EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the proposed rezoning located at Lot 2 DP 737056, 90 Thirlmere Way, Tahmoor. The proposal is to rezone the land from RU4 Rural Small Holdings to R2 Low Density Residential.

An indicative concept plan identifies 20 lots ranging in size from 703 m^2 - 833 m^2 (smaller lots) with two larger lots with a size of 3710 & 3719m^2.

This report identifies matters for consideration for the planning proposal and highlights the required bushfire protection measures for future development.

The key principle for the proposal is to ensure that future development is capable of complying with the NSW Rural Fire Service policy *Planning for bushfire protection 2006 (PBP)*.

Planning principles (as outlined within PBP) include the provision of adequate access including perimeter roads, establishment of adequate asset protection zones (APZs) for future housing, specifying minimum lot depths to accommodate APZs and the introduction of controls which avoid placing inappropriate developments in hazardous areas and placement of combustible material in APZs.

This report has assessed the potential bushfire risk posed to the site and has found that bushfire can potentially affect the site from the forest vegetation located 70 metres to the west, remnant forest to the south-west and unmanaged grassland vegetation to the east, resulting in possible ember attack, radiant heat and potentially flame attack. The bushfire risk posed to the rezoning proposal, and in particular the concept plan, will be mitigated with the inclusion of appropriate bushfire protection measures (including APZs) which will be put in place and managed in perpetuity.

The assessment has concluded that the current proposal for future development on site will provide compliance with the planning principles of *Planning for bush fire protection 2006* and the NSW Rural Fire Service *Community Resilience Practice Note 2/12 – Planning Instruments and Policies*. This accords with the requirements of section 4.4 of the S117 Ministerial Directions for planning proposals.

John Travers *B.App.Sc. / Ass. Dip. / Grad. Dip / BPAD A*

Nicole van Dorst *B.App.Sc / Grad. Dip* BPAD D

GLOSSARY OF TERMS

APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BCA	*Building Code of Australia*
BSA	Bushfire Safety Authority
FDI	Fire Danger Index
FZ	Flame Zone
IPA	Inner Protection Area
LEP	*Local Environmental Plan*
OPA	Outer Protection Area
PBP	*Planning for bush fire protection, 2006*
NSW RFS	*NSW Rural Fire Service*
SFPP	Special Fire Protection Purpose
AS3959 (2009)	*Australian Standard – Construction of buildings in bushfire-prone areas.*

TABLE OF CONTENTS

Introduction 1

Travers bushfire & ecology has been requested by *EG Property Group to* undertake a bushfire protection assessment for the proposed rezoning located at Lot 2 DP 737056, 90 Thirlmere Way, Tahmoor.

The proposal is located on land mapped by *Wollondilly Shire Council* as being bushfire prone. As such the proposal is subject to the *Environmental Planning and Assessment Act* and Section 117(2) Ministerial Direction no. 4.4 (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 planning principles, including the provision of perimeter roads, asset protection zones (APZs) and other specific fire management issues
- Review the potential to carry out hazard management over the landscape, taking into consideration the proposed retention of trees within the final development plans.

1.2 Project Synopsis

The proposal is to rezone the land from RU4 Rural Small Holdings (minimum lot size 2ha) to R2 Low Density Residential (minimum lot size 700m^2).

An indicative concept plan identifies 20 lots, ranging in size from 703 - 833 m^2 (smaller lots) with two larger lots with a size of 3710 & 3719 m^2 (refer Figure 1.1).

Bushfire constraints have been highlighted and APZ's have been recommended on the south-eastern and southern boundaries. Managed lands exist to the north, east, south and west. Recommendations have also been made for future road design, building construction, water supplies and utilities.

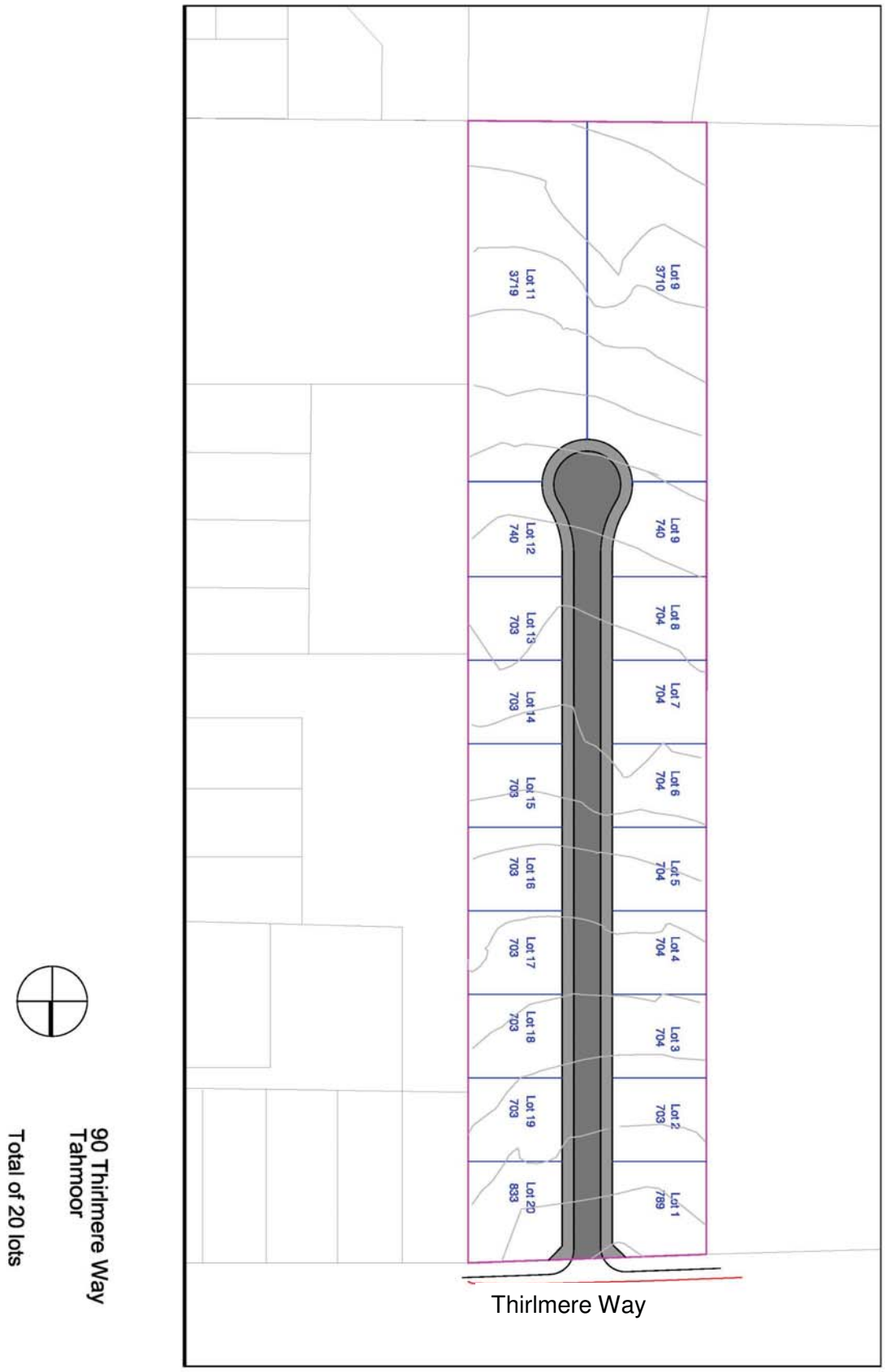


Figure 1.1: Concept Plan

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:

- Wollondilly Local Environmental Plan 2011
- Wollondilly Development Control Plan 2011
- Flora and Fauna Assessment, 2012 prepared by *Travers bushfire & ecology*
- *Google* aerial photography
- Topographical maps *DLPI of NSW* 1:25,000
- Australian Standard 3959 *Construction of buildings in bush fire prone areas*
- *Planning for bush fire protection 2006 (NSW RFS)*
- *Community Resilience Practice Notes 2/12 Planning Instruments and Policies.*

An inspection of the proposed development site and surrounds was undertaken by John Travers on 21st August 2012 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 site is located at Lot 2 DP 737056, 90 Thirlmere Way, Tahmoor (refer Figure 1.2). It is situated to the west of the Tahmoor township approximately 100 metres to the west of the intersection of Thirlmere Way and Milne Street.

The site is bounded to the east by low density residential development and by large rural residential lots to the north, south and west.

Figure 1.2: Aerial Appraisal (north is top of photo)

Table 1.1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

Table 1.1 – Site Features

Location	90 Thirlmere Way, Tahmoor
Local government area	Wollondilly
Grid reference	277200E 6210600N
Topography	Situated on a gentle slope which is south-facing. Generally between 0-2 degrees
Geology and soils	Geology; Sandstone. Soils; Lucas Heights – residual type of moderate depth over layers of sandstone and shale
Catchment & drainage	Tributary off Myrtle Creek
Vegetation	Woodland vegetation with a moist understorey that is largely regrowth where present
Existing land use	Vacant
Clearing	65% is presently clear of any native vegetation

1.5 Legislation and Planning Instruments

1.5.1 Environmental Planning and Assessment Act 1979 (EP&A Act) and bushfire prone land.

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.*

The identification of bushfire prone land is required under Section 146 of the *EP& A Act*. Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed rezoning is located on land that is mapped, partially by *Wollondilly Shire Council* as being bushfire prone (refer Figure 1.3). There is only a small section (<20%) of land within the south-western corner of the site mapped as bushfire prone.

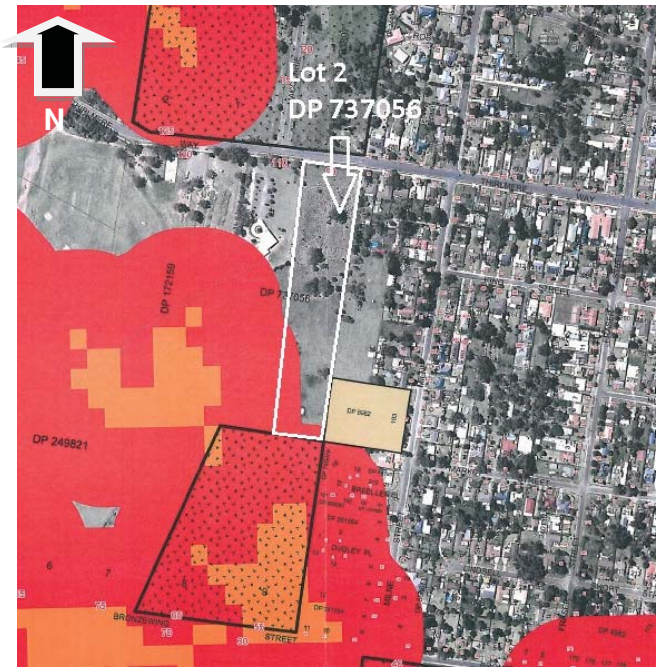


Figure 1.3: Bushfire Prone Land Map

1.5.2 Section 117 Ministerial Directions

The planning proposal is located on land partially mapped by *Wollondilly Shire Council* as being bushfire prone. As such a planning proposal is subject to the *Environmental Planning and Assessment Act* (Section 117(2) Ministerial Direction and in particular section 4.4 'Planning for bush fire protection' of that Direction. This direction (issued on 1st July 2009) requires a planning proposal to introduce controls that avoid placing inappropriate

developments in hazardous areas. This would be achieved by being consistent with *Planning for Bushfire Protection 2006* (NSW Rural Fire Service).

1.5.3 Local Environmental Plan (LEP)

A LEP provides for a range of zonings which list development that is permissible or not permissible, as well as the objectives for development within a zone.

The proposal is to proceed as an amendment to the current *Wollondilly LEP 2011* as outlined below.

Wollondilly Local Environmental Plan 2011

The site is zoned under the current *Wollondilly LEP 2011* as RU4 – Primary Production Small Lots (refer Figure 1.4). The land surrounding the property to the north, south and west is also RU4 Zone, with the land to the east zoned as R2 – Low Density Residential. The proposal seeks to amend the *LEP 2011* to rezone the land to R2 – Low Density Residential.

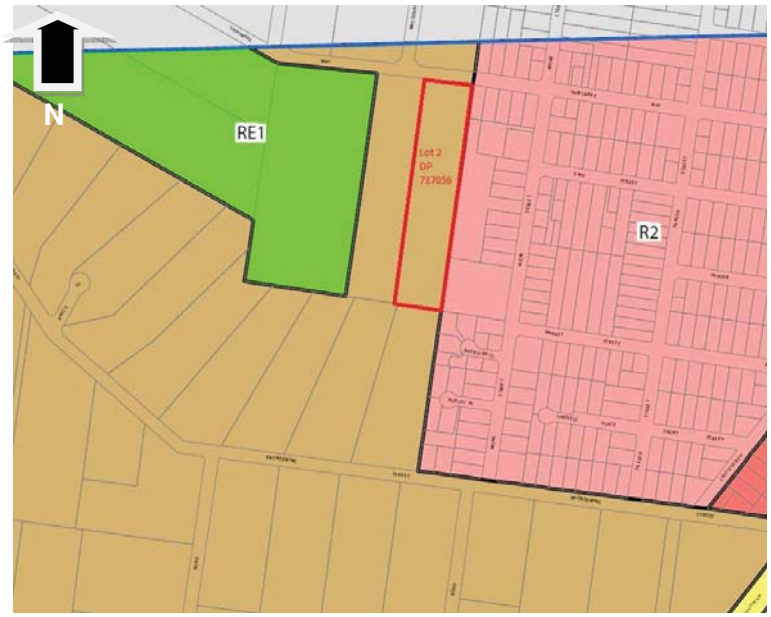


Figure 1.4: Wollondilly LEP 2000
(Source: Wollondilly Shire Council website)

The rezoning proposal, including the provision of APZs, should be able to to comply with the objectives of the proposed rezoning.

1.5.4 Planning for bush fire protection 2006 (PBP)

Bushfire protection planning requires the consideration of the *NSW RFS* planning document entitled *Planning for bush fire protection 2006 (PBP). PBP* provides planning principles for rezoning to residential land 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 planning principles that should be achieved for all rezoning proposals:

1. Provision of a perimeter road with two way access which delineates the extent of the intended development.

2. Provision, at the urban interface, for the establishment of adequate asset protection zones for future housing

3. Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads

4. Minimising the perimeter of the area of land interfacing the hazard, which may be developed

5. Introduction of controls which avoid placing inappropriate developments in hazardous areas, and

6. Introduction of controls on the placement of combustible materials in asset protection zones.

In addition to the above, *PBP* outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas.

The proposed rezoning has been assessed in compliance with the following measures to ensure that future development is capable of complying with *PBP*:

- Asset protection zones
- Building construction and design
- Access arrangements
- Water supply and utilities
- Landscaping
- Emergency arrangements

1.5.5 Building Code of Australia (BCA) 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 Class 1, 2 and 3 buildings. The construction manual for the deemed-to-satisfy requirements is the *Australian Standard AS3959 2009.*

Although consideration of *AS3959* is not specifically required in a rezoning proposal, this report (Section 3.2) provides the indicative setbacks for each dwelling construction level and can be used in future planning for master plans and / or subdivision proposals.

1.6 Environmental & Cultural Constraints

1.6.1 Environmental Constraints

A Flora and Fauna Assessment has been prepared by *Travers bushfire & ecology* (2012). The report has concluded that there are no threatened fauna species, no protected migratory bird species, no threatened flora species recorded within the site.

One endangered ecological community (Shale-Sandstone Transition Forest) exists in the form of immature regrowth vegetation (0.8 ha). This was not regarded as being an ecological constraint to future development.

Despite there being a mapped watercourse (as shown on the topographic map) in the north-western corner of the subject site, it has been diverted into roadside drainage. There is also a very small swale approximately 1-2m from the western boundary on the adjoining lot, however, this is not considered to be a watercourse and riparian setbacks will not affect any portion of the subject site.

1.6.2 Cultural Constraints

A basic search was conducted on the Aboriginal Heritage Information System (AHIMS). The results show that there are no identified Aboriginal sites of significance within Lot 2 DP 737056 or within 50 metres of site.

Bushfire Threat Assessment 2

To assess the bushfire threat and to determine the required width of an asset protection zone 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 – Construction in bushfire-prone areas* AUSLIG Pictorial Analysis is used to determine the vegetation, and hence APZ setbacks and building construction standards (refer Section 3.2 of this report).

The hazardous vegetation is calculated for a distance of at least 140 metres from a proposed site boundary and can be summarised as:

- Forest vegetation approximately 70 metres from the western boundary of the property.

- Remnant forest adjoining the southern boundary of the property. *Planning for bushfire protection, 2006* describes remnant vegetation as a parcel of vegetation with a size of less than 1 ha or a shape that provides a potential fire run directly towards a building not exceeding 50 metres. The vegetation to the south exhibits these qualities and therefore the threat posed is considered low and APZ setbacks for this aspect are the same as for the rainforests category outlined in PBP 2006.

- Unmanaged grassland vegetation to the east. Please note that AS3959 (2009) states that managed grassland in a minimal fuel condition is regarded as low threat vegetation. Managed grass does not require APZ or BAL construction standards. Minimal fuel condition is recognised as short-cropped grass (i.e. nominal height of 100mm). It is recommended that the future use and management of the land to the east should be explored at development application stage to determine if APZ's are required.

Regrowth woodland has been identified within the ecological assessment undertaken by *Travers bushfire & ecology* as occurring within the site. It is envisioned that this vegetation will be removed as part of the future development of the site and therefore no APZ setbacks have been provided from this vegetation assemblage. The following photographs depict the hazardous vegetation surrounding the site.

Photo 1 – Remnant Forest vegetation to the south-west of the site.

Photo 2 – Grassland to the east of the site

Photo 3 – Managed grass to the west of the site (looking north)
(does not constitute a bushfire threat)

Photo 4 – Managed grassland to the west of the site (southern half)
(does not constitute a bushfire threat)

2.2 Effective Slope

The effective slope has been assessed for a distance of 100 metres. 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:

- A level slope within the forest vegetation over 70m to the west
- 2^0 upslope within the remnant forest to the south
- A level slope within the unmanaged grassland to the east.

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 below provides a summary of the bushfire attack assessment and the minimum required asset protection zones in compliance with BAL 29 building construction standards (AS3959, 2009).

Table 2.1 – Bushfire attack assessment

Aspect	Vegetation formation within 140 metres of development	Effective slope of land	Minimum APZ required equivalent to BAL 29
North	Managed Lands	$2–3^{0\ D}$	N/A
East	Grassland **Refer Note 1**	Level	9 metres
South	Remnant Forest	$2^{0\ U}$	11 metres
West	Managed grassland for 70 metres then Forest	Level	N/A (the adjoining managed land provides adequate defendable space)

*Notes: * Slope is either 'U' meaning upslope or 'C' meaning cross slope or 'D' meaning downslope*

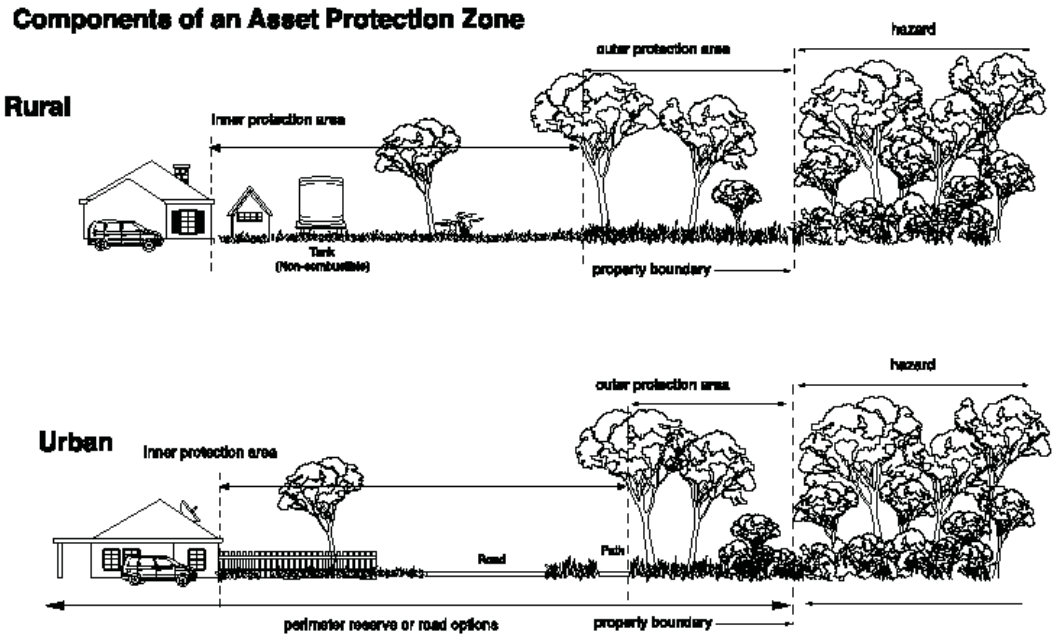
Note 1: It is recommended that the future use and management of the land to the east is reassessed at the development application stage to determine the final APZ distances & BAL construction levels required. If it can be determined that this grassland exhibits minimal fuel condition (i.e. short-cropped grass with nominal height of 100 mm) the APZ can be removed from this aspect.

Specific Protection Issues

3

3.1 Asset Protection Zones (APZs)

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, non-attached garages, cabanas, etc. A typical APZ and therefore defendable space is graphically represented below:



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 29 kW/m^2 for residential subdivision developments. This rating assists in determining the size of the APZ in compliance with PBP to provide the necessary *defendable space* between hazardous vegetation and a building. Table 3.1 outlines the current proposal's compliance with the performance criteria for APZ's.

Regrowth woodland has been identified within the Flora and Fauna Assessment (Sept 2012) Prepared by *Travers bushfire & ecology* as occurring within the site. It is envisioned that this vegetation will be removed as part of the future development and in this event no APZ setbacks would be required to be offset from that vegetation.

However any future proposal to revegetate this land would require the implementation of APZ's. APZ widths required would be between 11–14m (if vegetation parcels are less than 1ha or provide a width of less than 50m) or an APZ of 25–32m (if vegetation is greater than 1ha or provide a vegetated width of greater than 50m).

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 (PBP) APZs are wholly within the boundary of the development site	Yes - refer Table 2.1 & Figure 3.1
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* (*NSW RFS* 2005)	Yes - to be made a condition of consent for subdivision / dwelling DA
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 degrees.	Yes - Slopes are less than 18 degrees


Thirlmere Way
Lot 1
Lot 2
Lot 3
Lot 4
Lot 5
Lot 6
Lot 7
Lot 8
Lot 9
Lot 10
Lot 11
Lot 12
Lot 13
Lot 14
Lot 15
Lot 16
Lot 17
Lot 18
Lot 19
Lot 20
231m
107m
15m
27m
20m
9m APZ
11m APZ
Managed Grassland
Unmanaged Grassland
Forest
Mine Street
Legend
Site Boundary
Asset Protection Zone
0 10 20 30 40 50 m
Travers bushfire & ecology
PROJECT
Thirlmere Road, Tahmoor
REFERENCE
TBE_A12082
SCALE
1:2,000 @ A4
DATE (ISSUE)
20.09.2012 (Issue 1)
TITLE
Figure 3.1 - Bushfire Protection Measures

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 future subdivision approval the minimum APZ must be provided in accordance with Appendix 2 of *PBP.* The APZs provided in Table 2.1 (Section 2.3) of this report comply with these requirements, whilst also considering the final building setbacks as per AS3959 (2009).

Although not required in terms of rezoning the following advice in relation to building construction levels can be used for future planning and subdivision design.

The *NSW RFS* has released an interim amendment to *PBP 2006* entitled Addendum Appendix 3. This amendment follows the adoption on 1 May 2010 of *AS3959 (2009)* through the *Building Code of Australia (BCA) 2010.* This appendix, in conjunction with Table 2.4.2 of *AS3959 (2009)*, 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.

Table 3.2 below provides an indication of the BALs that are likely to apply to future building construction. These BAL levels are for planning purposes only and should be confirmed prior to building construction stage.

Table 3.2 – Determination of Bushfire Attack Level (BAL)

Aspect	Vegetation formation within 140 metres of development	Effective slope of land	Minimum APZ required equivalent to BAL 29	Construction standards
North	Managed Lands	$2–3^{0\ D}$	N/A	N/A
East	Grassland (currently unmanaged) **Refer Note 1 below**	Level	9 metres	BAL 29 (9–<13m) BAL 19 (13-<19m) BAL 12.5 (19-<50m)
South	Remnant Forest	$2^{0\ U}$	11 metres	BAL 29 (11–<16m) BAL 19 (16-<23m) BAL 12.5 (23-<100m)
West	Managed grassland for 70 metres then Forest	Level	N/A (the adjoining managed land provides adequate defendable space)	BAL 12.5 (48-<100m)

*Notes: * Slope is either 'U' meaning upslope or 'C' meaning cross slope or 'D' meaning downslope*

Note 1: It is recommended that the future use and management of the land to the east is reassessed at development application stage to determine the final APZ distances and BAL construction levels required. If it can be determined that this grassland exhibits minimal fuel condition (i.e. short-cropped grass with nominal height of 100mm) recommended BAL levels can be removed from this aspect.

3.3 Hazard Management

The APZs are to be managed in accordance with the *NSW RFS* guidelines *Standards for Asset Protection Zones (RFS, 2005)* with landscaping to comply with Appendix 5 of *PBP.*

A summary of the guidelines for managing APZs are attached as Appendix 1 in this report.

In terms of implementing and / or maintaining APZs, there is no physical reason that could constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing).

3.4 Access for Fire Fighting Operations

Table 3.3 outlines the performance criteria and acceptable solutions for future public roads within future subdivision design as they might apply to this land.

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

Performance Criteria	RFS Acceptable Solutions	Compliance
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.	The planning proposal is compliant
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 8 metres minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.4 below. Perimeter road is linked with the internal road system at an interval of no greater than 500 metres in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3 degrees. All roads are through roads. If unavoidable dead end roads are not	The planning proposal is compliant The planning proposal provides for a one way road being 230 metres in length. This is 30 metres above the RFS acceptable solution. The deviation, in this case, is warranted due to the peripheral hazardous landscapes being at such a distance that sees no significance asset protection zones being required within the development boundaries for the 700 m2 lots. This means radiant heat flux is low and flame potential is low as it affects those lots. The two larger lots (at the end of the culdesac) have increased

Performance Criteria	RFS Acceptable Solutions	Compliance
	more than 200 metres in length, incorporate a minimum 12 metre outer radius turning circle, sign posted dead end and direct traffic away from the hazard. In the case of the proposed planning proposal a culdesac is located approximately 230 metres from Thirlmere Way. Curves of roads (other than perimeter) have a minimum inner radius of 6 metres and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6 metres. Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees. Minimum vertical clearance of 4 metres above the road at all times.	capability to provide asset protection zones (if they are so required) in any future development plan submitted for a development application.
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.	The planning proposal is compliant
Roads that are clearly sign posed (with easily distinguishable names) and buildings / properties that are clearly numbered.	Public roads >6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water. Public roads 6.5-8.0 metres wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5 metres 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 3.5 metres wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.	The planning proposal is compliant
There is clear access to reticulated water supply. Parking	Parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are located within parking bays.	Can be made a condition of consent

Performance Criteria	RFS Acceptable Solutions	Compliance
does not obstruct the minimum paved width	Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.	

Table 3.4: Minimum widths for public roads that are not perimeter roads

Curve radius (inside edge) (metres width)	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 property in the form of an underground reticulated water system.

Table 3.5 outlines the performance criteria and acceptable solutions for reticulated water supply.

Table 3.5: Performance Criteria for reticulated water supplies (P*BP* guidelines pg. 27)

Performance criteria	Acceptable Solutions	Compliance
Water supplies are easily accessible and located at regular intervals	Reticulated water supply to urban subdivision uses a ring main system for areas with perimeter roads. Fire hydrant spacing, sizing and pressures comply with AS2419.1 - 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. Hydrants are not placed within any road carriageway All above ground water and gas pipes external to the building are metal, including and up to taps. The provisions of parking on public roads are met.	Can be made a condition of consent

3.6 Gas

Table 3.6 outlines the required performance criteria for the gas supply.

Table 3.6: Performance Criteria for Reticulated Water Supplies (PBP guidelines pg. 27)

Performance criteria	Acceptable Solutions	Compliance
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 10 metres 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 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.	Can be made a condition of consent

3.7 Electricity

Table 3.7 outlines the required performance criteria for electricity supply.

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

Performance criteria	Acceptable Solutions	Compliance
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 (30 metres), unless crossing gullies, gorges or riparian areas: and • No part of a tree is closer to a power line than the distance set out in accordance with the 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 rezoning located at Lot 2 DP 737056, 90 Thirlmere Way, Tahmoor.

This report has assessed the potential bushfire risk posed to the site and has found that bushfire can potentially affect the site from the forest vegetation located 70 metres to the west, remnant forest to the south-west and unmanaged grassland vegetation to the east, resulting in possible ember attack, radiant heat and potentially flame attack. The bushfire risk posed to the rezoning proposal, and in particular the concept plan, will be mitigated with the inclusion of appropriate bushfire protection measures (including APZs) which will be put in place and managed in perpetuity.

The assessment has concluded that the current proposal for future development on site will provide compliance with the planning principles of *Planning for bush fire protection 2006* and the NSW Rural Fire Service *Community Resilience Practice Note 2/12 – Planning Instruments and Policies*.

Future development on site is to comply with the following planning principles.

Table 4.1: Planning Principles

Planning Principles	Recommendations
Provision of a perimeter road with two way access which delineates the extent of the intended development.	Given the low bushfire risk and presence of forest vegetation over 70 metres to the west, the requirement for a perimeter road along the eastern and western boundaries is not necessary. The planning proposal provides for a one way road being 230 metres in length. This is 30 metres above the RFS acceptable solution. However the deviation, in this case, is acceptable due to the insignificant peripheral hazardous landscapes being at such a distance that sees no significance asset protection zones required within the development boundaries for the 700 m2 lots. This means radiant heat flux is low and flame potential is low as it affects those lots.
Provision, at the urban interface, for the establishment of adequate asset protection zones for future housing	APZ's have been recommended in compliance with BAL 29 (AS3959, 2009).
Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads	Future subdivision design is to allow for the minimum APZ's as recommended within Table 2.1 and as depicted within Figure 3.1.

Planning Principles	Recommendations
Minimising the perimeter of the area of land interfacing the hazard, which may be developed	Compliant.
Introduction of controls which avoid placing inappropriate developments in hazardous areas	Future development consists of residential dwellings and is appropriate for the level of bushfire risk.
Introduction of controls on the placement of combustible materials in asset protection zones.	Compliant –can be made a condition of consent.

In terms of the bushfire threat posed to the site, future residential development within the property can be safely accommodated as per the concept subdivision plan depicted within Figure 1.3.

The following recommendations will assist in ensuring that future residential development is in accordance with or greater than the requirements of *PBP.*

4.2 Recommendations

Recommendation 1 - APZs are to be provided to the future residential development for those parts of the site impacted by bushfire threat. APZs are to be measured from the exposed wall of these dwelling toward the hazardous vegetation. The minimum APZ must be achievable within all lots fronting the bushfire hazard as nominated in Table 2.1 and also as generally depicted in Figure 3.1.

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 as advised by the *NSW RFS* in their publications.

Recommendation 3 – This assessment has assumed the removal of the regrowth woodland vegetation within the site as part of future development applications. However any future proposal to retain and revegetate this land would require the implementation of APZ's. APZ widths required would be between 11–14m (if vegetation parcels are less than <1ha or provide a width of <50m) or an APZ of 25–32m (if vegetation is >1ha or provide a vegetated width of >50m).

Recommendation 4 - Building construction standards are to be applied for future residential dwellings in accordance with *Australian Standard AS3959 Construction of buildings in bushfire prone areas (2009)* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 of *PBP.*

Recommendation 5 – Public access roads are to comply with the acceptable solutions provided within Section 4.1.3 of *PBP* (refer Section 3.4 of this report) except that a perimeter road is not required; and the access road length of 230 metres is acceptable in this case.

Recommendation 6 - Water, electricity and gas supply is to comply with the acceptable solutions as provided within Section 4.1.3 of *PBP* (refer Sections 3.5, 3.6 & 3.7 of this report)

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 bush fire 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.

Travers, J. (2003) *The Ecological Management of Asset Protection Zones at Wallarah Peninsula – A Case Study*.

Management of Asset Protection Zones

A1

The *NSW Rural Fire Service (RFS)* advises that when living in a bushfire prone environment asset protection zones are required to be provided between hazardous fuels and a dwelling.

The *NSW RFS* provides basic advice in respect of managing asset protection zones in several documents namely *Planning for bush fire protection 2006 (PBP)* and *Standards for Asset Protection Zones* (undated but circa 2006).

Asset protection zones (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.

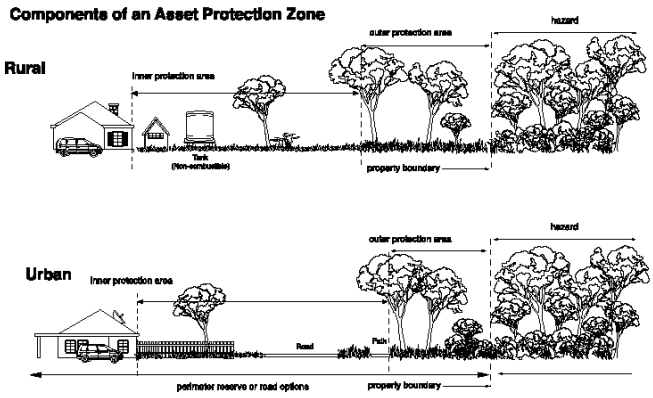
When considering bushfire fuel it is important to understand that it occurs in our native bushland in three vertical layers – see Table 1.

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	0-200 mm	Litter layer (leaves & twigs)
Aerial Fuels	200 – 3000 mm	Shrubs and grasses
Canopy Fuels	> 3000 mm	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.



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 5 metres 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 100 m2 (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 lessen 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 20 metres in height the canopy is separated from the land surface by some distance. In an 'open woodland' the low canopy height (usually < 5 metres) 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 5 metres	No trees	No trees
Between 5-10 metres	One tree per 100 m^2	2 trees per 100 m^2
Between 10-20 metres	<10 tree per 400 m^2.	<10 trees per 400 m^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 6 mm 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.

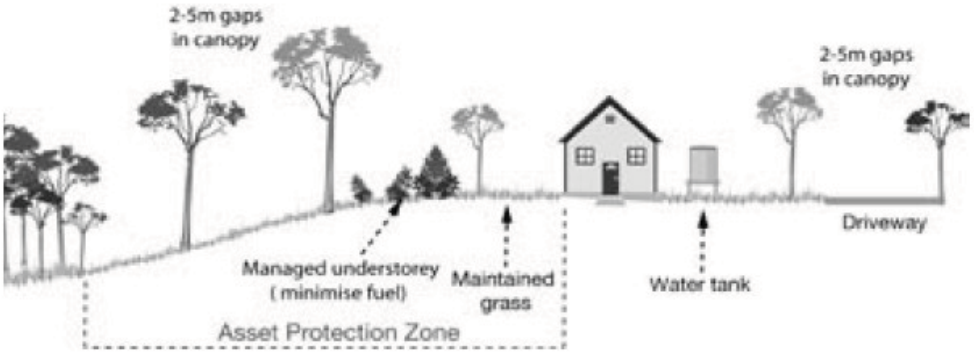
- Removal or pruning of trees, shrubs and understorey - The control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation. Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by two to five metres. A canopy should not overhang within two to five metres 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.

- Tree 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 occupier 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 two metres from the ground to prevent a ground fire from spreading into trees.
- Locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission.
- 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 crush tile; and
- The following *NSW 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.