Holiday Coast Bushfire Solutions

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BUSHFIRE ASSESSMENT REPORT

Rezoning Application & Application for a Bushfire Safety Authority

REPORT PREPARED IN RELATION TO:	**PROPOSED REZONING APPLICATION**
PROPERTY DESCRIPTION:	**LOTS 2//529457, 3//209779, & PART LOTS 1//558807, 1//209779, & 4//1160566, APPIN ROAD, MACQUARIEDALE ROAD & SPORTGROUND PARADE, APPIN.**
REPORT COMMISSIONED BY: (my Client)	**Walker Corporation Pty Ltd.**
	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	-	Building Code of Australia.
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***).
DE	-	Dwelling or Building Envelope. The foot print of a (proposed) structure.
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.

1.0 GENERAL DESCRIPTION OF LAND AND PROPOSAL

1.1 The Land

A site assessment was carried out by me on Friday 27th September 2013 for the purpose of preparing a Bushfire Risk Report. This Report has been prepared to provide sufficient information for:

- The rezoning of the land by addressing the matters set out by Section 117(2) (Ministerial Directions) of the *Environmental Planning and Assessment Act 1979*; and
- The issuing of a Bushfire Safety Authority for the future subdivision of the subject land as set out in Cl.44 of the Rural Fires Regulation 2008.

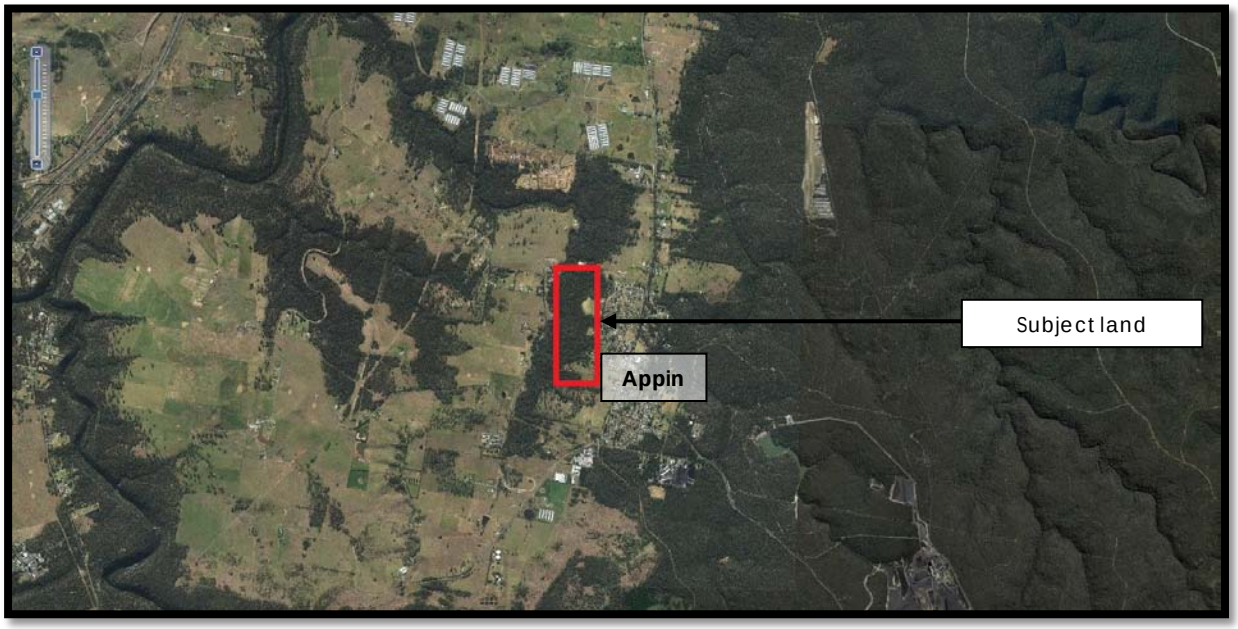


Figure 1: aerial image indication general locality of subject land

The subject land is located to the west of an existing, established urban area, and will essentially become a western extension of the suburb of Appin. Parts of the subject land are partly cleared and/or occupied, while other parts are presently occupied by native vegetation.

A motorway corridor is planned to be routed through the subject properties, from north-to-south, as indicated in Figure 2 below. If and when completed, this motorway corridor will provide a significant separation of the urban areas to the east from the bushfire hazard remaining to the west.

The land to the north of the subject site is land also recently developed by the Client, and consists of an urban subdivision located between the proposed motorway corridor to the west and Appin Road to the east. The land to the south of the subject site is essentially a grassland area with scattered and clustered trees.

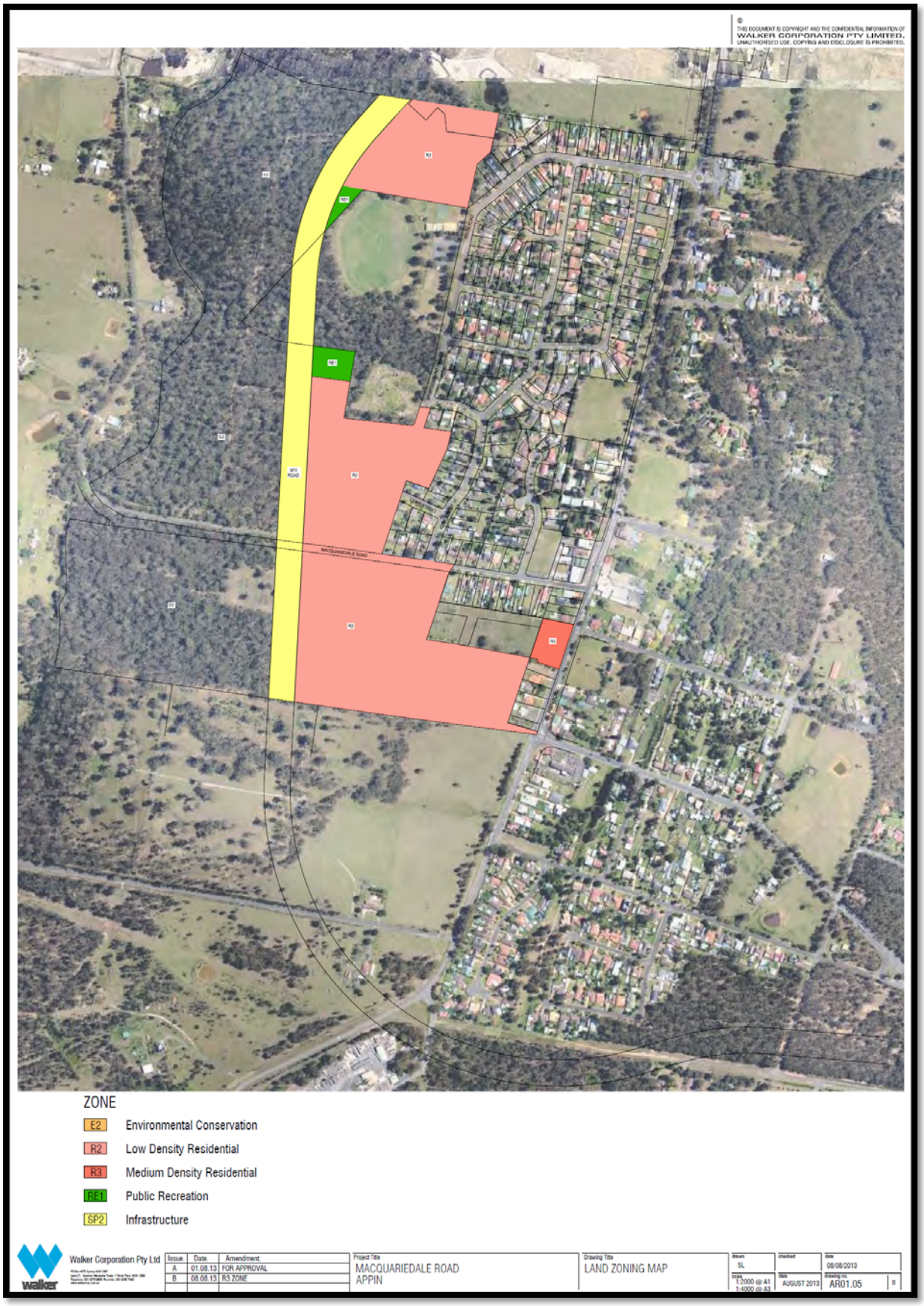


Figure 2: proposed land rezoning map

Bushfire prone land maps provide the trigger for the various development assessment provisions. The identification of bushfire-prone areas in NSW is required under section 146 of the *EP&A Act*. The NSW Rural Fire Service designates, through separate guidelines, what constitutes a bushfire-prone area and how it is to be mapped. Each Council then prepares a map in accordance with the guidelines and submits the map for approval by the NSW Rural Fire Service.

The subject property has been identified as bushfire-prone land by the Wollondilly Shire Council's Bushfire Prone Land Map, an extract of which is provided below.

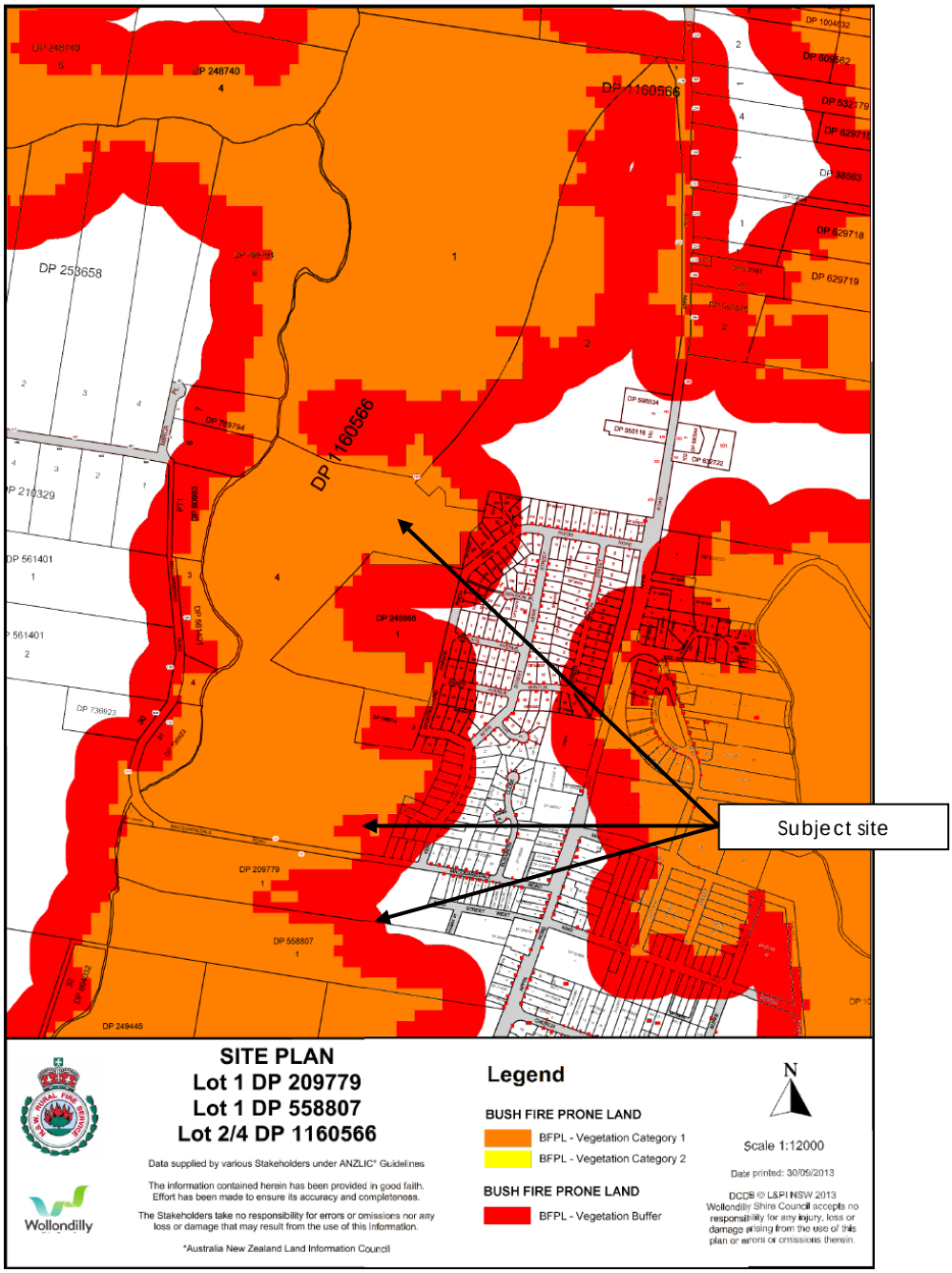


Figure 3: extract of Wollondilly Shire Council's BPLM (© WSC, 2013)

1.2 The Proposal

Holiday Coast Bushfire Solutions Pty Ltd has been engaged by the Client to provide a Bushfire Assessment Report to support a rezoning application. The development proposed on the rezoned land will be an urban subdivision, consistent with the adjoining land use to the east of the site.

The proposal will be measured against the specific requirements outlined in s.117(2) (Ministerial Directions) of the EP&A Act 1979, as well as the bushfire protection measures required for residential subdivisions by Planning for Bushfire Protection 2006 (***PBP-2006***). The assessment criteria listed in these 2 documents will form the headings of the following subsections of this Report. ***PBP-2006*** also states:

> 2.3 Preparation of LEPs and DCPs
>
> LEPs and DCPs are the best way of strategically achieving bush fire protection objectives. Inclusion of bush fire planning provisions in an LEP:
>
> • gives weight to bush fire management planning principles, ensuring they are considered at subdivision and construction stages;
>
> • can allow for sufficient space to be incorporated into land use zones for setbacks and adequate access for firefighting and evacuation; and
>
> • controls inappropriate land uses in BPAs.
>
> LEP amendments that affect BPAs need to address the planning principles of PBP (see below). Where appropriate the proposed land uses must be considered with respect to bush fire protection (including appropriate setbacks).
>
> If a proposed amendment to land use zoning or land use affects a designated BPA, then the section 117(2) Direction No 19 must be applied (section 117 of the EP&A Act provides for the Minister for Planning to direct a council, in relation to the preparation of a draft LEP, to apply the planning principles specified in that direction).
>
> The section 117 Direction No 19 requires councils to:
>
> • consult with the Commissioner of the RFS under section 62 of the EP&A Act, and to take into account any comments by the Commissioner; and
>
> • have regard to the planning principles of PBP below (rezoning to residential land).
>
> If a council proceeds with a draft LEP that does not comply with the provisions in the section 117 Direction, the council must obtain written advice from the Commissioner of the RFS to the effect that the RFS does not object to that non-compliance.
>
> The requirement to review LEPs in accordance with the Standard LEP is an opportunity to consider appropriate uses on Bush Fire Prone Land as well as exempt and complying development provisions.
>
> Planning Principles for Rezoning to Residential Land in Bush Fire Prone Areas
>
> a. Provision of a perimeter road with two way access which delineates the extent of the intended development;
>
> b. Provision, at the urban bushland interface, for the establishment of adequate asset protection zones for future housing;
>
> c. Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads;
>
> d. Minimising the perimeter of the area of land, interfacing the hazard, which may be developed;
>
> e. Introduction of controls which avoid placing inappropriate developments in hazardous areas; and
>
> f. Introduction of controls on the placement of combustible materials in asset protection zones.

2.0 VEGETATION ASSESSMENT

The procedure adopted for the site inspection generally followed the site assessment methodology of Appendix 2 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 site, in all directions. It is determined that the general vegetation description is summarised by the following Figure 4. The Legend for the Figure 4 is provided below.

1 = Managed land (APZ to link with neighbouring subdivision)
2 = Managed land (existing urban development)
3 = Managed land (recreation reserve / playing fields)
4 = Forest

5 = Forest
6 = Grassland (if left unmanaged, this grasslands will most probably regenerate to forest)
7 = Managed land (existing urban development)
8 = Forest

9 = Managed land
10 = Grasslands
11 = Grasslands
12 = Forest

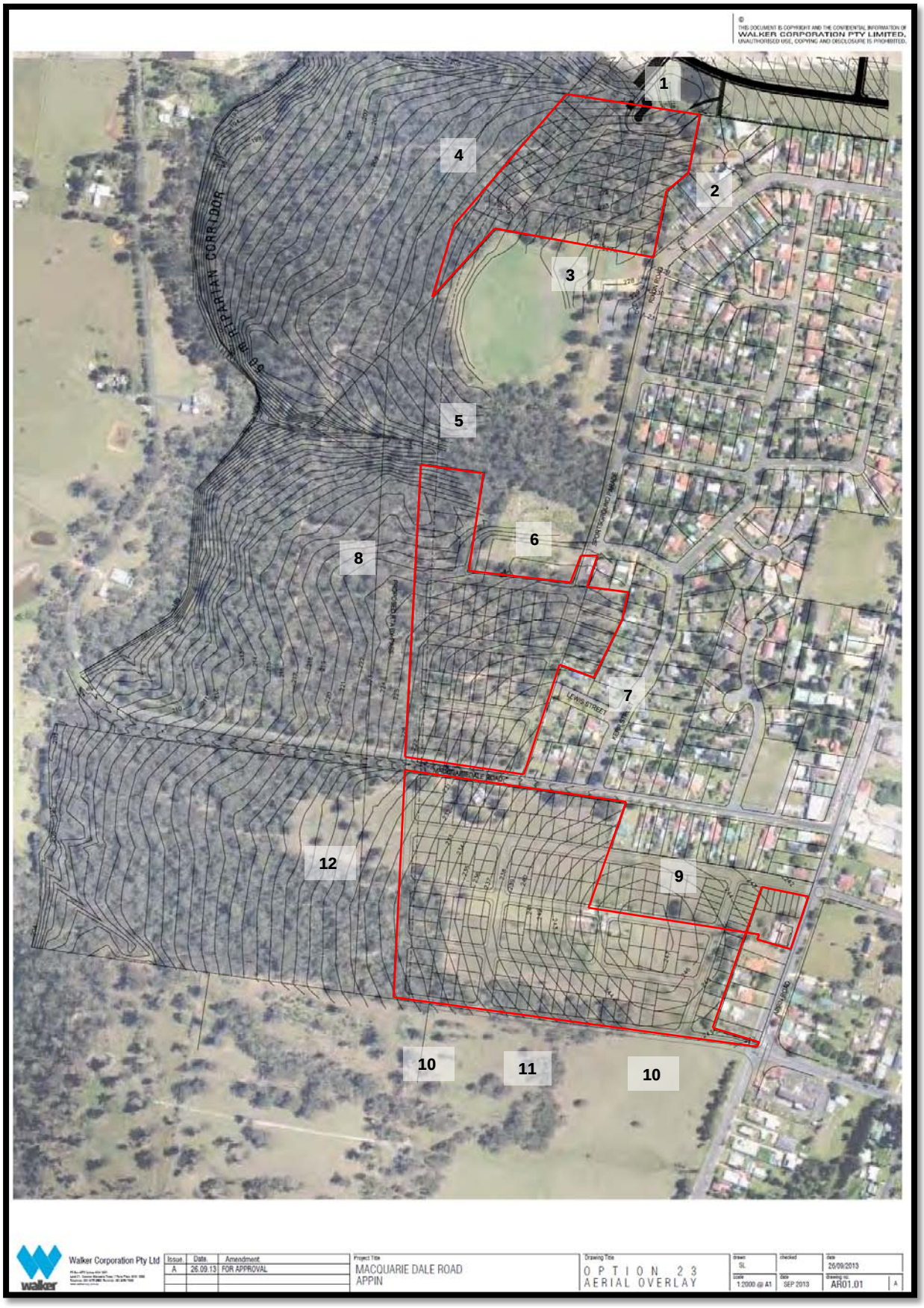


Figure 4: vegetation summary

3.0 SLOPE

A slope assessment was carried out to include a distance of 100 metres from the cleared area of the site, in all directions. Slope was determined using a clinometer. The gradient that would most significantly influence bushfire behaviour varied and is summarised by the above Figure 4. The Legend for the Figure 4 is provided below.

1 = Managed land, therefore slope N/A
2 = Managed land, therefore slope N/A
3 = Managed land, therefore slope N/A
4 = Forest on a 0^o - 5^o downslope to west

5 = Forest on a 5^o - 10^o downslope to gully, then upslope
6 = Forest on a 0^o - 5^o downslope
7 = Managed land, therefore slope N/A
8 = Forest on a 0^o - 5^o downslope to west

9 = Managed land, therefore slope N/A
10 = Grasslands on a 0^o - 5^o downslope
11 = Grasslands on a 5^o - 10^o downslope
12 = Forest on a 0^o - 5^o downslope to west

4.0 BUSHFIRE ASSESSMENT MATTERS

4.1 Section 117(2) Ministerial Directions

4.1.1 A draft LEP shall have regard to *PBP-2006*.

This Report will aim to address the requirements of the EP&A Act and ***PBP-2006*** as they relate to the bushfire constraints of the site.

All of the provisions of ***PBP-2006*** as they relate to residential subdivision will be addressed at section 4.3 of this Report. The purpose of addressing the ***PBP-2006*** requirements is to aid in the design or layout of the future subdivision of the subject land. Such matters include perimeter roads, traffic 'pinch-points', water supply requirements, in addition to identifying the bushfire-resisting construction standards for future dwellings. This will avoid the necessity to revisit the ***PBP-2006*** requirements at a later date.

4.1.2 A draft LEP shall introduce controls that avoid placing inappropriate developments in hazardous areas.

The establishment of the residential area on the site is wholly within the scope of ***PBP-2006***. There are no proposals to create opportunities for any development that could be considered inappropriate for a bushfire-prone area, such as:

- Power generating works
- Sawmills
- Junk yards
- Liquid fuel depots
- Offensive and hazardous industries
- Chemical industries
- Service stations
- Ammunition storage/manufacture
- Fire works manufacture/storage

All of the land being subject to the rezoning application is to be zoned for either Low Density Residential, Medium Density Residential, Public Recreation or Infrastructure (motorway corridor). As previously mentioned, the motorway corridor separates the proposed residential areas from the remaining bushfire hazard to the west.

4.1.3 A draft LEP shall ensure that bushfire hazard reduction is not prohibited within the APZ.

The envisaged APZ will be totally within the zoned SP2 Road Corridor (the Appin Bypass Road), envisaged by NSW Roads and Maritime Services. Under Wollondilly LEP 2011 Clause 5.11, "bush fire hazard reduction work authorised by the Rural Fires Act 1997 may be carried out on any land without development consent". Bushfire hazard reduction will therefore be permitted within this zone by virtue of Clause 5.11 of the LEP.

Furthermore, while the land identified for the APZ within the SP2 zone is constrained by environmental factors (it has been mapped as Shale Sandstone Transition Forest) the planning proposal is premised upon any impacts from the necessary clearing being accepted by the NSW Office of Environmental Heritage due to the biodiversity offsets strategy prepared by Travers Environmental and Eco Logical, and submitted as part of the planning proposal.

4.1.4 Provide an Asset Protection Zone (APZ) incorporating at a minimum:

(i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and

(ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road.

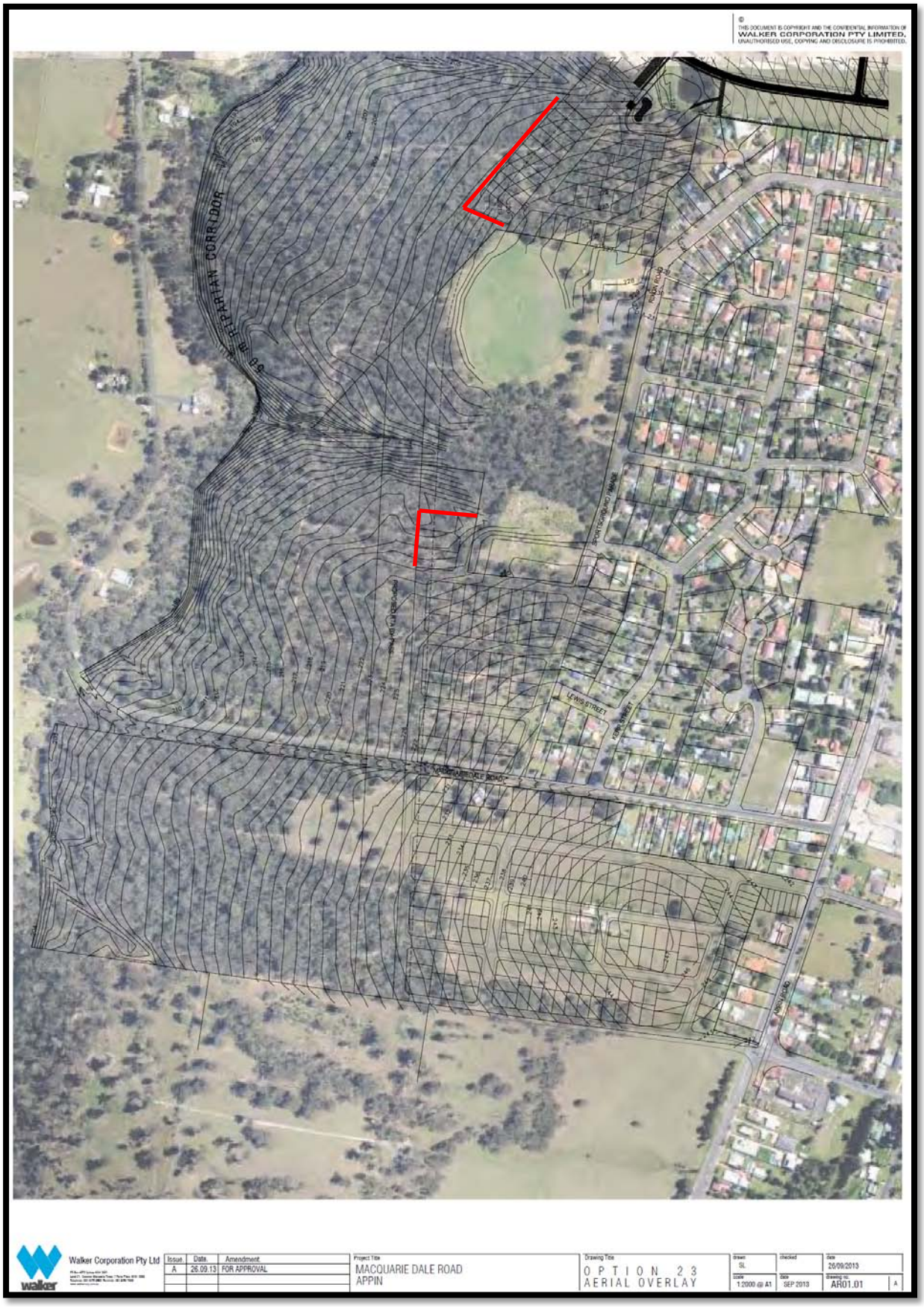
The proposed subdivision layout, as presented, provides for an APZ along all interfaces with bushfire hazard vegetation. The APZ will comply with the minimum separation distance required by Appendix 2 of ***PBP-2006***.

All of the land within the southern portion of the site incorporates a perimeter road into the interface areas. Along the southern exposures the hazard is grasslands, along the larger western exposure the hazard is forest. The proposed motorway corridor is located on the hazard side of the proposed perimeter road. If constructed, the motorway will provide a separation distance significantly greater than that required by ***PBP-2006*** along the western interface.

The land in the northern portion of the site occupies a relatively small portion of the overall land. A perimeter road is not proposed in some of these portions of the site. The proposed lots along the western interface of this area back onto the proposed motorway corridor. These lots are longer than the other lots in an attempt to accommodate the required APZ. For further discussion on the distances required by ***PBP-2006***, refer to sections 4.3.1 & 4.3.7 of this Report.

As a proposal to address the lack of a perimeter road at this location, a fire trail could be provided along the rear of the 11 lots at the interface. The fire trail would be located within the proposed motorway corridor. If/when the motorway is constructed, the fire trail would be 'extinguished' as it would no longer serve a useful purpose. This proposal would mean that the proposed lots at this interface would not be encumbered by a fire trail. The fire trail would serve its purpose while the hazard existed (partly) within the motorway corridor.

The areas of interface that are not provided with a perimeter road (at this stage) have been identified on the following Figure 5.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RIPARIAN CORRIDOR
SPORTSGROUND
LEWIS STREET
MACQUARIE DALE ROAD
Walker Corporation Pty Ltd
Issue: A
Date: 26.09.13
Amendment: FOR APPROVAL
Project Title: MACQUARIE DALE ROAD APPIN
Drawing Title: OPTION 23 AERIAL OVERLAY
Drawn: SL
Checked:
Date: 26/09/2013
Scale: 1:2000 @ A1
Date: SEP 2013
Drawing no: AR01.01
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Figure 5

4.1.5 Contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks.

The roads of the proposed subdivision will comply with the provisions of ***PBP-2006***. This will extend to those parts of the subject land that remain as bushfire-prone land once the proposed development is completed. Once the development is completed, some of the land currently identified as bushfire-prone land will no longer be bushfire-prone if it is located more than 100m from unmanaged bushfire hazard vegetation (the outer edge of the proposed APZ). Notwithstanding, the road dimensions should not diminish in width as they near the main arterial road of Appin Road or the existing urban streets of the established neighbouring residential areas.

Perimeter road pavements should not be less than 8m wide, non-perimeter road widths should comply with the "two way" requirements set out in Australian Standard 2890.2 – 2002, provided below as Figure 5 (road widths for medium rigid vehicles).

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Figure 6: road widths for non-perimeter roads

4.1.6 Contain provisions for adequate water supply for firefighting purposes.

Reticulated water mains and fire hydrants should be provided to meet the requirements of ***PBP-2006***. This will result in the hydrants located with the remaining bushfire-prone land areas needing to meet the requirements of *AS 2419.1-2005 Fire hydrant installations (Part 1: System design, installation and commissioning)* with reference to "feed hydrants" (refer to Table 2.2 of *AS 2419.1-2005*).

4.1.7 Minimise the perimeter of the area of land interfacing the hazard which may be developed.

Due to the nature of the proposal (size, shape and orientation), this measure is deemed not applicable in this circumstance.

The proposal does however significantly improve the bushfire protection outcome for the existing residential areas of Appin. The proposed subdivision, with its inherent bushfire protection measures, will provide a significant buffer between the bushfire hazard vegetation in the west, and the established urban areas to the east of the subject site.

The improved bushfire protection outcome for the existing urban areas of Appin should be reason alone to waive the minor non-compliance with this Direction.

4.1.8 Introduce controls on the placement of combustible materials in the Inner Protection Area.

This "guidance level" statement is very broad, and if taken literally would restrict anything that is combustible being placed or housed within the IPA of the APZ. This would include any vegetation, vehicles, furniture and the like. A realistic approach, therefore, is needed.

The Consent Authority should decide on how the controls should be implemented, such as through Planning Instruments, Development Consents or Policy documents.

The control measure should be worded in such a way that requires the APZ to be maintained in accordance with the APZ principles, but which also restricts anything being done or placed within the APZ that compromises the effectiveness of the APZ.

The Consent Authority needs to decide on whether the control measures are to be punitive, i.e., penalties are able to be imposed for a breach of the APZ principles. If the measures are not punitive, one must question the validity or importance of the "guidance level" statement.

The control measure is probably most easily dealt with via specific conditions on Development Consents at subdivision stage and construction stage, such as:

> At the issue of subdivision certificate/occupation certificate and in perpetuity, the allotments shall be maintained as an inner protection area as outlined within Appendix 5 of "*Planning for Bushfire Protection 2006*" and the NSW Rural Fire Service's document "*Standards for asset protection zones*".

4.2 Planning Principles for Rezoning to Residential Land in Bushfire Prone Areas

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

The provision of perimeter roads and access to and from the subject land has been addressed at section 4.1.4 above, and section 4.3.3 below. Moreover, the entire site is bounded by a proposed motorway corridor along its western interface. Should the proposed motorway be constructed the *required* APZ will be significantly enhanced.

4.2.2 Provision, at the urban bushland interface, for the establishment of adequate asset protection zones for future housing

With the provision of perimeter roads for most of the interface areas, and elongated lot sizes where no perimeter road is proposed, the bushfire fuel reduced areas (APZ) will be sufficient to provide resilient dwellings within the proposed lots. This is further addressed at sections 4.3.1 and 4.3.7 below.

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

This will be addressed at section 4.3.1 and 4.3.7 below.

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

Refer to section 4.1.7 above.

4.2.5 Introduction of controls which avoid placing inappropriate developments in hazardous areas

Refer to sections 4.1.2 and 4.1.8 above.

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

Refer to section 4.1.8 above.

4.3 Residential Subdivision Provisions of *PBP-2006*

4.3.1 Asset Protection Zones / Separation Distances

Table 3 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 1

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(1) Radiant heat levels at any point on a proposed building will not exceed 29kW/m².	**(1.1)** An APZ is provided in accordance with the relevant tables/ figures in Appendix 2 of ***PBP-2006***.	Complies
	(1.2) The APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply (see section 3.3)	Complies
(2) APZs are managed and maintained to prevent the spread of a fire towards the building.	**(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
(3) APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated.	**(3.1)** The APZ is located on lands with a slope less than 18°.	Complies

In relation to *Acceptable Solution 1.1*, below is Table A2.4 of ***PBP-2006*** which provides the *required* separation distance/APZ for subdivision developments.

Table A2.4 Minimum Specifications for Asset Protection Zones (m) for Residential and Rural Residential Subdivision Purposes (for Class 1 and 2 buildings) in FDI 100 Fire Areas (≤29kW/m²)

	Effective Slopes				
Vegetation Formation	**Upslope/Flat**	**>0°-5°**	**>5°-10°**	**>10°-15°**	**>15°-18°**
Rainforests	10	10	15	20	25
Forests	20	25	35	50	60
Woodland (Grassy)	10	15	20	25	30
Plantations (Pine)	20	25	30	45	50
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	25	35	45

Figure 7: extract from PBP-2006 (Table A2.5)

The minimum APZ / separation distances *required* by ***PBP-2006*** can easily be accommodated within the development site. The following plan indicates that the required minimum APZs as per ***PBP-2006*** Appendix 2 are able to be accommodated within the subject property.

The western interface area requires the provision of a 25m APZ (forest on a 0° – 5° downslope), and this is achieved by the provision of a perimeter road and standard building line setback. In relation to the small interface area with forest on a 5° – 10° downslope (refer to '5' on Figure 4), the required APZ of 35m may be achieved by the creation of the APZ over the land identified as "Public Recreation" on Figure 2 (proposed rezoning map).

A plan identifying the required APZ determined by Appendix 2 of ***PBP-2006*** is provided below.

*Figure 8: plan showing APZs complying with **PBP-2006** Appendix 2*

4.3.2 Water Supplies

Table 4 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**
Reticulated water supplies **(4)** Water supplies are easily accessible and located at regular intervals.	**(4.1)** Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	Able to comply
	(4.2) 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.	Able to comply
	(4.3) Hydrants are not located within any road carriageway.	Able to comply
	(4.4) All above ground water and gas service pipes external to the building are metal, including and up to any taps.	Not applicable
	(4.5) The provisions of parking on public roads are met.	Able to comply

All of the above *Acceptable Solutions* are to be accommodated into the design and construction of the proposed subdivision. *Acceptable Solution* 4.4 can only be satisfied at construction stage for future dwellings and is therefore irrelevant for the subdivision.

In relation to *Acceptable Solution 4.2*, the pressure and flow rates stipulated in AS 2419.1-2005 are able to be provided for the proposed lots within the subject land that will remain as bushfire-prone land once the subject site is developed. Once completed, the proposed subdivision will have created lots that will no longer be bushfire-prone (more than 100m from the remaining bushfire hazard vegetation), and therefore the provisions of ***PBP-2006*** should not apply to those lots.

4.3.3 Capacity of Public Roads

Table 5 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 3

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(5) Firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources).	**(5.1)** Public roads are two-wheel drive, all weather roads.	Complies
(6) Public road widths and design that allow safe access for firefighters while residents are evacuating an area.	**(6.1)** 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
	(6.2) The perimeter road is linked to the internal road system at an interval of no greater than 500m in urban areas.	Complies
	(6.3) Traffic management devices are constructed to facilitate access by emergency services vehicles.	Complies
	(6.4) Public roads have a cross fall not exceeding 3°.	Complies
	(6.5) 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
	(6.6) 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
	(6.7) The minimum distance between inner and outer curves is 6m.	Complies
	(6.8) 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
	(6.9) There is a minimum vertical clearance to a height of 4m above the road at all times.	Complies
(7) The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles.	**(7.1)** 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

(8) Roads that are clearly sign- posted (with easily distinguishable names) and buildings/properties that are clearly numbered.	**(8.1)** Public roads greater than 6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression. **(8.2)** 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 Complies
(9) There is clear access to reticulated water supply.	**(9.1)** 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. **(9.2)** 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 Not applicable
(10) Parking does not obstruct the minimum paved width.	**(10.1)** 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. **(10.2)** Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.	Not applicable Complies

In relation to *Acceptable Solution* 6.1, not all of the proposed new public roads are perimeter roads. Therefore the non-perimeter roads will not need to meet the 8m wide requirement. However, the road widths will be provided as per Table 4.1 of ***PBP-2006*** (below).

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Figure 9: Road widths for Category 1 Tanker (Medium Rigid Vehicle)

The land in the northern portion of the site occupies a relatively small portion of the overall land. A perimeter road is not proposed in some of these portions of the site. The proposed lots along the western interface of this area back onto the proposed motorway corridor. These lots are longer than the other lots in an attempt to accommodate the required APZ.

As a proposal to address the lack of a perimeter road at this location, a fire trail could be provided along the rear of the 11 lots at the interface. The fire trail would be located within the proposed motorway corridor. If/when the motorway is constructed, the fire trail would be 'extinguished' as it would no longer serve a useful purpose. This proposal would mean that the proposed lots at this interface would not be encumbered by a fire trail. The fire trail would serve its purpose while the hazard existed (partly) within the motorway corridor.

The areas of interface that are not provided with a perimeter road (at this stage) have been identified on Figure 5 above.

4.3.4 Access and Egress

PBP-2006 provides the following concession in relation to property access roads.

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

As the entire subdivision will be provided with reticulated water supply, and speed limits will presumably be restricted to 50 km/h, this concession will apply to this development proposal, therefore no specific property access road provisions are applicable.

4.3.5 Fire Trails

Table 6 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 4

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
(11) The width and design of the fire trails enables safe and ready access for firefighting vehicles	**(11.1)** 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.	Complies
	(11.2) The trail is a maximum grade of 15° if sealed and not more than 10° if unsealed.	Complies
	(11.3) A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.	Complies
	(11.4) The cross-fall of the trail is not more than 10°.	Complies
	(11.5) 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.*	Complies
(12) 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.	**(12.1)** The fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land.	Complies

	(12.2) Appropriate drainage and erosion controls are provided.	Complies
	(12.3) 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.	Does not comply
	(12.4) Fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge).	Complies
	(12.5) Gates for fire trails are provided and locked with a key/lock system authorized by the local RFS.	Complies
(13) Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	**(13.1)** Fire trail design does not adversely impact on natural hydrological flows.	Complies
	(13.2) Fire trail design acts as an effective barrier to the spread of weeds and nutrients.	Complies
	(13.3) Fire trail construction does not expose acid-sulphate soils.	Complies

As previously mentioned, 14 of the proposed new lots in the northern portion of the site are not provided with a perimeter road along the western interface of the site. As a suitable alternative to the provision of a perimeter road, these lots are provided with extra depth to provide the required 25m APZ (refer to section 4.3.1 and 4.3.7). In addition, and if required, a fire trail could be provided along the rear boundaries of these 14 lots. The fire trail would be located within the motorway corridor, and should the motorway be constructed the fire trail would be 'extinguished' and replaced with the more substantial motorway as the separation from the hazard. The land remaining within the rear yards of these lots would be a sufficient defendable space.

4.3.6 Bushfire Maintenance Plans

To ensure that bushfire hazard vegetation does not remain on the subject site, at the issue of subdivision certificate and in perpetuity, the entire site shall be managed as an asset protection zone as outlined within section 4.1.3 and Appendix 5 of 'Planning for Bush Fire Protection 2006' and the NSW Rural Fire Service's document 'Standards for asset protection zones' until each Lot is further developed.

Vegetation management over the vacant bushfire-prone allotments should be carried out, by the property owner, in accordance with the principles for Outer Protection Areas (OPA) 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.

Once occupied, the landscaping of the individual bushfire-prone allotments should be required to comply with the principles for Inner Protection Areas (IPA) 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). This should be conditioned at DA stage for the future dwellings that are located on bushfire-prone land.

4.3.7 Building Construction Standards

The procedure adopted for determining the construction standards applicable followed the site assessment methodology of Addendum Appendix 3 of ***PBP-2006***. The methodology is outlined below.

A3.5 Site assessment methodology for determining level of bushfire attack

Step 1: Determine vegetation formation types and sub-formations around the building (see Appendix 2), as follows:
(i) Identify all the vegetation types within 140 metres of the site using Keith (2004);
(ii) Classify the vegetation formations as set out in Table A2.1 in Appendix 2; and
(iii) Convert Keith to Specht classifications using Table A3.5.1 below.
AS3959-2009 as referenced in the BCA-2010 uses AUSLIG (1990) vegetation classifications while PBP uses Keith.

Step 2: Determine the distance between each vegetation formation identified (from the edge of the foliage cover) and the building.

Step 3: Determine the effective slope of the ground for each vegetation group (see Appendix 2) using the classes provided below. Slopes are classified as follows:
(i) Upslopes are considered to be 0°.
(ii) Greater than 0° but not greater than 5° downslope.
(iii) Greater than 5° but not greater than 10° downslope.
(iv) Greater than 10° but not greater than 15° downslope.
(v) Greater than 15° but not greater than 20° downslope.

Step 4: Determine the relevant FDI for the council **area** in which the development is to take place from Table A2.3 in Appendix 2.

Step 5: Match the relevant FDI, appropriate vegetation, distance and effective slope classes to determine the bushfire attack levels using the relevant tables of AS3959-2009 as indicated below:
- FDI 100 -Table 2.4.2
- FDI 80 - Table 2.4.3
- FDI 50 - Table 2.4.4

Steps 1, 2, and 3

Figure 9 below is the conversion table used for dealing with the anomalies caused by the different vegetation classes in Appendix 2 and Appendix 3 of ***PBP-2006***.

David Keith's *Ocean Shores to Desert Dunes*	AUSLIG (1990) Pictorial Analysis (AS3959-2009)
Forests (Wet & Dry Sclerophyll)	*Forest*
Pine Plantations	
Forested Wetlands	
~~Woodlands (Grassy, Semi-Arid)~~	~~*Woodland*~~
Tall Heath (Scrub)	*Scrub*
Freshwater Wetlands	
Short Heath (Open Scrub)	*Shrubland*
Arid Shrubland	*Mallee/Mulga*
Alpine Complex (Sedgelands)	*Tussock Moorland*
Rainforest	*Rainforest*
Grassland	*Grassland*

Figure 10: Conversion of vegetation classification from David Keith's Ocean Shores to Desert Dunes (used in PBP-2006) to the AUSLIG Pictorial Analysis (used in AS3959-2009).

Below is an extract from Table 2.4.2 of *AS 3959-2009 Construction of buildings in bushfire-prone areas* which identifies the Bushfire Attack Level (BAL) of construction in correlation with the separation distance from the identified bushfire hazard vegetation.

Vegetation classification	Bushfire Attack Levels (BALs)				
	BAL—FZ	BAL—40	BAL—29	BAL—19	BAL—12.5
	Distance (m) of the site from the predominant vegetation class				
	All upslopes and flat land (0 degrees)				
A. Forest	<19	19–<25	25–<35	35–<48	48–<100
B. Woodland	<12	12–<16	16–<24	24–<33	33–<100
C. Shrubland	<7	7–<9	9–<13	13–<19	19–<100
D. Scrub	<10	10–<13	13–<19	19–<27	27–<100
E. Mallee/Mulga	<6	6–<8	8–<12	12–<17	17–<100
F. Rainforest	<8	8–<11	11–<16	16–<23	23–<100
G. Grassland	<6	6–<9	9–<13	13–<19	19–50
	Downslope >0 to 5 degrees				
A. Forest	<24	24–<32	32–<43	43–<57	57–<100
B. Woodland	<15	15–<21	21–<29	29–<41	41–<100
C. Shrubland	<7	7–<10	10–<15	15–<22	22–<100
D. Scrub	<11	11–<15	15–<22	22–<31	31–<100
E. Mallee/Mulga	<7	7–<9	9–<13	13–<20	20–<100
F. Rainforest	<10	10–<14	14–<20	20–<29	29–<100
G. Grassland	<7	7–<10	10–<15	15–<22	22–<50
	Downslope >5 to 10 degrees				
A. Forest	<31	31–<39	39–<53	53–<69	69–<100
B. Woodland	<20	20–<26	26–<37	37–<50	50–<100
C. Shrubland	<8	8–<11	11–<17	17–<25	25–<100
D. Scrub	<12	12–<17	17–<24	24–<35	35–<100
E. Mallee/Mulga	<7	7–<10	10–<15	15–<23	23–<100
F. Rainforest	<13	13–<18	18–<26	26–<36	36–<100
G. Grassland	<8	8–<11	11–<17	17–<25	25–<50

Figure 11: extract of Table 2.4.2 of AS3959

Below is a summary of the vegetation identified to be impacting on the site and the effective slope of that vegetation. It should be noted that although 'grasslands' does not appear as a bushfire hazard vegetation class under Appendix 2 of ***PBP-2006***, it has been identified as an indicative bushfire hazard vegetation class for the purpose of *AS 3959-2009 Construction of buildings in bushfire-prone areas*.

Legend from Figure 4	Vegetation Classification	Effective Slope	BAL-29 setback	BAL-19 setback	BAL-12.5 setback
1	Managed land	N/A	N/A	N/A	N/A
2	Managed land	N/A	N/A	N/A	N/A
3	Managed land	N/A	N/A	N/A	N/A
4	Forest	>0° - 5° downslope	32m – <43m	43m – <57m	57m – <100m
5	Forest	>5° - 10° downslope	39m – <53m	53m – <69m	69m – <100m
6	Forest	>0° - 5° downslope	32m – <43m	43m – <57m	57m – <100m

7	Managed land	N/A	N/A	N/A	N/A
8	Forest	>0° - 5° downslope	32m – <43m	43m – <57m	57m – <100m
9	Managed land	N/A	N/A	N/A	N/A
10	Grassland	>0° - 5° downslope	10m – <15m	15m – <22m	22m – <50m
11	Grassland	>5° - 10° downslope	11m – <17m	17m – <25m	25m – <50m
12	Forest	>0° - 5° downslope	32m – <43m	43m – <57m	57m – <100m

The distances and BAL standards are further summarised in the following plan which identifies the BAL thresholds across the subject site. Land that is within the site but outside the identified BAL thresholds is land that will no longer be bushfire-prone land once the bushfire hazard vegetation within the site has been removed.

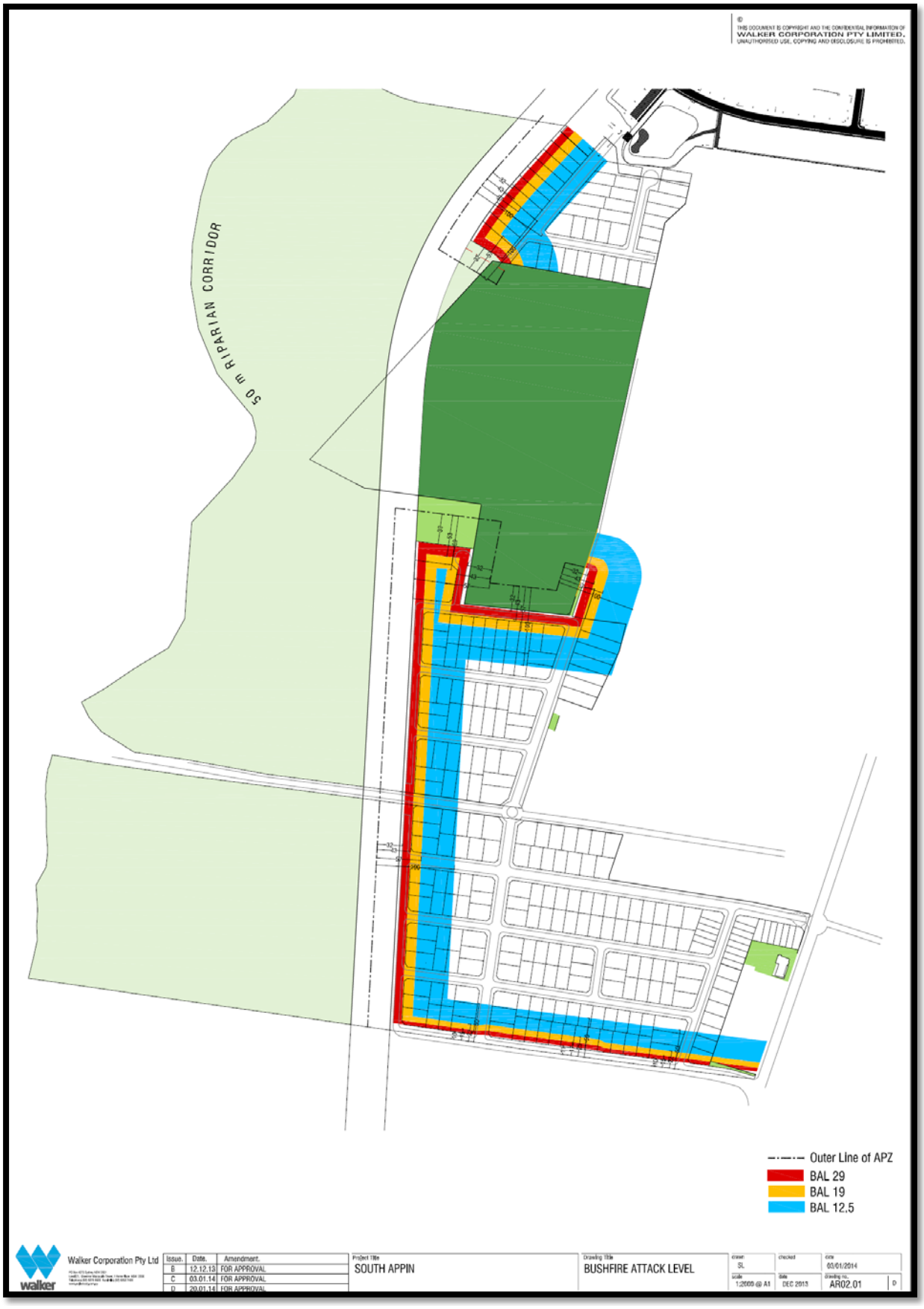

Figure 12: plan showing BAL thresholds – AS3959-2009

4.3.8 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 5

PBP-2006 **Performance Criteria**	***PBP-2006*** **Acceptable Solution**	**Complies / Does Not Comply**
Electricity Services **(14)** Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings **(15)** Regular inspection of lines is undertaken to ensure they are not fouled by branches.	**(14.1)** Where practicable, electrical transmission lines are underground. **(15.1)** 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
Gas services **(16)** Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	**(16.1)** Reticulated or bottled gas is installed and maintained in accordance with AS1596 and the requirements of relevant authorities. Metal piping is to be used. **(16.2)** 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. **(16.3)** 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. **(16.4)** Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.	Able to comply Able to comply Able to comply Able to comply

In relation to electricity supplies, the proposed subdivision will be provided with an underground reticulated electricity supply.

In relation to LPG supplies, the relevant *Acceptable Solutions* should be required as DA consent conditions for the future dwellings that are to be constructed on land that remains identified as bushfire-prone land.

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

5.0 SUMMARY / CONCLUSION / RECOMMENDATIONS

Holiday Coast Bushfire Solutions Pty Ltd has been engaged by the Client to provide a Bushfire Assessment Report to support a rezoning application. The development proposed on the rezoned land will be an urban subdivision, consistent with the adjoining land use to the east of the site.

The proposal has been measured against the specific requirements outlined in s.117(2) (Ministerial Directions) of the EP&A Act 1979, as well as the bushfire protection measures required for residential subdivisions by ***PBP-2006***. The assessment criteria listed in these 2 documents have formed the headings for subsections 4.1 and 4.2 of this Report. In addition, the proposal has been assessed against the residential subdivision requirements of ***PBP-2006***. Therefore, this Report has been prepared to provide sufficient information for:

- The rezoning of the land by addressing the matters set out by Section 117(2) (Ministerial Directions) of the *Environmental Planning and Assessment Act 1979*; and
- The issuing of a Bushfire Safety Authority for the future subdivision of the subject land as set out in Cl.44 of the Rural Fires Regulation 2008.

The subject land is located to the west of an existing, established urban area, and will essentially become a western extension of the suburb of Appin. Parts of the subject land are partly cleared and/or occupied, while other parts are presently occupied by native vegetation.

A motorway corridor (Appin Bypass Road) is planned to be routed through the subject properties, from north-to-south, as indicated in Figure 2 above. If and when completed, this motorway corridor will provide a significant separation of the urban areas to the east from the bushfire hazard remaining to the west.

The land to the north of the subject site is land also recently developed by the Client, and consists of an urban subdivision located between the proposed motorway corridor to the west and Appin Road to the east. The land to the south of the subject site is essentially a grassland area with scattered and clustered trees.

I recommend the proposal be approved subject to the various recommendation made throughout this Report

5.1 Limitation

6.1.1 This Report and the subsequent recommendations reflect the reasonable and practical efforts of the author. It is important to note that the author (and State and Local Government authorities) cannot guarantee that bushfire ignition and subsequent bushfire damage will not occur.

6.1.2 Current legislation is 'silent' in relation to the maintenance of bushfire protection measures for dwellings. Maintenance is a major factor in the effectiveness of any BPM provided/installed. The extent to which the BPMs are implemented and maintained will affect the probability of achieving adequate bushfire safety margins.

6.1.3 Given the natural phenomenon of bushfires, and limitations in technology and research, a system to guarantee the survival of life and property cannot be made. This is reflected in the following statements of limitations:

> *The goal of 'absolute' or '100%' safety is not attainable and there will always be a finite risk of injury, death or property damage. (*IFEG-2005*)*

*No development in a bushfire prone area can be guaranteed to be entirely safe from bushfires. (**PBP-2001**)*

Notwithstanding the precautions adopted, it should always be remembered that bushfires burn under a wide range of conditions and an element of risk, no matter how small, always remains. (**PBP-2001**)

Steve Ellis
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Graduate Diploma in Design For Bushfire Prone Areas

7.0 REFERENCES

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8.0 APPENDICES

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