Travers

bushfire & ecology

bushfire protection assessment

Rezoning Application
Part Lot 4 -7 & 15 -17 DP 11133
Castle Hill Road and Oratava Avenue,
West Pennant Hills

Under Section 117(2) Direction No 4.4
of the *EP&A Act*

May 2019
(REF: 18CNSW02BF)

Bushfire Protection Assessment

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Report Authors:	Nicole van Dorst B. App. Sc., Grad. Dip., BPAD-L2 23610 Emma Buxton B. Sc.
Plans prepared:	Alexandra Scott B. Sc.
Checked by:	Nicole van Dorst/ John Travers
Date:	10/05/19
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BPAD Bushfire Planning & Design Accredited Practitioner Level 3

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

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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.

TBE Environmental Pty Ltd
ABN 85 624 419 870
PO Box 7138
Kariong NSW 2250

38A The Avenue
Mt Penang Parklands
Central Coast Highway
Kariong NSW 2250

t: 02 4340 5331
e: info@traversecology.com.au
www.traversecology.com.au

EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the planning proposal located at 131 Oratava Avenue & 87-89 Castle Hill Road, West Pennant Hills. The proposal is to rezone two (2) sites within the broader Cumberland State Forest (owned by the Forestry Corporation) from RU3 Forestry to R2 Low Density Residential.

This report identifies matters for consideration for the planning proposal and highlights the required bushfire protection measures, including asset protection zones (APZs), for future development under the *Environmental Planning and Assessment Act 1979 (EP&A Act), Section 117 Direction 4.4 and* in accordance *Planning for Bush Fire Protection 2006* (*PBP*) and *Community Resilience Practice Note 2/12 Planning Instruments and Policies*.

The key principle for the proposal is to ensure that future development is capable of complying with *PBP*. Planning principles for the proposal include the provision of adequate access including perimeter roads, establishment of adequate 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.

Our assessment found that bushfire can potentially affect the site from the wet sclerophyll forest vegetation and remnant forest which adjoins each of the sites resulting in possible ember attack, radiant heat and potentially flame attack.

This assessment has been undertaken to take into account the methodology outlined in *Pre-release PBP 2018*. It is anticipated that *PBP 2018* will become legislated by mid – 2019, to coincide with the enactment of the National Construction Code 2019. Until then, *PBP 2018* is in a 'pre-release' stage, also formerly referenced by the RFS as the transitionary period. Until *PBP 2018* becomes legislated, *PBP 2006* is the legally referenced document, however *PBP 2018* can be used on a performance basis, as proposed with this application for the determination of asset protection zones.

Future concept / subdivision plans will ensure that the bushfire risk posed to the site can be mitigated with appropriate bushfire protection measures. This includes the provision of APZs which will be managed in perpetuity, effective road design and the location of the development sites within close proximity to the public roads.

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP (2006 & 2018)* and *Community Resilience Practice Note 2/12 – Planning Instruments and Policies*.

GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	Asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EEC	Endangered ecological community
FDI	Fire danger index
IPA	Inner protection area
LEP	*Local environmental plan*
OPA	Outer protection area
PBP	*Planning for bush fire protection 2006*
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose

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Introduction 1

Travers bushfire & ecology has been engaged to undertake a bushfire protection assessment for the proposed rezoning located within Part Lot 4-7 & 15-17 DP 11133, Castle Hill Road and Oratava Avenue, West Pennant Hills.

The proposal is located on land mapped by *The Hills Shire Council* as being bushfire prone. *Direction 4.4, Planning for Bush Fire Protection 2006 (PBP)* identifies matters for consideration for planning proposals that will affect, or are in proximity to land mapped as bushfire prone.

As such, the proposal is subject to the requirements of Section 117(2) of *the Environmental Planning and Assessment Act 1979 (EP&A Act)* which requires Council to consult with the Commissioner of the NSW Rural Fire Service (RFS) and to take into account any comments by the Commissioner.

1.1 Aims of the assessment

Planning applications are required to address Section 117 Direction 4.4 of Planning for Bushfire Protection. The objectives of this direction are to;

a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and
b) to encourage sound management of bush fire prone areas.

The potential for future rezoning of the property, from a bushfire context, needs to ensure that future land uses are in a suitable location to minimise the risk and impact of bush fire attack. In addition services and infrastructure to facilitate effective suppression of a bush fire also needs to be provided.

The broad principles which should be applied to strategic level development are as follows:

- not all land is suitable for development in the context of bush fire risk
- any new development on bush fire prone land must comply with PBP
- infrastructure associated with emergency evacuation and firefighting operations must be provided
- appropriate ongoing land management practices must be facilitated.

Strategic planning should provide for the exclusion of inappropriate development in bush fire prone areas as follows:

a) when the bush fire risk makes it inappropriate for new development to occur
b) for development that is likely to be difficult to evacuate during a bush fire
c) for development that will adversely affect other bush fire protection strategies or place existing development at increased risk
d) for development that is within an area of high bush fire risk where density of existing development may cause evacuation issues for both existing and new occupants.
e) where environmental constraints to the site cannot be overcome.

1.2 Project synopsis

The rezoning involves two (2) sites within the broader Cumberland State Forest with the ultimate view to subdivide and divest these areas in the future. The northern site (adjoining Castle Hill Road) includes Part Lot 4, 5, 6 and 7 and is adjacent to the northern boundary of Castle Hill Road. The southern site includes part Lot 15, 16 and 17 and is adjacent to Oratava Avenue (refer Figures 1.1-1.2). The proposal seeks to rezone each of these sites from RU3 Forestry to R2 Low Density. The APZ's recommended with this report are for standard residential purposes only (i.e. do not include special fire protection purpose development (SFPP).

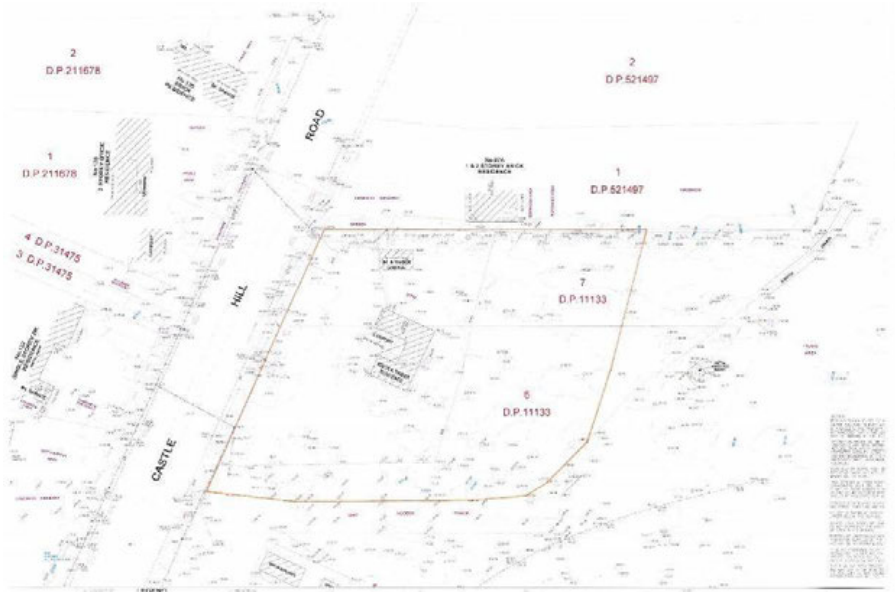


Figure 1.1– Proposed rezoning area off Castle Hill Road (north)

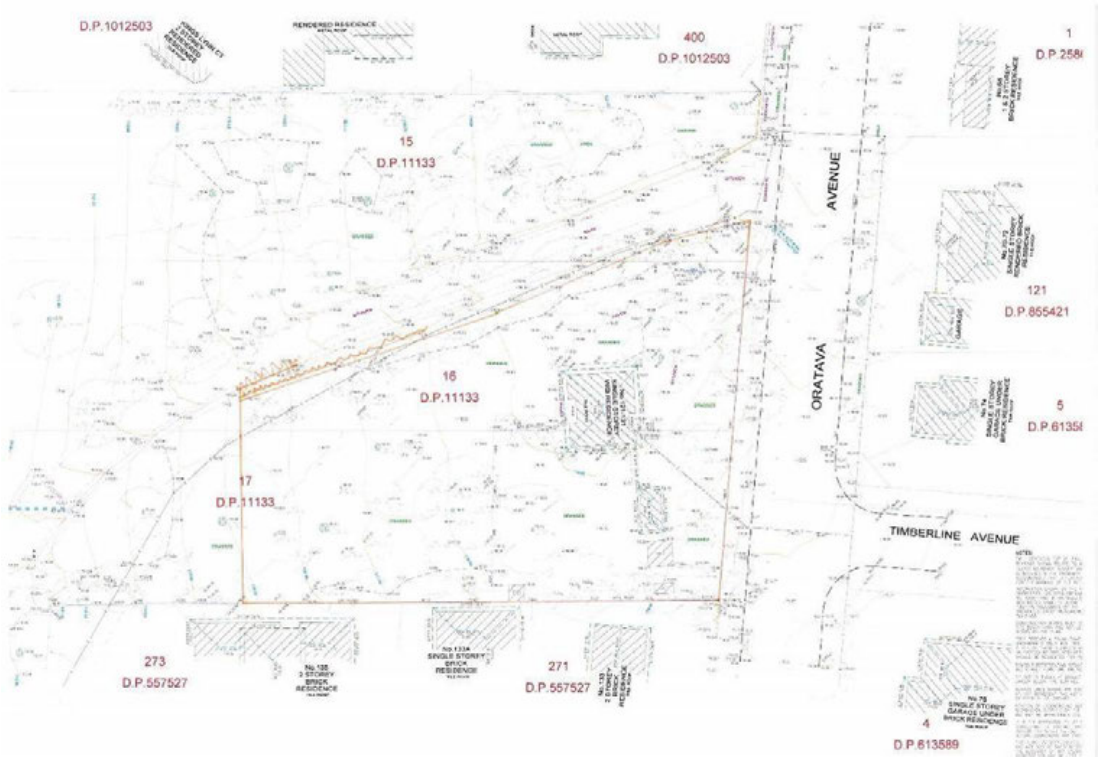


Figure 1.2 – Proposed rezoning area off Oratava Avenue (south)

The proposal at this stage does not involve a concept plan and as such the bushfire constraints have been highlighted and minimum APZs have been recommended. Recommendations have also been made for future road design, building construction, water supply and utilities.

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:

- The Hills Local Environmental Plan 2012
- Concept plans supplied by *Forestry Corporation of NSW*, received 30 November 2018
- Biodiversity Development Assessment Report, 2019 prepared by *Travers bushfire & ecology*
- *Nearmap* aerial photography
- Topographical maps *DLPI of NSW* 1:25,000
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas*
- *Planning for Bush Fire Protection 2006 (PBP)*
- *Community Resilience Practice Notes 2/12 Planning Instruments and Policies.*

An inspection of the proposed development site and surrounds was undertaken by Nicole van Dorst in March 2018 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 two (2) sites are located within Part Lot 4, 5, 6, 7, 15, 16 and 17 DP 11133 (refer Figure 1.3). The northern site is bound by Castle Hill Road, whilst the southern site is bound by Oratava Avenue. Both sites are adjoined by wet sclerophyll forest vegetation associated with the greater Cumberland State Forest and well as remnant forest.

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

Table 1.1 – Site features

Location	Part Lot 4, 5, 6, 7, 15, 16 and 17 DP 11133. Castle Hill Road and Oratava Avenue, West Pennant Hills.
Local government area	The Hills
Grid reference	Northern site - 318300E 6264900N / Southern site – 318500E 6263900N
Topography	Castle Hill Road site - situated on a moderate sloping ridgetop / Oratava Avenue site – situated on a relatively flat slope leading towards a riparian line.
Catchment and drainage	Catchment – Darling Mills Creek
Vegetation	The Cumberland State Forest contains extensive Sydney Turpentine Ironbark Forest and Blue Gum High Forest. Both of these communities are a wet sclerophyll forest formation. There is fragmented connectivity along Castle Hill Road to the east, and along tributaries of Darling Mills Creek to the south-west.
Existing land use	There are some existing buildings and previous vegetation clearance within the proposed rezoning areas.

Figure 1.3 – Aerial appraisal
(source: Nearmap, 2018)

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 (BCA).* The identification of bushfire prone land is required under Section 10.3 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 by *The Hills Shire Council* as being bushfire prone (refer Figure 1.4).

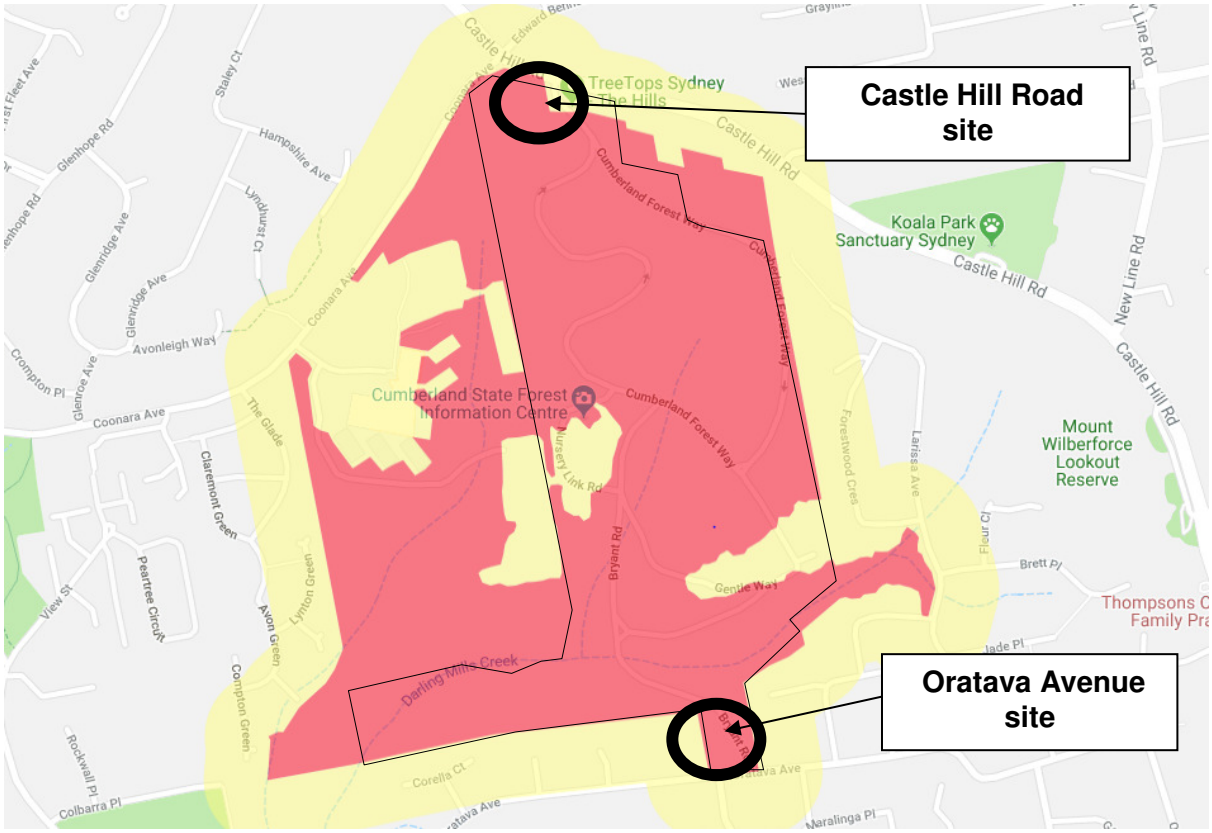


Figure 1.4 – Bushfire prone land map
(source: Planning Portal, 2019)

PBP (pg 4) stipulates that if a proposed amendment to land use zoning or land use affects a designated bushfire prone area then the Section 117(2) Direction No 4.4 of the *EP&A Act* must be applied. This requires Council to consult with the Commissioner of the RFS and to take into account any comments by the Commissioner and to have regard to the planning principles of *PBP* (detailed within Section 1.5.3).

1.5.2 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 *The Hills LEP 2012* as outlined below.

The Hills Local Environmental Plan 2012

The site is zoned under the current *The Hills LEP 2012* as RU3 – Forestry (refer Figure 1.5). The land surrounding the Cumberland State Forest to the north, south and east is zoned as R2 – Low Density Residential whilst the land to the west is zoned B7 – Business Park.

The proposal seeks to amend the LEP to rezone both the northern and southern sites to R2 – Low Density Residential, consistent with the adjoining land zoning.

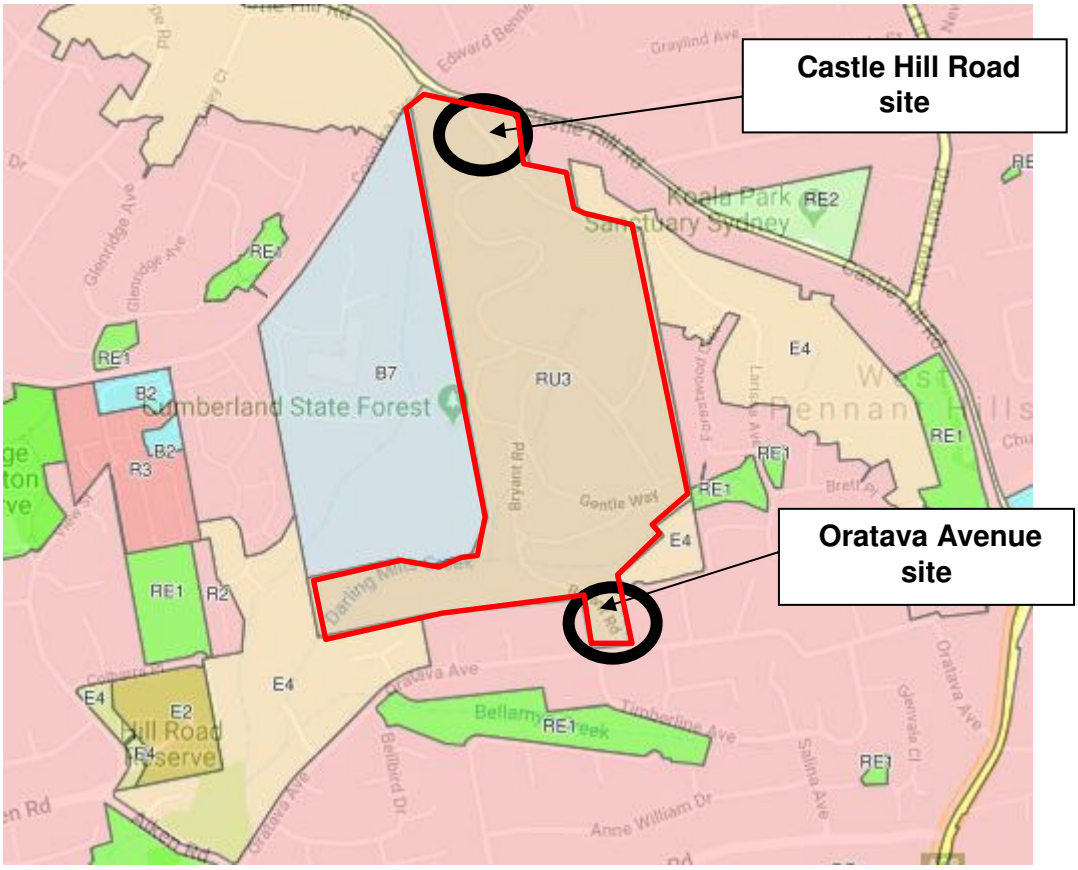


Figure 1.5 – The Hills LEP 2012
(source: Planning Portal, 2019)

The proposal, including the provision of APZs, would seek to comply with the objectives of the proposed rezoning.

1.5.3 Planning for Bush Fire Protection 2006 (PBP) & Pre-release PBP 2018

Bushfire protection planning requires the consideration of the RFS planning document entitled *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.

The NSW Rural Fire Service has conducted a review of the current PBP 2006, and it is proposed that Pre-release PBP (2018), will come into effect in May 2019. Prior to the formal adoption in legislation of PBP 2018, developments (excluding complying development) that conform with the requirements of the pre-release edition of PBP 2018 can be considered in certain circumstances.

Where it is proposed to use the pre-release edition of PBP 2018, this must be undertaken as a Performance Solution in consultation with the NSW Rural Fire Service under section 4.14(1A) of the Environmental Planning and Assessment Act 1979. Until PBP 2018 is adopted through the relevant legislation, PBP 2006 remains the law for development on bush fire prone land in NSW.

The proposed rezoning areas have been assessed in compliance with Pre-release PBP 2018. This includes an assessment against the following bushfire protection measures to ensure that future development is capable of complying with *PBP 2018*:

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

1.5.4 Building Code of Australia (BCA) and the Australian Standard AS3959 Construction in bushfire-prone areas 2009 (AS3959)

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions. For residential dwellings these include Classes 1, 2 and 3 buildings. The construction manual for the deemed to satisfy requirements is *AS3959.*

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 constraints

The Biodiversity Development Assessment Report (BDAR) prepared *Travers bushfire & ecology* (February, 2019) found that the direct impacts of the proposal within the subject site are considered as:

- Removal of hollows with low potential use by threatened species
- 0.136ha of PCT 1237 (Blue Gum High Forest)
- 0.344ha of PCT 1281 (Sydney Turpentine Ironbark Forest)
- Up to 0.48ha loss of vegetated habitat for threatened species

The report concluded that the impacts on the areas ecology is limited to just below 0.5ha. The proposed rezoning from RU3 to R2 is suitable for the locality, however will be subject to the BOS (or Species Impact Statement), will require a full Biodiversity Development Assessment Report (BDAR), assessment of SAIIs and an assessment upon *EPBC Act* matters.

Bushfire Threat Assessment 2

To assess the bushfire threat and to determine the required width of an APZ for a development, a review of the elements that comprise the overall threat needs to be completed.

PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

2.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation formation, for a distance of at least 140m from a proposed development envelope, in accordance with David Keith (2004) to determine APZ distances for SFPP developments.

Recently these vegetation groups have been subject to further fuel load research by the University of Wollongong (UoW) and Dr Penny Watson. These fuel loads have been published in the 2017 public draft release of PBP 2017 (RFS 2017) and are summarised in Table 2.1. The fuel loads adopted in this assessment (Column 3) are based on UoW research and are current best practice.

Table 2.1 – Vegetation / fuel load

Vegetation community	Vegetation Formation / Fuel load (PBP 2006)	Vegetation Class / Fuel load (Draft PBP 2017)
PCT 1237 Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Wet Sclerophyll Forests (Shrubby sub-formation) (25/30 t/ha)	North Coast Wet Sclerophyll Forests (22/35.98 t/ha)
PCT 1281 Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Wet Sclerophyll Forests (Grassy sub-formation) (20/25 t/ha)	Northern Hinterland Wet Sclerophyll Forests (20/33.1 t/ha)

The hazardous vegetation is calculated for a distance of at least 140m from a proposed site boundary and is summarised below. Photo points have been provided in Schedule 1 & 2 attached.

Castle Hill Road

- Remnant forest to the south and west (refer Schedule 1 attached). *PBP* describes remnant vegetation as a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards a building not exceeding 50m. The vegetation to the immediate south and west exhibits these qualities with significant fire breaks being provided between these remnant patches and further bushfire prone vegetation.

  These fire breaks consist of large picnic areas to the south 'Calgaroo Picnic Area' and well as the main public access road and the managed land surrounding the telecommunications tower in the west.

  The threat from the vegetation to the immediate south and west is considered low and APZ setbacks for this aspect are the same as for the rainforests category outlined in Pre-release *PBP 2018* (fuel load 10/13.2 t/ha).

- North-Coast Wet Sclerophyll Forest beyond the public road to the west and the picnic area to the south.

Photo 1 – Remnant forest to the west. APZ includes the dirt access track (shown in photo) which provides access to the telecommunications tower.

Photo 2 – Public access road (looking north towards Castle Hill Road)

Photo 3 – Managed land to the east

Photo 4 & 5 – Managed picnic area to the south providing a fire break of over 40m

Oratava Avenue

Photo 6 – Oratava development site (APZ to include existing public road to the site)

- North-Coast Wet Sclerophyll Forest to the north (refer Photo 7)

- Northern Hinterland Wet Sclerophyll Forest to the north-east where fire run potential exceeds 50m (refer Schedule 1 attached)

- Remnant forest to the east and slightly north-east (refer Schedule 2 attached). *PBP* describes remnant vegetation as a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards a building not exceeding 50m. The vegetation to the east exhibits these qualities with a large portion of this area currently being maintained for bushfire protection of the existing adjoining residential sites (refer Photo 8 & 9). Whilst this land is currently managed a worst case scenario has been adopted and a remnant threat (fire run of <50m) has been adopted. The threat posed is considered low and APZ setbacks for this aspect are the same as for the rainforests category outlined in Pre-release *PBP 2018* (fuel load 10/13.2 t/ha).

Photo 7 – Forest to the north-east

Photo 8 – Existing APZ to the north-east & east

Photo 9 – Remnant forest / managed land to the east

2.2 Effective slope

The effective slope is determined by reviewing the slopes within 100m of the development boundary. 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 provided within Table 2.2.

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site using an FDI 100 based on the sites location within the Greater Sydney region.

Table 2.2 provides a summary of the bushfire attack assessment. Columns 4 identifies the minimum required APZs in accordance with Table A1.12.5 of Pre-release *PBP 2018*. Column 5 provides the APZ distances measured from the indicative proposed lot boundary, as shown within Schedule 1 & 2, based on current management regimes using an alternative solution approach (accurate slopes and fuel loads identified in Draft PBP 2017).

Table 2.2 – Bushfire attack assessment

Aspect	Vegetation formation within 140m of development	Effective slope of land	APZ required Pre-release PBP 2018 (Table A1.12.2) (metres)	APZ provided alternative solution approach (refer Note 1)
Oratava Avenue site (refer Schedule 2 attached)				
North	North Coast Wet Sclerophyll Forest (22 / 35.98 t/ha)	12 ^{0D}	45	44
North-east		8 ^{0D}	37	35
North-east	Northern Hinterland Wet Sclerophyll Forest (20 / 33.1 t/ha)	8 ^{0D}	37	31
East	Remnant forest (refer Note 2)	0-5 ^{0D}	14	N/A
South & west	Managed land	NA	N/A	>100
Castle Hill Road site (refer Schedule 1 attached)				
South	Remnant forest (refer Note 2)	7^{0D}	18	15
West	Remnant forest (refer Note 2)	0-5 ^{0D}	14	N/A
	North Coast Wet Sclerophyll Forest (22 / 35.98 t/ha)	7^{0D}	37	33

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

Note 1: A performance based assessment using Appendix B of *AS3959* was undertaken to determine the required minimum APZ (equivalent to BAL 29 construction) based on the fuel loads identified in Column 2 and the slope identified in Column 3. The results of the assessment, provided within Appendix 2, were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting.*

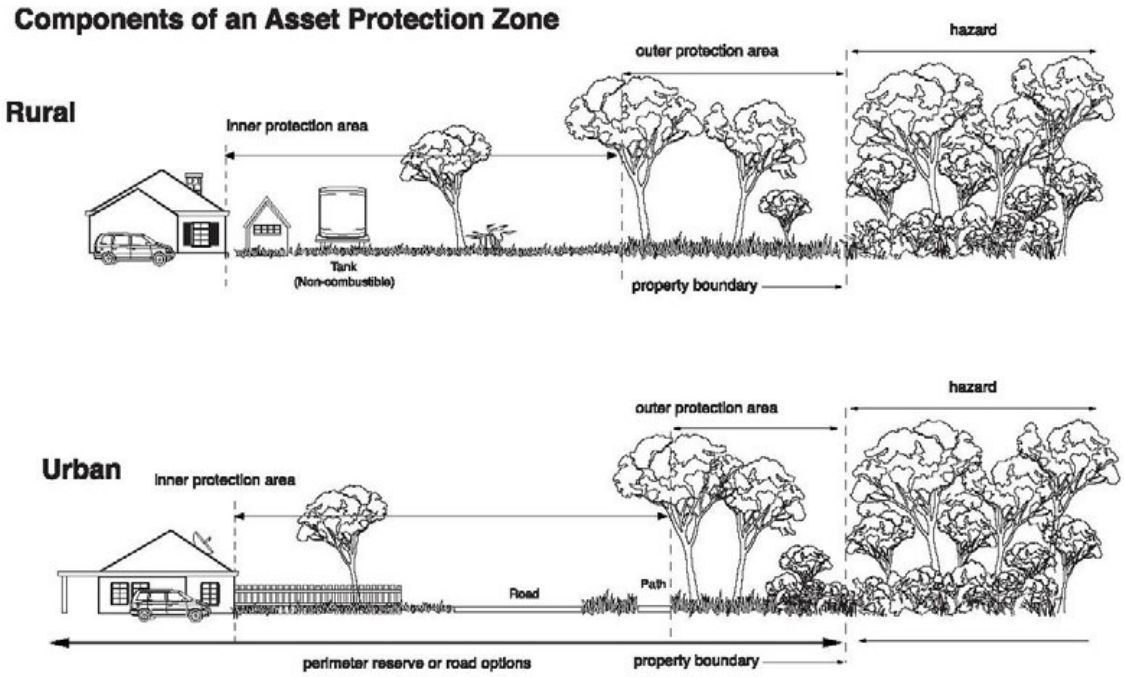
Note 2: *PBP* describes remnant vegetation as a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards a building not exceeding 50m. The vegetation to these aspects exhibits these qualities and therefore the threat posed is considered low and APZ setbacks for this aspect are the same as for the rainforest category outlined in *PBP*.

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:



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

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

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of 29kW/m^2 for residential subdivision developments. This rating assists in determining the size of the APZ in compliance with *PBP* to provide the necessary defendable space between hazardous vegetation and a building. Table 3.1 outlines the proposals compliance with the performance criteria for APZs.

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

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2	An APZ is provided in accordance with Appendix 2 of *PBP.* The APZ is wholly within the boundaries of the development.	☐	☑	Refer Section 2.3. An alternative solution approach has been undertaken using accurate slopes and fuel loads. Buildings will be located outside of APZ areas to ensure radiant heat levels will not exceed 29kW/m^2. APZ's include the existing public road to the east of the Oratava Avenue site and the gravel access track for the telecommunications tower adjacent to the Castle Road site in the west.
APZs are managed and maintained to prevent the spread of fire towards the building	In accordance with the requirements of *Standards for Asset Protection Zones* (RFS 2005)	☑	☐	The APZ consists of landscaped areas, roads and turf areas. The APZ is not located on slopes exceeding 18^o.
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	The APZ is located on lands with a slope of less than 18^o	☑	☐	APZs are located on slopes less than 18^o

3.2 Building protection

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 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 – *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 provides an indication of the BALs that are likely to apply for future building construction. These BAL levels are for planning purposes only and will be assessed / confirmed prior to building construction stage.

Table 3.2 – Determination of bushfire attack level (BAL)

Aspect	Vegetation formation within 140m of development	Effective slope of land	APZ provided	Building construction standards
Oratava Avenue site				
North	North Coast Wet Sclerophyll Forest (22 / 35.98 t/ha)	12 ^{0D}	44	BAL 29 (44–<55m) BAL 19 (55-<71m) BAL 12.5 (71-<100m)
North-east		8 ^{0D}	35	BAL 29 (35–<46m) BAL 19 (46-<61m) BAL 12.5 (61-<100m)
North-east	Northern Hinterland Wet Sclerophyll Forest (20 / 33.1 t/ha)	8 ^{0D}	31	BAL 29 (31–<43m) BAL 19 (43-<57m) BAL 12.5 (57-<100m)
East	Remnant forest (refer Note 2)	0-5 ^{0D}	14	BAL 29 (31–<43m) BAL 19 (43-<57m) BAL 12.5 (57-<100m)
South & west	Managed land	NA	>100	BAL level determined above
Castle Hill Road site				
South	Remnant forest (refer Note 2)	7^{0D}	15	BAL 29 (15–<22m) BAL 19 (22-<31m) BAL 12.5 (31-<100m)
West	Remnant forest (refer Note 2)	0-5 ^{0D}	14	BAL 29 (14–<21m) BAL 19 (21-<29m) BAL 12.5 (29-<100m)
	North Coast Wet Sclerophyll Forest (22 / 35.98 t/ha)	7^{0D}	33	BAL level determined above

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

3.3 Hazard management

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

The APZs are to be managed in accordance with the 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 is attached as Appendix 1 to this report.

3.4 Access for fire fighting operations

Future residential development within each of the sites will provide direct access to the existing public roads Castle Hill Road in the north and Oratava Avenue in the south. Given the small size of the proposed development areas and the proposed R2 zoning it is expected that future subdivision will be limited to 2 – 3 allotments for each site.

Future access within each of the sites will therefore be limited to property access only onto the exiting public road network.

Table 3.3 outlines the performance criteria and acceptable solutions for future property access roads.

Table 3.3 – Performance criteria for property roads (Pre-release *PBP* 2018 guidelines pg. 46)

Performance criteria	Acceptable solutions
Firefighting vehicles can access the dwelling and exit safely	No specific access requirements apply in a urban area where a 70 metre unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply).
	In circumstances where this cannot occur, the following requirements apply: • minimum carriageway width of 4m; • in forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay; and • a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; and • provide a suitable turning area in accordance with Appendix 3; and • curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress; and • the minimum distance between inner and outer curves is 6m; and the crossfall is not more than 10°; and • maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads; and • a development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.

3.5 Water supplies

Town reticulated water supply is available to the property in the form of an underground reticulated water system.

Table 3.4 outlines the performance criteria and acceptable solutions for reticulated water supply.

Table 3.4 – Performance criteria for reticulated water supplies (Pre-release *PBP* guidelines pg. 48)

Performance criteria	Acceptable solutions
A water supply is provided for firefighting purposes	Reticulated water is to be provided to the development, where available; A static water supply is provided where no reticulated water is available.

Performance criteria	Acceptable solutions
Water supplies are located at regular intervals the water supply is accessible and reliable for firefighting operations	Fire hydrant spacing, design and sizing comply with the Australian Standard AS 2419.1:2005; Hydrants are not located within any road carriageway; Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.
Flows and pressure are appropriate	Fire hydrant flows and pressures comply with AS 2419.1:2005.
The integrity of the water supply is maintained	All above-ground water service pipes are metal, including and up to any taps.

3.6 Gas

Table 3.5 outlines the required performance criteria for the gas supply.

Table 3.5 – Performance criteria for gas supplies (Pre-release *PBP* guidelines pg. 48)

Performance criteria	Acceptable solutions
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 (2014) and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side. Connections to and from gas cylinders are metal; Polymer sheathed flexible gas supply lines are not used. Above ground gas service pipes are metal, including and up to any outlets.

3.7 Electricity

Table 3.6 outlines the required performance criteria for electricity supply.

Table 3.6 – Performance criteria for electricity services (Pre-release *PBP* guidelines pg. 48)

Performance criteria	Acceptable solutions
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings	Where practicable, electrical transmission lines are underground Where overhead electrical transmission lines are proposed: • Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas: and • No part of a tree is closer to a power line than the distance set out in accordance with the specification in *ISSC3 Guideline for Managing Vegetation Near Power Lines*

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the planning proposal located at 131 Oratava Avenue & 87-89 Castle Hill Road, West Pennant Hills. The proposal is to rezone two (2) sites within the broader Cumberland State Forest (owned by the Forestry Corporation) from RU3 Forestry to R2 Low Density Residential.

Our assessment found that bushfire can potentially affect the site from the wet sclerophyll forest vegetation and remnant forest which adjoins each of the sites resulting in possible ember attack, radiant heat and potentially flame attack.

This assessment has been undertaken to take into account the methodology outlined in *Pre-release PBP 2018* and is therefore considered a performance based assessment.

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP (2006 & 2018)* and *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 small size of the proposed redevelopment areas (i.e. 2 – 3 allotments for each site), their location and close proximity existing public roads a perimeter road is not required. The existing public road network within the Cumberland State Forest provides adequate firefighting access to all areas of vegetation and to the rear of the proposed development areas.
Provision, at the urban interface, for the establishment of adequate APZs for future housing.	APZs have been recommended in compliance with BAL 29 (AS3959, 2009).
Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.	Future subdivision design is to allow for the minimum APZs as recommended within Table 2.2 and as depicted within Schedule 1 & 2 attached.
Minimising the perimeter of the area of land interfacing the hazard, which may be developed.	Compliant. Redevelopment areas have been located within close proximately to public roads and within existing cleared areas.
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 APZs.	Compliant – can be made a condition of consent.

The following recommendations are provided to ensure 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. APZs are to be measured from the exposed wall of any dwelling toward the hazardous vegetation. The minimum APZ must be achievable within all lots fronting the bushfire hazard as nominated in Table 2.2 and also as generally depicted in Schedule 1 & 2.

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 RFS in their publications.

Recommendation 3 - 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 4 – Property access roads are to comply with the acceptable solutions provided within Table 5.3b of Pre-release *PBP 2018* (refer Section 3.4 of this report).

Recommendation 5 – Water, electricity and gas supply is to comply with the acceptable solutions as provided within Table 5.3b of Pre-release *PBP 2018* (refer Sections 3.5, 3.6 and 3.7 of this report).

REFERENCES

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Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research.

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Hon Brad Hazzard (7 June 2012) – *Planning proposal to rezone land at Boundary Road, Medowie from 1 (c1) Rural Small Holdings Zone to 1(c5) Rural Small Holdings, 1(c4) Rural Small Holdings and 7(a) Environmental Protection.*

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.

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

Umwelt, 2012. *Ecological Assessment for Rezoning Application Lots 93 – 96 Boundary Road, Medowie.*

Plan of Bushfire Protection Measures

S1& S2

Legend

- Study area (source: LPI)
- Contours - 1m (source: LiDAR)
- Indicative proposed lot boundary
- Existing managed land
- Proposed Asset Protection Zone (APZ)
- P(x) Photo points

Vegetation Classification (source: TBE 2019)

- Planted / Landscaped and Managed
- North Coast Wet Sclerophyll Forest (moderate-good) (PCT 1237)
- Managed/modified North Coast Wet Sclerophyll Forest (PCT 1237)
- Cleared

- T Telecommunications tower
- Track
- Managed area boundary (source: TBE)

Aerial source: Nearmap

0 25 50 m

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.

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
87-89 Castle Hill Road, West Pennant Hills 18FCNSW_BF001	8/02/2019 Issue 1 ATS	1:1,500 @A3 GDA 1994 MGA Zone 56

TITLE

Schedule 1 - Bushfire Protection Measures (Castle Hill Road)

Document Path: N:\GIS STORAGE\N Drive\A17225_OratavaAve_CastleHillRd_WestPennantHills\MXDs\18FCNSW_BF001.mxd

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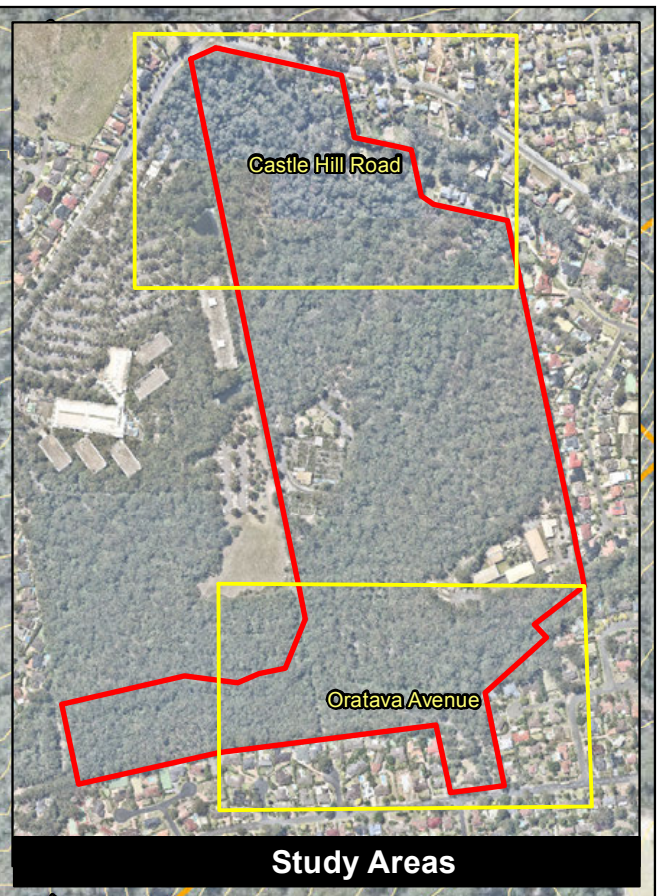

Existing managed land/firetrail

APZ includes existing concrete public access road

ORATAVA AVENUE

REMNANT FOREST

12°

8°

44m

35m

31m

14m

P6

P7

P8

P9

Legend

- Site boundary (source: LPI)
- Contours - 1m (source: LiDAR)
- Detailed investigation area
- Proposed lot boundary (source: CAD)
- Photo points

Asset Protection Zone (APZ)

- Existing APZ (protect existing houses)
- Proposed APZ
- Road
- Tracks

Vegetation Classification (source: TBE 2019)

- Planted / Landscaped and Managed
- North Coast Wet Scleophyll Forest (moderate-good) (PCT 1237)
- Northern Hinterland Wet Sclerophyll Forest (managed/modified) (PCT 1281)
- Cleared

Aerial source: Nearmap

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PROJECT & MXD REFERENCE
121-131 Oratava Avenue, West Pennant Hills
18FCNSW_BF002

DATE & ISSUE NUMBER
8/02/2019
Issue 1
ATS

SCALE & COORDINATE SYSTEM
1:1,000 @ A3
GDA 1994 MGA Zone 56

0 20 40 m

TITLE

Schedule 2 - Bushfire Protection Measures (Oratava Avenue)

Document Path: N:\GIS STORAGE\N Drive\A17225_OratavaAve_CastleHillRd_WestPennantHills\MXDs\18FCNSW_BF002.mxd

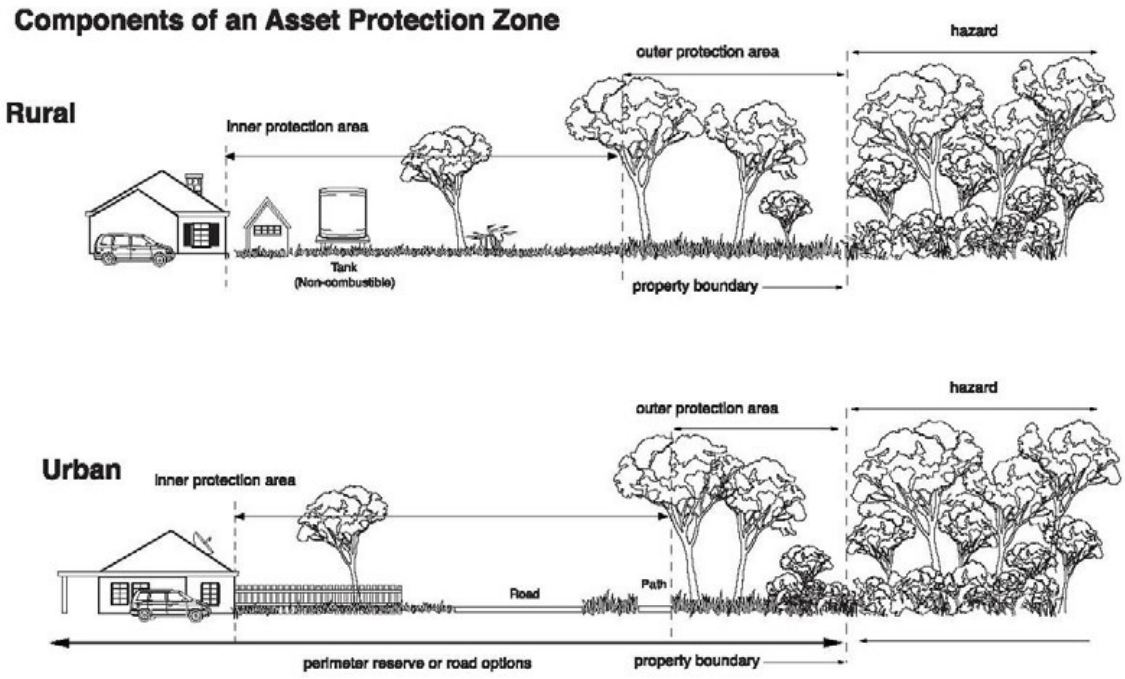
Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered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

Management of Asset Protection Zones

A1

The RFS provides basic advice in respect of managing APZs through documents such as, *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. A typical APZ is graphically represented below:



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

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

The following provides maintenance advice for vegetation within the IPA.

Inner Protection Area (IPA)
Fuel loads within the IPA are to be maintained so it does not exceed 4t/ha.

Trees are to be maintained to ensure;

- Canopy cover does not exceed 15%
- Trees (at maturity) do not touch or overhang the building
- Tree canopies (at maturity) should be well spread out and not form a continuous canopy

- There should be no unmanaged vegetation within 10m of windows, doorways, eaves and gutters
- Lower limbs should be removed up to a height of 2m above ground

Shrubs are to be maintained to ensure;
- Large discontinuities or gaps in vegetation
- Shrubs should not be located under trees
- Shrubs should be in clumps no greater than $5m^2$
- Shrubs should be no closer than 10 metres from an exposed window or door.

Grass is to be maintained to ensure:
- A height of 10cm or less
- Leaves and debris is removed.

Landscaping to the site is to comply with the principles of Appendix 5 of PBP. In this regard the following landscaping principles are to be incorporated into the development:

- Suitable impervious areas being provided immediately surrounding the building such as courtyards, paths and driveways;
- Restrict planting in the immediate vicinity of the building which may over time and if not properly maintained come in contact with the building;
- When considering landscape species consideration needs to be given to estimated size of the plant at maturity;
- Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies;
- Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown;
- Avoid planting of deciduous species that may increase fuel at surface/ ground level (i.e. leaf litter);
- Avoid climbing species to walls and pergolas;
- Locate combustible materials such as woodchips/mulch, flammable fuel stores away from the building;
- Locate combustible structures such as garden sheds, pergolas and materials such timber garden furniture way from the building; and
- Use of low flammability vegetation species.

Performance based assessment

A2

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 6/02/2019 **Assessment Date:** 30/01/2019

Site Street Address: Cumberland State Forest, West Pennant Hills

Assessor: Mr Admin; admin

Local Government Area: Baulkham Hills **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: A Oratava (north)

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	12 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	22	**Overall Fuel Load(t/ha):**	35.98

Site Information

Site Slope	5 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	44

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	14.83
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	112324
Radiant Heat(kW/m2):	26.4	**Flame Angle (degrees):**	59
Flame Length(m):	43.59	**Maximum View Factor:**	0.435
Rate Of Spread (km/h):	6.04	**Inner Protection Area(m):**	44
Transmissivity:	0.799	**Outer Protection Area(m):**	0

Run Description:	B Oratava (north-east)		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	8 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	22	**Overall Fuel Load(t/ha):**	35.98
Site Information			
Site Slope	5 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	35
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	12
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	85233
Radiant Heat(kW/m2):	27.44	**Flame Angle (degrees):**	62
Flame Length(m):	34.12	**Maximum View Factor:**	0.444
Rate Of Spread (km/h):	4.58	**Inner Protection Area(m):**	35
Transmissivity:	0.812	**Outer Protection Area(m):**	0

Run Description:	C - Oratava (north-east)		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	8 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	33.1
Site Information			
Site Slope	5 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	31
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	11
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	71282
Radiant Heat(kW/m2):	28.94	**Flame Angle (degrees):**	62
Flame Length(m):	31.06	**Maximum View Factor:**	0.464
Rate Of Spread (km/h):	4.17	**Inner Protection Area(m):**	31
Transmissivity:	0.821	**Outer Protection Area(m):**	0

Run Description:	D Castle Hill Road (south)		
Vegetation Information			
Vegetation Type:	Remnant Vegetation	Vegetation Group:	Remnant Vegetation
Vegetation Slope:	7 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	10	Overall Fuel Load(t/ha):	13.2
Site Information			
Site Slope	19 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	15
Fire Inputs			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
Calculation Parameters			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	100
Program Outputs			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	1.86
Level of Construction:	BAL 29	Fire Intensity(kW/m):	13266
Radiant Heat(kW/m2):	27.64	Flame Angle (degrees):	81
Flame Length(m):	14.23	Maximum View Factor:	0.428
Rate Of Spread (km/h):	1.95	Inner Protection Area(m):	15
Transmissivity:	0.85	Outer Protection Area(m):	0

Run Description:	E Castle Hill Road (west)		
Vegetation Information			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	7 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	22	Overall Fuel Load(t/ha):	35.98
Site Information			
Site Slope	5 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	33
Fire Inputs			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
Calculation Parameters			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	100
Program Outputs			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	11.3
Level of Construction:	BAL 29	Fire Intensity(kW/m):	79550
Radiant Heat(kW/m2):	27.74	Flame Angle (degrees):	62
Flame Length(m):	32.13	Maximum View Factor:	0.447
Rate Of Spread (km/h):	4.28	Inner Protection Area(m):	33
Transmissivity:	0.816	Outer Protection Area(m):	0