road carriageway widths of 6.5m (two-way) and 3.5m (one-way) for all roads regardless of curve radius as well as the 2.1m wide grassed parking bays satisfy the performance criteria which is to enable safe access for emergency services and allow crews to work with equipment about the vehicle.

The NSW RFS reviewed this information and provided approval for the intent of measures (refer Appendix 3).

3.5 Water supplies

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

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

Performance criteria	Acceptable solutions	Complies
Water supplies are easily accessible and located at regular intervals.	<p>Access points for reticulated water supply to SFPP developments incorporate a ring main system for all internal roads.</p> <p>Fire hydrant spacing, sizing and pressures comply with <i>AS2419.1</i>. 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.</p> <p>The provisions of public roads in Section 4.1.3 of <i>PBP</i> in relation to parking are met.</p>	Yes. Alternative solution proposed (refer notes below)

The proposed water services will use a combination of reticulated and non-reticulated water supply as outlined in the pre-DA advice prepared by this firm and approved by the NSW RFS (refer Appendix 3). The proposed buildings (chapel, function room, café & flower shop, administration office, ground staff facilities and outbuildings) will be provided with hydrants in accordance with the requirements of the relevant Australian Standard. Hydrants will be located to ensure a 70m unobstructed path can be provided between the hydrant and all aspects of the buildings.

However hydrants are not proposed to be installed within the remainder of the road system. Given the extent of managed land surrounding the internal road network, the proposed use and limited built assets additional hydrants are not considered necessary.

Additional water supply is proposed and can be provided via the existing dams. Appropriate access for fire fighting vehicles to the dams will be provided via access roads which allow truck access within 4m of the dam.

3.6 Gas

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

Table 3.4 – Performance criteria for gas supplies

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

3.7 Emergency and evacuation planning

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

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

Performance criteria	Acceptable solutions	Complies
An emergency and evacuation management plan is approved by the relevant fire authority for the area.	<p>An emergency / evacuation plan is prepared consistent with the <i>RFS</i> Guidelines for the Preparation of Emergency / Evacuation Plan.</p> <p><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></p>	Complies - can be made a condition of consent.
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	<p>An emergency planning committee is established to consult with staff in developing and implementing and emergency procedures manual.</p> <p>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.</p>	Complies - can be made a condition of consent.



Conclusion & Recommendations

4

4.1 Conclusion

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed staged construction of Macarthur Memorial Park on a 113 hectare property at 166-176 St Andrew Road, Varroville.

Our assessment found that bushfire can potentially affect future buildings on site from the woodland vegetation proposed to be retained and rehabilitated on site, resulting in possible ember attack, radiant heat and potentially flame attack.

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

The assessment has concluded that the proposed development will provide compliance with *Planning for Bushfire Protection (PBP) 2006* with the following proposed alternative solutions:

- Road carriageway widths of 6.5m (two-way) and 3.5m (one-way) for all roads regardless of curve radius as well as 2.1m wide grassed parking bays in accordance and in compliance with the pre-DA advice received from the NSW RFS (refer Appendix 3).
- The proposed water services will use a combination of reticulated and non-reticulated water supply. The proposed buildings will be provided with hydrants in accordance with the BCA requirements. Hydrants are not proposed to be installed within the remainder of the road system. In compliance with the pre-DA advice received from the NSW RFS additional water supply is proposed and can be provided via the existing dams.

4.2 Recommendations

Recommendation 1 - APZs are to be provided to the proposed development as outlined in Table 2.1 & 2.2 and depicted in Schedule 1.

Recommendation 2 - Fuel management within the APZs is to be maintained by regular maintenance of the landscaped areas, mowing of lawns in accordance with the guidelines provided in Appendix 1, and / or as generally advised by the RFS in their publications.

It is recommended that a plan of management is prepared for the site which identifies the staging of the development, areas where vegetation is to be retained / rehabilitated as well as the implementation and ongoing maintenance requirements of the asset protection zones.

Recommendation 3 – Building construction standards are to be applied in accordance with *AS3959 Construction of buildings in bushfire prone areas (2009)* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 *PBP*.

Based on the proposed use, sufficient APZ and adequate access the café, gatehouse and proposed re-purposed outbuildings will not require compliance with AS3959.

The following BAL levels will apply to the remainder of the buildings

- Multipurpose Chapel (Class 9b) – BAL 12.5
- Function room (Class 6) – BAL 12.5
- Administration building (Class 5) – BAL 29 (southern and western elevation) and BAL 19 (northern and eastern elevation)
- Ground staff facility (Class 8)– BAL 19

Recommendation 4 – Water supply is to comply with the performance criteria outlined Section 4.2.7 of *PBP*.

The proposed buildings (chapel, function room, café & flower shop, administration office, ground staff facilities and outbuildings) are to be provided with hydrants to ensure a 70m unobstructed path can be provided between the hydrant and all aspects of the buildings.

Additional water supply is provided via the existing dams. Appropriate access for fire fighting vehicles to the dams is to be provided via access roads which allow truck access within 4m of the dam.

Recommendation 5 – Access is to comply with the performance criteria outlined Section 4.2.7 of *PBP*. The proposed perimeter road (adjacent to the multipurpose chapel) is 8m. The remainder of the carriageway widths are 6.5m (two-way) and 3.5m (one-way) regardless of curve radius. Parking bays are 2.1m wide.

Recommendation 6 – Electricity and gas supply is to comply with the acceptable solutions as provided within Section 4.2.7 of *PBP*.

Recommendation 7 – An emergency / evacuation plan will need to be prepared consistent with the *RFS Guidelines for the Preparation of Emergency / Evacuation Plan* prior to building occupation.

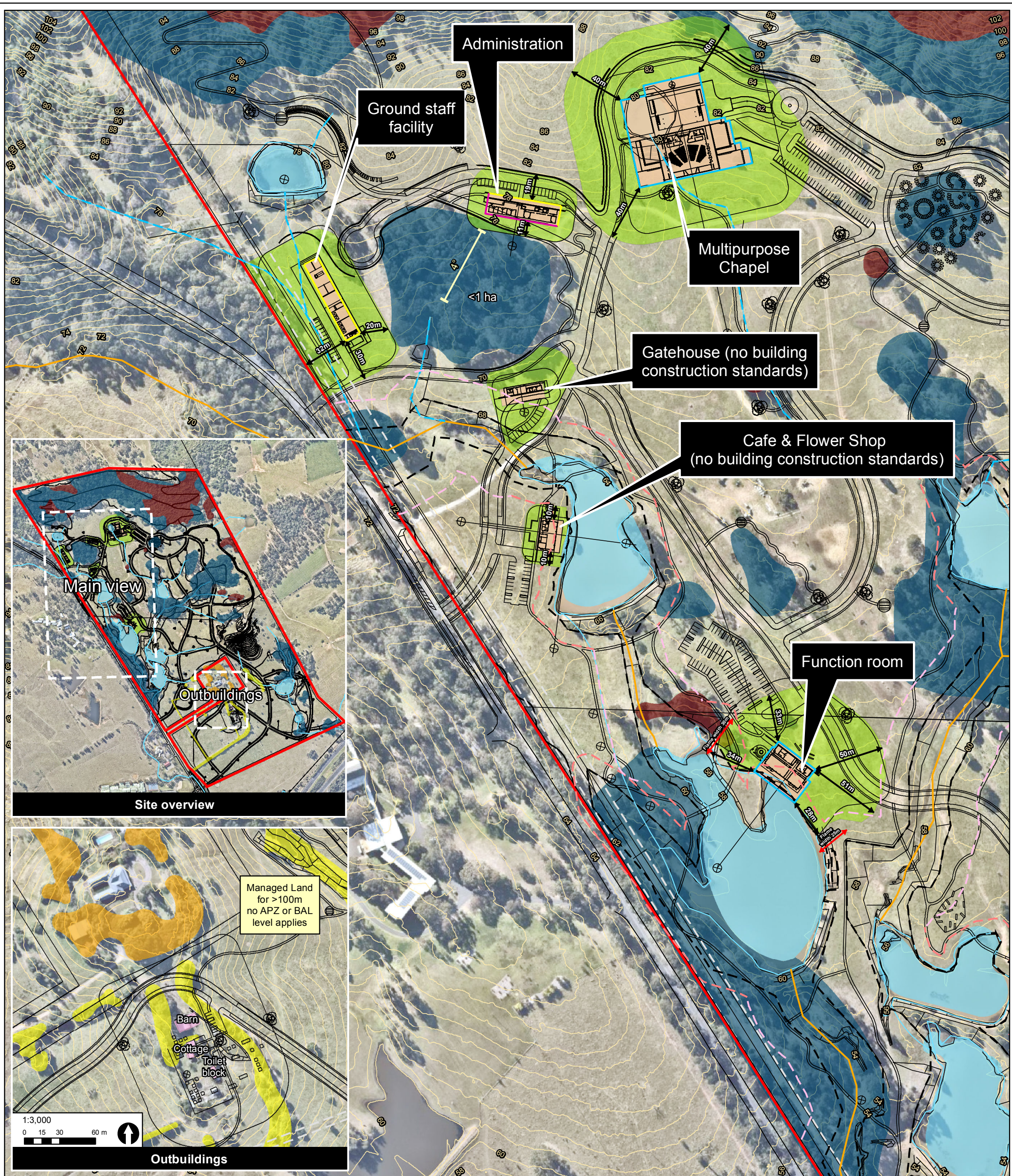
REFERENCES

- Australian Building Codes Board (2010) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2
- Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research
- Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bush fire-prone areas*
- Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change
- Rural Fire Service (2006) - *Planning for bushfire protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service
- Rural Fire Service (2006) - Bushfire Attack Software on RFS web site
- Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack*. RFS Development Control Service



Plan of Bushfire Protection Measures

S1



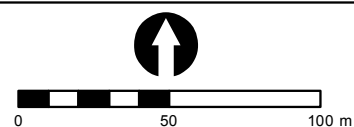
PROJECT & MXD REFERENCE
St Andrews Road, Varroville
A16228_BF003

DATE & ISSUE NUMBER
20/09/2017
Issue 1

SCALE & COORDINATE SYSTEM
1:2,500 @ A3
GDA 1994 MGA Zone 56

TITLE
Schedule 1 - Bushfire Protection Measures

Document Path: N:\GIS STORAGE\N Drive\A16228 St Andrews Rd Varroville\MXD\A16228_BF003.mxd



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



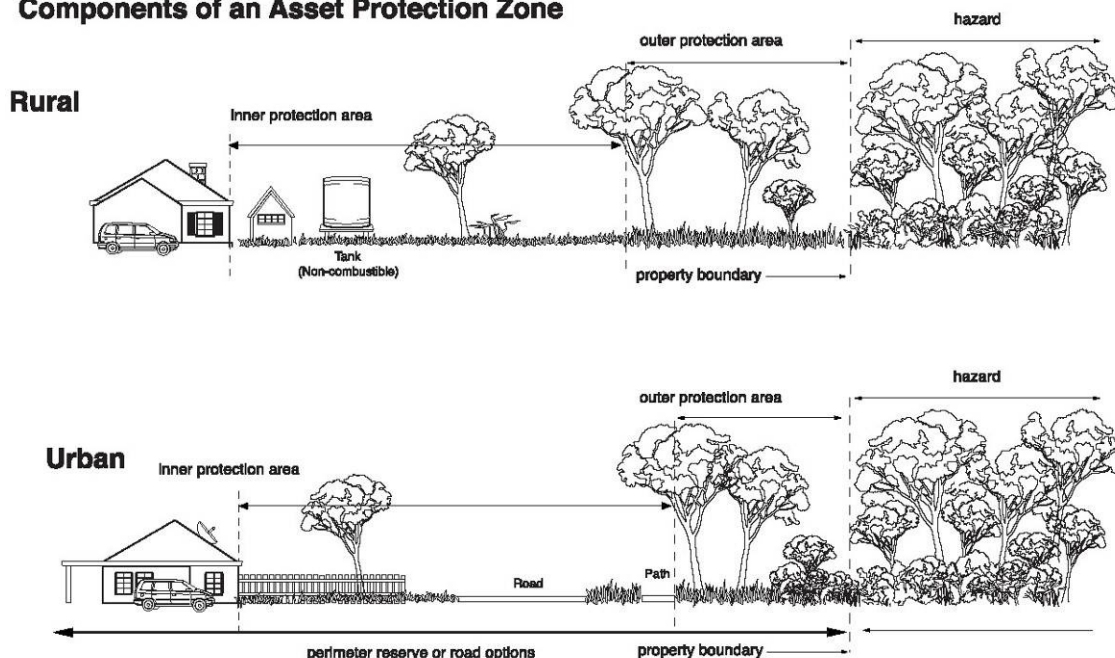
Management of Asset Protection Zones

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 APZ's are to be maintained as an inner protection area. The following provides maintenance advice for vegetation within the inner protection areas.

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% (at maturity)
- Trees (at maturity) should not touch or overhang the building
- Lower limbs should be removed up to a height of 2m above ground

- Preference should be given to smooth barked and evergreen trees

Shrubs are to be maintained to ensure;

- Create large discontinuities or gaps in vegetation to slow down or break the progress of fire towards buildings
- Shrubs should not be located under trees
- Shrubs should not form more than 10% of ground cover in the APZ area
- Shrubs should be in clumps no greater than 5m²
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of vegetation

Grass is to be maintained to ensure:

- Should be kept mown (as a guide grass should be kept to no more than 100mm in height.
- Leaves and vegetation 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: 12/08/2017 Assessment Date: 15/05/2017

Site Street Address: 166-176 St Andrews Road, Varroville

Assessor: Mr Admin; admin

Local Government Area: Blacktown

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 Function Room (south)

Vegetation Information

Vegetation Type: Woodland

Vegetation Group: Forest and Woodland

Vegetation Slope: 3 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 10

Overall Fuel Load(t/ha): 15

Site Information

Site Slope: 2 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 28

Fire Inputs

Veg./Flame Width(m): 25

Flame Temp(K): 1200

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg): 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Category of Attack: LOW

Peak Elevation of Receiver(m): 4.44

Level of Construction: BAL 12.5

Fire Intensity(kW/m): 11439

Radiant Heat(kW/m2): 9.69

Flame Angle (degrees): 72

Flame Length(m): 11.39

Maximum View Factor: 0.106

Rate Of Spread (km/h): 1.48

Inner Protection Area(m): 28

Transmissivity: 0.823

Outer Protection Area(m): 0

Run Description: B Function Room (North-west)	
<u>Vegetation Information</u>	
Vegetation Type:	Woodland
Vegetation Slope:	3 Degrees
Surface Fuel Load(t/ha):	10
Vegetation Group:	Forest and Woodland
Vegetation Slope Type:	Downslope
Overall Fuel Load(t/ha):	15
<u>Site Information</u>	
Site Slope	3 Degrees
Elevation of Receiver(m)	Default
Site Slope Type:	Downslope
APZ/Separation(m):	33
<u>Fire Inputs</u>	
Veg./Flame Width(m):	40
Flame Temp(K)	1200
<u>Calculation Parameters</u>	
Flame Emissivity:	95
Heat of Combustion(kJ/kg)	18600
Moisture Factor:	5
Relative Humidity(%):	25
Ambient Temp(K):	308
FDI:	100
<u>Program Outputs</u>	
Category of Attack:	LOW
Level of Construction:	BAL 12.5
Radiant Heat(kW/m2):	9.92
Flame Length(m):	11.39
Rate Of Spread (km/h):	1.48
Transmissivity:	0.81
Peak Elevation of Receiver(m):	3.82
Fire Intensity(kW/m):	11439
Flame Angle (degrees):	77
Maximum View Factor:	0.11
Inner Protection Area(m):	33
Outer Protection Area(m):	0
Run Description: C Administration Building	
<u>Vegetation Information</u>	
Vegetation Type:	Remnant Vegetation
Vegetation Slope:	4 Degrees
Surface Fuel Load(t/ha):	8
Vegetation Group:	Remnant Vegetation
Vegetation Slope Type:	Downslope
Overall Fuel Load(t/ha):	10
<u>Site Information</u>	
Site Slope	0 Degrees
Elevation of Receiver(m)	Default
Site Slope Type:	Level
APZ/Separation(m):	11
<u>Fire Inputs</u>	
Veg./Flame Width(m):	100
Flame Temp(K)	1090
<u>Calculation Parameters</u>	
Flame Emissivity:	95
Heat of Combustion(kJ/kg)	18600
Moisture Factor:	5
Relative Humidity(%):	25
Ambient Temp(K):	308
FDI:	100
<u>Program Outputs</u>	
Category of Attack:	HIGH
Level of Construction:	BAL 29
Radiant Heat(kW/m2):	28.19
Flame Length(m):	9.42
Rate Of Spread (km/h):	1.27
Transmissivity:	0.868
Peak Elevation of Receiver(m):	4.23
Fire Intensity(kW/m):	6537
Flame Angle (degrees):	64
Maximum View Factor:	0.427
Inner Protection Area(m):	11
Outer Protection Area(m):	0



NSW RFS pre DA Advice

A3



NSW RURAL FIRE SERVICE



PRE-DA ADVICE SUMMARY

Applicant: John Travers, Travers Bushfire & Ecology

Subject: 166-176 St Andrews Road, Varroville
RFS Ref. DOC17/38466

Details of the proposal

☒ Other Cemetery

Bush fire protection issues discussed

- ☒ Access ➤ Alternate solution for road widths and water provision on the basis of the limited bush fire hazard at the site / large extent of management proposed, and low occupancy nature of the proposed use.
- ☒ Services

Documentation / plans referenced

Letter, Travers Bushfire & Ecology, A17003B:NVD/JT, 5 April 2017-04-21
Proposed Road Design, Warren Smith & Partners, 5162001, 4 April 2017, Rev 3

Advice Provided

- No objection is held in principle to the proposed approach set out in the above documents. The proposals shall be set out as an alternate solution in the bush fire report prepared for the future development application for the proposal.

Disclaimer

RFS advice is based on information provided and policy and legislative requirements applicable at the time. The advice should be copied into, or referenced in, any subsequent development application.

All efforts are made to identify issues of relevance and likely concern with the preliminary proposal. However, the comments and views in this document are based only on the plans and information submitted for preliminary assessment and discussion at the pre-DA meeting. You are advised that: -

- The views expressed may vary once detailed plans and information are submitted and formally assessed in the development application process, or as a result of issues contained in submissions by interested parties;
- Given the complexity of issues often involved and the limited time for full assessment, no guarantee is given that every issue of relevance will be identified;
- Amending one aspect of the proposal could result in changes which would create a different set of impacts from the original plans and therefore require further assessment and advice; and,
- The Pre-DA advice given does not bind Council officers, the elected Council members, or other parties to the DA process.

Signed:

Jason Maslen
Team Leader,
Development Assessment and Planning

Date: 21 April 2017