



APPENDIX C – Bushfire Risk Assessment

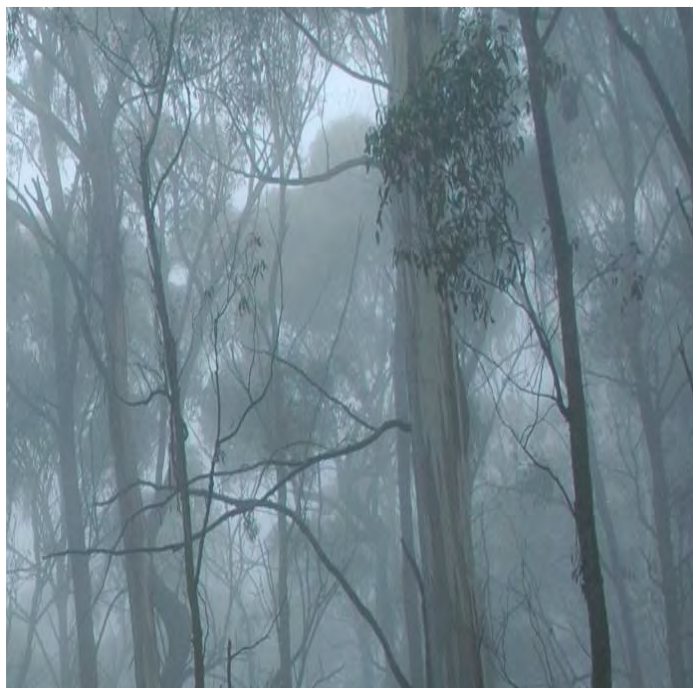


BUSHFIRE ASSESSMENT – PLANNING PROPOSAL

North Boambee Valley (West)

Prepared for
Coffs Harbour City Council

30 October 2012



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1 Introduction

1.1 BACKGROUND

Coffs Harbour City Council (CHCC) engaged Eco Logical Australia Pty Ltd (ELA) as part of the de Groot & Benson local consortium to undertake a bushfire assessment of the North Boambee Valley (NBV) lands to inform the preparation of a Planning Proposal to rezone the land.

CHCC adopted a Structure Plan for NBV in 2010. The Plan identified the need to investigate specific issues and constraints including bushfire protection planning for future urban development. This technical report is prepared to inform a Planning Proposal to rezone NBV from primarily Rural 1A and Environmental Protection 7A Habitat and Catchment under the *Coffs Harbour Local Environmental Plan 2000* to more urban zoning to support residential and industrial uses.

1.2 LOCATION AND DESCRIPTION OF NORTH BOAMBEE VALLEY (NBV)

The NBV is approximately 4 km by road southwest of the Coffs Harbour town centre. Figure 1 locates the site. Steep forested terrain associated with Roberts Hill Reserve and Boambee State Forest border the site to the north and west, respectively. Agricultural lands and largely developed lands border the site to the south and east, respectively.

Access is provided to NBV via the two primary east-west roads of North Boambee Road in the northern part of the site and England's Road in the south. Both roads link directly to the Pacific Highway just south of Coffs Harbour town centre.

The site is characterized by large cleared areas used for agricultural purposes intersected by a network of bushland remnants that remain or are regenerating along the many drainage lines, floodplains and steep hillsides. Extensive areas of bushland exist generally to the west of the site.

1.3 AIMS AND OBJECTIVES OF BUSHFIRE ASSESSMENT

The aim of this study is to investigate the capability and general suitability of the site for future residential subdivision and other land uses with the appropriate bushfire protection measures as guided by the relevant legislation and policy into bushfire planning and design of new development in NSW. The findings and recommendations are to inform a Planning Proposal to appropriately rezone the site.

The objectives of this study are therefore to:

1. Provide statements as to the capability of the site to achieve the required minimum bushfire protection measures for future development, namely subdivision and the construction of dwellings;
2. Satisfy the legislative requirements for assessment of rezoning bushfire prone land for residential purposes under the *Environmental Planning and Assessment Act 1979*;
3. Address the bushfire management issue raised by the NBV Structure Plan 2010;

4. Investigate the application of Asset Protection Zone (APZ) building setbacks to vegetation/bushland and report on the location and dimensions of any required APZ;
5. Provide guidance on the access and egress requirements for residential development in bushfire prone land; and
6. Provide guidance on other bushfire protection measures such as the provision of utilities.

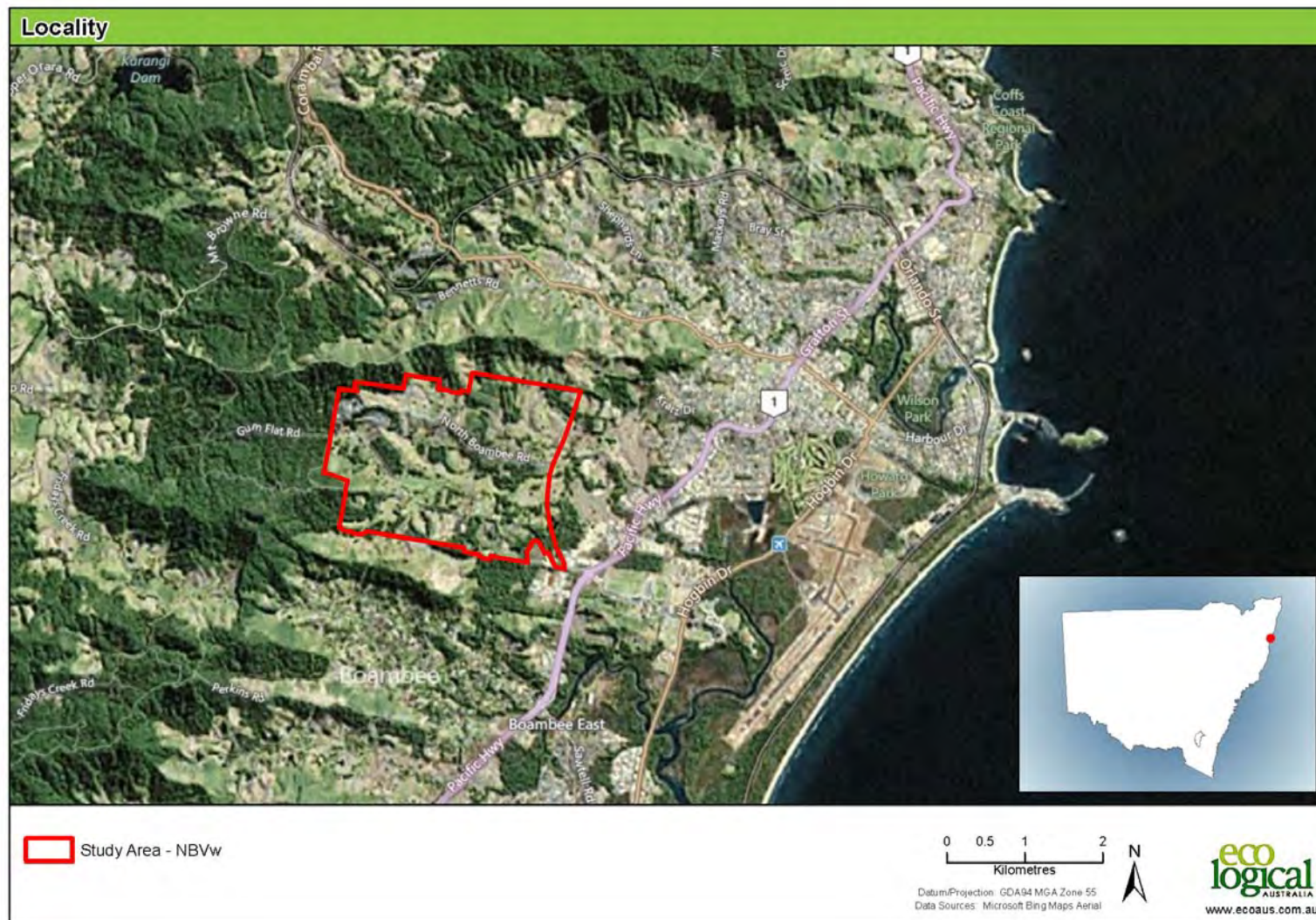


Figure 1: Locality

2 Assessment Requirements

The site has been identified as containing bushfire prone land as mapped by Coffs Harbour City Council and certified by the NSW Rural Fire Service (RFS) under a requirement of the *Rural Fires Act 1997*. In NSW, bushfire prone lands are those identified that could support a bushfire or are potentially likely to be subject to bushfire attack and are generally lands that contain or are within 100 m of significant stands of bushland.

When investigating the capability of bushfire prone land to be rezoned for residential purposes, local councils must have regard to s.117 (2) Direction 4.4 – ‘Planning for Bush Fire Protection’ of the *Environmental Planning and Assessment Act 1979*. The objectives of Direction 4.4 are:

- *To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas; and*
- *To encourage sound management of bushfire prone areas.*

Direction 4.4 instructs councils on the bushfire matters which need to be addressed when drafting LEPs. This includes:

- Consultation with the Commissioner of the RFS under s.62 of the EPA Act, and take into account any comments so made;
- Draft LEPs shall have regard to *Planning for Bushfire Protection 2006* (PBP); and
- Compliance with numerous bushfire protection provisions where development is proposed.

After the rezoning stage, future subdivision of land and the construction of buildings also require an assessment against PBP. These assessments are based on a final development application for these uses.

3 Methods and Approach

This bushfire assessment followed the methods and approach outlined in Table 1 below.

Table 1: Methods and Approach

Method and Approach	Task	Considerations
Review	A literature review of relevant reports and studies occurred.	Coffs Harbour Bush Fire Prone Land Map; Structure Plan for North Boambee Valley; Mid North Coast Bushfire Risk Management Plan.
Desk top analysis	Review and analysis of all available mapping layers in GIS relevant to bushfire hazard.	GIS layers include: aerial and satellite imagery; vegetation mapping; topographical data (e.g. contours).
Site inspection	One bushfire site inspection occurred in July 2012.	The inspection ground-truthed the results of the desk-top analysis, particularly in regards to vegetation classification and slopes that influence the overall bushfire hazard and APZ calculations. The inspection took place with the consulting ecologist (ELA) so that discussions could take place on the likely retention and enhancement of remnants for the protection and maintenance of biodiversity (e.g. Koala habitat and movement) and the impact on bushfire protection measures.
Ecological consultation	Consultation with ecologist to enable integrated design	Workshop sessions occurred with the consulting ecologist to refine the bushfire protection measures. The biodiversity constraints were first presented on which to base the required APZs (i.e. the vegetation to be retained due to conservation values forms the bushfire hazard to be assessed and the overall development footprint).
Assessment	Determine all relevant bushfire protection measures.	Assessment in accordance with PBP methodology, Direction 4.4 of EP&A Act and RFS requirements.
Reporting	Preparation of bushfire assessment.	Carry out all necessary reporting required for rezoning and Planning Proposals for urban development of bushfire prone land.

4 Bushfire Hazard

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as Asset Protection Zone location and dimension. The following sub-sections provide a detailed account of the vegetation communities (bushfire fuels) and the topography (effective slope) that combine to create the bushfire hazard that may affect bushfire behaviour at the site.

This assessment is based on the possible future vegetation coverage as determined by ELA within the ecological assessment. The future vegetation is discussed in Section 4.1 below. Some of the current bushland areas will contribute to the future bushfire hazard, however this hazard will be significantly added to, particularly in the way of connectivity between remnants and along drainage lines to achieve biodiversity and riparian environmental objectives. The increase in hazard is not significant enough to preclude development or pose a future hazard that cannot be addressed by typical bushfire protection planning precautions as outlined within PBP.

Following on from above, the concept of bushfire risk as influenced by fire history and current and past bushfire issues has little bearing on the determination of bushfire protection strategies for rezoning and future development at this site. This is due to a different future vegetation layer and the fact that PBP assesses bushfire protection based purely on vegetation and slope (i.e. hazard and not risk), making the assumption that a fire may occur in any patch of bushland at a worst-case scenario (based on a set design fire).

Notwithstanding this, the *Mid North Coast Bushfire Risk Management Plan* was reviewed to gain a greater understanding of the bushfire environment, hazard and risk issues that affect NBV. The Plan does not report on any issue of factor that affects the site.

4.1 VEGETATION COMMUNITIES INFLUENCING BUSHFIRE

The 'predominant vegetation' influencing fire behaviour approaching future developable areas has been assessed strictly in accordance with the methodology specified within PBP.

Comprehensive and site specific vegetation assessment and mapping has occurred as part of the ecological assessment (Eco Logical Australia 2012). A map displaying the current coverage of vegetation is provided in Figure 2. The bushland throughout and adjoining the site is predominantly Tall Open Forest of varying conditions with floristics, particularly within the understorey, changing from the wetter lowland areas such as along the drainage line to the higher slopes.

Figure 3 shows the recommended future coverage of vegetation based on environmental objectives. It is this layer that the bushfire assessment is based on. There are three zones:

- Zone 2 – High conservation lands: These are existing areas of bushland marked for retention;
- Zone 3 – Environmental rehabilitation and restoration: These areas essentially link or 'fill in' between the high conservation lands (Zone 2) to create connectivity and improve these areas;
- Zone 3 – Drainage revegetation buffers: These areas are improved riparian zones and often provide linkages between the other zones. It is assumed these riparian zones will regenerate.

The PBP predominant vegetation classification of all future vegetation is ‘forest’, with the exception of small remnants (less than 1 ha) and narrow corridors (less than 50 m in width) which are able to be classified as ‘low hazard’ due to the limited fire behaviour in small areas of vegetation.

The presence and potential for rainforest throughout the site has been carefully assessed. Although some gullies and riparian areas provide habitat for mesic communities, these areas are relatively small and maintain (or likely to present) a Eucalypt dominant overstorey such that they cannot be classified as ‘rainforest’ in accordance with PBP methodology.

4.2 SLOPES INFLUENCING BUSHFIRE

The ‘effective slope’ influencing fire behaviour approaching the developable area has been assessed strictly in accordance with the methodology specified within PBP. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 m transect measured outwards from the development boundary. The slope classes are listed in Table 2 below.

Table 2: PBP slope classes

Upslope or Downslope	PBP Slope Class
Upslope / Flat Land	Flat land and all upslope land leading away from the development
Downslope	>0-5 degrees downslope leading away from the development
	>5-10 degrees downslope leading away from the development
	>10-15 degrees downslope leading away from the development
	>15-18 degrees downslope leading away from the development



Figure 2: Vegetation Communities

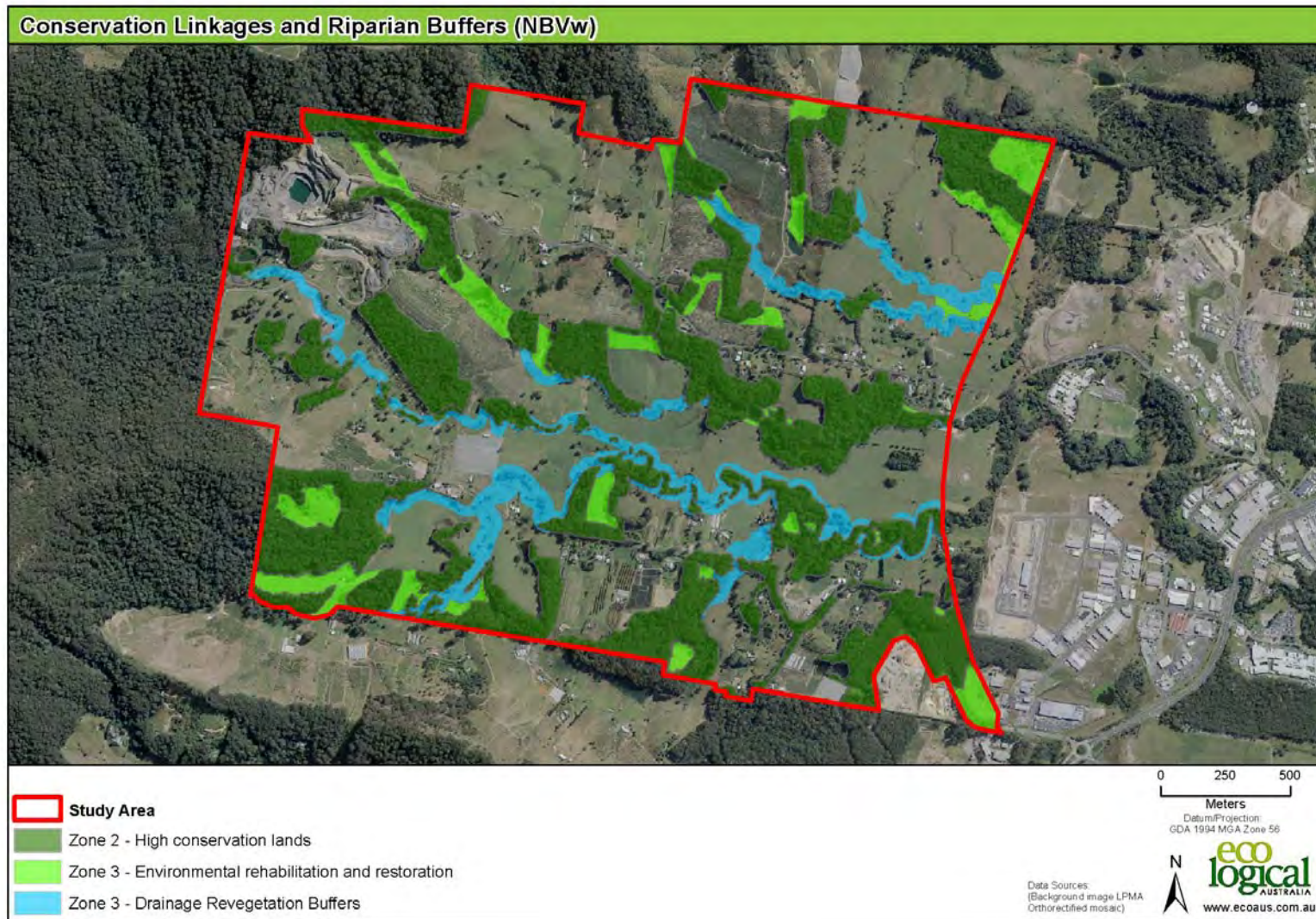


Figure 3: Significant Vegetation and Riparian Buffers and Corridors

5 Bushfire Protection Measures

PBP requires the assessment of a suite of bushfire protection measures that in total afford an adequate level of protection. The measures required to be assessed for rezoning are listed in Table 3 below and are discussed in detail in the remainder of this section. This section demonstrates that the site can accommodate the required bushfire protection measures and achieve the Direction 4.4 objectives and RFS requirements.

Table 3: PBP bushfire protection measures

Bushfire Protection Measure	Considerations
Asset Protection Zones (APZ)	Location and dimension of APZ setbacks from vegetation including prescriptions of vegetation management within the APZ.
Access	Assessment to include access and egress in and out of the subdivision such as alternate access, operational response and evacuation options. APZ perimeter access to be considered as is design standards of public roads and any fire trails.
Water supply and other utilities	List requirements for reticulated water supply and hydrant provisions, and any static water supplies for fire fighting.
Building construction standards	Provide a guide on the application of construction standards for future buildings.

5.1 ASSET PROTECTION ZONES

5.1.1 APZ Location and Dimension

Using the vegetation and slope data discussed in Section 4, APZs suitable for residential subdivision around all significant environmental lands have been calculated. These have been mapped and identified on Figure 4 and described in Table 4.

A second APZ dimension for Special Fire Protection Purposes (SFPP) is also listed in Table 4. These SFPP APZs are for schools, child care centres, accommodation, retirement villages and other uses listed under s100B (6) *Rural Fires Act 1997*.

It is recommended that development associated with employment lands, such as commercial and industrial development, be treated as residential development for the purpose of the rezoning analysis. Non-habitable development of this kind has the opportunity to have an APZ less than that required for residential subdivision. This flexibility relies on the known use of the building, its design and construction standard, and can be determined at the development application stage.

At the time of assessment and report preparation, PBP and the APZ dimension for residential development was undergoing review by the RFS (a draft is expected in November 2012). It is understood the APZ requirements in NSW would align with AS 3959-2009 *Construction of buildings in*

bushfire-prone areas (Standards Australia 2009) Bushfire Attack Level (BAL)-29. This will represent an increase in APZ dimension which should be noted in the rezoning phase to ensure that the future development constraints are fully accounted for. The increase in APZ provides a higher level of bushfire protection and ensures that future home owners are not impacted by the additional costs and associated with construction of a dwelling at a higher BAL (e.g. BAL-40 and BAL-FZ). Table 4 lists the current minimum APZ and the possible future APZ related to BAL-29 (refer to Section 5.4 for more information on AS 3959-2009).

It is important to note that the APZ calculations quoted in this assessment are indicative only and have been determined at a landscape scale. This level of detail is suitable for a rezoning assessment whereby the aim is to demonstrate whether a parcel of land can accommodate the bushfire hazard, the expected APZ and future development. The final APZ dimensions for any future subdivision or development depends on the accuracy of a slope assessment undertaken at a site-specific level. The APZ dimensions quoted in this assessment should not be relied on to approve a future subdivision; they may be used as a guide only.

Table 4: Asset Protection Zone (APZ) calculation

Predominant Vegetation	Effective Slope	APZ width	APZ colour Figure 4	SFPP APZ width	BAL-29 APZ
Forest	Upslope/Flat	20 m (10 m OPA)		60 m (20 m OPA)	21 m
Forest	>0-5° downslope	20 m (5 m OPA)		70 m (20 m OPA)	27 m
Forest	>5-10° downslope	30 m (15 m OPA)		85 m (25 m OPA)	33 m
Forest	>10-15° downslope	40 m 20 m OPA)		100 m (30 m OPA)	42 m
Forest	>15-18° downslope	45 m (20 m OPA)		100 m (25 m OPA)	52 m
Low hazard	Upslope/Flat	10 m		30 m	9 m
Low hazard	>0-5° downslope	10 m		40 m	11 m
Low hazard	>5-10° downslope	15 m		50 m	15 m
Low hazard	>10-15° downslope	15 m		60 m	19 m

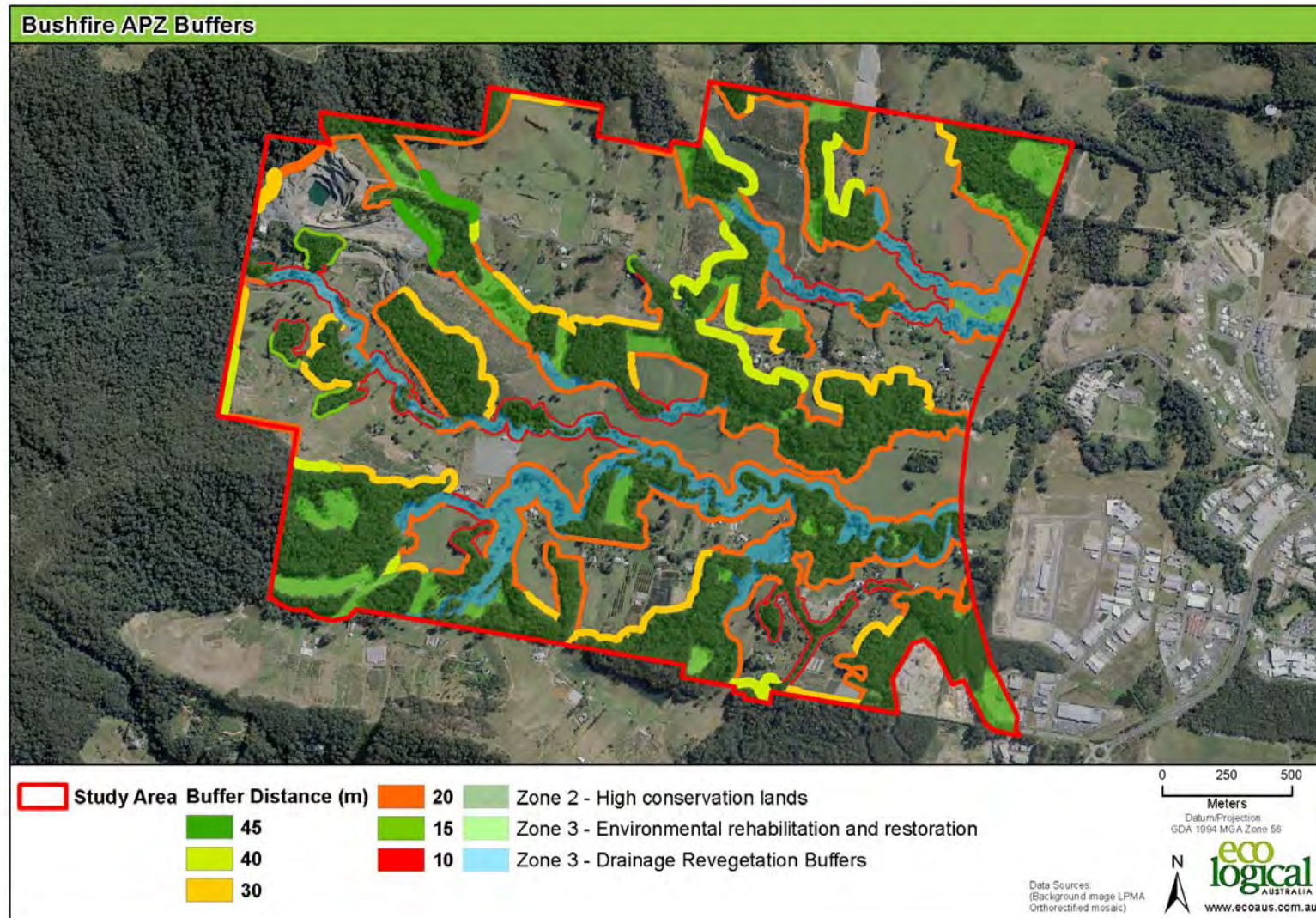


Figure 4: Bushfire APZ Buffers

5.1.2 Vegetation Management within APZ

The management of vegetation within the APZ is to achieve the specifications of an Inner Protection Area (IPA) and Outer Protection Area (OPA) as described by PBP. As such, the APZ should be managed as follows:

- No tree or tree canopy is to occur within 2 - 5 m of future dwelling rooflines;
- The presence of a few shrubs or trees in the APZ is acceptable provided that they are well spread out, do not form a continuous canopy, and are located far enough away from future buildings so that they will not ignite the buildings by direct flame contact or radiant heat emission;
- Any landscaping or plantings should preferably be low flammability species such as local rainforest species;
- In the IPA, the ground fuel is to be maintained to less than 4 tonnes per hectare of fine fuel (4 t/ha is equivalent to a 1 cm thick layer of leaf litter and fine fuel means any dead or living vegetation of less than 6 mm in diameter, e.g. twigs less than a pencil in thickness); and
- In the OPA, the ground fuel may have up to 8 tonnes per hectare of fine fuel.

5.1.3 Perimeter Access within APZ

An APZ may require a perimeter road depending on the significance of the bushfire threat. The assessment of perimeter access is provided in the following Section 5.2.

5.2 ACCESS

PBP requires an access design that enables safe evacuation away from an area whilst facilitating adequate emergency and operational response to the area requiring protection. The following sections present the bushfire planning requirements for access in bushfire prone land.

5.2.1 Safe Access and Egress

All bushfire prone areas should have an alternate access or egress option. This is usually achieved by providing more than one public road into and out of a precinct. The need for an alternative road and its location depends on the bushfire risk, the density of the development, and the chances of the road being cut by fire. All precincts within the site should allow for an alternative public access road.

5.2.2 Perimeter Roads

Depending on the bushfire risk, all bushland interface areas containing an APZ for a significant bushfire hazard should feature a perimeter public road within the APZ. It is acceptable for some areas not to have a perimeter road or have a perimeter trail instead. These include areas of lower bushfire risk (such as adjoining low hazard areas), rural residential areas with large lot sizes where by perimeter access can be provided within each lot, or areas where it may not be feasible to provide a continuous road due to the shape of the interface or the terrain. These areas should have some other access strategy such as trails or regular access points including access to a hydrant network.

The design details (PBP acceptable solutions) of public perimeter roads and fire trails are listed in Section 5.2.3 below.

5.2.3 Road Design and Construction Standards

Public roads and perimeter fire trails are to comply with the PBP acceptable solution design standards as listed in Tables 5 and 6 respectively. Future residential subdivision within the site will be able to comply with these standards.

Table 5: Design and construction for public roads (RFS 2006; pg. 21)

Performance Criteria	Acceptable Solutions
Firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)	Public roads are two-wheel drive, all weather roads
Public road widths and design that allows safe access for firefighters while residents are evacuating an area	- Urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with PBP Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle) - The perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas - Traffic management devices are constructed to facilitate access by emergency services vehicles - Public roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard - Curves of roads (other than perimeter roads) are a minimum inner radius of six metres - Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient - There is a minimum vertical clearance to a height of four metres above the road at all times
The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles	The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicated load rating
Roads that are clearly sign posted (with easy	Public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated

Performance Criteria	Acceptable Solutions
<i>distinguishable names) and buildings / properties that are clearly numbered</i>	<i>water for fire suppression</i> • <i>Public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression</i>
• <i>There is clear access to reticulated water supply</i>	• <i>Public roads up to 6.5 metres wide provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression</i> • <i>One way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression</i>
• <i>Parking does not obstruct the minimum paved width</i>	• <i>Parking bays are a minimum of 2.6 metres wide from kerb to kerb edge to road pavement. No services or hydrants are located within the parking bays</i> • <i>Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road</i>

Table 6: Design and construction for fire trails (RFS 2006; pg. 25)

Performance Criteria	Acceptable Solutions
• <i>The width and design of the fire trails enables safe and ready access for firefighting vehicles</i>	• <i>A minimum carriageway width of four metres with an additional one metre wide strip on each side of the trail (clear of bushes and long grass is provided</i> • <i>The trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed</i> • <i>A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided</i> • <i>The crossfall of the trail is not more than 10 degrees</i> • <i>The trail has the capacity for passing by:</i> - <i>Reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with an inner minimum turning radius of six metres and outer minimum radius of 12 metres; and / or</i> - <i>A passing bay every 200 meters, 20 metres long by tree metres wide, making a minimum trafficable width of seven metres at the</i>

Performance Criteria	Acceptable Solutions
	<i>passing bay</i> <i>Note: Some short construction in the access may be accepted where they are not less than the minimum (3.5m) and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed</i>
Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non authorised persons	- The fire service is accessible to firefighters and maintained in a serviceable condition by the owner of the land - Appropriate drainage and erosion controls are provided - The fire trail system is connected to the property access road and / or to the through road system at frequent intervals of 200 metres or less - Fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge) - Gates for fire trails are provided and locked with a key / lock system authorized by the local RFS
Fire trails designed to prevent ween infestation, soil erosion and other land degradation	- Fire trail does not adversely impact on natural hydrological flows - Fire trail design acts as an effective barrier to the spread of weeds and nutrients - Fire trail construction does not expose acid-sulphate soils

5.3 WATER SUPPLY AND OTHER UTILITIES

5.3.1 Water Supply and Hydrants

Future lots are to be serviced by reticulated water infrastructure suitable for fire fighting purposes. With the exception of rural residential subdivision, the furthest point from any future dwellings to a hydrant is to be less than 90 m (with a tanker parked in-line) in accordance with AS 2419.1 – 2005 *Fire Hydrant Installations - System Design, Installation and Commissioning* (Standards Australia 2005). The reticulated water supply is to comply with the following acceptable solutions within Section 4.1.3 of PBP:

- Reticulated water supply to use a ring main system for areas with perimeter roads;
- Fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005;
- Hydrants are not located within any road carriageway;
- All above ground water and gas service pipes external to the building are metal, including and up to any taps; and
- The PBP provisions of parking on public roads are met.

Future dwellings on rural residential lots will require a static water supply at time of development application as the dwellings will be beyond the hydrant distance quoted above.

5.3.2 Electrical and Gas Supplies

In accordance with PBP, electricity should be underground wherever practicable. Where overhead electrical transmission lines are installed:

- Lines are to be installed with short pole spacing, unless crossing gullies, and
- No part of a tree should be closer to a powerline than the distance specified in *Vegetation Safety Clearances* issued by Energy Australia (NS179, April 2002).

Any gas services are to be installed and maintained in accordance with *AS/NZS 1596-2008 The storage and handling of LP gas* (Standards Australia 2008).

5.4 BUILDING CONSTRUCTION STANDARDS

The application of building construction standards for bushfire protection under *AS 3959-2009 Construction of buildings in bushfire-prone areas* (Standards Australia 2009) is to be considered at the development application stage for individual dwellings and buildings. An assessment under AS 3959-2009 is not required at the rezoning or subdivision stages. The following is a brief introduction on AS 3959-2009.

AS 3959-2009 contains six Bushfire Attack Levels (BAL) each with a corresponding construction standard. These are introduced below:

- BAL-Low: The threat does not warrant application of construction standards. Developments with BAL-Low are generally not within bushfire prone land (greater than 100 m from bushland);
- BAL-12.5: Addresses background radiant heat at lower levels and ember attack;
- BAL-19: Addresses mid-range radiant heat and ember attack;
- BAL-29: Addresses high range radiant heat and ember attack;
- BAL-40: Addresses extreme range of radiant heat and potential flame contact and ember attack; and
- BAL-FZ: Addresses construction within the flame zone. New subdivided lots are not permitted within the flame zone in NSW.

NSW has a variation to AS 3959-2009 which requires consideration. The variation is contained within the document 'PBP Appendix 3 Addendum' (RFS 2010).

6 Conclusion

6.1 STATEMENT OF CAPABILITY

This bushfire assessment demonstrates that the site is capable of accommodating future subdivision and land development with the appropriate bushfire protection measures.

6.2 RECOMMENDATIONS AND CONCLUSION

The recommendations of this bushfire assessment are located within Section 5 – Bushfire Protection Measures. They include the provision of Asset Protection Zones, adequate access, water supply for fire fighting, and the safe installation of electricity, gas and building construction standards for future dwellings.

This bushfire assessment demonstrates that the subject land is capable of accommodating future residential subdivision and associated land use with the appropriate bushfire protection measures and bushfire planning requirements prescribed by s.117 (2) Direction 4.4 – ‘Planning for Bush Fire Protection’ (EP&A Act) and *Planning for Bushfire Protection* (RFS 2006).

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