

ATTACHMENT 8

BUSHFIRE ASSESSMENT

A photograph of a squirrel climbing a tree trunk, positioned on the left side of the cover. The squirrel is facing upwards, with its front paws gripping the bark and its hind legs pushing off. The tree bark is rough and textured. The background is a solid light blue color.

Travers

bushfire & ecology

bushfire protection assessment

IN SUPPORT OF A REVISED
PLANNING PROPOSAL FOR
THE REZONING OF

LOT 23 DP 1159704

76 BERKELEY ROAD,
FOUNTAINDALE

JULY 2011
(REF: A11049)

Travers

bushfire & ecology

BUSHFIRE PROTECTION ASSESSMENT

REVISED REZONING PROPOSAL

Lot 23 DP 1159704
BERKELEY ROAD
FOUNTAINDALE

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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 in support of a revised Planning Proposal for the rezoning of Lot 23 DP 1159704 Berkeley Road, Fountainsdale. The proposed rezoning will allow for a proposed three (3) lot rural residential subdivision.

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 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 *asset protection zone (APZ)*, in compliance with Appendix 2 of PBP, 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 forest vegetation fringing the proposed site to the north, south and west resulting in possible ember attack, radiant heat attack. The bushfire risk posed to the development however can be mitigated if appropriate APZs are put in place and managed in perpetuity.

The assessment has concluded that the proposed development will provide:

- Compliance with Planning for Bushfire Protection 2006.
- Compliance with AS 3959 (2009)

Other bushfire protection measures are identified within the recommendations.

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1

Introduction

Travers bushfire & ecology has been engaged by Hapido Pty Ltd & TSM Projects Pty Ltd to undertake a bushfire protection assessment in support of a revised planning proposal for the rezoning of Lot 23 DP 1159704 at 76 Berkeley Road, Fountaindale and subsequent three (3) lot rural residential subdivision.

The proposed rezoning is located on land that is mapped by Wyong Council as being bushfire prone. This triggers a referral to the NSW Rural Fire Service (RFS).

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- Review the bushfire threat to the site.
- 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

Rezoning

The proposal intends to transfer the proposed E2 zoned lands to Wyong Shire Council and the E4 zoned lands will be retained in private ownership to allow for a three (3) lot rural residential subdivision - see Figure 1

Access

Each proposed lot will gain access from Berkeley Road which is an existing bitumen road. This road is 6-7 metres in width with cleared road side verges.

Construction of dwellings

The construction of future buildings will be in accordance with *AS3959 - 2009 Construction of buildings in bushfire prone areas* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 (Planning for Bushfire Protection, 2006). Details of the recommended construction standards are provided within Section 3.2 of this report and are depicted within Schedule 1 attached.

Ancillary works

Development works will involve the provision of driveways and services such as water tanks, sewerage, power and on site drainage.

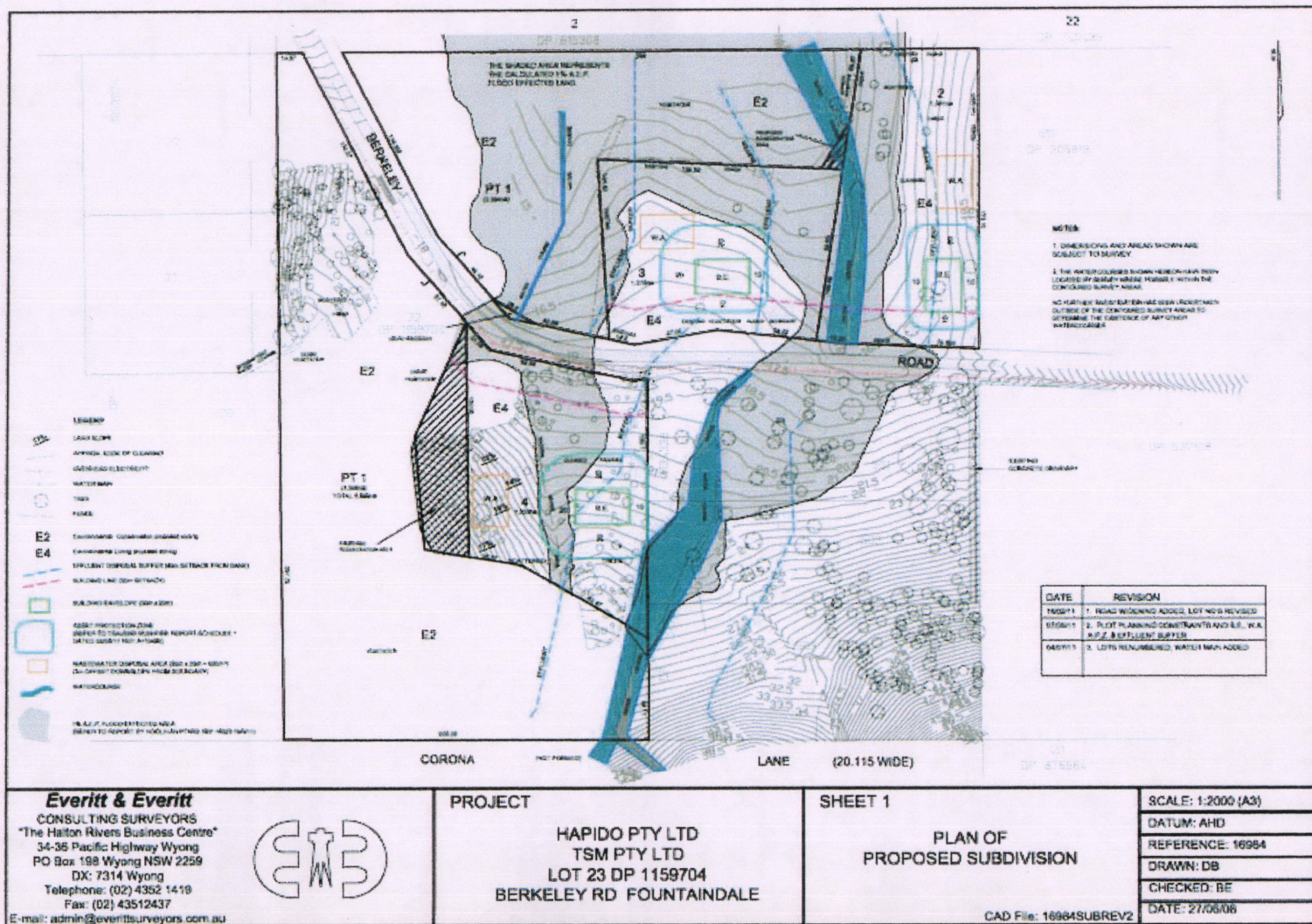


Figure 1 – Proposed Subdivision

1.3 Information collation

To achieve the aims of this report, a review of the information relevant to the property was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Site plans prepared by *Everitt & Everitt Consulting Surveyors*, 27/6/2008
- 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)*.

An inspection of the proposed development site and surrounds was undertaken to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bush fire measures and a visual appraisal of bush fire hazard and risk were also undertaken.

1.4 Site description

The site is located to the north of Berkeley Road, Fountaindale within the Local Government Area of Wyong – see Figure 2.

The immediate area surrounding the proposed dwelling sites is managed vegetation. A remnant strip of vegetation is located along a water course between proposed lots 2 and 3. Forest vegetation is located to the north and south. The vegetation to the east and west is primarily rural residential land.

The residential suburb of Berkeley Vale is located approximately 400 metres to the east of the site. The surrounding area further to the north and east consists of the industrial area of Berkeley Vale and residential area of Fountaindale.

The area to the north of Berkeley Road is level. Lot 4 is level where it adjoins Berkeley Road and then slopes uphill to the south-west. The adjoining forest vegetation to the south and south-west is upslope.



Figure 2: Aerial Appraisal

1.5 Bushfire prone land

The proposed rezoning is located on land that is mapped by Wyong Shire Council as being bushfire prone (refer Figure 3). The orange colour indicates Category 1 vegetation (forest) with the red colour indicating a 100 metre buffer zone to the forest vegetation.

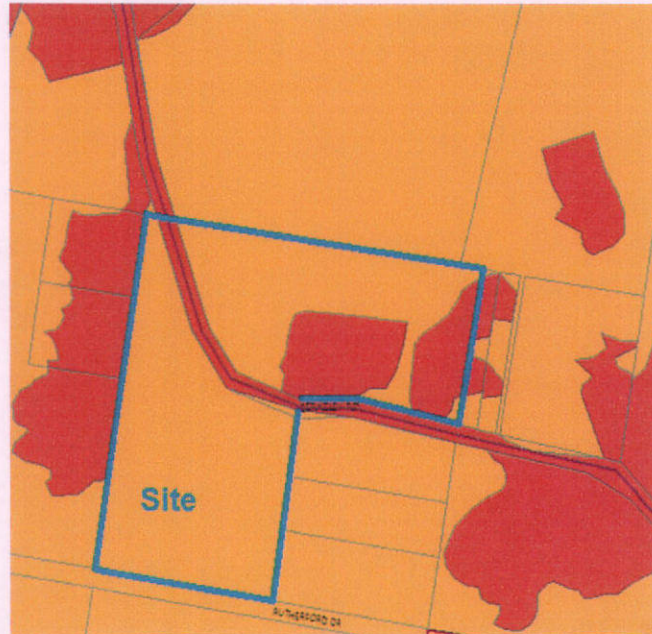


Figure 3: Bushfire Prone Land Map
(source: Wyong Shire Council website)

The rezoning proposal needs to address the planning principles of PBP. Council is required to consult with the RFS and take into account their comments, if any.

The RFS is required to review the development against PBP.

2

Bushfire Protection Assessment

Bushfire protection planning requires the consideration of the RFS planning document entitled *Planning for bush fire protection* published in 2006 (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. More specifically, the aims and objectives for all rural residential development located on bushfire prone land should:

1. Afford occupants of any building adequate protection from exposure to a bushfire
2. Provide for a defensible 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)

The additional objectives for subdivisions 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 slopes – 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 *Building Code of Australia*
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

Thus development in bushfire prone areas requires consideration of the overall threat upon a site and the way occupants of a site are potentially able to cope in the event of a bushfire.

To assess the bushfire threat that is likely to occur and thus affect the proposed development property, a review of the elements that comprise the overall threat needs to be completed. These elements include the potential hazardous landscape that may affect the site, the subsequent extent of the bushfire risk and the expected level of vulnerability that is likely to affect occupants and or fire fighters.

2.1 Hazardous fuels

The bushfire hazard is defined as the potential severity of a bushfire and is measured in terms of the potential fire intensity and the resultant radiant heat flux emanating from the fire.

The factors that influence bushfire hazard are primarily the type of vegetation (fuel) and the effective slope that contributes to increasing bushfire behaviour. Factors such as wind velocity and fuel dryness also significantly contribute to the hazard achieving maximum intensity levels.

The hazardous fuels are categorised according to vegetation descriptions identified by David Keith (DECC, 2004). These units have been defined in accordance with their ability to cause different levels of fire intensity based essentially on their sustained flammability. This arises from the extent of fine fuel presence and weight.

Hazardous fuels are primarily the native bushland that exist, largely, to the north and south, for example:

- The forest vegetation to the north of Lots 3 and 2, in the proposed environmental conservation areas.
- The forest vegetation to the west of Lots 3 and 4, in the proposed environmental conservation areas.
- The narrow remnant retained as a water course buffer between proposed Lots 3 and 2.
- The adjoining forested land to the south which is upslope.

The land to the east is rural residential managed lands, it retains some canopy trees but the understory is mown or grazed. Various houses and sheds are located to the east.

2.1.1 Potential bushfire risk

The bushfire risk is defined as the chance of a bushfire igniting, spreading and causing damage to property or the environment.

The presence of native vegetation within the hazardous areas presents a permanent potential for bushfire attack upon the rural residential landscape. The bushfire prone nature

of the landscape will require measures to mitigate the bushfire risk such that it is deemed acceptable. These measures are primarily based on the provision of defensible space between the hazards and the habitable dwellings.



Photo 1 - Lot 3



Photo 2 - Lot 2



Photo 3 - Lot 4

2.1.2 Level of development vulnerability

Vulnerability is the likely exposure of the intended development site to the expected fire behaviour that could impact life and / or property.

There is forest vegetation located off the property to the north and south. With the exception of Lot 4, the land is essentially level. Rural residential properties are located to the east and west and the vegetation on these properties is managed to varying degrees.

It is possible that fires could occur within the surrounding bushland with the potential impact in the form of radiant heat, flame impact and potentially ember attack. However, with an appropriately sized APZ the intensity of the bushfire can be mitigated down to the acceptable radiant heat performance threshold of $<29 \text{ k/W m}^2$.

2.2 Bushfire attack assessment

The RFS requires that a development application must include a bushfire attack assessment to determine the possible impact or vulnerability of a habitable structure from fire. The assessment may be undertaken using a 'deemed to satisfy' approach or a 'performance based' approach. The former is qualitatively explained within PBP whilst the latter requires specialist assessment techniques not covered within PBP.

PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. In addition PBP advises on building construction design levels, being relevant to AS3959 *Construction of buildings in bushfire prone areas*.

The assessment uses the vegetation type and slope gradient to determine the size of the APZ and the accompanying construction level. Vegetation type is assessed for a distance of 140 metres external to the proposed development area whilst the effective slope is assessed for 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.

Slopes have been verified in the field using a clinometer. The slope on the site and surrounding lands is level.

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 1 below provides a summary of the bushfire attack assessment and the minimum required asset protection zones in compliance with Appendix 2 (PBP).

Table 1 – bushfire attack assessment

Lot 2

Aspect	Vegetation within 140m of development	Effective slope of land	Minimum APZ required (Appendix 2, PBP)	APZ provided
North	Forest	Level	20 metres	50 metres
East	Managed lands / rural residential	Level	Not required	14 metres (although >100m currently managed)
West	Riparian Area (see note 1) / Managed lands / rural residential	Level	10 metres	23 - 26 metres
South	Managed lands / Rural residential	Level	not required	30 metres (although >100m currently managed)

Lot 3

Aspect	Vegetation within 140m of development	Effective slope of land	Minimum APZ required (Appendix 2, PBP)	Proposed APZ (as shown on Schedule 1 plan)
North	Forest	Level	20 metres	40 metres
East	Riparian Area (see note 1) / Managed lands / rural residential	Level	10 metres	40 metres
West	Forest	Level	20 metres	40 metres
South	Managed lands / Rural residential	Level	not required	20 metres (although >100m currently managed)

Lot 4

Aspect	Vegetation within 140m of development	Effective slope of land	Minimum APZ required (Appendix 2, PBP)	APZ provided
North	Forest	Level	20 metres	40 metres
East	Managed lands / rural residential	Level	not required	10 metres (although >100m currently managed)
West	Forest	Upslope	20 metres	40 metres
South	Forest	Upslope	20 metres	30 metres

Note 1: PBP identifies that riparian areas less than 20 metres wide are treated with the same APZ dimensions as rainforest. The vegetation to the east of Lot 3 and the west of Lot 2 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.

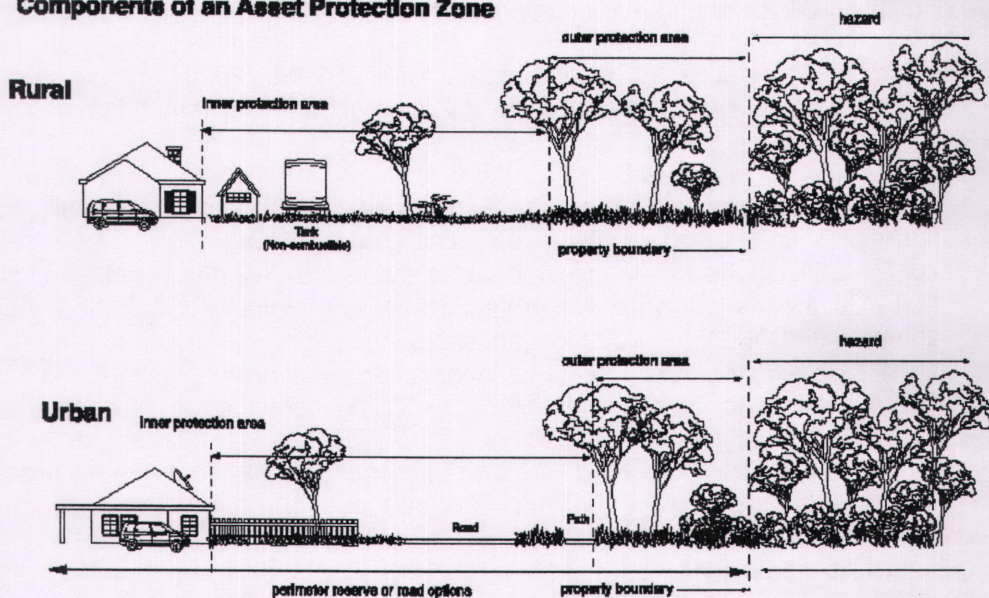
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Specific Protection Issues

3.1 Asset protection zones

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

Components of an Asset Protection Zone



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.

BBP 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 Appendix 2 of PBP to provide the necessary *defendable space* between hazardous vegetation and a building.

In achieving this rating the size of the APZ has been determined according to RFS 'deemed to satisfy' standards. The results illustrate that the site is exposed to a medium / high level of bushfire attack from the impact of bushfires burning within the adjacent bushland

surrounding the site. The APZs shown in Tables 1, 2 & 3 and depicted in Schedule 1 attached exceed the requirements of PBP.

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 asset protection zone must be provided in accordance with Appendix 2 of PBP. The asset protection zones provided in Section 2.2 of this report comply with these requirements.

Following on from the subdivision stage, any future construction is subject to Section 79BA of the *Environmental Planning and Assessment Act 1979*. Appendix 3 of PBP 2006 is used in conjunction with Table 2.4.2 of AS3959 (2009), 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.

Building construction standards (in accordance with AS3959, 2009) are not applied until building construction stage and as such the following general recommendations have been provided:

- Lot 3 – Utilising the existing cleared lands as an asset protection zone will require the future building to comply with BAL 19 building construction.
- Lot 2 – Utilising the existing cleared lands and maintaining the vegetation to the west (23 - 36 metres) as an asset protection zone will require the future building to comply with BAL 12.5 building construction.
- Lot 4 – Utilising the existing cleared lands as an asset protection zone will require the future building to comply with BAL 29 building construction. There is scope to decrease this construction to BAL 19 if the APZ in the south is potentially increased to 35 metres (i.e. the existing forest would require management in accordance with the requirements for an Outer Protection Area for a further 5 metres.)

3.3 Hazard management

Should the development be approved, the owner or occupier will be required to manage the APZ to the specifications of Council's approval.

Guidelines for managing APZs are attached as Appendix 1.

The land owners will have an ongoing liability to ensure the management of the lands within the property in order to prevent the build up of combustible fuel. Should the development be approved, the owner or occupier will be required to manage the APZ to the specifications of Council's approval.

The adjoining rural residential landscapes are regularly managed and / or grazed by horses and should be accepted as managed landscapes for the purposes of *defendable space*.

Thus there is no physical reason that could constrain ongoing hazard management in any potential APZ and / or *in situ* default APZ on adjoining lands from being successfully carried out by normal means (e.g. mowing / slashing / grazing) following initial clearing works.

In most cases the RFS would require a guarantee on the management of the hazardous fuels within the defendable space and this would typically require that a Section 88B instrument be prepared over any affected (adjoining) properties for the purpose of maintaining fuel level to a specified level.

However in this case the managed landscapes in the adjoining properties can be assumed to be compliant due to little possibility for any change in their vegetated state. The immediate environment is more likely than not to have more rural residential landscape rather than a hazardous forested landscape due to the heightened land values.

3.4 Availability of fire fighting services

There is an RFS brigade located at Chittaway Bay approximately 2.0 kilometres (road distance) to the north of the site. The Chittaway RFS brigade would have a response time of approximately 15-20 minutes to service the development if they are not assisting elsewhere.

The Ourimbah RFS Brigade is located approximately 5.3 kilometres (road distance) to the south of the site. The Ourimbah RFS Brigade would have a response time of approximately 20- 30 minutes to service the development if they are not assisting elsewhere.

3.5 Access for fire fighting operations

Berkeley Road provides direct access to the proposed lots from two directions. No additional road works are required. Berkeley Road is 6 to 7 meters wide sealed, with mown grass verges. It is a busy secondary road linking Wyong Road to Enterprise Drive.

Wyong Shire Council identified in its Desktop Assessment that a perimeter road may be required. Section 4.1.3 of PBP identifies that perimeter roads are the preferred option for urban subdivision, however this is not a requirement under PBP for rural residential properties. The proposed asset protection zones provide defendable space and appropriate separation between the hazard and buildings. Safe operational access and egress for emergency service personnel and residents is available from Berkeley Road.

Property Access

A proposed driveway will be provided from Berkeley Road to each lot providing safe access and egress.

The *performance criteria* for property access roads required by the RFS involves "providing safe access to/from the public road system for firefighters providing property protection during a bushfire and for occupants faced with evacuation".

Acceptable Solutions	Compliant or not
At least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200 m from a public through road.	Dwellings will be less than 200 m from Berkeley Road
Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes.	N/A

Acceptable Solutions	Compliant or not
Roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge)	Berkeley Road is subject to flood otherwise N/A
A minimum carriageway width of four metres for dwellings with a distance of greater than 70 metres from the nearest hydrant point to the most external part of a proposed building. Note: No specific access requirements apply in a urban area where a 70 m unobstructed path can be demonstrated between the most distant external part of a dwelling and the nearest part of the public access road that supports the operational use of firefighting vehicles (road speed limit <70kph)	Four metre carriageway required
In forest, woodland and heath situations, rural property access roads have passing bays every 200 m that are 20 m long by 2m wide (min. width 6m).	N/A
A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches	Complies
Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum outer radius of 12m.	Comply by way of condition of consent
Curves have a minimum inner radius of 6 m and are minimal in number to allow rapid access/egress.	Comply by way of condition of consent
The minimum distance between inner and outer curves is 6 metres.	Comply by way of condition of consent
The cross fall is not more than 10 degrees	Site is level
Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.	Site is level or within the acceptable grade
Access to a development comprising more than three dwellings have formalized access by dedication of a road and not by right of way.	N/A

3.6 Evacuation safety

The lots will have safe and direct egress onto Berkeley Road.

The impact of smoke causing visual obstruction and / or breathing difficulties upon evacuees or emergency service personnel should not in all probabilities be a significant constraint to evacuation due to the safe evacuation routes.

3.7 Water supplies

No reticulated water supply is available to the proposed dwelling so onsite water storage will be required.

The *performance criteria* for non-reticulated water supply is that 'a water supply reserve dedicated to firefighting purposes must be installed and maintained. The acceptable solutions are:

Acceptable Solutions	Compliant or not
<p>The minimum 20,000 Litres dedicated water supply for each building is to be provided in accordance with Table 4.2 of PBP 2006.</p> <p>A 65mm Storz outlet with a Gate or Ball valve is provided as a suitable connection for fire fighting purposes within the asset protection zone.</p> <p>Gate or Ball valve and pipes are metal (not plastic) and are adequate for water flow.</p> <p>Underground tanks have an access hole of 200mm to allow tankers to refill straight from the tank. A hardened ground surface for truck access is supplied within 4 metres of the access hole.</p> <p>Above ground tanks are concrete or metal and raised tanks have their stands protected. Tanks on the hazard side of the building are provided with shielding to protect fire fighters.</p> <p>All above ground water pipes external to the water pipe are metal including and up to any taps. Pumps are shielded.</p>	<p>Water supply requirements should be identified as a condition of consent for each lot at the building application stage.</p>

3.8 Gas

PBP outlines the following *performance criteria* for gas services:

- Location of gas services is not to lead to the ignition of surrounding bushland land or the fabric of buildings
- Gas bottles are to be maintained in accordance with AS 1596 - 2002. Metal piping is to be used
- All fixed LPG tanks are to be kept clear of flammable materials and located on the non-hazard side of the building
- If gas cylinders are to be kept close to the building the release valves must be directed away from the building
- Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used

3.9 Electricity

Electricity should be located underground so as not to lead to ignition of surrounding bushland or the building itself.

4 Conclusion & Recommendations

4.1 Conclusion

A bushfire protection assessment has been undertaken to consider the revised rezoning proposal which would allow for the subdivision of three rural-residential lots and consider the development in compliance with PBP.

The assessment found that bushfire can potentially affect the proposed development from the forest vegetation to the north, south and west of the site, resulting in possible attack for embers and radiant heat.

The assessment has concluded that applying the principles of PBP would allow:

- Compliance with Planning for Bushfire Protection 2006.
- Compliance with AS 3959 (2009)

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

The following illustrates the proposals compliance with PBP.

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

Response: APZs have been provided in accordance with Appendix 2 of PBP. The proposed dwellings will be constructed in accordance with AS 3959. Access will comply with section 4.2.7 of PBP. Other bushfire protection measures are planned and identified with the recommendations below.

Provide for a defensible space to be located around buildings

Response: APZs have been provided in accordance with Appendix 2 of PBP.

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

Response: APZs have been provided in accordance with PBP and building construction will be applied in accordance with AS3959 (2009). Fuel management will occur in the APZ and will be managed in perpetuity.

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

Response: Berkeley Road provides direct access to the proposed lots. Access and egress is available in two directions, west to Enterprise Drive and East to Wyong Road.

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 and access to water tanks can be assured by a condition of Council consent.

The following recommendations are provided to ensure that the development is in accord or greater than the requirements of PBP.

4.2 Recommendations

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

Recommendation 2 - APZs are to be provided to the proposed development. APZs are to be measured from the exposed wall of the any dwelling toward the hazardous vegetation. The APZs shall be as nominated in Table 1 and also as generally depicted in Schedule 1.

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.

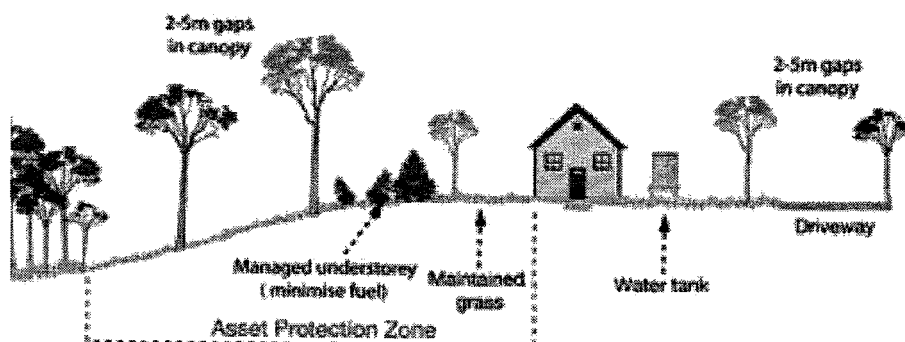
Notwithstanding specialist advice in those guidelines, the following general advice for maintaining an APZ is to be followed:

- *Mowing or grazing of grass:* Grass needs to be kept short (approximately 5 cm in height) and green where possible adequate water supplies are available.
- *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. 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 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 two metres 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 are to be applied 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 (Planning for Bushfire Protection, 2006).

Recommendation 5 - 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 6 - The landowner / manager should be provided with publications such as *Bushfire Protection for New and Existing Rural Properties* relating to living in a bushfire prone area and available through the RFS or Council

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.











S1

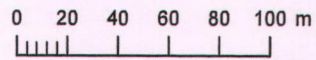


Plan of Bushfire
Protection Measures

Bushfire Protection Measures

Legend

-  Proposed Lot Boundary
-  Asset Protection Zone Requirement in Accordance with Section 100B of Rural Fires Act
-  Indicative Building Location
-  Forest
-  Managed Rural Residential
-  Revegetation Area
-  Riparian Zone
-  1% AEP Flood Effected Land Boundary



1:2,000

Original plan produced in A3 colour
GDA 1984 MGA Zone 56
Ref.No. A11049B
02/06/11

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.

Aerial photography has been edited to show location of current dwellings & managed landscape surrounding the site

Travers
bushfire & ecology

www.traverseecology.com.au



SOURCE: Aerial Photography © Google Earth Pro



A1



Management of Asset
Protection Zones

Management of Asset Protection Zones

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 RFS provide 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 (eg. 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.

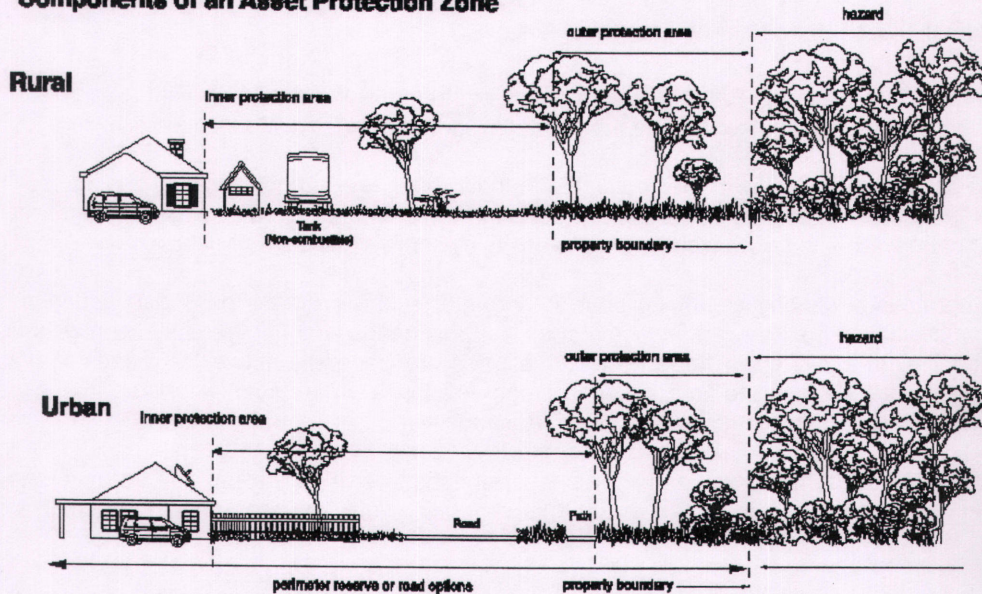
Table 1 – Fuel Layers

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.

Components of an Asset Protection Zone



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 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 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.

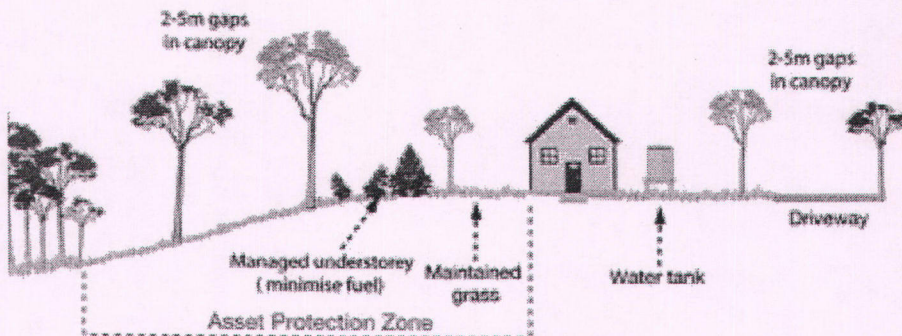
Managing the APZ

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 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.