Holiday Coast Bushfire Solutions

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BUSHFIRE HAZARD ASSESSMENT REPORT

REPORT PREPARED IN RELATION TO:	**RESIDENTIAL SUBDIVISION**
PROPERTY DESCRIPTION:	**PART LOT 112 DP 1073791 off LYONS ROAD, TOORMINA, via SAWTELL.**
REPORT COMMISSIONED BY: (my Client)	**Utila Pty Ltd, c/- Mr Adrian Borsato**
	DATE ISSUED:

IMPORTANT NOTICE

Site inspections, and the results found herein, are carried out in accordance with the methodology as set out in the document ***"Planning for Bushfire Protection 2006"***.

The results of the site inspections and their correlation with ***PBP-2006*** are based on information provided by the "Reference Documents" and information provided by the Client (or his/her agents).

Holiday Coast Bushfire Solutions Pty Ltd will not be held liable for the omission to provide, or restrict access to, critical information (such as restrictions on property Title, easements, relevant consultant reports, etc) relevant to this development proposal.

The author of this Report, S. Ellis, is an Accredited Bushfire Consultant (through the National Certification Program administered by the Fire Protection Association of Australia), whose qualifications include Graduate Diploma in Design for Bushfire Prone Areas (UWS) and Certificate 2 & 3 in Firefighting Operations and Certificate 4 in Firefighting Supervision.

This Report is not an application for a Bushfire Safety Authority, but rather forms part of such application. It is the proponent's responsibility to provide the Consent Authority with an assessment of the matters set out in Clause 44 of the Rural Fires Regulation 2008. It is the Consent Authority's responsibility to provide the application for a Bushfire Safety Authority to the NSW Rural Fire Service, in its entirety.

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GLOSSARY

APZ	-	Asset protection zone. An area surrounding a development managed to reduce the bush fire hazard to an acceptable level. The APZ, consisting of an area maintained to minimal fuel loads and, for subdivision, comprising a combination of perimeter road, fire trail, rear yard or a reserve, so that a fire path is not created between the hazard and the building.
AS 3959	-	Australian Standard AS3959 Construction of buildings in bushfire-prone areas, Standards Australia, 2009, that outlines construction standards applicable to residential developments in bush fire prone areas.
BAL	-	Bushfire Attack Level – refer to CoBA below.
BCA-2010	-	Building Code of Australia.
BE	-	Building Envelope. The foot print of a (proposed) structure.
BPM	-	Bushfire protection measures. A range of measures (controls) available to minimise the risk arising from a bushfire. BPMs include APZs, construction standards, suitable access arrangements, water and utility services, emergency management arrangements and landscaping.
Bushfire hazard	-	The potential severity of a bushfire. Usually measured in terms of intensity (kW/m), the factors that influence a bush fire hazard include climate and weather patterns, vegetation (fuel quantity, distribution and moisture) and slope.
Bushfire-prone area / land	-	An area of land that can support a bushfire or is likely to be subject to bushfire attack. In general, a bushfire-prone area is an area mapped for a local government area that identifies the vegetation types and associated buffer zones. Bushfire prone land maps are prepared by local councils and certified by the Commissioner of the RFS.
Bushfire risk	-	Is the chance of a bushfire igniting, spreading and causing damage to assets of value to the community. Risk may be rated as being extreme, major, moderate, minor or insignificant and is related to the vulnerability of the asset.
CoBA	-	Category of Bushfire Attack. Either BAL-12.5, BAL-19, BAL-29, BAL-40, or BAL-FLAME ZONE. The degree to which a (proposed) building is subject to the modelled RHF from a potential bushfire. The CoBA determines the construction standards applicable.
Contagious Ignition	-	The ignition of one building by an adjoining flaming building (or material) other than by the direct ignition from the flaming bushfire hazard.
Defendable Space	-	An area within the APZ that provides an environment in which a person can undertake property protection after the passage of a bushfire with some level of safety.
D-T-S	-	Deemed to Satisfy (prescriptive requirements of either the BCA or *PBP-2006*).

FFDI	-	Forest fire danger index.
Flame Zone	-	The distance from a bushfire at which it is calculated for the purposes of this document that there is significantly increased likelihood for flame contact to a building. Determined by the calculated distance at which the radiant heat received by the proposed building exceeds 40kW/m^2 or calculated by the point of potential flame contact, whichever occurs first.
IFEG-2005	-	International Fire Engineering Guidelines (Edition 2005).
Infill Development	-	The development of land by the erection of or addition to a residential building (or buildings) which does not require the spatial extension of services including public roads, electricity, water or sewerage and is within an existing allotment.
Inner Protection Area	-	The inner component of an asset protection zone, consisting of an area maintained to minimal fuel loads and comprising a combination of perimeter road, fire trail, rear yard or reserve, so that a fire path is not created between the hazard and the building.
Outer Protection Area	-	The outer component of an asset protection zone, where fuel loads are maintained at a level (usually less than 8 t/ha) where the intensity of an approaching bushfire would be significantly reduced.
Required	-	Required by *PBP-2006* or other legislative requirements.
Setback	-	The distance required through planning provisions to separate a building from the bushfire hazard, street frontage or from adjacent buildings. In most cases the land within the setback will also be within the Flame Zone.

0.0 EXECUTIVE SUMMARY

The purpose of this Report is to address the key issues and assessment requirements provided in the NSW Rural Fire Service's letter of 21/5/2008 to the Department of Planning, in accordance with section 75F(4) of the Environmental Planning and Assessment Act 1979. The requirements set out in the NSW Rural Fire Service's letter have been reproduced below:

1. The NSW Rural Fire Service (RFS) notes that the subject site has significant bush fire issues and is identified as bush fire prone. The proposed Special Fire Protection Purpose and residential developments are to fully comply with the requirements of *Planning for Bush Fire Protection 2006*.
2. The impact of radiant heat and exposure to residents and occupants of the tourist facility is to be achieved by separating the development from the bushfire hazard. This is achieved by identifying the extent to which future development can provide for Asset Protection Zones in accordance with *Planning for Bush Fire Protection 2006*. Setbacks will depend on proximity to vegetation, vegetation type and slope.
3. The rate of heat output (intensity) of a bush fire close to a development is to be reduced through control of fuel levels.
4. The ability to provide for adequate egress/access to the proposed development as outlined within 4.1.3 and 4.2.7 of *Planning for Bush Fire Protection 2006*.
5. The ability to site and provide for adequate future water supplies for bush fire suppression operations in accordance with *Planning for Bush Fire Protection 2006*.
6. The vulnerability of buildings to ignition from radiation and ember attack is to minimised by addressing the construction of assets in accordance with *Australian Standard AS3959-1999 'Construction of buildings in bushfire-prone areas'*.

The matters raised by the NSW Rural Fire Service have been addressed throughout this Report, specifically the proposed development has been assessed against the raft of *Acceptable Solutions* contained within the bushfire protection measures (BPM) within section 4.1 of ***PBP-2006***, which are:

- Asset protection zones and appropriate separation from bushfire hazard vegetation;
- Water supplies and utility services;
- Public road access;
- Fire trails;
- Additional protection measures such as maintenance.

Throughout section 7 of this Report it has been demonstrated that not only have the *required Acceptable Solutions* been provided, in some instances the *required* bushfire protection measures (BPM) have been augmented (such as fire trails and static water supplies).

All of the BPMs listed in ***PBP-2006*** that apply to residential subdivisions have been provided for this development project.

On 6/7/2011 the NSW Rural Fire Service issued another letter of advice to the Dept of Planning in response to an amended subdivision design. The issues raised in the RFS's letter have been reproduced below:

- Construction of future buildings shall be in accordance with AS3959–2009;
- Future development in the northern part of the site does not appear to have the required asset protection zones when considering the proposed revegetation plans;
- The single entry / exit for vehicles is not compliant with the acceptable solutions of Planning for Bush Fire Protection. In some circumstances this may be acceptable provided the single entry / exit is not likely to be closed during a bush fire event. In this regard the proposed revegetation plan creates a pinch point;

- Road profile number 7 indicates that the perimeter road has a proposed carriageway width of 7 metres. The requirement is 8 metres similar to proposed Roads 5 & 6;
- Suitable turning provisions shall be provided at the eastern end of Road 8;
- Is the Road 8 loop road proposed as a one way road;
- The use of fire trails in the adjoining land to the east and south of the site should be referred to the adjoining land owner for advice.

Nearly all of the concerns raised above are as a result of the revegetation of the watercourse within the site. At the time of the site assessment and initial Report, the watercourse was essentially free from woody vegetation. An agreement was reached with the project Ecologist (James Warren & Associates) and myself that the watercourse could be managed in a bushfire hazard free state (revegetated and managed conforming to the standards required for asset protection zones). The revegetation of the watercourse increases the bushfire hazard impact to the site.

The above matters are specifically addressed briefly below, and more generally throughout this Report.

o During consultation with the NSW Rural Fire Service development control staff (pers. comm. with Mr Alan Bawden and Mr John Ball on 12/12/2012) I have been advised that it is not necessary to identify construction standards at subdivision stage. Therefore, although my previous versions of this Report indicated the construction thresholds on the proposed subdivision plan, this practice is now considered to be superfluous.

o The layout design of the site to the north of the watercourse has been amended and the appropriate APZs are now provided.

o Some clarification was sought on this matter from the RFS, as there are no *Acceptable Solutions* within ***PBP-2006*** that specifically address traffic pinch-points. The RFS have advised (by email on 25/7/2012) that the *Acceptable Solution* of concern relates to "all roads are through roads".

It is my opinion that the issue of through roads / dead-end roads and pinch-points are separate issues. Even the corresponding *Performance Criteria* does not refer to pinch-points when stating the performance outcome for through-roads.

If the issue is the pinch-point, an APZ could be provided for the road where it crosses the watercourse.

If the issue is the lack of a through road, it must logically follow that what is proposed are dead-end roads. It is my position that none of the roads on the southern side of the watercourse are dead-end roads, and *ipso facto* are through roads.

The existing public through road is Lyons Road, it is the only road that the proposed development can direct traffic to. If an additional road is provided (to create a though road as sought by the RFS) both of the roads would still take traffic across the watercourse. The pinch-point issue will not have been addressed.

o All of the road widths need to be rechecked to ensure compliance with the relevant *Acceptable Solution*s of ***PBP-2006***. As stated in the previous versions of my Report, "<u>All of the *Acceptable Solutions* above are able to be incorporated into the design of the public road network for the proposed subdivision.</u>"

o See note above.

o The road layout has been amended to create a cul-de-sac (dead-end road).

o The National Parks and Wildlife Service were consulted on 13/1/2010 to seek an assurance that the fire trails on the adjacent NP were to be maintained in a bushfire

hazard reduced state. The proponent was at this meeting and should be able to provide written evidence of the agreement. Also refer to section 2.3 of this Report.

1.0 GENERAL DESCRIPTION OF LAND AND PROPOSAL

1.1 The Land

Site assessments were carried out by me on Friday 21st November 2008 and Tuesday 16th December 2008 for the purposes of preparing a Bushfire Hazard Assessment Report as required by clause 44 of the *Rural Fires Regulation 2008 – Application for a bush fire safety authority*.

The property is located on the south-western outskirts of Sawtell on the NSW mid north coast. The property has an area of approximately 38.5 hectares, with the proposed residential subdivision (subject of the DA) occupying approximately 25.8 hectares.

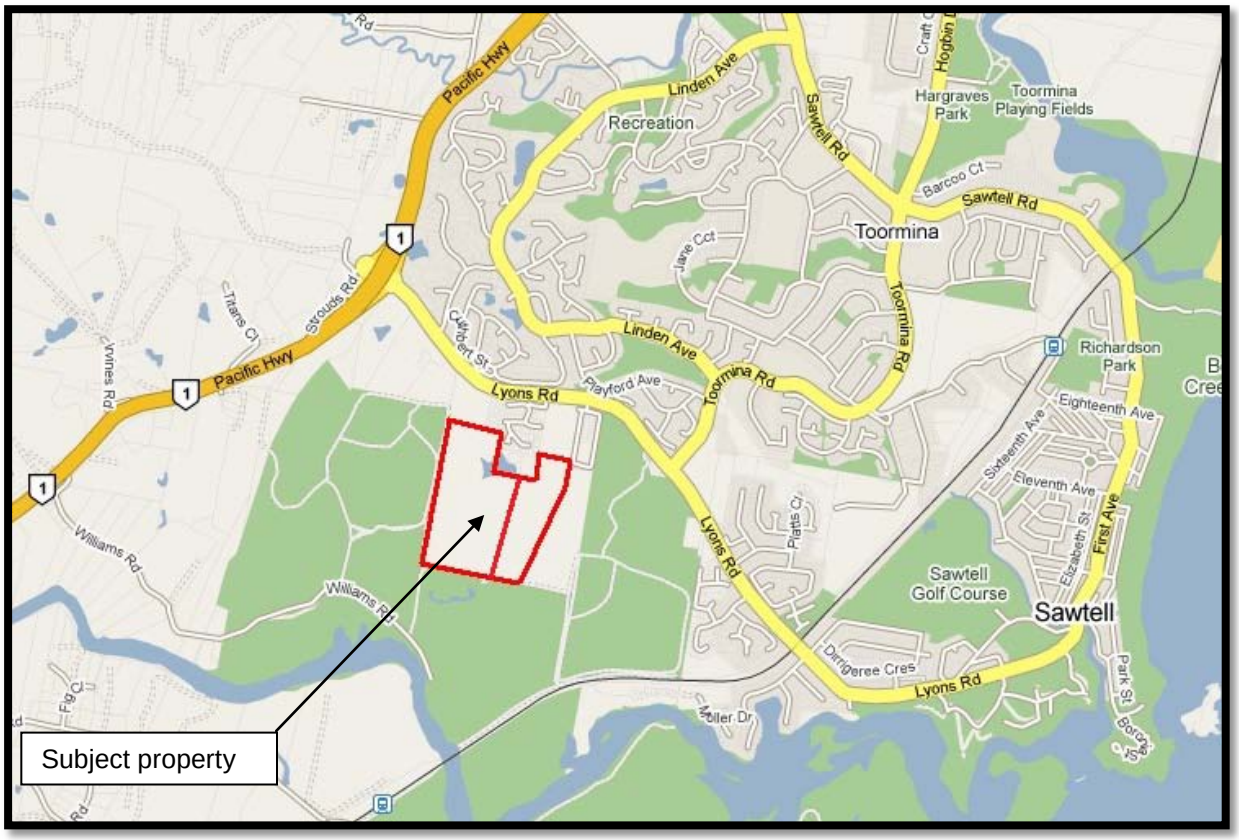

Figure 1: aerial image showing general location of subject properties (© Google maps 2008)

A large portion of the site (approximately the eastern ⅓) is forested wetland, while a remnant of forested wetland occupies the east-west watercourse in the north of the site. The remainder of the site is grassed paddock and is presently being grazed by cattle.

The lands to the north of the site are residential developments. The Bongil Bongil National Park is located to the west, south and east of the property.

Figure 2: aerial image showing existing vegetation and surrounding landuse (© NSW Lands 2012)

The NP provides existing fire trails along the interface with the subject property for much of the common boundary. The NP to the west of the property was previously managed as hardwood plantation (Sydney Blue Gum and Blackbutt), but is undergoing rehabilitation to improve its ecological values and integrity. Most of the NP to the south-east and south-west of the property is forested wetland along the watercourses, merging to dry sclerophyll forest along the elevated areas.

1.2 The Proposal

This report refers to the proposed residential subdivision to create approximately 165 residential allotments.

The subdivision layout will incorporate a perimeter road along the interface with the existing forested vegetation. In addition, the existing fire trails within the adjoining National Park will be linked with the perimeter road.

Access to and from the estate will be via a single access to Lyons Road, through existing residential developments to the north. Due to the existing development to the north of the site, access to and from the development has been constricted to a single urban road.

The northern precinct was originally proposed to accommodate a SEPP Seniors Living complex. As a result, the setbacks provided in this precinct are based on *Special Fire Protection Purpose* requirements rather than residential requirements.

Below is a copy of the latest layout of the proposal.

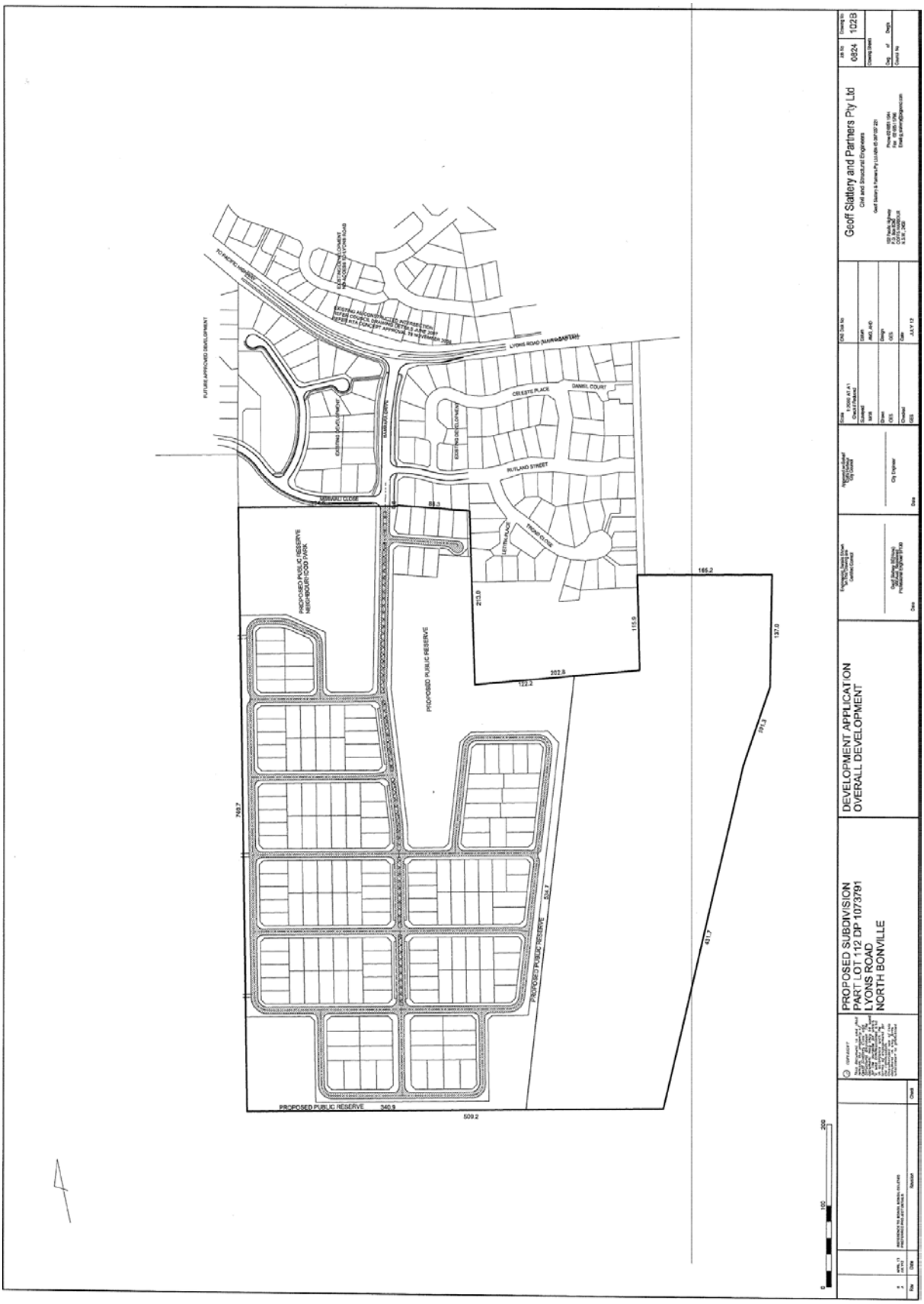

Figure 3: copy of proposed subdivision (Geoff Slattery & Partners, 2013)

2.0 VEGETATION ASSESSMENT

2.1 Vegetation Description

The procedure adopted for the site inspection followed the site assessment methodology of ***PBP-2006***. The methodology is outlined below.

A2.3 Site assessment methodology for determining APZ	
(a)	Determine vegetation formations, as follows: (i) identify all vegetation in all directions from the site for a distance of 140 metres; (ii) consult Table A2.1 to determine the predominant vegetation type; and (iii) select the predominant vegetation formation as described in Table A2.1.
(b)	Determine the effective slope of the land under the Predominant Vegetation Class and the site.
(c)	Determine the appropriate fire (weather) area in Table A2.3 and note the relevant FDI.
(d)	Consult Tables A2.4 – 2.7 and determine the appropriate setback for the assessed land use, vegetation group and slope range.

A vegetation assessment was carried out to include a distance of 140 metres from the subject parcel boundaries, in all directions. It is determined that the general vegetation description is summarised as follows:

North - To the north-west of the property is lot 2 DP 1065589 which is currently being developed as a residential subdivision. Beyond this development is Lyons Road and existing established residential developments.

To the north of the property is existing established residential development. To the north-east of the property is a Melaleuca-dominant swamp sclerophyll forest. Along the east-west watercourse the forest has been modified due to previous farming practices. On the dryer areas the remnant trees are scattered with Broad Leaf Paspalum, ferns and Bladey Grass dominating the surface and near surface fuels. Along the wetter areas and adjacent to the dams the grasses give way to Twig Rush and reeds. Residential developments adjoin this watercourse immediately to the north.

Figure 4: looking east through forested wetland remnant (circa Dec 2008)

East - To the east and north-east of the proposed residential development is a continuation of the swamp sclerophyll forest described above. Although still dominated by Melaleucas, Eucalypts are scattered along the western perimeter of the swamp. There is a distinct lack of mid-storey stratum with the surface and near surface fuels dominated by Broad Leaf Paspalum, Bladey Grass, Saw Sedge and Lomandra.

Figure 5: looking east into forested wetland at north-eastern corner of paddocks (circa Dec 2008)

Figure 6: looking east into forested wetland at south-eastern corner of paddocks (circa Dec 2008)

South - The swamp sclerophyll forest, as described above, extends south along the eastern edge of the cleared development site, and south beyond the southern boundary.

Figure 7: looking south into forested wetland at south-eastern corner (circa Dec 2008)

Moving west along the southern boundary, the swamp sclerophyll forest merges to dry sclerophyll forest as elevation increases up to the ridge line. Moving west from the ridge line, the dry sclerophyll forest merges back to swamp sclerophyll forest at the south-western boundary.

Figure 8: looking south into dry sclerophyll forest along southern boundary (circa Dec 2008)

Figure 9: looking west from southern boundary towards forested wetland in low area (circa Dec 2008)

A fire trail is located along the southern boundary, within the NP.

West - Moving north from the south-western corner the swamp sclerophyll forest merges to Sydney Blue Gum-dominant dry sclerophyll forest with an open woodland structure. This open structure is due to the area being previously used as a hardwood plantation.

Figure 10: looking west into Bongil Bongil NP, across fire trail to old hardwood plantation (circa Dec 2008)

Further north the open dry sclerophyll forest merges to a more closed arrangement for the remainder of the western boundary.

Figure 11: looking north-west into Bongil Bongil NP, along fire trail to old hardwood plantation (circa Dec 2008)

A fire trail is located along the western boundary, within the NP.

Figure 12: looking south along fire trail to west of western boundary (circa Dec 2008)

2.2 Vegetation Classification

PBP-2006 requires the various vegetation formations to be classified in accordance with the system adopted by Keith (*Ocean Shores to Desert Dunes, 2004*), and by the general description in Table A2.1 of ***PBP-2006***. Following is a summary of the vegetation classification.

North - *Managed lands*

East - *Forested wetlands*

South - *Forested wetlands and Forest*

West - *Forested wetlands and Forest*

2.3 Past or Future Disturbance Factors (including extenuating circumstances)

A 6m wide fire trail has been identified along the southern and western boundaries of the site, within the NP. This fire trail has been identified in the North Bonville DCP held by Council, as well as the Bongil Bongil NP Fire Management Strategy. As this fire trail is subject to formal management regimes it will be used as part of the *required* APZ for the development site.

As mentioned earlier, the NP to the west of the property has undergone disturbance in association with past hardwood plantation operations and grazing. The natural structure associated with dry sclerophyll forests has been influenced by the previous disturbance to the effect that the canopy is open, creating a woodland-type structure, and the introduction of Broad Leaf Paspalum has resulted in the gradual elimination of a shrubby stratum. The NPWS (Martin Smith pers. comm. 14/12/08) advises that plantation and farming operations have ceased and the area is subject to ongoing rehabilitation/regeneration.

The finger of forested wetland occupying the east-west watercourse at the north-east of the development site is planned to be revegetated. This will not reduce the bushfire hazard threat from the riparian corridor as the vegetation will be continuous with the swamp sclerophyll forest further east. This vegetation management regime will, however, still provide the riparian corridor with the "remnant" concession afforded in ***PBP-2006***.

There are not considered to be any other past or future disturbance factors affecting the bushfire hazard vegetation impacting on the site.

3.0 SLOPE ASSESSMENT

A slope assessment was carried out to include a distance of 100 metres from the subject parcel boundaries, in all directions. Photographs were taken to verify my assessment. Slope was determined using a clinometer.

The gradient that would most significantly influence fire behaviour varied, and is summarised as follows:

Table 1

North	*Managed lands* *Riparian corridor*	N/A 0° – level ground
East	*Forested wetlands*	0° – level ground
South	*Forested wetlands*, and *Forest*	0° – level ground >10° – 15° downslope
West	*Forested wetlands*, and *Forest*, and *Forest*	0° – level ground >10° – 15° downslope <5° upslope

4.0 SIGNIFICANT ENVIRONMENTAL FEATURES

The following environmental features are to be considered and assessed by the applicant in an Environmental Assessment:
riparian corridors
SEPP 14 – Coastal Wetlands
SEPP 26 Littoral rainforests
SEPP 44 – Koala Habitat
areas of geological interest
environmental protection zones or steep lands (>18°)
land slip or flood prone areas
National parks estate or various other reserves

5.0 THREATENED SPECIES, POPULATIONS, COMMUNITIES, HABITAT

These matters are to be considered and assessed by the applicant in an Environmental Assessment.

6.0 ABORIGINAL HERITAGE

Aboriginal heritage issues are to be considered and assessed by the applicant in an Environmental Assessment.

7.0 BUSHFIRE ASSESSMENT MATTERS

7.1 Asset Protection Zones / Separation Distances

Table 2 below sets out the *Performance Criteria* and *Acceptable Solutions* provided in ***PBP-2006***, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 2

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(1.1) radiant heat levels at any point on a proposed building will not exceed 29 kW/m^2	(1.1.1) an APZ is provided in accordance with the relevant tables/ figures in Appendix 2 ***PBP-2006***. (1.1.2) the APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply (see section 3.3 of ***PBP-2006***).	Complies Complies
(1.2) APZs are managed and maintained to prevent the spread of a fire towards the building.	(1.2.1) in accordance with the requirements of Standards for Asset Protection Zones (RFS, 2005) *Note: A Monitoring and Fuel Management Program should be required as a condition of development consent.*	Complies
(1.3) APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	(1.3.1) the APZ is located on lands with a slope less than 18°.	Complies

Below is Table A2.5 of ***PBP-2006*** which provides the *required* separation distance/APZ for subdivision developments. All of the *required* APZs (circled) are able to be accommodated within the boundaries of the subject property. Where the *required* APZs adjoin an existing fire trail within the Bongil Bongil NP, the fire trail will be incorporated into the *required* APZ.

Table A2.5 Minimum Specifications for Asset Protection Zones (m) for Residential and Rural Residential Subdivision Purposes (for Class 1 and 2 buildings) in FDI 80 Fire Areas (≤29kW/m^2)

	Effective Slopes				
Vegetation Formation	**Upslope/Flat**	**>0°-5°**	**>5°-10°**	**>10°-15°**	**>15°-18°**
Rainforests	10	10	15	15	20
Forests	20	20	30	40	45
Woodland	10	15	15	20	25
Plantations (Pine)	15	20	25	35	40
Tall Heath (Scrub)	15	15	20	20	20
Short Heath (Open Scrub)	10	10	10	15	15
Freshwater Wetlands	10	10	10	15	15
Forested Wetlands	15	20	20	30	35
Semi-Arid (Woodland)	10	10	10	10	15
Arid Shrubland	10	10	10	15	15

Figure 13: extract from PBP-2006 (Table A2.5)

These required APZs have been overlayed onto a copy of the proposed subdivision plan and provided below.

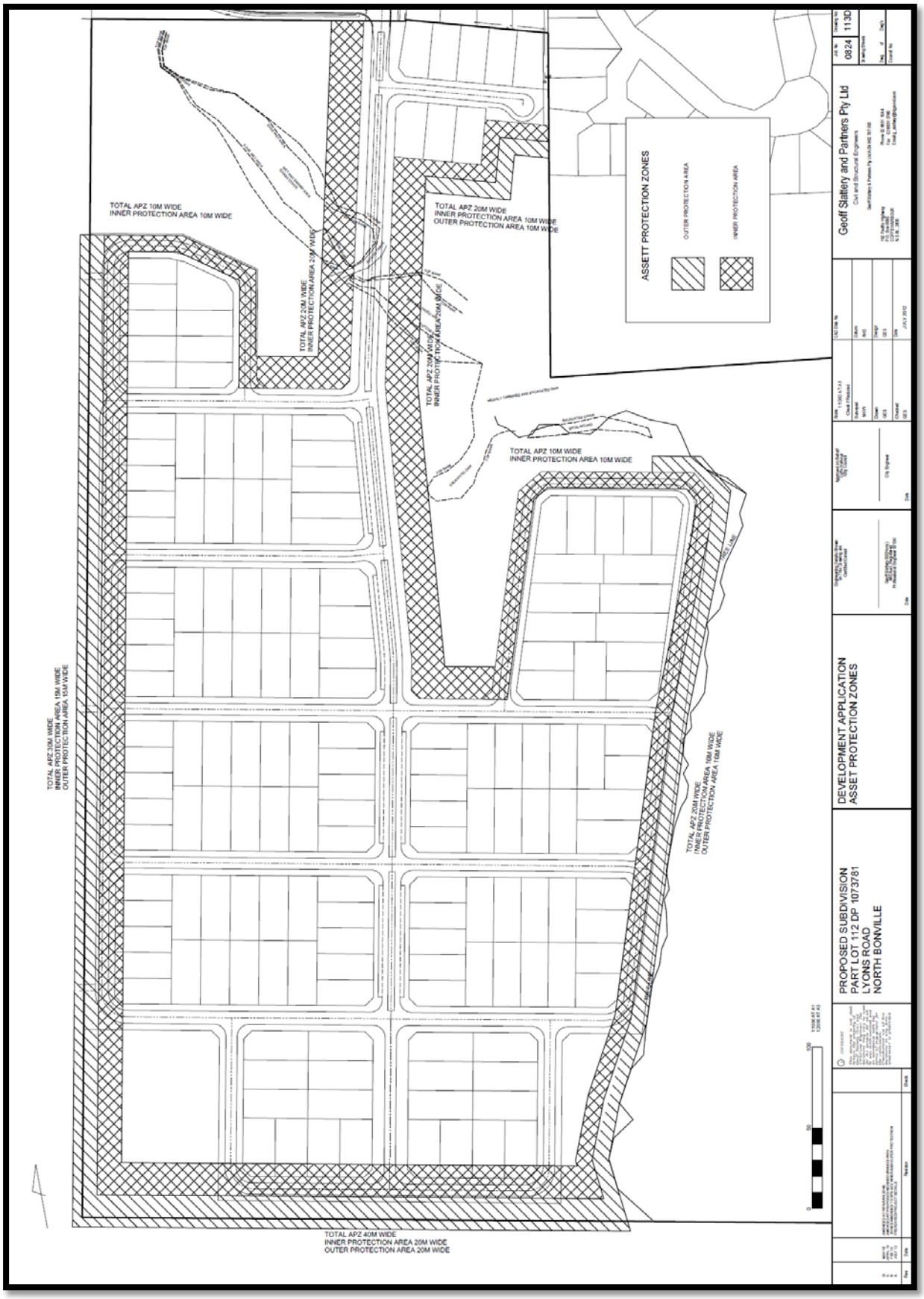

Figure 14: APZ plan

Figure 14 above identifies minimum APZ areas, and verifies these APZs can be provided with the proposed development. The revegetation of the riparian area (which increases the bushfire threat to the site) will require APZs to be provided around its perimeter. These have also been identified on Figure 14 above. Some of the areas around the riparian areas have been identified as being dedicated to the Coffs Harbour City Council. It is my understanding, after consulting with Mr Geoff Slattery (Client's representative) that:

- the riparian revegetation will be undertaken in such as way that will enable a 'view' to be achieved across the riparian area, therefore the larger woody vegetation along the riparian areas will be discontinuous; and
- the areas between the revegetation and the APZs shown on Figure 14 above (and in some instances including the APZ) will be grassed areas able to be easily maintained by ride-on lawn mowers and the like.

In relation to *Acceptable Solution 1.1.2*, the proposal satisfies the exceptional circumstances provisions of ***PBP-2006***. The fire trails in the NP have been identified on the Fire Management Strategy for the NP, as well as on the Council's DCP for the locality. The fire trail has been identified as 6m wide on the DCP, and this 6m will be included in the *required* APZ. This in no way compromises safety as the perimeter roads are still incorporated into the subdivision layout.

In relation to *Acceptable Solution 1.2.1*, attached as Appendix A of this Report is a document incorporating the *Standards for Asset Protection Zones* (NSW 2005) and Appendix 5 of ***PBP-2006*** (*Bush Fire Provisions - Landscaping and Property Maintenance*).

✓ Therefore, having met the *Acceptable Solutions*, it is determined that the separation distance / APZs required by ***PBP-2006*** have been achieved.

7.2 Water Supplies

Table 3 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in ***PBP-2006***, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 3

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(2.1) Water supplies are easily accessible and located at regular intervals.	(2.1.1) Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	Complies
	(2.1.2) Fire hydrant spacing, sizing and pressures comply with AS2419.1–2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles.	Complies
	(2.1.3) Hydrants are not located within any road carriageway.	Complies
	(2.1.4) All above ground water and gas service pipes external to the building are metal, including and up to any taps.	Complies

	(2.1.5) The provisions of parking on public roads are met.	Complies

In relation to *Acceptable Solution 2.1.5***,** the parking provisions are covered at section 7.3 of this Report (below).

In addition, the client advises that the sediment retention ponds to be located along the eastern perimeter of the development will be able to be used as an additional static water supply in the event of a major bushfire emergency event. This does not negate the need to comply with the reticulated supply provisions, but rather is in addition to the requirements.

✓ Therefore, having met the *Acceptable Solutions*, it is determined that the supply of water provisions of ***PBP-2006*** have been complied with.

7.3 Capacity of Public Roads

Table 4 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in ***PBP-2006***, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 4

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(3.1) Firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources).	(3.1.1) Public roads are two-wheel drive, all weather roads.	Complies
(3.2) Public road widths and design that allow safe access for firefighters while residents are evacuating an area.	(3.2.1) Urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb), allowing traffic to pass in opposite directions. Non-perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle).	Complies
	(3.2.2) The perimeter road is linked to the internal road system at an interval of no greater than 500m in urban areas.	Complies
	(3.2.3) Traffic management devices are constructed to facilitate access by emergency services vehicles.	Complies
	(3.2.4) Public roads have a cross fall not exceeding 3°.	Complies
	(3.2.5) All roads are through-roads. Dead-end roads are not recommended, but if unavoidable, dead-ends are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, and are clearly sign posted as a dead-end and direct traffic away from the hazard.	Complies
	(3.2.6) Curves of roads (other than perimeter roads) are a minimum inner radius of 6m and minimal in number, to allow for rapid access and egress.	Complies
	(3.2.7) The minimum distance between inner and outer curves is 6m.	Complies

	(3.2.8) Maximum grades for sealed roads do not exceed 15° and an average grade of not more than 10° or other gradient specified by road design standards, whichever is the lesser gradient.	Complies
	(3.2.9) There is a minimum vertical clearance to a height of 4m above the road at all times.	Complies
(3.3) The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles.	(3.3.1) 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 indicate load rating.	Complies
(3.4) Roads that are clearly sign-posted (with easily distinguishable names) and buildings/properties that are clearly numbered.	(3.4.1) Public roads greater than 6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression.	Complies
	(3.4.2) Public roads between 6.5m and 8m wide are "No Parking" on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.	Complies
(3.5) There is clear access to reticulated water supply.	(3.5.1) Public roads up to 6.5m wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.	Complies
	(3.5.2) One-way only public access roads are no less than 3.5m wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.	Complies
(3.6) Parking does not obstruct the minimum paved width.	(3.6.1) Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within the parking bays.	Complies
	(3.6.2) Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.	Complies

In relation to *Acceptable Solution 3.2.5*, it is my opinion that the road design throughout the proposed subdivision meets the intent of the "through-road" provisions. If no dead-ends or cul-de-sacs are created, then it must logically follow that what is proposed are through-roads.

If the concerns raised by the NSW Rural Fire Service are in relation to the perceived "pinch-point" where the main public road crosses the revegetated watercourse, then that is an entirely different matter, and therefore can not be resolved by applying the "through-road" intents. Even the corresponding *Performance Criteria* does not refer to "pinch-points" when stating the performance outcome for through-roads. It is my opinion that the "pinch-point" concerns can be adequately addressed by creating an APZ for the road where it crosses the revegetated watercourse. The existing public through road is Lyons Road, it is the only road that the proposed development can direct traffic to. If an additional road is provided (to create a though road as sought by the RFS) both of the roads would still take traffic across the watercourse. The pinch-point issue will not have been addressed nor resolved – a safer outcome will not have been achieved.

As a qualified alternative solution, I propose that the vegetation within the watercourse, within a distance of not less than 19m (commensurate with BAL-12.5 – protection within a vehicle with no inherent bushfire resisting properties other than ember resistance and limited radiant heat shielding) from the road, is to be free of trees and closely spaced shrubs.

✓ Therefore, having met the *Acceptable Solutions*, it is determined that the public road provisions of ***PBP-2006*** have been complied with.

7.4 Access and Egress

Table 5 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in ***PBP-2006***, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 5

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(4.1) Access to properties is provided in recognition of the risk to fire fighters and/or evacuating occupants.	(4.1.1) At least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200m from a public through-road.	Not applicable
(4.2) The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles.	(4.2.1) Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes.	Not applicable
(4.3) All weather access is provided.	(4.3.1) Roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge).	Not applicable
(4.4) Road widths and design enable safe access for vehicles	(4.4.1) A minimum carriageway width of 4m for rural-residential areas, rural landholdings or urban areas with a distance of greater than 70m from the nearest hydrant point to the most external part of a proposed building (or footprint). *No specific access requirements apply in a urban area where a 70 metres 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).*	Not applicable
	(4.4.2) 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.	Not applicable
	(4.4.3) A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.	Not applicable
	(4.4.4) Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12m outer radius.	Not applicable

	(4.4.5) Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.	Not applicable
	(4.4.6) The minimum distance between inner and outer curves is 6m.	Not applicable
	(4.4.7) The cross-fall is not more than 10°.	Not applicable
	(4.4.8) Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads. *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.*	Not applicable
	(4.4.9) Access to a development comprising more than 3 dwellings have formalised access by dedication of a road and not by right of way.	Not applicable

PBP-2006 (s.4.1.3) provides the following concessions for urban subdivision developments:

> No specific access requirements apply in a urban area where a 70 metres 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).

From the details in Figure 3 provided by the proponent it is evident that the lot layout proposal meets the concession provided in ***PBP-2006***. Therefore no specific provisions apply in relation to property access roads.

✓ Therefore, it is determined that the property access road provisions of ***PBP-2006*** are not applicable to this development proposal.

7.5 Fire Trails

Table 6 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in ***PBP-2006***, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 6

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(5.1) The width and design of the fire trails enables safe and ready access for firefighting vehicles	(5.1.1) A minimum carriageway width of 4m with an additional 1m wide strip on each side of the trail (clear of bushes and long grass) is provided.	Not applicable
	(5.1.2) The trail is a maximum grade of 15° if sealed and not more than 10° if unsealed.	Not applicable
	(5.1.3) A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.	Not applicable
	(5.1.4) The cross-fall of the trail is not more than 10°.	Not applicable

	(5.1.5) The trail has the capacity for passing by: - reversing bays using the access to properties to reverse fire tankers, which are 6m wide and 8m deep to any gates, with an inner minimum turning radius of 6m and outer minimum radius of 12m; and/or - a passing bay every 200m, 20m long by 3m wide, making a minimum trafficable width of 7m at the passing bay. *Note: Some short constrictions 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.*	Not applicable
(5.2) 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.	(5.2.1) The fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land.	Not applicable
	(5.2.2) Appropriate drainage and erosion controls are provided.	Not applicable
	(5.2.3) The fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200m or less.	Not applicable
	(5.2.4) Fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge).	Not applicable
	(5.2.5) Gates for fire trails are provided and locked with a key/lock system authorized by the local RFS.	Not applicable
(5.3) Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	(5.3.1) Fire trail design does not adversely impact on natural hydrological flows.	Not applicable
	(5.3.2) Fire trail design acts as an effective barrier to the spread of weeds and nutrients.	Not applicable
	(5.3.3) Fire trail construction does not expose acid-sulphate soils.	Not applicable

As stated at 7.3 above, the proposed subdivision is to be provided with a perimeter road, therefore the fire trail provisions are superfluous.

However, the NPWS have indicated (meeting held at Coffs Harbour 13/1/2010) that access from the proposed development to the existing fire trails should be provided. It is proposed to provide fire appliance access from the perimeter road to the fire trail at locations along the western and southern boundaries of the development site. The vehicular access gates are to be of a similar design and performance as the perimeter fencing (Koala friendly but restricting domestic pet access) and be lockable.

The existence of the fire trails within the adjacent National Park has enable part of the required APZ to be provided on land outside of the site being developed. This in no way compromises safety as the perimeter roads are still incorporated into the subdivision layout.

✓ Therefore, it is determined that the fire trail provisions of ***PBP-2006*** are not applicable to this development proposal.

7.6 Bushfire Maintenance Plans

Landscaping of the individual allotments will be required to comply with the principles of Appendix 5 of ***PBP-2006***, and "*Standards for Asset Protection Zones*" published by the NSW Rural Fire Service (refer to Appendix A of this Report), once an occupation certificate is issued for each dwelling constructed.

Vegetation management over vacant allotments and the residue of the development site should be carried out, by the property owner, in accordance with the principles for Outer Protection Areas to ensure that bushfire hazard vegetation does not regenerate on the subject lands. Generally this will require the grass to be kept short and green, tree canopies to be maintained <30% foliage cover, and 'crown lifting' to at least 2m above ground level.

These standards for APZs have been reproduced and attached as Appendix A of this Report.

This vegetation management regime should be monitored by the Consent Authority on a regular basis to ensure the standards required for APZ are maintained.

7.7 Building Construction Standards

Although previously considered an integral part of the assessment process to ensure proposed dwelling envelopes were able to accommodate a building complying with *AS3959-2009 Construction of buildings in bushfire-prone areas*, the NSW Rural Fire Service has since indicated that ensuring compliance with *AS3959-2009* is no longer relevant at subdivision stage. Therefore, although my previous versions of this Report indicated the construction thresholds on the proposed subdivision plan, this practice is now considered to be superfluous.

7.8 Additional Bushfire Protection Measures

In addition to the bushfire protection measures discussed above, the following Table identifies the ***PBP-2006*** *Performance Criteria* and *Acceptable Solution* for gas and electricity supplies, together with an assessment of the proposal's compliance.

Table 7

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(6.1) Electricity Services • location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings • regular inspection of lines is undertaken to ensure they are not fouled by branches.	(6.1.1) 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 specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002).	Complies
(6.2) Gas services	(6.2.1) Reticulated or bottled gas is installed and maintained in accordance	Not applicable

• location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	with AS 1596 and the requirements of relevant authorities. Metal piping is to be used.	(see note)
	(6.2.2) All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side of the installation.	Not applicable (see note)
	(6.2.3) If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal.	Not applicable (see note)
	(6.2.4) Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.	Not applicable (see note)

In relation to *Acceptable Solution 6.1.1*, the electricity supply services the proposed subdivision will be from Lyons Road. No transmission lines will be provided through any forest or woodland vegetation. Therefore the transmission lines may be provided above ground where the pole spacing and vegetation clearances are being maintained in accordance with Essential Energy's "Vegetation Management Plan": (http://www.essentialenergy.com.au/asset/cms/pdf/aasp/ce_vmp.pdf).

In relation to *Acceptable Solutions (6.2.1) – (6.2.4),* the installation of LPG services to future dwellings should be addressed at DA stage for the proposed structures on an individual basis.

Apart from the above matters, no other additional bushfire protection measures are considered necessary for this proposal.

8.0 SUMMARY / CONCLUSION / RECOMMENDATION

The proposal is a large urban subdivision development on land that is currently used for cattle grazing. The majority of the property is paddock, and it is on the paddock sections of the property that the subdivision development will be undertaken – no forest will need to be cleared to undertake the proposed development.

The development site is adjacent to the Bongil Bongil National Park on its western and southern boundary. The eastern perimeter of the proposed subdivision adjoins forested wetland located within the boundaries of the subject property.

All of the relevant *Acceptable Solutions* of ***PBP-2006*** relating to urban subdivisions have been addressed and complied with.

Some specific recommendations are provided below in an attempt to ensure appropriate bushfire protection measures are maintained:

SR1 The *Acceptable Solutions* of ***PBP-2006*** in relation to road widths, road grades, water supply locations and pressures, and parking provisions are to be incorporated into the subdivision layout and construction.

SR2 Landscaping of the individual allotments will be required to comply with the principles of Appendix A of this Report, once an occupation certificate is issued for each dwelling constructed.

Vegetation management over vacant allotments should be carried out by the property owner, in accordance with the principles for Outer Protection Areas of Appendix A of this Report.

This vegetation management plan should be monitored by the Consent Authority on a regular basis to ensure the standards required for APZ are maintained.

SR3 The vegetation within the watercourse, within a distance of not less than 19m from the road, is to be free of trees and closely spaced shrubs.

Therefore, having satisfied the *Intent* and *Acceptable Solutions* of the ***PBP-2006***, it is my recommendation that the proposal should be granted approval.

Holiday Coast Bushfire Solutions Pty Ltd

✓ Graduate Diploma in Design For Bushfire Prone Areas

✓ BPAD-A Certified Business and Practitioner – Fire Protection Association Australia "Bushfire Planning and Design" Certification Program

9.0 REFERENCES

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10.0 APPENDICES

APPENDIX A - Standards for APZs (RFS 2005) and Appendix 5 of ***PBP-2006***.

UTILA-2012 APPENDIX A

PROPOSED RESIDENTIAL SUBDIVISION

LOT 112 DP 1073791,
OFF LYONS ROAD,
TOORMINA, via COFFS HARBOUR.

standards

for asset protection zones

protection

NSW RURAL FIRE SERVICE

STANDARDS FOR ASSET PROTECTION ZONES

INTRODUCTION

For thousands of years bush fires have been a natural part of the Australian landscape. They are inevitable and essential, as many Australian plants and animals have adapted to fire as part of their life cycle.

In recent years developments in bushland areas have increased the risk of bush fires harming people and their homes and property. But landowners can significantly reduce the impact of bush fires on their property by identifying and minimising bush fire hazards. There are a number of ways to reduce the level of hazard to your property, but one of the most important is the creation and maintenance of an Asset Protection Zone (APZ).

A well located and maintained APZ should be used in conjunction with other preparations such as good property maintenance, appropriate building materials and developing a family action plan.

WHAT IS AN ASSET PROTECTION ZONE?

An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, commercial or heritage buildings.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows suppression of fire;
- an area from which backburning may be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Potential bush fire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

WHAT WILL THE APZ DO?

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;
- damage to the built asset from intense radiant heat; and
- ember attack on the asset.

WHERE SHOULD I PUT AN APZ?

An APZ is located between an asset and a bush fire hazard.

The APZ should be located wholly within your land. You cannot undertake any clearing of vegetation on a neighbour's property, including National Park estate, Crown land or land under the management of your local council, unless you have written approval.

If you believe that the land adjacent to your property is a bush fire hazard and should be part of an APZ, you can have the matter investigated by contacting the NSW Rural Fire Service (RFS).

There are six steps to creating and maintaining an APZ. These are:

1. Determine if an APZ is required;
2. Determine what approvals are required for constructing your APZ;
3. Determine the APZ width required;
4. Determine what hazard reduction method is required to reduce bush fire fuel in your APZ;
5. Take measures to prevent soil erosion in your APZ; and
6. Landscape and regularly monitor in your APZ for fuel regrowth.

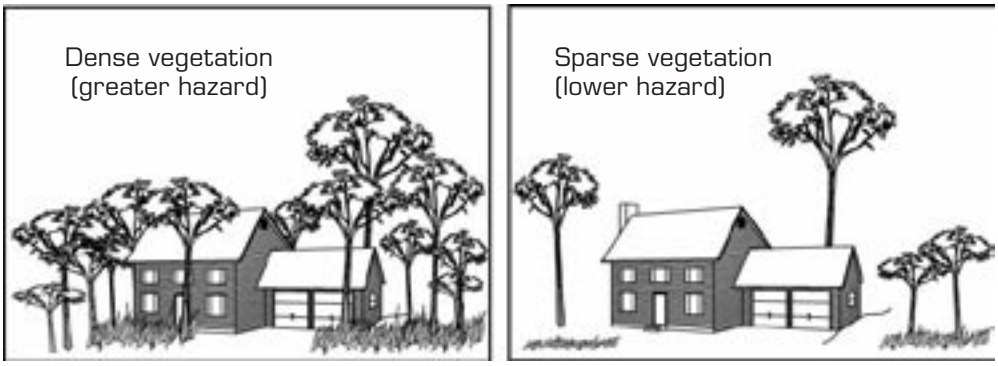
STEP 1. DETERMINE IF AN APZ IS REQUIRED

Recognising that a bush fire hazard exists is the first step in developing an APZ for your property.

If you have vegetation close to your asset and you live in a bush fire prone or high risk area, you should consider creating and maintaining an APZ.

Generally, the more flammable and dense the vegetation, the greater the hazard will be. However, the hazard potential is also influenced by factors such as slope.

- A large area of continuous vegetation on sloping land may increase the potential bush fire hazard.
- The amount of vegetation around a house will influence the intensity and severity of a bush fire.
- The higher the available fuel the more intense a fire will be.



Isolated areas of vegetation are generally not a bush fire hazard, as they are not large enough to produce fire of an intensity that will threaten dwellings.

This includes:

- bushland areas of less than one hectare that are isolated from large bushland areas; and
- narrow strips of vegetation along road and river corridors.

If you are not sure if there is a bush fire hazard in or around your property, contact your local NSW Rural Fire Service Fire Control Centre or your local council for advice.

STEP 2. DETERMINE WHAT APPROVALS ARE REQUIRED FOR CONSTRUCTING YOUR APZ

If you intend to undertake bush fire hazard reduction works to create or maintain an APZ you must gain the written consent of the landowner.

Subdivided land or construction of a new dwelling
If you are constructing an APZ for a new dwelling you will need to comply with the requirements in *Planning for Bushfire Protection*. Any approvals required will have to be obtained as part of the Development Application process.

Existing asset
If you wish to create or maintain an APZ for an existing structure you may need to obtain an environmental approval. The RFS offers a free environmental assessment and certificate issuing service for essential hazard reduction works. For more information see the RFS document *Application Instructions for a Bush Fire Hazard Reduction Certificate* or contact your local RFS Fire Control Centre to determine if you can use this approval process.

Bear in mind that all work undertaken must be consistent with any existing land management agreements (e.g. a conservation agreement, or property vegetation plan) entered into by the property owner.

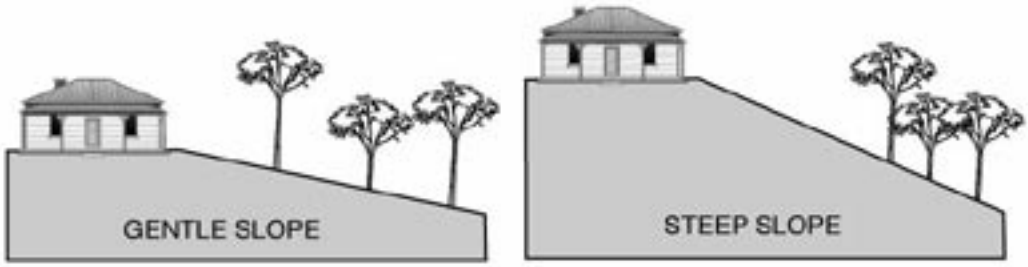
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

If you intend to burn off to reduce fuel levels on your property you may also need to obtain a Fire Permit through the RFS or NSW Fire Brigades. See the RFS document *Before You Light That Fire* for an explanation of when a permit is required.

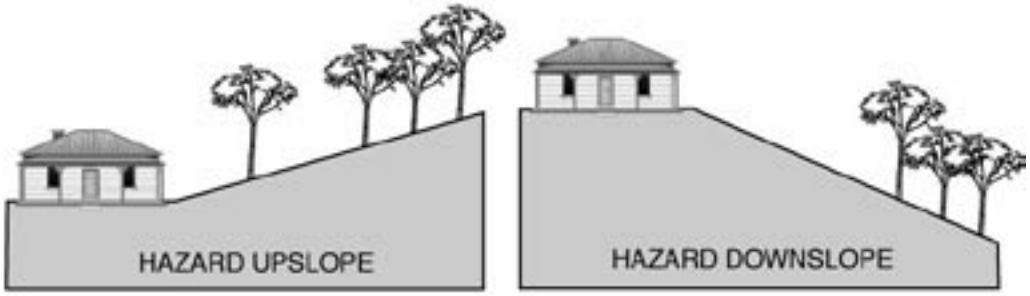
STEP 3. DETERMINE THE APZ WIDTH

The size of the APZ required around your asset depends on the nature of the asset, the slope of the area, the type and structure of nearby vegetation and whether the vegetation is managed.

Fires burn faster uphill than downhill, so the APZ will need to be larger if the hazard is downslope of the asset.



Gentle slopes require a smaller APZ distance than steep slopes



A hazard downslope will require a greater APZ distance then a hazard upslope of the asset

Different types of vegetation (for example, forests, rainforests, woodlands, grasslands) behave differently during a bush fire. For example, a forest with shrubby understorey is likely to result in a higher intensity fire than a woodland with a grassy understorey and would therefore require a greater APZ width.

A key benefit of an APZ is that it reduces radiant heat and the potential for direct flame contact on homes and other buildings. Residential dwellings require a wider APZ than sheds or stockyards because the dwelling is more likely to be used as a refuge during bush fire.

Subdivided land or construction of a new dwelling
If you are constructing a new asset, the principles of *Planning for Bushfire Protection* should be applied. Your Development Application approval will detail the exact APZ distance required.

Existing asset
If you wish to create an APZ around an existing asset and you require environmental approval, the Bush Fire Environmental Assessment Code provides a streamlined assessment process. Your Bush Fire Hazard Reduction Certificate (or alternate environmental approval) will specify the maximum APZ width allowed.

For further information on APZ widths see *Planning for Bushfire Protection* or the *Bush Fire Environmental Assessment Code* (available on the RFS website), or contact your local RFS Fire Control Centre.

STEP 4. DETERMINE WHAT HAZARD REDUCTION METHOD IS REQUIRED TO REDUCE BUSH FIRE FUEL IN YOUR APZ

The intensity of bush fires can be greatly reduced where there is little to no available fuel for burning. In order to control bush fire fuels you can reduce, remove or change the state of the fuel through several means.

Reduction of fuel does not require removal of all vegetation, which would cause environmental damage. Also, trees and plants can provide you with some bush fire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns. Some ground cover is also needed to prevent soil erosion.

Fuels can be controlled by:

1. 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.

2. mowing or grazing of grass
Grass needs to be kept short and, where possible, green.

3. 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.

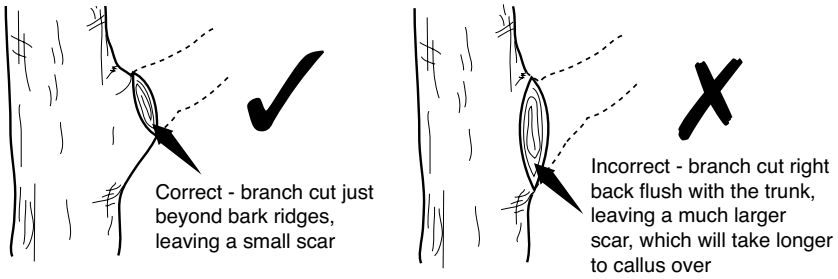
When choosing plants for removal, the following basic rules should be followed:

1. Remove noxious and environmental weeds first. Your local council can provide you with a list of environmental weeds or 'undesirable species'. Alternatively, a list of noxious weeds can be obtained at **www.agric.nsw.gov.au/noxweed/;**
2. Remove more flammable species such as those with rough, flaky or stringy bark; and
3 Remove or thin understorey plants, trees and shrubs less than three metres in height

The removal of significant native species should be avoided.

Prune in acordance with the following standards:

- Use sharp tools. These will enable clean cuts and will minimise damage to the tree.
- Decide which branches are to be removed before commencing work. Ensure that you maintain a balanced, natural distribution of foliage and branches.
- Remove only what is necessary.
- Cut branches just beyond bark ridges, leaving a small scar.
- Remove smaller branches and deadwood first.



There are three primary methods of pruning trees in APZs:

1. Crown lifting (skirting)
Remove the lowest branches (up to two metres from the ground). Crown lifting may inhibit the transfer of fire between the ground fuel and the tree canopy.

2. Thinning
Remove smaller secondary branches whilst retaining the main structural branches of the tree. Thinning may minimise the intensity of a fire.

3. Selective pruning
Remove branches that are specifically identified as creating a bush fire hazard (such as those overhanging assets or those which create a continuous tree canopy). Selective pruning can be used to prevent direct flame contact between trees and assets.

Your Bush Fire Hazard Reduction Certificate or local council may restrict the amount or method of pruning allowed in your APZ.

See the *Australian Standard 4373 (Pruning of Amenity Trees*) for more information on tree pruning.

4. Slashing and trittering
Slashing and trittering are economical methods of fuel reduction for large APZs that have good access. However, these methods may leave large amounts of slashed fuels (grass clippings etc) which, when dry, may become a fire hazard. For slashing or trittering to be effective, the cut material must be removed or allowed to decompose well before summer starts.

If clippings are removed, dispose of them in a green waste bin if available or compost on site (dumping clippings in the bush is illegal and it increases the bush fire hazard on your or your neighbour's property).

Although slashing and trittering are effective in inhibiting the growth of weeds, it is preferable that weeds are completely removed.

Care must be taken not to leave sharp stakes and stumps that may be a safety hazard.

5. Ploughing and grading
Ploughing and grading can produce effective firebreaks. However, in areas where this method is applied, frequent maintenance may be required to minimise the potential for erosion. Loose soil from ploughed or graded ground may erode in steep areas, particularly where there is high rainfall and strong winds.

6. Burning (hazard reduction burning)
Hazard reduction burning is a method of removing ground litter and fine fuels by fire. Hazard reduction burning of vegetation is often used by land management agencies for broad area bush fire control, or to provide a fuel reduced buffer around urban areas.

Any hazard reduction burning, including pile burns, must be planned carefully and carried out with extreme caution under correct weather conditions. Otherwise there is a real danger that the fire will become out of control. More bush fires result from escaped burning off work than from any other single cause.

It is YOUR responsibility to contain any fire lit on your property. If the fire escapes your property boundaries you may be liable for the damage it causes.

Hazard reduction burns must therefore be carefully planned to ensure that they are safe, controlled, effective and environmentally sound. There are many factors that need to be considered in a burn plan. These include smoke control, scorch height, frequency of burning and cut off points (or control lines) for the fire. For further information see the RFS document *Standards for Low Intensity Bush Fire Hazard Reduction Burning,* or contact your local RFS for advice.

7. Burning (pile burning)
In some cases, where fuel removal is impractical due to the terrain, or where material cannot be disposed of by the normal garbage collection or composted on site, you may use pile burning to dispose of material that has been removed in creating or maintaining an APZ.

For further information on pile burning, see the RFS document *Standards for Pile Burning.*

In areas where smoke regulations control burning in the open, you will need to obtain a Bush Fire Hazard Reduction Certificate or written approval from Council for burning. During the bush fire danger period a Fire Permit will also be required. See the RFS document *Before You Light that Fire* for further details.

STEP 5. TAKE MEASURES TO PREVENT SOIL EROSION

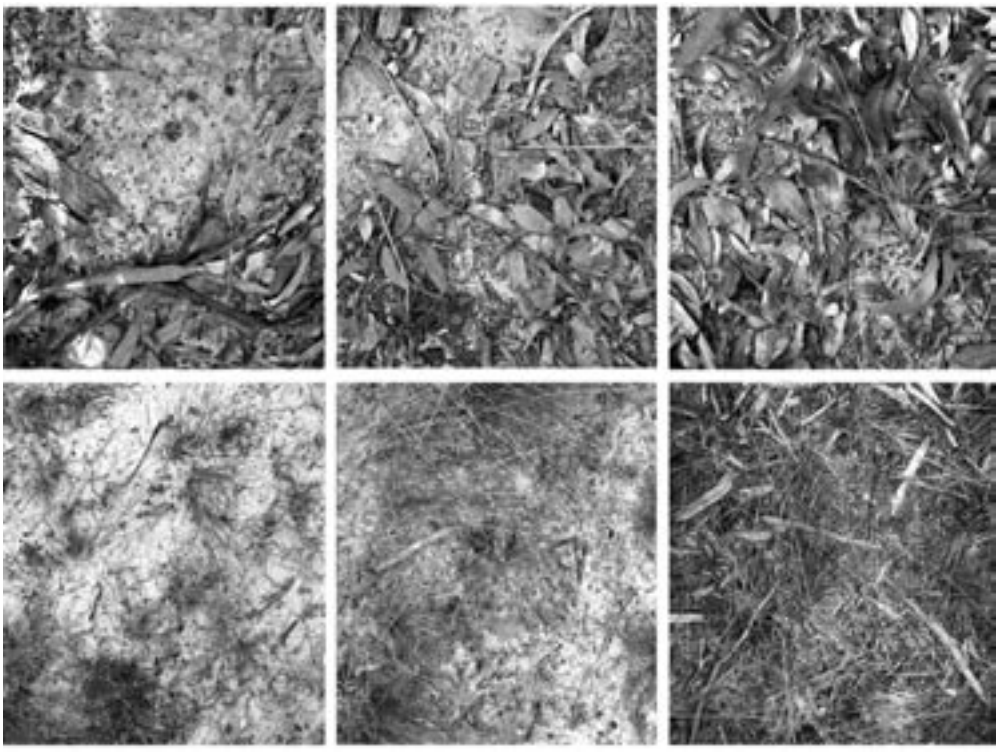
While the removal of fuel is necessary to reduce a bush fire hazard, you also need to consider soil stability, particularly on sloping areas.

Soil erosion can greatly reduce the quality of your land through:

- loss of top soil, nutrients, vegetation and seeds
- reduced soil structure, stability and quality
- blocking and polluting water courses and drainage lines

A small amount of ground cover can greatly improve soil stability and does not constitute a significant bush fire hazard. Ground cover includes any material which directly covers the soil surface such as vegetation, twigs, leaf litter, clippings or rocks. A permanent ground cover should be established (for example, short grass). This will provide an area that is easy to maintain and prevent soil erosion.

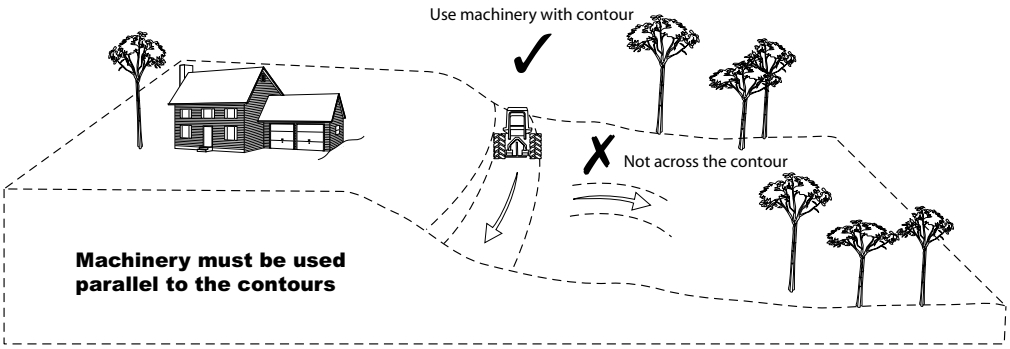
When using mechanical hazard reduction methods, you should retain a ground cover of at least 75% to prevent soil erosion. However, if your area is particularly susceptible to soil erosion, your Hazard Reduction Certificate may require that 90% ground cover be retained.



50% **75%** **100%**

Ground Cover

To reduce the incidence of soil erosion caused by the use of heavy machinery such as ploughs, dozers and graders, machinery must be used parallel to the contours. Vegetation should be allowed to regenerate, but be managed to maintain a low fuel load.

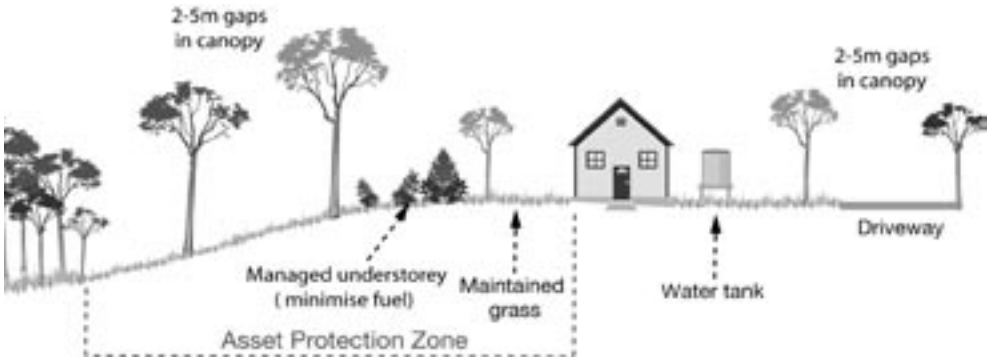


STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

Your home and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time. To provide an effective APZ, you need to plan the layout of your garden to include features such as fire resistant plants, radiant heat barriers and windbreaks.

Layout of gardens in an APZ
When creating and maintaining a garden that is part of an APZ you should:

- ensure that vegetation does not provide a continuous path to the house;
- remove all noxious and environmental weeds;
- 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;
- plant and maintain short green grass around the house as this will slow the fire and reduce fire intensity. Alternatively, provide non-flammable pathways directly around the dwelling;
- 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
- avoid erecting brush type fencing and planting "pencil pine" type trees next to buildings, as these are highly flammable.



Removal of other materials
Woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. should be located away from the house. These items should preferably be located in a designated cleared location with no direct contact with bush fire hazard vegetation.

Other protective features
You can also take advantage of existing or proposed protective features such as fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts and vegetable gardens as part of the property's APZ.

PLANTS FOR BUSH FIRE PRONE GARDENS

When designing your garden it is important to consider the type of plant species and their flammability as well as their placement and arrangement.

Given the right conditions, all plants will burn. However, some plants are less flammable than others.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage the ground fire to spread up to, and then through, the crown of the trees.

Plants that are less flammable, have the following features:

- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without "ribbons" hanging from branches or trunks; and
- dense crown and elevated branches.

When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into your garden that can cause greater long-term environmental damage.

For further information on appropriate plant species for your locality, contact your local council, plant nurseries or plant society.

If you require information on how to care for fire damaged trees, refer to the Firewise brochure *Trees and Fire Resistance; Regeneration and care of fire damaged trees.*

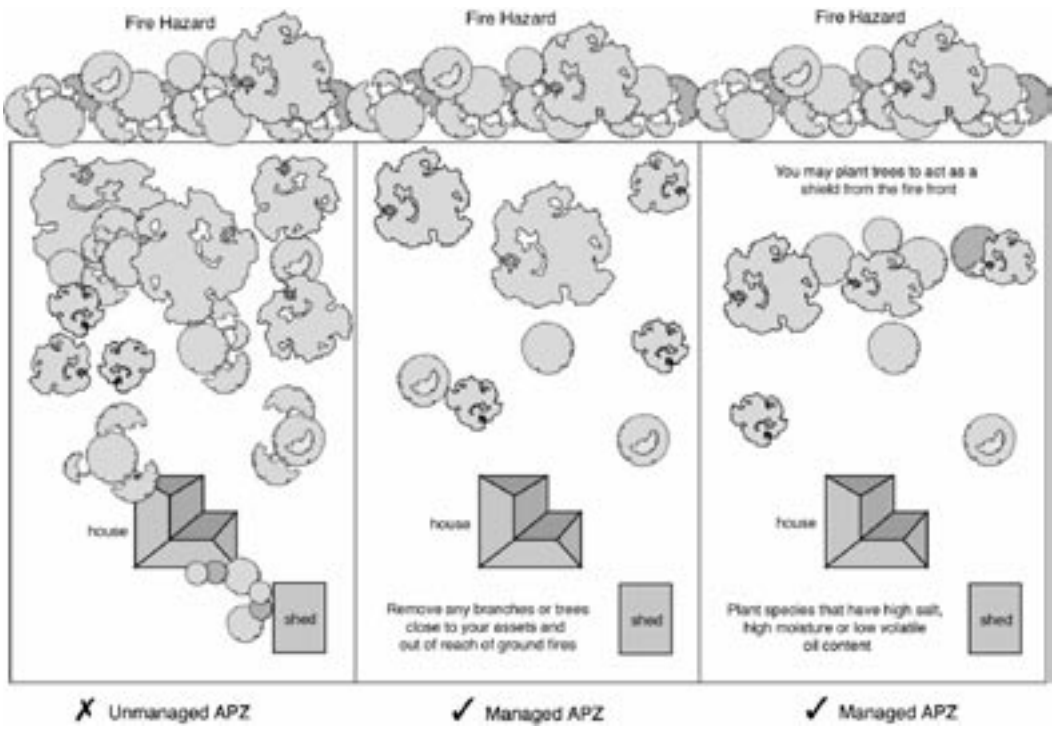
WIND BREAKS

Rows of trees can provide a wind break to trap embers and flying debris that could otherwise reach the house or asset.

You need to be aware of local wind conditions associated with bush fires and position the wind break accordingly. Your local RFS Fire Control Centre can provide you with further advice.

When choosing trees and shrubs, make sure you seek advice as to their maximum height. Their height may vary depending on location of planting and local conditions. As a general rule, plant trees at the same distance away from the asset as their maximum height.

When creating a wind break, remember that the object is to slow the wind and to catch embers rather than trying to block the wind. In trying to block the wind, turbulence is created on both sides of the wind break making fire behaviour erratic.



HOW CAN I FIND OUT MORE?

The following documents are available from your local Fire Control Centre and from the NSW RFS website at **www.rfs.nsw.gov.au.**

- Before You Light That Fire
- Standards for Low Intensity Bush Fire Hazard Reduction Burning
- Standards for Pile Burning
- Application Instructions for a Bush Fire Hazard Reduction Certificate

If you require any further information please contact:

- your local NSW Rural Fire Service Fire Control Centre. Location details are available on the RFS website or
- call the NSW RFS Enquiry Line 1800 679 737 (Monday to Friday, 9am to 5pm), or
- the NSW RFS website at **www.rfs.nsw.gov.au.**

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Appendix 5

Bush Fire Provisions - Landscaping and Property Maintenance

A5.1 Introduction

Bush fires are a natural and periodic event in the Australian landscape. Many Australian plants and animals have adapted to fire over thousands of years and require fire as part of their life cycle.

However, development adjacent to bushland areas has increased the risk of fire impacting on people and their assets. Fire management needs to strike a balance between the protection of life and property and the maintenance of ecological processes and systems.

In Australia, bush fires are inevitable and an essential aspect of the landscape.

However, the impact on property and life can be reduced with responsible preparation and management of bush fire hazards. This is the responsibility of all land managers, as well as communities and individuals taking responsibility for their own fire safety.

The level of protection for life or whether or not a house or other assets survive a bush fire ultimately depends on the landowner and their level of preparedness against bush fire attack.

The planning system can be used to better effect in protecting human life, property and environmental values from the impacts of bush fire events.

In some cases this will involve land use planning and development controls, construction standards, APZs and subdivision layout, siting, design and provision of services. It also involves careful and deliberate consideration of the environmental impacts of these and how we can recognise the need to protect our wetlands, rainforests, koala habitat and other biodiversity and cultural values.

However, the best planning can be undone by poor maintenance and lack of forethought when landscaping a development. Therefore house survival ultimately depends on the householder.

Some maintenance also depends upon adjoining neighbours and upon fuel management in adjacent bush land areas by the owners, occupiers or managers of that land. General housekeeping and maintenance of the grounds by the householder is equally important and, in some cases, may even be more so.

Experience from the Canberra 2003 fires suggests that house losses are greatest in the area up to 250 metres from the bush interface. Distances of less than 100 metres are particularly vulnerable to flame contact, radiant heat and ember attack.

Hence it is within this distance that efforts should be made to prepare for the onslaught of major bush fire events.

While other legislation provides the impetus for planning objectives, the RF Act provides the legislative vehicle to achieve bush fire management objectives.

In this appendix consideration will be given to the principles for landscaping and management, and the role of property maintenance during the fire event.

A5.2 Principles of Protection

Bush fire attack takes essentially five forms;

- wind,
- smoke,
- ember,
- radiant heat and
- flame.

Evidence indicates ember attack is responsible for most bush fire related house fires. Strong winds resulting from severe bush fires will drive embers into vulnerable areas of a building, preheat and dry fuel ahead of a fire, lift roofing and extend flames along a more horizontal plane closer to building elements. Embers can also cause spotting in advance of the bush fire and provide piloted ignition to building elements. To effectively protect a building, strategies must be implemented that separate it from the hazard and reduce the intensity of bush fires to minimise the combined impact of ember, wind, flame and heat attack.

While smoke will cause minimal damage to property, it can severely affect the health of residents. Smoke is a significant factor in areas in which aged or disabled persons reside – hospitals and nursing homes - and more so where residents are susceptible to respiratory disorders.

Radiant heat (measured in kW/m^2) can severely impair firefighting operations, the health of residents and the integrity of building elements. Radiant heat in excess of $10kW/m^2$ can prevent emergency services personnel assisting residents of SFPP developments.

Flame attack will severely restrict firefighting operations, provide piloted ignition to building elements and threaten the health of residents and their capacity to evacuate the area.

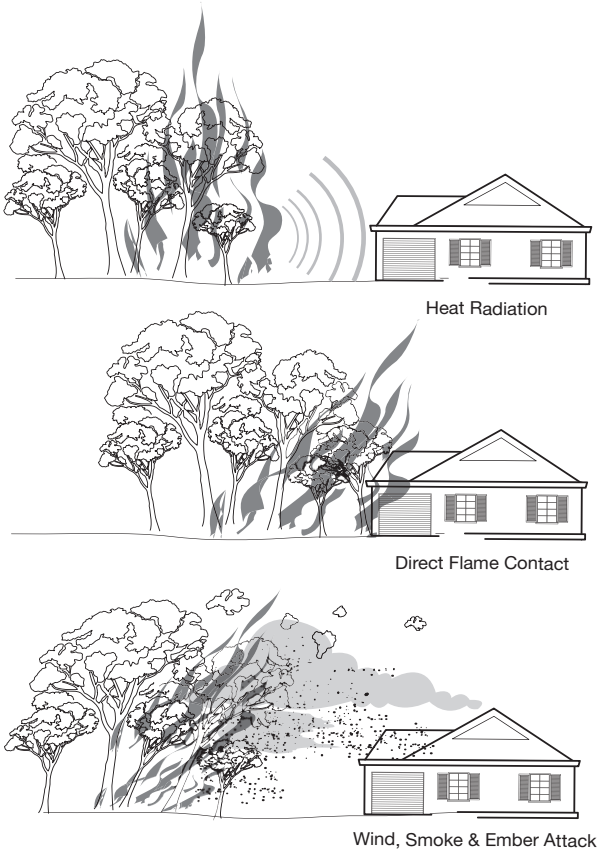

Figure A 5.1 Bush Fire Attack Mechanisms

Overall the intention of bush fire protection measures should be to prevent flame contact to a structure, reduce radiant heat to below the ignition thresholds for various elements of a building, to minimise the potential for wind driven embers to cause ignition and reduce the effects of smoke on residents and firefighters.

A5.3 Principles of Landscaping Properties for Bush Fire Protection

The principles of landscaping for bush fire protection aim to:

- Prevent flame impingement on the dwelling;
- Provide a defendable space for property protection;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat; and
- Reduce wind speed.

(a) Vegetation choices

All vegetative material can burn under the influence of bush fire.

With this in mind, careful attention must be paid to species selection, their location relative to their flammability, avoidance of continuity of vegetation (horizontally and vertically), and ongoing maintenance to readily remove flammable fuels (leaf litter, twigs and debris).

In the paper *"Landscape and Building Design for Bushfire Areas"* G.C. Ramsay and L. Rudolph have provided 14 attributes of vegetation which affect bush fire attack. In summary these attributes are:

- Moisture content of leaves;
- Volatile oil content of leaves;
- Mineral content of leaves;
- Leaf fineness;
- Density of foliage;
- Continuity of plant form;
- Height of lowest foliage above ground;
- Size of plant;
- Dead foliage on the plant;
- Bark texture;
- Quantity of ground fuels;
- Fineness of ground fuels;
- Compaction ability of ground fuels; and
- Mineral content of ground fuel.

What is clear is that the higher moisture content of leaves (mesic), the less bark that will be available and the lower the leaf drop, all of which will assist with maintenance of the understorey and will also assist in reducing bush fire attack.

Work in the USA and elsewhere has also suggested that in addition to removal of understorey species, the trimming of lower limbs of trees also assists in reducing fire penetration into the canopy. Trees such as 'pencil pines' and African olive have been attributed with high fire propagation due to the high fine fuel and/or oil content captured within the canopy. This leads to significant flame height. Avoid such species in favour of rainforest species such as Figs and Syzygium.

When choosing plants, be sure not to introduce weed species into an area. Fire events may provide the opportunity for weed species to spread and may contribute fuel to an area of otherwise lower fuel loads.

Contact local councils, plant nurseries and plant societies to determine suitable species for your area.

(b) Trees as Windbreaks

The use of trees as windbreaks is a common practice but trees also provide a useful function, trapping embers and flying debris, which would otherwise reach the house. The tree crown will rarely carry fire unless there is a significant fuel loading on the ground.

By reducing the wind speed, a row of trees also slows the rate of spread of a bush fire and a dense foliage traps radiant heat, lowering bush fire radiant heat.

Because of the effect of turbulence, a balance has to be struck between a high density of trees (that

maximises the trapping of embers and radiant heat but also maximises turbulence) and a lower density (that allows more embers and radiant heat to pass through but minimises turbulence). A windbreak that allows 30–60% of the wind to pass through is ideal as less than this becomes too solid with ember laden winds being carried over the top of the break.

To be effective a windbreak must:

- be located on the side of the lot from which fire weather normally approaches;
- be of sufficient length (generally 100 metres minimum length);
- be located at a distance of one to three times the height of fully grown trees but not within the IPA;
- use smooth barked eucalypts, rainforest trees or deciduous trees;
- make sure there are no breaks of sufficient size to allow winds to funnel through; and
- be separated by sufficient distance from the hazard so as not to be consumed and become a hazard itself.

A5.4 Vegetation Management

Where APZs have been incorporated as part of the development approval for subdivision or for dwelling construction, the environmental aspects of the development should have already been taken into account.

In general, it is expected that APZs will be maintained by the owner of the land including maintenance of any fire trail constructed as part of the development.

It is accepted practice that after construction of a dwelling, gardens will be established and landscaping of the grounds will be undertaken. It is essential that efforts to reduce fuels on adjoining properties are therefore not negated by actions within the immediate curtilage of the building.

In terms of priorities of addressing bush fire attack, priority should be given to preventing flame impingement by not allowing fine debris to accumulate close to the building. Secondly, removal of understorey fuels aids in the reduction of flame heights and likely canopy fire, thereby reducing overall radiant heat. Removal of loose bark and fine fuels reduces both heat output and ember generation, while the retention of taller trees with canopies will also assist in filtering out embers.

To maintain a garden that does not contribute to the spread of bush fires, it is necessary to plan the layout of the garden beds and take an active decision to minimise certain features in favour of other features. These should include:

- maintaining a clear area of low cut lawn or pavement adjacent to the house;
- keeping areas under fences, fence posts and gates and trees raked and cleared of fuel;
- utilising non-combustible fencing and retaining walls
- breaking up the canopy of trees and shrubs with defined garden beds;
- organic mulch should not be used in bush fire prone areas and non flammable material should be used as ground cover, eg Scoria, pebbles, recycled crushed bricks.
- planting trees and shrubs such that:
  - the branches will not overhang the roof;
  - the tree canopy is not continuous; and
  - there is a windbreak in the direction from which fires are likely to approach.

The RFS has developed its document "Standards for Asset Protection Zones" which should be consulted for APZ specifications. This is also available on the RFS web page at www.rfs.nsw.gov.au.

A5.5 Maintenance of Property

Sensible arrangements for landscaping and maintenance of the property are critical in the prevention of losses.

In considering property maintenance the following items should therefore be implemented in advance of the bush fire season:

- removal of material such as litter from the roof and gutters;
- ensure painted surfaces are in good condition with decaying timbers being given particular attention to prevent the lodging of embers within gaps;
- check pumps and water supplies are available and in working order;
- driveways are in good condition with trees not being too close and forming an obstacle during smoky conditions;
- check tiles and roof lines for broken tiles or dislodged roofing materials;
- screens on windows and doors are in good condition without breaks or holes in flyscreen material and frames are well fitting into sills and window frames;
- drenching or spray systems are regularly tested before the commencement of the fire season;
- hoses and hose reels are not perished and fittings are tight and in good order;
- doors are fitted with draught seals and well maintained;
- mats are of non combustible material or in areas of low potential exposure; and
- woodpiles, garden sheds and other combustible materials are located downslope and well away from the house.

Trees and other vegetation in the vicinity of power lines and tower lines should be managed and trimmed in accordance with the specifications in "Vegetation Safety Clearances" issued by Energy Australia (NS179, April 2002).