Travers

bushfire & ecology

bushfire protection assessment

Proposed Subdivision
Lot 72 DP 706546
51 St Andrews Road, Leppington

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

FPA AUSTRALIA
Certified Business
Bushfire Planning & Design

September 2014
(REF: A14009)

Bushfire Protection Assessment

Proposed Subdivision
Lot 72 DP 706546
51 St Andrews Road, Leppington

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File:	A14009

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

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EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the proposed staged residential subdivision of Lot 72 DP 3706546, 51 St Andrews Road, Leppington. The proposed subdivision forms part of the East Leppington Precinct which is part of the South West Growth Centres.

The development is categorised by the NSW Rural Fire Service (RFS) as being a residential subdivision and this requires the RFS to issue a bushfire safety authority (BSA) in accordance with *Planning for Bush Fire Protection 2006 (PBP).*

PBP dictates that the subsequent extent of bushfire attack that can potentially impact a building must not exceed a radiant heat flux of 29kW/m^2 for residential subdivision development. This rating assists in determining the size of the asset protection zone (APZ), to provide the necessary defendable space between hazardous vegetation and a building.

The assessment found that bushfire can potentially affect the proposed development from the unmanaged woodland vegetation located external to the site's south-western boundary. The risk posed by this vegetation however will be reduced with the construction / upgrade of St Andrew Road which will occur concurrently with Stage 3 works.

The assessment has concluded that the proposed development will provide:

- compliance with *PBP*

Other bushfire protection measures are planned and identified within the recommendations of this report.

GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BCA	*Building Code of Australia*
BSA	bushfire safety authority
CRZ	core riparian zone
EP&A Act	*Environmental Planning & Assessment Act 1979*
FDI	fire danger index
IPA	inner protection area
LEP	Local Environmental Plan
LGA	local government area
OPA	outer protection area
PBP	*Planning for Bush Fire Protection 2006*
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
SEPP	state environmental planning policy
SFPP	special fire protection purpose

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Introduction 1

Travers bushfire & ecology has been requested by *SMEC Urban* to undertake a bushfire protection assessment for the proposed residential subdivision of Lot 72 DP 706546, 51 St Andrews Road, Leppington.

The proposed subdivision is located on land mapped by Camden 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

It is proposed to subdivide Lot 72 DP 706546 to create two hundred and fifteen (215) residential allotments (refer Figure 1.1). St Andrews Road (adjoining the sites south-western boundary) will be constructed by Cornish Group at the same time as Stage 3 is developed.

The proposed subdivision forms part of the East Leppington Precinct which is part of the South West Growth Centres. The Indicative Layout Plan (refer Figure 1.2) illustrates the broad level development outcomes for the East Leppington Precinct such as the development footprint, land uses, open space, major transport linkages and community facilities.

Schedule 1 shows the proposed subdivision's bushfire protection measures, including APZs.

Figure 1.1 – Plan of proposed subdivision

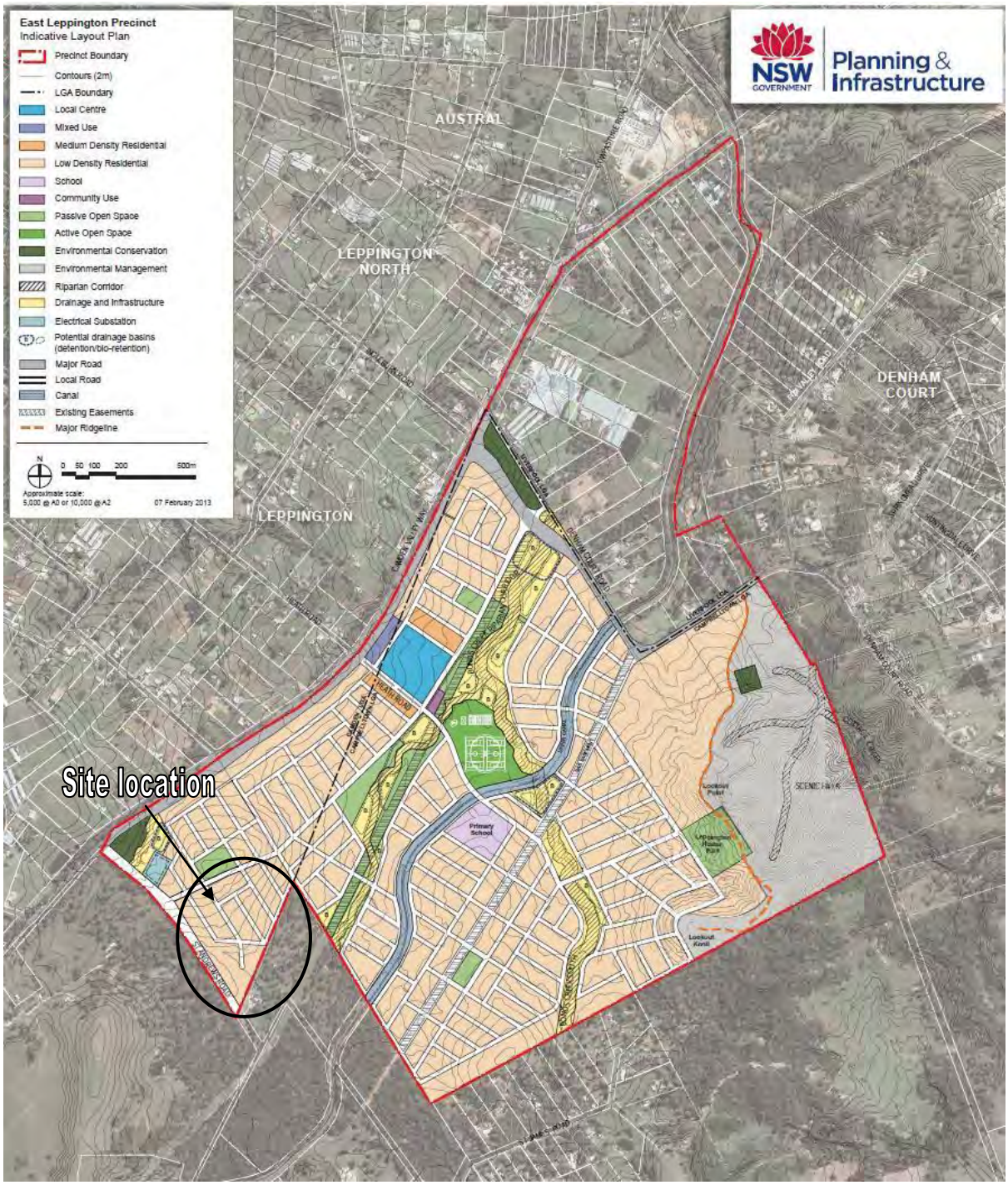

Figure 1.2 – Indicative Layout Plan

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:

- Stages 1 – 3 - Plan of proposed subdivision prepared by *SMEC Urban, January 2013*
- Camden Growth Centres Draft DCP, *October 2011*
- *Google* 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 (PBP).*

An inspection of the proposed development site and surrounds was undertaken by John Travers in January 2014 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 located on the north-eastern side of St Andrews Road approximately 400m from its intersection with Camden Valley Way, Leppington within the local government area (LGA) of Camden (refer Figure 1.3).

The site is bound by existing large lot residential land to the south-east and south-west. The land adjoining the northern and north-eastern boundary has been recently cleared (refer Figures 1.4) and is subject to a recently submitted development application by *Stockland* for a residential subdivision in accordance with the indicative layout plan (refer Figure 1.2).

Figure 1.3 – Topography

Figure 1.4 – Aerial appraisal

1.5 Legislation and planning instruments

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

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *Building Code of Australia (BCA)*. The identification of bushfire prone land is required under Section 146 of the *EP&A Act*.

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed development is located on land that is mapped by Camden Council as being bushfire prone.

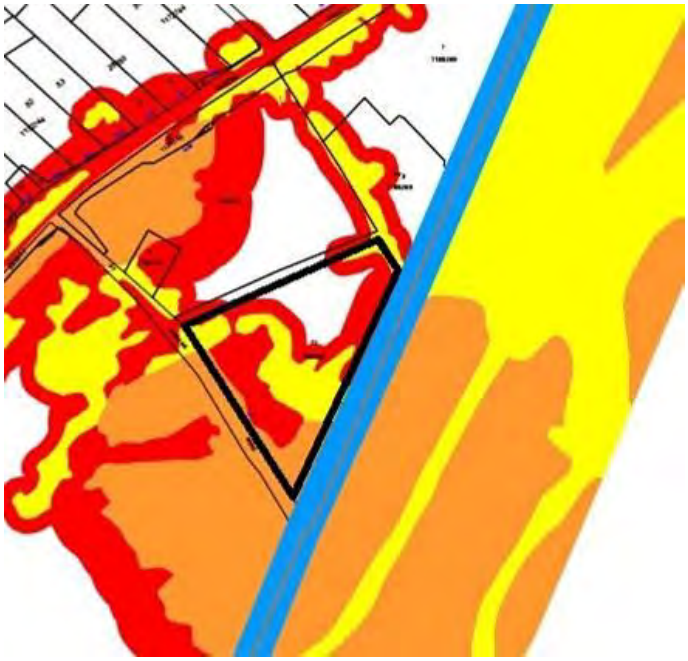

Figure 1.5 – Bushfire Prone Land Map (Source: Camden Council)

The proposed development is an integrated development under Section 91 of the *EP&A Act 1979*. Consequently, the proposed residential development will require a bushfire safety authority (BSA) from the NSW Rural Fire Service (RFS). The Commissioner must be satisfied that the proposal complies with *PBP* before granting a BSA.

1.5.3 Rural Fires Act (RF Act)

This legislation is concerned with the prevention and control of bushfire, hazard reduction and administration. Section 100B of the *Rural Fires Act* states that the Commissioner may issue a BSA for a subdivision development on bushfire prone land.

1.5.4 State Environmental Planning Policy (Sydney Region Growth Centres) 2006

The proposed subdivision is located within the south-western portion of the East Leppington Precinct and has been recently rezoned for urban development.

The Growth Centres SEPP and the relevant precinct plan provide the statutory planning control for development in the precinct.

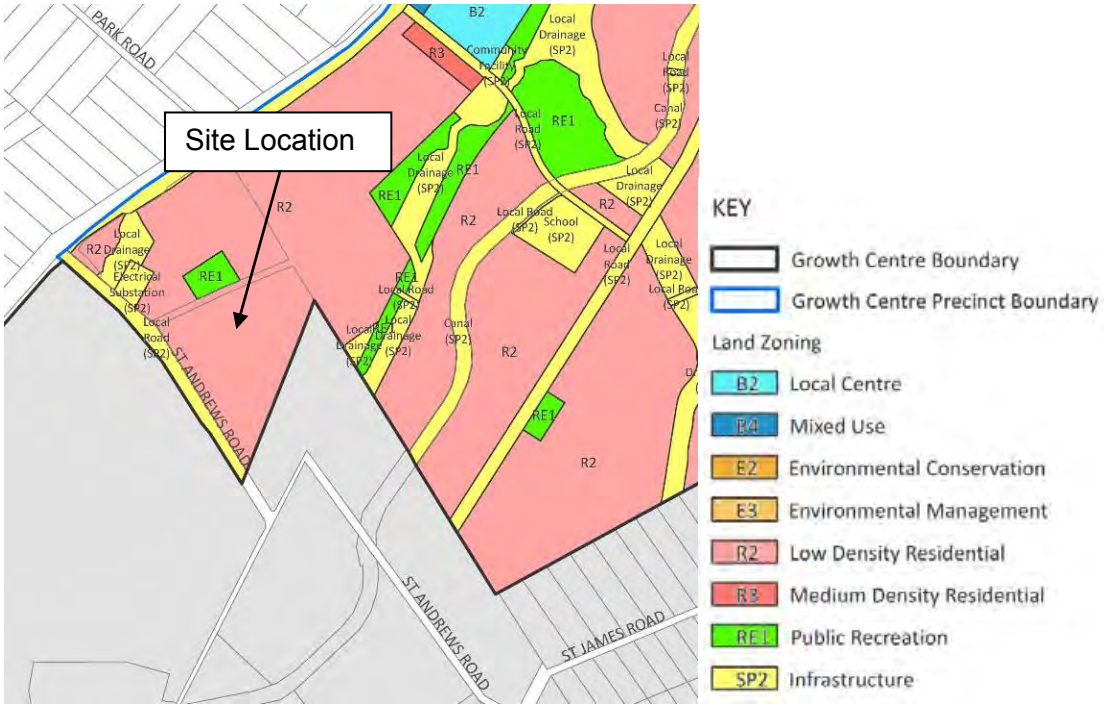

Figure 1.6 – East Leppington Precinct – South West Growth Centre Land Zoning Map (source: Growth Centres SEPP, 2006)

The site and adjoining lands are zoned under the Growth Centres SEPP (2006) as R2 – Low Density Residential. The RE1 zoned land to the north is proposed as a future park and is clear of vegetation.

The proposal, including the provision of APZs, is consistent with the objectives of the zoning.

1.5.5 Camden Growth Centres Development Control Plan (DCP) Draft 2011

The DCP was prepared to provide additional objectives, controls and guidance to applicants proposing to undertake development in the South West Growth Centre Precincts.

Section 2.3.6 of the DCP outlines the bushfire hazard management objectives and controls for development within the precinct. These controls are:

1. Reference is to be made to *Planning for Bush Fire Protection 2006* in subdivision planning and design and development is to be consistent with *Planning for Bush Fire Protection 2006*, except where varied by controls that follow.

2. Subject to detailed design at development application stage, the indicative location and widths of asset protection zones (APZs) are to be provided generally in accordance with the Bushfire Risk and Asset Protection Zone Requirements figure in the relevant Precinct Schedule. APZs and construction standards are to be accurately mapped and detailed for each affected lot on plans submitted with the development application.

3. APZs:
   - are to be located wholly within the Precinct;
   - may incorporate roads and flood prone land,

- are to be located wholly outside of a core riparian zone (CRZ) but may be located within the vegetated buffer
- may be used for open space and recreation subject to appropriate fuel management,
- are to be maintained in accordance with the guidelines in *Planning for Bush Fire Protection 2006,*
- may incorporate private residential land, but only within the building setback (no dwellings are to be located within the APZ),
- are not to burden public land except where consistent with control 4 below, and are to be generally bounded by a public road or perimeter fire trail that is linked to the public road system at regular intervals in accordance with *Planning for Bush Fire Protection 2006*.

4. Vegetation outside core Riparian Protection Area, Native Vegetation Protection Areas and Existing Native Vegetation is to be designed and managed as a 'fuel reduced area'.

5. Where an allotment fronts and partially incorporates an APZ it shall have an appropriate depth to accommodate a dwelling with private open space and the minimum required APZ. The APZ will be identified through a Section 88B instrument

6. Temporary APZs, identified through a Section 88B instrument, will be required where development is proposed on allotments next to undeveloped land that presents a bushfire hazard. Once the adjacent stage of development is undertaken, the temporary APZ will no longer be required and shall cease.

7. Reticulated water is to meet the standards contained within *Planning for Bush Fire Protection 2006.* Water supply is to be via a ring main system, engineered to the requirements of Australian Standard 2419.1-1994 Fire Hydrant Installations.

8. Buildings adjacent to APZs are to be constructed in accordance with the requirements of Appendix 3 of *Planning for Bush Fire Protection 2006* and *Australian Standard 3959-1999 - Construction of Buildings in Bushfire-prone Areas.*

1.5.6 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *PBP. PBP* provides planning controls for building in bushfire prone areas as well as guidance on effective bushfire protection measures. The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment. *PBP* outlines the following general objectives that must be achieved for all development, as well as the specific objectives for subdivision development.

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

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

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

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

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

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

More specifically, the objectives for subdivision development are to:

7. Minimise the perimeters of the subdivision exposed to the bushfire hazard

8. Minimise bushland corridors that permit the passage of fire

9. Provide for the siting of future dwellings away from ridge tops and steep slope, particularly up slopes, within saddles and narrow ridge crests.

10. Ensure that separation distances (APZs) between the bushfire hazard and future dwellings enable conformity with the deemed to satisfy requirements of the *BCA.*

11. Provide and locate, where the scale of development permits, open space and public recreation areas as accessible public refuge areas or buffers (APZs)

12. Ensure the ongoing management of APZs

13. Provide clear and ready access from all properties to the public road system for residents and emergency services

14. Ensure the provision and adequate supply of water and other services to facilitate effective fire fighting.

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.

1.5.7 Building Code of Australia and the Australian Standards 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. For residential dwellings these include Classes 1, 2 & 3 buildings. The construction manual for the deemed to satisfy requirements is *AS3959*.

1.6 Environmental constraints

Significant environmental studies were undertaken during the rezoning of the East Leppington Precinct. The following figure identifies key elements of the water cycle management and open space.

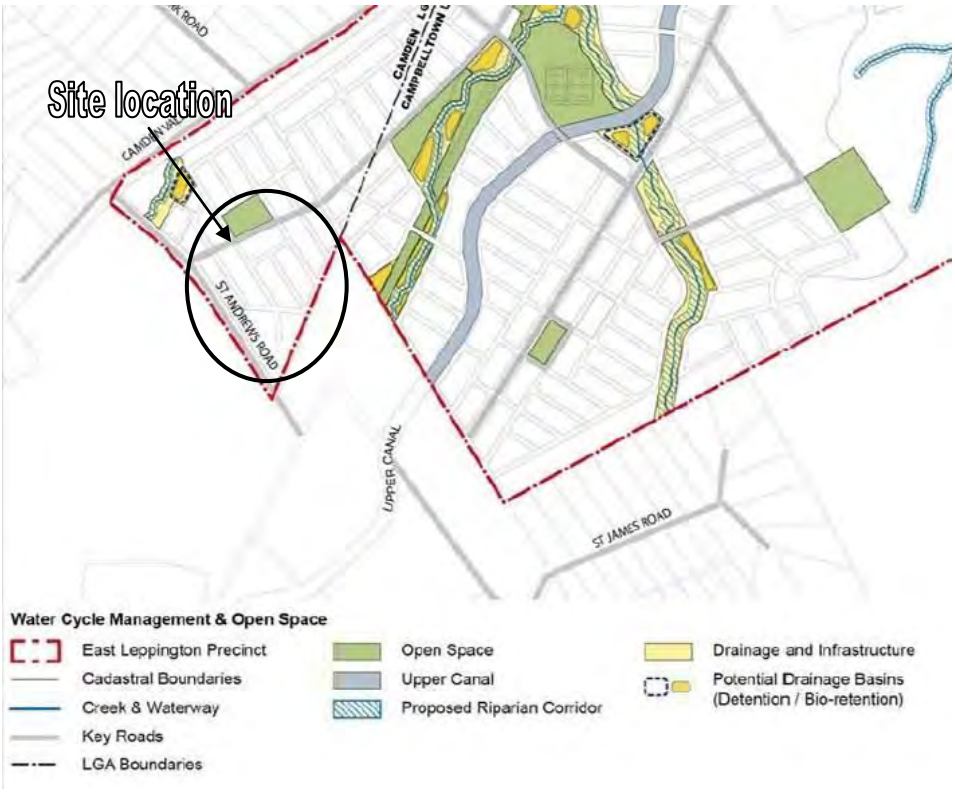

Figure 1.7 – Key elements of the water cycle management and open space
(Source: East Leppington – Schedule 1, 2012)

The proposed asset protection zones are located wholly outside of vegetation identified as proposed riparian corridor and fuel management will not impact on this vegetation in any way.

1.7 Cultural constraints

A review of the Development Control Plan for East Leppington has revealed that the property is not identified as having potential Aboriginal archaeological significance.

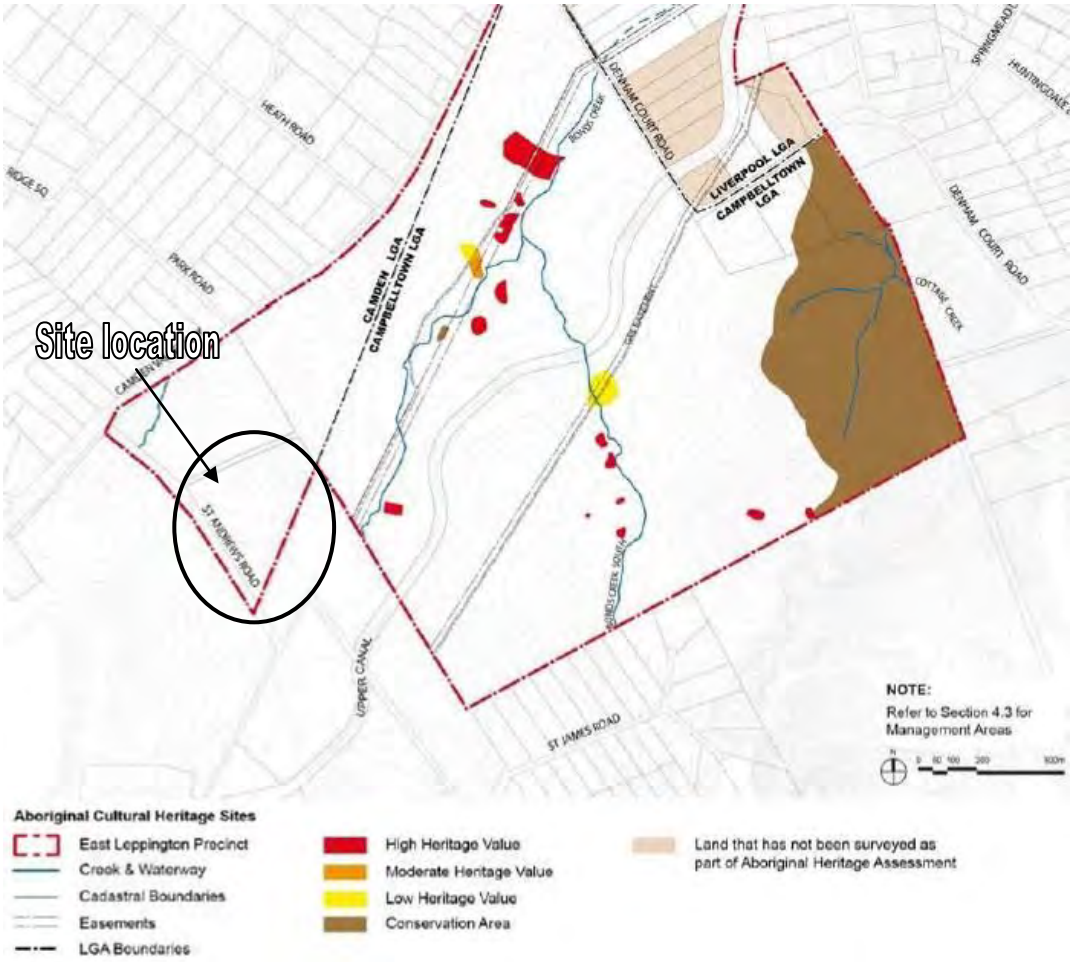

Figure 1.8 – Aboriginal cultural heritage
(Source: East Leppington – Schedule 1, 2012)

Bushfire Threat Assessment

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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 subdivision developments. However, when determining construction standards in accordance with *AS3959,* AUSLIG Pictorial Analysis is used to determine the vegetation and hence building construction standards (refer Section 3.2 of this report). The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

The closest vegetation posing a bushfire threat to the site is the grassy woodland vegetation external to the site's south-western boundary. The bushfire threat posed from this aspect will be reduced by the upgrading of St Andrews Road which is being undertaken by Cornish Group at the same time as Stage 3 is developed

The remaining land, within 140m of the dwellings, is not considered a bushfire threat as it consists of a managed landscape with mown grass and scattered trees (south-east) with the land to the north-west and north-east recently cleared for the construction of a residential subdivision.

Photo 1 – Woodland vegetation to south-west

Photo 2 – Recently cleared land to the north-east

Photo 3 – St Andrews Road (adjoining the site's south-western boundary) – to be upgraded by Cornish Group at the same time as Stage 3 constructions.

Photo 4 – Managed land to the east of the site

Photo 5 – Managed land to the north-west of the site

2.2 Effective slope

The effective slope is assessed for a distance of 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 grassy woodland vegetation is as following:

- Level to upslope to the south-west

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site based on its location within the Greater Sydney region. Table 2.1 provides a summary of the bushfire attack assessment. Column 4 identifies the minimum required APZs to ensure appropriate setbacks in accordance with BAL 29, whilst column 6 identifies the APZs provided.

Table 2.1 – Bushfire attack assessment

Aspect	Vegetation formation within 140m of development	Effective slope of land	APZ required (to ensure <BAL 29 (metres)	APZ provided (metres)
North-west	Cleared / current DA submitted to council	0-5° [D]	N/A	>100
North-east	Cleared / current DA submitted to council	0-5° [D]	N/A	>100
South-east	Managed / mown grass / scattered trees / subject to future rezoning	0-5° [D]	N/A	>100
South-west	Grassy Woodland	Level to upslope	16	16 (includes St Andrews Road) **(refer Note 1)**

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

Note 1 – The APZ provided to the south-west includes the final constructed road width of St Andrews Road, the associated footpath and batter which will be constructed by Cornish Group at the same time as Stage 3 development.

Specific Protection Issues

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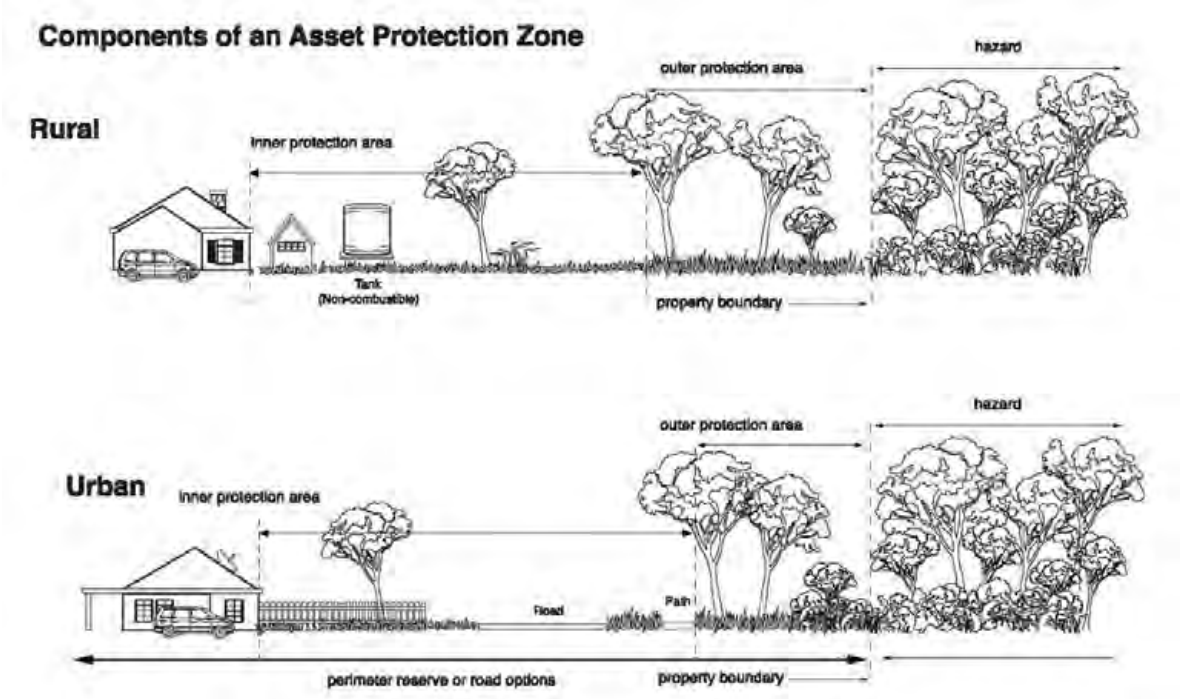
3.1 Asset protection zones

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



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

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

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of $29kW/m^2$ for residential subdivision developments. This rating assists in determining the size of the APZ to provide the necessary defendable space between hazardous vegetation and a building.

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

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

Performance criteria	Acceptable solutions	Complies
Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2	APZs are provided in accordance with Appendix 2 APZs are wholly within the boundary of the development site	Yes – APZs comply with these minimum requirements
APZs are managed and maintained to prevent the spread of fire towards the building	In accordance with the requirements of *Standards for Asset Protection Zones* (RFS 2005)	Yes – can be made a condition of consent
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	The APZ is located on lands with a slope of less than 18^o	Yes. APZs are located on slopes less than 18^o

3.2 Building protection

The construction of buildings in bushfire prone areas is subject to stringent rules pertinent to the building envelope being located on the non-hazardous side of the APZ. The role of the APZ is to provide a safe space to separate the hazard from the building. In terms of subdivision approval, the minimum APZ must be provided in accordance with Appendix 2 of *PBP*. The APZs provided in Section 2.3 of this report comply with these requirements.

The NSW RFS has released an interim amendment to *PBP* in the form of Appendix 3. This amendment follows the adoption on 1 May 2010 of *AS3959* through the *BCA*. This appendix, in conjunction with Table 2.4.2 of AS3959, is used to determine construction considerations when building on bushfire prone land.

The construction classification system is based on five (5) bushfire attack levels (BAL). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 (AS3959 (2009) – *Construction of buildings in bushfire-prone areas*). 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 APZ to the south-west, as depicted in Schedule 1, is based on BAL 29 building construction ensuring subdivision approval. BAL levels will be determined prior to building construction subject to Section 79BA of the *EP&A Act* or the Code's SEPP.

3.3 Hazard management

Should the development be approved, the owner or occupier of each lot 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.

3.4 Access for fire fighting operations

Access to the site is provided via the existing St Andrews Road which runs parallel to the south-western boundary. Future access will also be provided from the subdivision in the north-west which has been recently submitted to council.

The Camden Growth Centres DCP outlines the following road hierarchy for the subdivision.

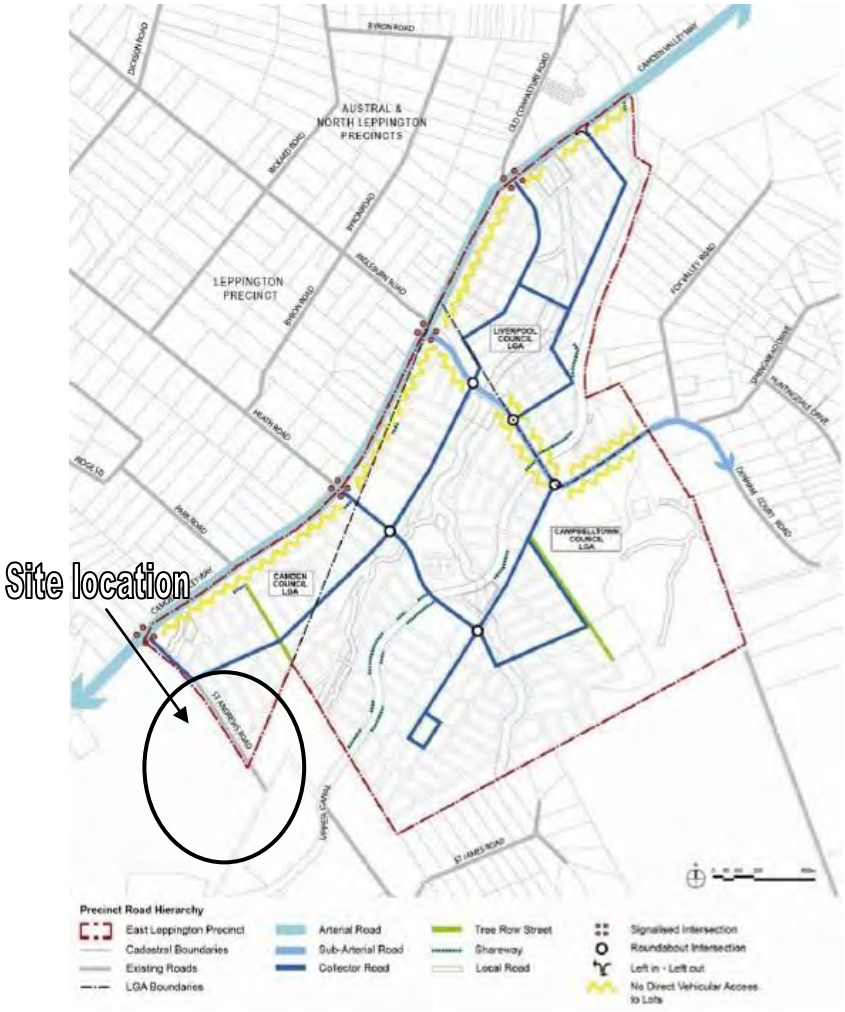


Figure 3.1 – Precinct road hierarchy
(Source: Camden Growth Centres DCP, 2011)

Table 3.3 – Performance criteria for public roads (PBP guidelines pg. 20)

Performance criteria	Acceptable solutions	Complies
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources).	Public roads are two-wheel drive, all weather roads.	Yes
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area.	Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.4. Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3^{o}. All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard. Curves of roads (other than perimeter) have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6m. Maximum grades for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o}. Minimum vertical clearance of 4m above the road at all times.	Yes

Table 3.3 – Performance criteria for public roads (PBP guidelines pg. 20)

Performance criteria	Acceptable solutions	Complies
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles.	The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (15 tonnes for reticulated water and 28 tonnes for all other areas). Bridges clearly indicate load rating.	Yes – Can be made a condition of consent.
Roads that are clearly sign posed (with easily distinguishable names) and buildings / properties that are clearly numbered.	Public roads >6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water. Public roads 6.5 - 8m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5m wide provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water. One way only public access are no less than 3.5m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.	Yes – Can be made a condition of consent.
There is clear access to reticulated water supply. Parking does not obstruct the minimum paved width	Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within parking bays. Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.	Yes – Can be made a condition of consent.

Table 3.4 – Minimum widths for public roads that are not perimeter roads (*PBP* guidelines pg. 20)

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

3.5 Water supplies

Town reticulated water supply is available to the proposed subdivision. Table 3.5 outlines the required performance criteria for water supply.

Table 3.5 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions	Complies
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 *AS2419.1*. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. 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. The provisions of public roads are met.	Complies - can be made a condition of consent.

3.6 Gas

Table 3.6 outlines the required performance criteria for gas supply.

Table 3.6 – Performance criteria for gas supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions	Complies
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings.	Reticulated or bottled gas bottles are to be installed and maintained in accordance with AS1596 – 2002 and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side of the installation. If gas cylinders are to be kept close to the building the release valves must be directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.	Yes – any future gas supply is to comply with this acceptable solution.

3.7 Electricity

Table 3.7 outlines the required performance criteria for the subdivision's electricity supply.

Table 3.7 – Performance criteria for electricity services (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions	Complies
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings Regular inspection of lines in undertaken to ensure they are not fouled by branches.	Where practicable, electrical transmission lines are underground Where overhead electrical transmission lines are proposed: • Lines are installed with short pole spacing (30m), 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 specification in *Vegetation Safety Clearances* issued by *Energy Australia* (NS179, April 2002)	Can be made a condition of consent.

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the proposed residential subdivision of Lot 72 DP 3706546, 51 St Andrews Road, Leppington.

The assessment found that bushfire can potentially affect the proposed development from the unmanaged woodland vegetation located external to the sites south-western boundary.

The bushfire risk posed to the development can however be mitigated as appropriate bushfire protection measures are in place and will be managed in perpetuity.

The assessment has concluded that the proposed development will provide:

- compliance with *PBP*

The following illustrates the proposal's compliance with *PBP.*

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

> Response: The entire property is to be managed to the standards of an APZ and the distances provided between the subdivision and the bushland vegetation complies with the minimum requirements.

Provide for a defendable space to be located around buildings

> Response: APZs comply with the minimum requirements and provide appropriate defendable space.

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

> Response: The entire property is managed in accordance with *PBP*. Future dwellings are to be constructed in accordance with *AS3959*.

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

> Response: Access complies with the performance requirement of Section 4.1.3 (1) of *PBP.*

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

> Response: Fuel management can be undertaken by the land owners under the guide of Appendix 1 and as outlined within NSW RFS publications such as *Standards for Asset Protection Zones* available from the RFS website at www.rfs.nsw.gov.au.

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

> Response: Water supply, gas services and electricity are to comply with Section 4.1.3 of *PBP.*

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

4.2 Recommendations

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

Recommendation 2 - The entire property is to be managed as an APZ.

Recommendation 3 - 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.

Notwithstanding specialist advice in those guidelines, the following general advice for maintaining an APZ is to be followed:

- *Mowing or grazing of grass*: Grass needs to be kept short (approximately 5cm in height) and green where adequate water supplies are available.

- *Raking or manual removal of fine fuels*: Ground fuels such as fallen leaves, twigs (less than 6mm in diameter) and bark should be removed on a regular basis. Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

- *Removal or pruning of trees, shrubs and understorey*: The control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation. Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by 2-5m. A canopy is not to overhang a dwelling unless specifically approved by the RFS. Native trees and shrubs should be retained as clumps in landscape beds and should not exceed a covering of more than 20% of the IPA.

- Trees or tall shrubs may require pruning upon dwelling completion in line with *PBP.* Notwithstanding this, the presence of shrubs and trees close to a dwelling in a bushfire prone landscape requires specific attention to day-to-day management and owners and / or occupiers should be made aware that whilst landscaping can contribute to a way of life and environmental amenity, the accumulated fuels must be regularly removed.

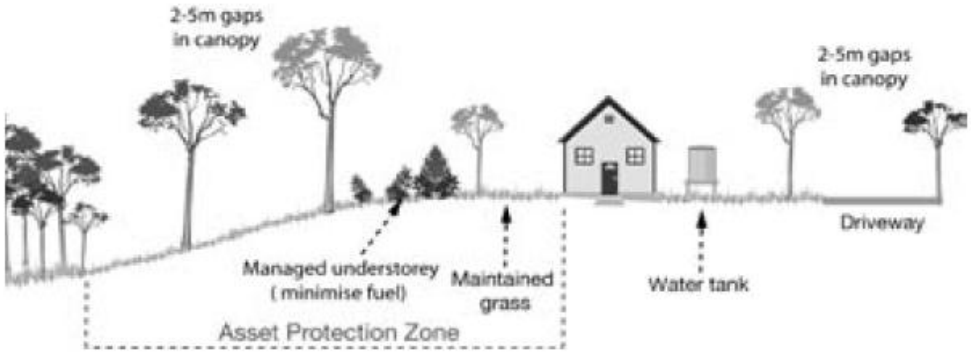
- Trees may remain within close proximity of a building where it can be demonstrated that the tree is not able to produce a build-up of fuel on the roof of a dwelling due to:

1. A roof pitch which self sheds leaf litter
2. Ongoing roof maintenance by staff or contractors
3. Adequate ember protection has been installed

- Trees that are likely to be structurally unstable such that they could cause a limb to fall would require removal for the RFS to agree to a dwelling in proximity to the trees.

In addition, the following general APZ planning advice is to be followed:

- Ensure that vegetation does not provide a continuous ignition path to the house
- Plant or clear vegetation into clumps rather than continuous rows
- Prune low branches 2m from the ground to prevent a ground fire from spreading into trees
- Locate vegetation far enough away from the proposed dwellings so that plants will not ignite the dwelling by direct flame contact or radiant heat emission
- Ensure that shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low-flammability plants and non-flammable ground cover such as pebbles and crushed tiles
- The following RFS diagram depicts one version of an ideal situation. Divergence from this ideal should not be undertaken without expert advice



Recommendation 4 - Building construction standards for the proposed future dwellings 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*.

Recommendation 5 - Access is to comply with Section 4.1.3 (1) of *PBP.*

Recommendation 6 - Water, electricity and gas supply is to comply with Section 4.1.3 of *PBP.*

Recommendation 7 - The landowner / manager is to be made aware of their liability to manage the development lands for the ongoing protection of themselves and their neighbours (refer Section 63(2) *Rural Fires Act*)

Recommendation 8 - Landowners living in bushfire prone areas should familiarise themselves with publications published by the NSW Rural Fire Service. These are located on the RFS web site www.rfs.nsw.gov.au under 'Publications'.

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

Stage 1
(106 lots)

Stage 2
(79 lots)

Stage 3
(30 lots)

ST ANDREWS ROAD

16m

16m

110

110

100

Legend

- Stage boundary
- Proposed road carriageway
- Proposed lot boundary
- Contour - 10m
- Asset Protection Zone
- Managed land

Aerial source: NearMap (30.09.2013)

Travers bushfire & ecology
www.traversecology.com.au

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
St Andrews Road, Leppington A14009_BF001	30/07/2014 Issue 2	1:2,000 @ A3 GDA 1994 MGA Zone 56

0 50 100 m

TITLE

Schedule 1 - Bushfire Protection Measures

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.

Document Path: n:\GIS STORAGE\N Drive\A14009_AndrewsRd_Leppington\MXDs\A14009_BF001.mxd

Management of Asset Protection Zones

A1

The RFS advises that when living in a bushfire prone environment APZs are required to be provided between hazardous fuels and a dwelling.

The RFS provides basic advice in respect of managing APZs in several documents namely, *Planning for Bush Fire Protection 2006 (PBP)* and *Standards for Asset Protection Zones* (undated but circa 2006).

APZs provide a level of defendable space between the hazard and a habitable dwelling or similar structure. These zones are usually shown on plans adjacent to either cultural or natural assets (e.g. dwelling). They act to significantly lessen the impact of intense fire. The major mitigating factor that limits the effects of wildfire is the amount of fuel available to burn. By reducing the amount of fuel there will be a reduction in the intensity of the fire.

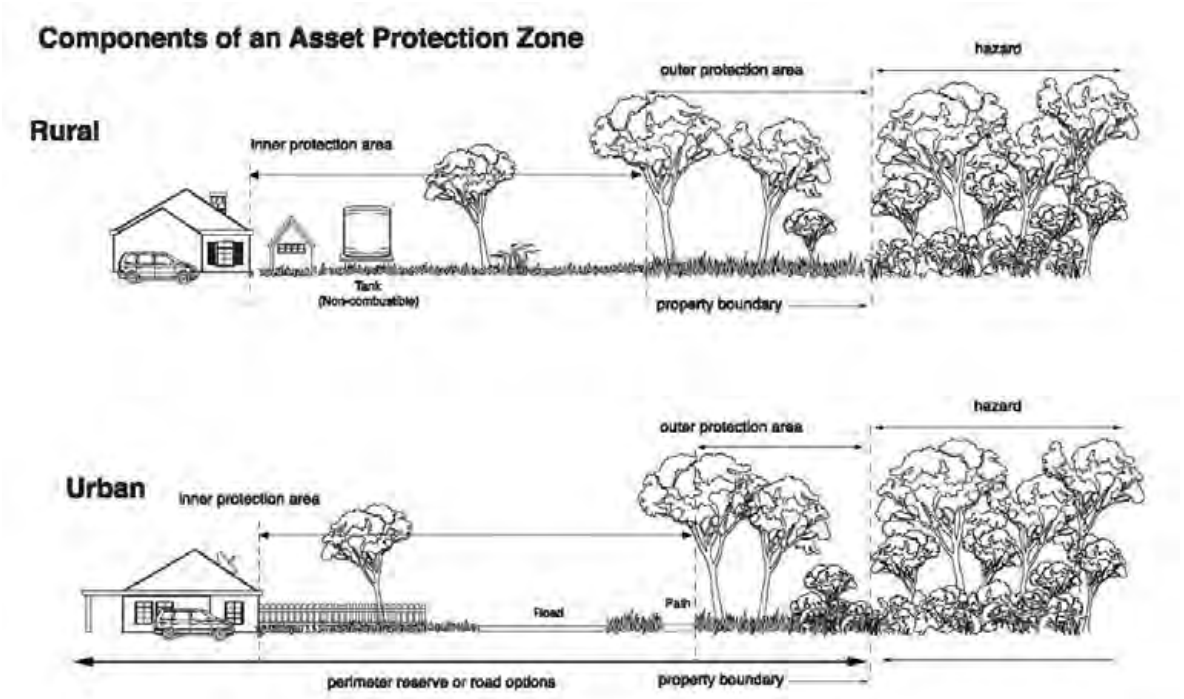
When considering bushfire fuel it is important to understand that it occurs in our native bushland in three vertical layers – see Table 1.

Table 1 – Fuel layers

Fuel layer name	Location of layer in vertical column	Type of fuel
Ground fuels	Below ground level	Peatmoss (always below the surface)
Surface fuels	0-200mm	Litter layer (leaves & twigs)
Aerial fuels	200 – 3,000mm	Shrubs and grasses
Canopy fuels	> 3,000mm	Tree canopy

The APZ can be further classified into two sub-zones with each having a specific role. These sub-zone areas are called the inner protection area (IPA) and the outer protection area (OPA) – see figure below.

The IPA is managed as a fuel free zone while the OPA is managed as a fuel reduced zone. This means that the fuel free zone has little fuel available to be consumed in the event of a fire whilst the fuel reduced zones has less than normal fuel levels that could be consumed in the event of a fire.



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

Inner protection area (IPA)

This area is almost free of all fuels and usually takes the form of grassy areas, car parks, roads, concrete areas, tracks or trails. It does not imply or require the wholesale removal of every tree and / or shrub.

This zone is intended to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fuel. This area also allows airborne embers to fall safely without igniting further outbreaks.

This zone also provides a safe fire fighting position and is operationally important for implementation of clear fire control lines.

Grasses may occur within an IPA if they are generally no higher than 50-75mm. Above this height, fuel weights tend to increase exponentially and consequentially cause greater flame heights and therefore fire intensity.

Shrubs may occur within an IPA in the form of clumping amidst open grassy areas. The design of the clumping will be dependent on species selection and spatial density. For example, the larger the shrubs the less clumping may occur in a given area.

As a general rule, trees are allowed within an IPA but only where those trees are at least 5m away from a dwelling.

A recommended performance standard for the fuel load of an IPA is between 0-4 t/ha. Shrubs may occur within an IPA commensurate with a spatial distribution of 15-20%. For example, an area of 100m2 (10mx10m) can have up to 20% of this area composed of shrubs.

If a shrub layer is present the following table shows the additional fuel weights that should be added to the calculated surface fuels.

Shrub cover	Fuel weight
10-30%	2.5 tonnes / ha
35-50%	5.0 tonnes / ha
55-75%	7.5 tonnes / ha

Presence of trees within an inner protection area

A tree may occur within an IPA if the canopy does not form a link with shrubs. The reason is to reduce any chance for vegetation linking and the capability for fire to extend into the canopy.
It is a basic premise in fire behaviour understanding that fire cannot occur in the canopy unless surface fuels such as grasses or shrubs are burning. This merging creates opportunity for fire to link with the canopy and therefore increase fire intensity by some significant amount.

Trees that have a canopy beginning near the ground (such as Forest Oaks *Allocasuarina*) form a continuous link with the tree canopy and shrubs. A forest canopy cannot therefore burn without fuel to feed that fire. In a tall open forest, where the trees are generally above 20m in height, the canopy is separated from the land surface by some distance. In an open woodland the low canopy height (usually < 5m) merges with the shrubland layer.

Knowing the relationship between the shrub layer and the tree canopy allows fire managers to design safer areas in the APZs. It is for this reason that vegetation such as Forest Oaks are usually excluded from an IPA.

Similarly in open forests the height of the forest is sufficiently removed from the shrub layer. As a general rule, trees are allowed within an IPA where the density of those trees is commensurate with Table 2 below and located on slopes up to 20% with a westerly aspect.

In respect of trees that can be located in an IPA Table 2 provides guidelines.

Table 2 – Tree density in inner protection area

Distance from dwelling wall	Trees permitted on the exposed side of a dwelling	Trees permitted on the non exposed side of a dwelling
Within 5m	No trees	No trees
Between 5-10m	One tree per 100m^2	2 trees per 100m^2
Between 10-20m	<10 tree per 400m^2	<10 trees per 400m^2

Outer protection area (OPA)

This zone is designed to stop the development of intense fires and the transmission of severe radiated heat.

The OPA assumes all trees will remain but with either a modified shrub / grass layer or regular removal of the litter layer. In some sparse vegetation communities the shrub layer may not require modification.

The fire fighting advantage will manifest in reduced fire intensity. It achieves this by denying fire a significant proportion of the fuel to feed upon. Fuels containing small (or fine) leaves such as Forest Oaks (or similar) are targeted for removal due to the capacity to burn quickly and therefore feed fire up into adjacent trees.

In most cases, the removal of 85% of the litter layer will achieve a satisfactory OPA. A recommended performance standard for the fuel load of an OPA is between 4-6 t/ha.

Managing the APZ

Fuel management within the APZs should be maintained by regular maintenance such as:

- Mowing grasses regularly - grass needs to be kept short and, where possible, green.

- Raking or manual removal of fine fuels - ground fuels such as fallen leaves, twigs (less than 6mm in diameter) and bark should be removed on a regular basis. This is fuel that burns quickly and increases the intensity of a fire. Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

- Removal or pruning of trees, shrubs and understorey - the control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation. Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by 2-5m. A canopy should not overhang within 2-5m of a dwelling. Native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

- Trees or tall shrubs may require pruning upon dwelling completion in line with *PBP.* Notwithstanding this, the presence of shrubs and trees close to a dwelling in a bushfire prone landscape requires specific attention to day to day management and owners and / or occupiers should be made aware that whilst landscaping can contribute to a way of life and environmental amenity the accumulated.

In addition, the following general APZ planning advice should be followed:

- Ensure that vegetation does not provide a continuous path to the house.

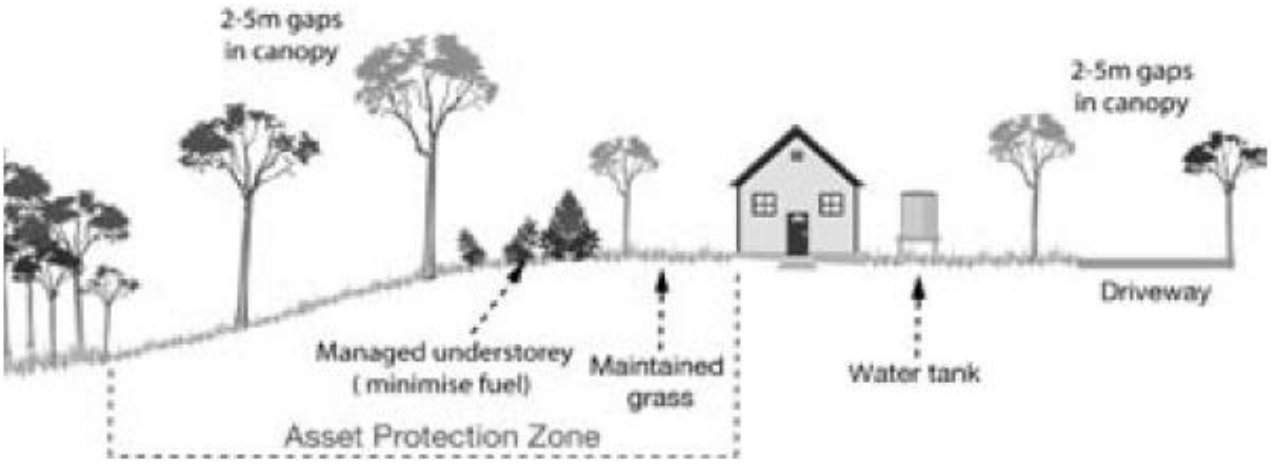
- Plant or clear vegetation into clumps rather than continuous rows.

- Prune low branches 2m from the ground to prevent a ground fire from spreading into trees.

- Locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission.

- Ensure that shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low flammability plants and non flammable ground cover such as pebbles and crushed tile; and

- The following RFS illustrative diagram depicts one version of an ideal situation. Specific advice is to be sought from qualified experts to ensure that the implemented APZs meet the performance criteria of APZs.



Figures courtesy of NSW RFS 2006.