



Leppington Precinct Planning Study

Bushfire Assessment

Prepared for
NSW Department of Planning

11 June 2014



DOCUMENT TRACKING

Item	Detail
Project Name	Leppington Precinct Planning Study – Bushfire Assessment
Project Number	12GOSBUS-0015
Prepared by	Daniel Copland
Approved by	David Peterson
Status	FINAL
Version Number	5
Last saved on	11 June 2014

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Department of Planning.

Disclaimer

This document may only be used for the purpose for which it was commissioned and in accordance with the contract between Eco Logical Australia Pty Ltd and Department of Planning. The scope of services was defined in consultation with Department of Planning, by time and budgetary constraints imposed by the client, and the availability of reports and other data on the subject area. Changes to available information, legislation and schedules are made on an ongoing basis and readers should obtain up to date information.

Eco Logical Australia Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report and its supporting material by any third party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.

Contents

1	Introduction	2
1.1	Aims and Structure of Report	2
1.2	Study Area	2
1.3	Proposed Land Uses	3
1.4	Legislative Requirements	5
1.4.1	Environmental Planning and Assessment Act 1979	5
1.4.2	Threatened Species Conservation Act 1995	5
1.4.3	Rural Fires Act, 1997	5
1.4.4	Planning For Bush Fire Protection 2006	5
1.4.5	Streamlined Residential Development within Bush Fire Prone Urban Release Areas	6
2	Bushfire Hazard Assessment	6
2.1	Assessment overview	6
2.2	Vegetation	6
2.3	Slope	7
2.4	Conclusions	7
3	Planning for Bush Fire Protection Assessment	11
3.1	Assessment Framework	11
3.1.1	Residential	11
3.1.2	Special Fire Protection Purpose (SFPP)	11
3.1.3	Industrial, Commercial, Other Development	12
3.2	Bushfire Protection Measures	13
3.2.1	Asset Protection Zones (APZs)	13
3.2.2	Emergency Access/Egress	15
3.2.2.1	Public roads	15
3.2.2.2	Property Access	16
3.2.3	Supply of Services	16
3.2.4	Construction Standards	17
4	Management Requirements	18
4.1.1	APZ Creation/Maintenance	18
4.1.2	Vegetation Management	18
4.1.3	Building Maintenance	18
4.2	Protected Vegetation	19
4.2.1	Fire Frequency	19

4.2.2	Fire Seasonality	20
4.2.3	Fire Intensity	20
5	Emergency Response	21
6	ILP Constraints Analysis	23
6.1	Study aims	23
6.2	Bushfire Hazard Assessment	23
6.3	Planning Controls	23
6.3.1	Asset Protection Zones (APZs)	24
6.3.2	Emergency Access / Egress	24
6.3.3	Services	24
6.3.4	Construction Standards	24
6.3.5	Special Fire Protection Purpose (SFPP)	24
6.4	Implications for Precinct Planning	25
6.5	Development Staging	25
7	Conclusions	27
8	References	28
	Appendix 1 – PBP 2006 Public Road Specifications	29
	Appendix 2 – PBP 2006 Property Access Specifications	31

List of Figures

Figure 1: Location and local context of the Leppington Precinct	4
Figure 2: Slope and Vegetation Formations.....	8
Figure 3: Vegetation Communities and Quality.....	9
Figure 4: Bushfire Hazard Assessment and Asset Protection Zones	10
Figure 5: Emergency Response.....	22
Figure 6: ILP Bushfire Constraints Plan	26

List of Tables

Table 1: PBP 2006 APZ Requirements for Residential Development*	14
Table 2: Internal Road Specifications	15
Table 3: Static Water Requirements	16
Table 4: AS3959 Bushfire Attack Level (BAL) Construction Requirements for Residential Development adjacent to Forest and Forested Wetland Vegetation.....	17
Table 5: AS3959 Bushfire Attack Level (BAL) Construction Requirements for Residential Development adjacent to Woodland Vegetation	17
Table 6: Recommended Interfire Periods	20
Table 7: Local Fire Stations.....	21

Executive Summary

This report considers the bushfire hazard affecting the Leppington Precinct of the South West Growth Centre. The report is intended to provide technical guidance on the development of the Indicative Layout Plan (ILP) and Precinct Plan for the Leppington Precinct, and identifies limitations to development and rezoning opportunities, integrated bushfire and environmental management actions, as well as the location and adequacy of emergency response facilities.

The bushfire hazard across the site is generally considered to be low, reflecting the relatively flat topography across the majority of the site and low fuel accumulation levels associated with the grassland and remnant woodland vegetation that is prevalent throughout. This report demonstrates that development at the subject site can meet the requirements of *Planning for Bush Fire Protection* (PBP) (NSW RFS 2006b) given the incorporation of a number of strategies designed to minimise the risk from bushfire.

A number of strategies have been provided in the form of planning controls such that the risk from bushfire can be minimised and further that the approvals process can be streamlined. The main strategies suggested include:

- Ensure adequate setback from bushfire prone vegetation (APZs)
- Integrate non-combustible infrastructure within APZs such as roads, easements and parking areas. The majority of APZs should be contained within perimeter roads and front yard setbacks
- Ensure adequate access and egress from the site through a well-designed road system
- Consider the adequacy of water supplies and the delivery of other services (gas and electricity)
- Provide temporary APZs during any staged development
- Consider SFPP and other development types
- Provide for effective and ongoing management of APZs; and
- Consider construction standards (AS3959) implications for future developments.

Asset Protections Zones (APZs) are a key component of bushfire planning and the issue which often has the greatest impact on development yields. Based on the bushfire hazard analysis, residential and Special Fire Protection Purposes (SFPP) APZs have been recommended according to the specifications contained within PBP 2006.

The ILP and Precinct Plan have been prepared based on the advice and constraints contained within this report.

1 Introduction

1.1 Aims and Structure of Report

The overarching objective of this report is to identify potential bushfire constraints to future development of the Leppington Precinct (hereafter referred to as the subject land) to inform the subject land planning process and for inclusion in the future rezoning. The results of this assessment will directly support the preparation of necessary planning documentation.

The objectives of the report are to:

- Ensure statutory requirements for bushfire protection are identified and can be met; and
- Achieve innovative management frameworks across bushfire and vegetation issues which enable long term conservation and management of these issues while facilitating development outcomes for the site.

The report assesses the potential bushfire hazard across the subject land in the context of existing remnant vegetation and the possible enhancement of vegetated areas. It then identifies planning requirements as per *Planning for Bush Fire Protection* (PBP) (NSW RFS 2006b).

Management of Asset Protection Zones (APZs) and environmental areas are considered. The location of emergency response facilities is mapped and the potential for future emergency response resources is discussed. Potential planning controls that integrate with PBP are also presented as are requirements for staged development.

1.2 Study Area

The subject land is in Leppington Precinct in Western Sydney, within the central eastern portion of the South West Growth Centre (Figure 1). The subject land is bounded by Camden Valley Way to the south east, Ingleburn Road to the north east, Cordeaux Street to the northwest, and various residential and rural residential land holdings, farming lands, market gardens and minor roads to the south west – including Anthony Road, Joseph Road, George Road and Hulls Road. The Precinct is approximately 655 hectares in size.

Similarly to the neighbouring precincts of Austral, Leppington North and East Leppington, this particular precinct has been identified as an area suitable for housing and employment purposes. Initial planning for the Precinct is underway and involves the preparation of numerous planning documents, including an Indicative Layout Plan (ILP), Precinct Plan and amendments to the Growth Centres SEPP to facilitate the formal rezoning of the site.

Kemps Creek flows south to north through the western portion of the subject land. This is fed by several side tributaries flowing southeast to northwest across the subject land. There is an additional tributary of Kemps Creek situated within the eastern portion of the subject lands, known as Scalabrini Creek, that also flows from south to north. The study area is largely comprised of private land owners with small allotments owned by Camden Council, Roads and Maritime Services and other government bodies.

1.3 Proposed Land Uses

The South West Structure Plan (Source: www.gcc.nsw.gov.au October 2009) has identified the Precincts in this area as suitable for housing and industry, with the proposal for the development of the Leppington Major Centre with connections to the South West Rail Link. Beyond the proposed Major Centre, it is assumed that most of the subject land will be given a residential zoning. Key exceptions will be the riparian corridors for Kemps Creek and Scalabrini Creek, transmission easements, schools, general open space and the drainage network.

The following is a list of the anticipated potential land uses for the site shown, based on the current proposed uses in the ILP:

- Retail/Commercial Area
- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- School
- Parks
- Sporting Fields
- Drainage & Infrastructure
- Riparian Corridor
- Roads
- Transmission Easements
- Future Major Roads.



Figure 1: Location and local context of the Leppington Precinct

1.4 Legislative Requirements

1.4.1 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals. Various legislation and instruments, such as the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Rural Fires Act 1997 (RF Act) are integrated with the EP&A Act.

1.4.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act 1974) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

In relation to bushfire, the TSC Act also identifies high frequency fire regimes as a key threatening process.

1.4.3 Rural Fires Act, 1997

Bushfire issues are regulated by the *Rural Fires Act, 1997* (RF Act). Both the EP&A Act and the RF Act were modified by the Rural Fires and Environmental Assessment Legislation Amendment Act, in 2002 to enhance bushfire protection through the development assessment process (NSW RFS 2006b). Key requirements of the RF Act include:

- The need for a bushfire safety authority to be issued by the RFS under section 100B of the RF Act for any development applications for subdivision (therefore considered integrated development); and
- All landowners to exercise a duty of care to prevent bushfire from spreading on or from their land under section 63 of the RF Act. This relates to the appropriate provision and maintenance of APZs, landscaping and any retained vegetation when developing land (NSW RFS 2006b).

1.4.4 Planning For Bush Fire Protection 2006

Precinct Planning requires consultation with the NSW RFS. As such Precinct Planning aims to satisfy the requirements of *Planning for Bush Fire Protection* (NSW RFS, 2006) which includes having regard to the planning principles of PBP (NSW RFS 2006b) as follows:

- Provision of a perimeter road with two way access which delineates the extent of the intended development
- Provision, at the urban bushland interface, for the establishment of adequate asset protection zones for future housing
- Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads
- Minimising the perimeter of the area of land, interfacing the hazard, which may be developed
- Introduction of controls which avoid placing inappropriate developments in hazardous areas

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

1.4.5 Streamlined Residential Development within Bush Fire Prone Urban Release Areas

Under planning reforms introduced through changes to Clause 273 of the *Environmental Planning and Assessment Regulations 2000*, exemptions are available with regards to the consideration of bushfire requirements at the Development Application or Complying Development stage for individual dwellings.

The above exemptions apply within bushfire-prone portions of the precinct that have received previous subdivision approval via the issue of a Bush Fire Safety Authority (BFSA) from the NSW Rural Fire Service (RFS). At the time of subdivision approval stage, an endorsement of the subdivision-wide Bushfire Attack Level (BAL) ratings is provided by the RFS. Once compliance with all conditions of the BFSA approval is achieved, all future dwellings are eligible for exemption from the further assessment of bushfire requirements by obtaining a Post-subdivision BAL Certificate (PSBC).

A PSBC can be obtained via applying to the RFS or through a qualified bushfire consultant, such as is available through Eco Logical (FPAA Accredited).

2 Bushfire Hazard Assessment

2.1 Assessment overview

The bushfire hazard affecting the Precinct was assessed during site inspections and using recent aerial photographs for at least a distance of 140 metres from the subject site (in line with PBP 2006). The purpose of this assessment was to identify the potential bushfire threat from both within and outside of the site and to allow for a prediction of required asset protection zones for future development.

The method used for this assessment relies on consideration of vegetation and slope and is outlined below along with results.

2.2 Vegetation

The largest area of vegetation influencing the subject land are the areas of Shale Plains Woodland, Shale Hills Woodland and Alluvial Woodland occurring within and adjacent to the riparian corridors of Kemps Creek and Scalabrini Creek – particularly within the western and eastern portions of the subject site. At this stage it is assumed that within these corridors further riparian planting will be proposed, therefore providing a consistent and high quality linking of the current remnant vegetation within these riparian areas and resulting in vegetation structure classification of Forested Wetlands or Forest.

The vast majority of remaining vegetation within the vicinity of the subject site consists of Grasslands with some isolated pockets of remnant Woodland vegetation. The higher quality Woodland vegetation is generally limited to three separate areas around the subject site, being two on the western boundary adjacent to Cordeaux Street and also adjacent to Joseph Road. A third area occurs within the eastern corner of the site, to the south of Ingleburn Road.

Outside of the subject site boundaries there are two additional areas on the south eastern side of Camden Valley Way – within the East Leppington Precinct - where small areas of Forest hazard are present and should be considered as potential constraints to the subject site due to their proximity. However, it should be noted that both of these areas are separated from the site by Camden Valley Way which provides permanent separation from the site. Furthermore, of these two areas, only the area adjacent to eastern most corner of the site has been classified as “Non-certified” and, as such, all other surrounding hazard areas are likely to be developed as part of the adjoining land release proposals.

2.3 Slope

The slope affecting the subject is generally less than 5 degrees across the entire site. There are a few small pockets where the slope is marginally above 5 degrees, however it is not anticipated that these will remain vegetated and as such have not been included within the assessment of effective slope.

A slope of 0-5 degrees downslope, as per PBP 2006, has been considered the effective slope within all riparian / drainage areas within the precinct.

2.4 Conclusions

In comparing the assessed bushfire hazard for the site with other environments across the state, the site is considered to have a low relative hazard rating. Relative hazard for the site has been assessed based on the slope, vegetation and required APZs according to PBP 2006. Figure 4 provides an indication of the required APZs across the site. Table 1 and Figure 2 and Figure 3 have been used in conjunction to estimate indicative APZ distances for different areas across the site (see section 3.2.1).

The analysis has also considered the relative topographic position that bushfire prone vegetation may have to potential development. The hazard rating assumes that bushland is downslope from development. As fires burn much slower and at a much lower intensity when travelling downhill, where bushland is located upslope from development a ‘very low’ hazard ranking is appropriate.

Consideration has been given to potential future areas of vegetation. It is inevitable that once development begins, there will be regeneration works in areas reserved for vegetation conservation, and mass planting in the proposed riparian corridors.

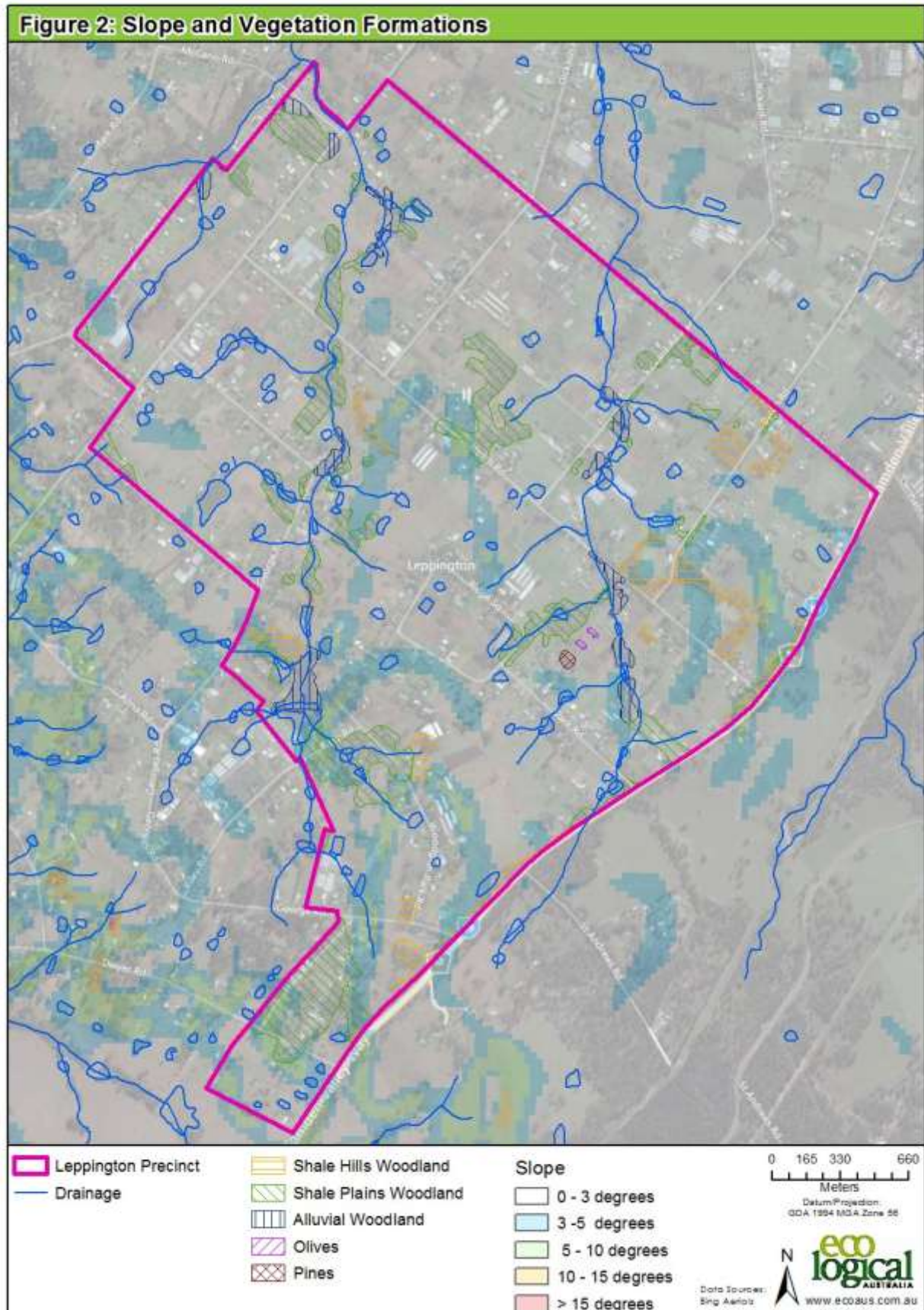


Figure 2: Slope and Vegetation Formations

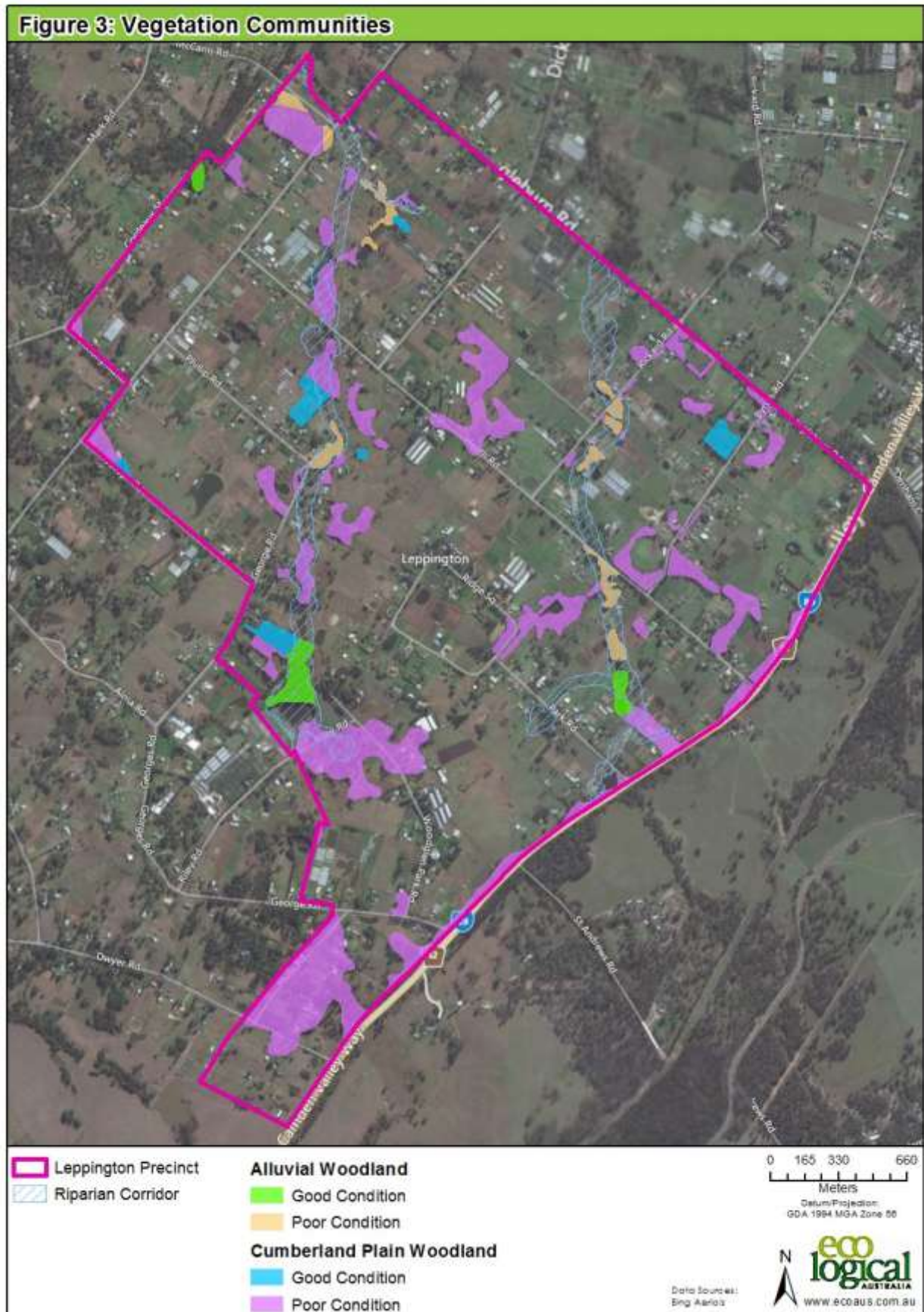


Figure 3: Vegetation Communities and Quality

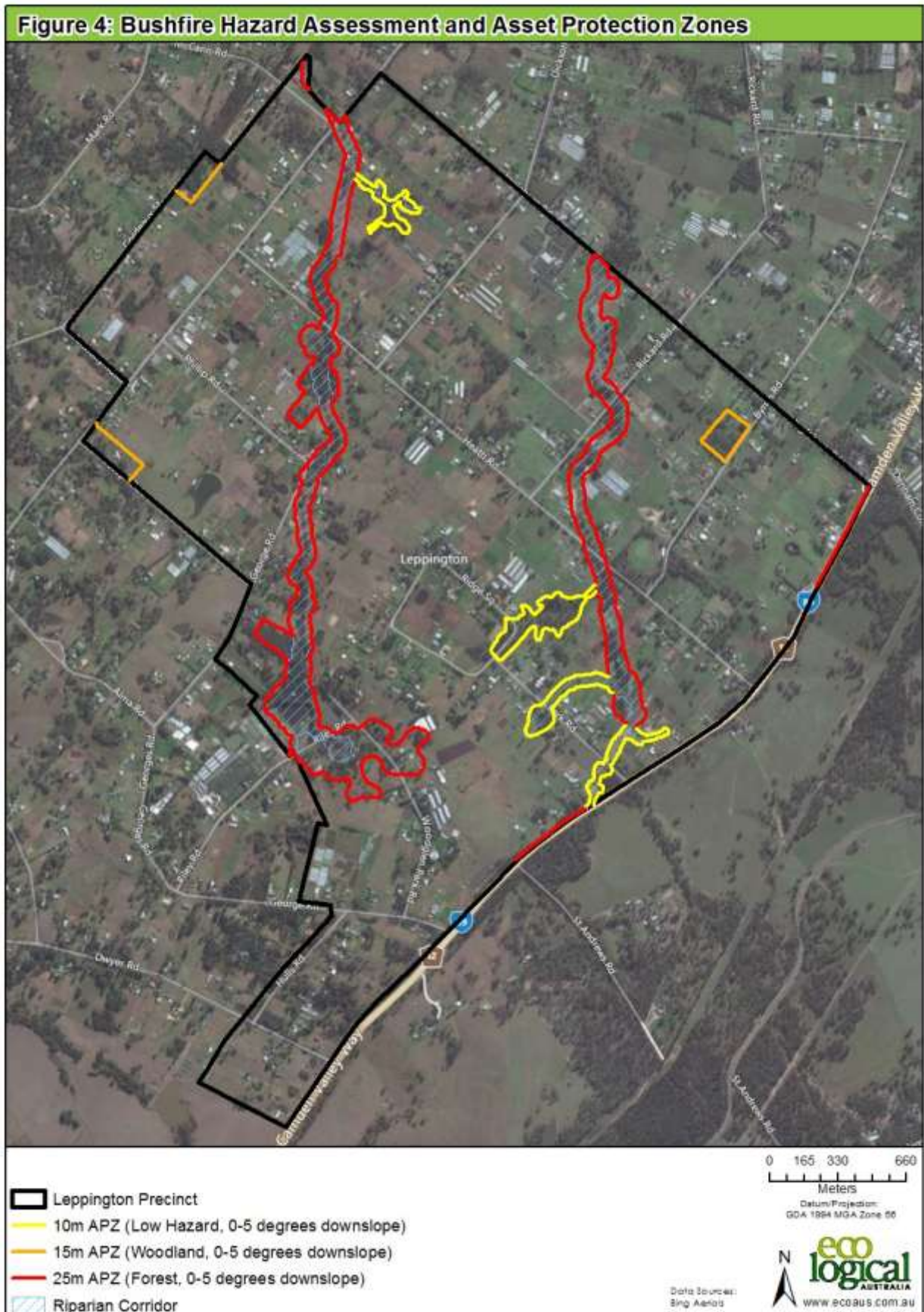


Figure 4: Bushfire Hazard Assessment and Asset Protection Zones

3 Planning for Bush Fire Protection Assessment

3.1 Assessment Framework

The current planning processes for the Leppington Precinct have now produced an Indicative Layout Plan (ILP) and Precinct Plan, which has been an outcome of the initial technical investigations and reporting for the subject site. Based on the current and proposed uses within the ILP, it is possible to detail the intended and suitable land uses for the subject site. The following section outlines how the relevant types of development will be assessed in accordance with *Planning for Bush Fire Protection* 2006 (PBP), based on the proposed ILP and Precinct Plan.

3.1.1 Residential

Residential development will be assessed under section 100B of the RF Act and a Bush Fire Safety Authority (BFSA) must be obtained from the NSW Rural Fire Service (RFS) at subdivision and/or DA stage'. Section 100B of the RF Act specifies conformance with the intent and performance criteria of the Bushfire Protection Measures outlined in PBP. The bushfire protection measures relevant to 100B of the RF Act within PBP 2006 are listed below:

- *The provision of clear separation of buildings and bushfire hazards, in the form of fuel-reduced APZ (and their subsets, inner and outer protection areas and defensible space)*
- *Construction standards and design*
- *Appropriate access standards for residents, fire fighters, emergency service workers and those involved in evacuation*
- *Adequate water supply and pressure*
- *Emergency management arrangements for fire protection and/or evacuation; and*
- *Suitable landscaping, to limit fire spreading to a building.*

3.1.2 Special Fire Protection Purpose (SFPP)

SFPP developments include developments where occupants may be more vulnerable to bushfire attack e.g.:

- *A school*
- *A child care centre*
- *A hospital (including a hospital for the mentally ill or mentally disordered)*
- *A hotel, motel or other tourist accommodation*
- *A building wholly or principally used as a home or other establishment for mentally incapacitated persons*
- *Housing for older people or people with disabilities within the meaning of State Environmental Planning Policy No 5 - Housing for Older People or People with a Disability (now State Environmental Planning Policy (Seniors Living))*
- *A group home within the meaning of State Environmental Planning Policy No 9 - Group Homes*
- *A retirement village*
- *Any other purpose prescribed by the regulations. (Section 100B (6) of the RF Act).*

For these developments the specific objectives of SFPP developments within PBP should be followed in addition to the requirements for residential developments. The specific objectives for SFPP developments are:

- *Provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and firefighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated*
- *Provide for safe emergency evacuation procedures. SFPP Developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bushfire threats. During emergencies, the risk to firefighters and other emergency services personnel can be high through prolonged exposure, where door-to-door warnings are being given and exposure to the bushfire is imminent.*

3.1.3 Industrial, Commercial, Other Development

Commercial, employment and/or industrial uses are classified in PBP 2006 as 'Other Development'. As such these developments need to satisfy the aims and objectives of PBP and the proposal will need to incorporate these considerations along with an adequate combination of relevant bushfire protection measures (BPM). Generally, the BPMs listed in PBP 2006 for residential development can be used as a guide and are discussed in the following sections. The aim and objectives of PBP 2006 are as follows.

- **Aim of PBP**

To use the NSW development assessment system to provide for the protection of human life (including firefighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, on-site amenity and protection of the environment.

- **Objectives of PBP**

(i) Afford occupants of any building adequate protection from exposure to a bush fire

(ii) Provide for a defensible space to be located around buildings

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

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

(v) Provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and

(vi) Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting)

3.2 Bushfire Protection Measures

The bushfire protection measures described in PBP are an effective way to design developments to minimise the risks from bushfire and to ensure that the aims and objectives of PBP are met.

The following key elements are required to be addressed in bushfire assessments;

- Asset Protection Zones (APZs)
- Evacuation and emergency management (including emergency access/egress arrangements)
- Water supplies
- Building construction standard
- Infrastructure (including access road provisions and other services); and
- Landscape management.

3.2.1 Asset Protection Zones (APZs)

APZs are areas located between bushfire hazards and development to provide a defensible space in which to undertake emergency operations and to provide a buffer from direct flame contact, and the impacts of radiant heat, smoke and embers.

The width of APZs is based on a combination of;

- Vegetation structure classification
- Effective slope (influencing fire behaviour)
- Siting or topographic position (i.e. if the asset is above, or below the hazard); and
- Fire Danger Index (FDI) (the FDI for the Precinct is 100).

The appropriate fire (weather) area for the site was assessed, according to Table A2.3 in PBP. An FDI rating of 100 has been applied to the Greater Sydney Region of NSW, including this Precinct. The FDI index is a relative number (1 to 100) providing an evaluation of suppression difficulty or rate of spread for specific combinations of wind speed, fuel and fuel moisture.

Vegetation across the Precinct currently consists predominantly of managed grassland/pasture with patches of bushfire prone vegetation. The bulk of the current bushfire prone vegetation meets the 'Woodland' vegetation formation classification according to Keith (2004). In addition, there are patches of both Woodland and 'Forested Wetland' vegetation found in the riparian corridor areas, with future proposed riparian planting increasing the vegetation quality and density to resemble a 'Forest' vegetation structure.

APZs meeting 'acceptable solution' requirements for residential development have been assessed across the Precinct (Figure 4) based on the widths in Table 1 below. All APZs are required to be located within the Precinct boundary (i.e. within the bounds of any proposed development).

It's important to note that PBP and the APZ dimensions for residential development are currently undergoing review by the RFS (a draft is expected by December 2014). It is understood the APZ requirements in NSW would align with AS 3959-2009 *Construction of buildings in bushfire-prone areas* (Standards Australia 2009) Bushfire Attack Level (BAL)-29. This may represent an increase in APZ dimension by 4 to 7 metres within the Precinct, depending on the combination of vegetation type and slope.

The increase in APZ provides a higher level of bushfire protection and ensures that future home owners are not impacted by the additional costs associated with construction of a dwelling at a higher BAL (e.g. BAL-40 and BAL-FZ).

It is important to note that the APZ calculations quoted in this assessment are indicative only and have been determined at a landscape scale. This level of detail is suitable for the development of an ILP whereby the aim is to demonstrate whether a parcel of land can accommodate the bushfire hazard, the expected APZ and future development. The final APZ dimensions for any future subdivision or development depends on the accuracy of a site-specific level.

The APZ dimensions quoted in this assessment should not be relied on to approve a future subdivision; they may be used as a guide only.

Table 1: PBP 2006 APZ Requirements for Residential Development*

Slope (degrees)	Woodland (Keith 2004)	Forest (Keith 2004)	Forested Wetland (Keith 2004)
Upslope/flat			
All	10m (40m SFPP)	20m (60m SFPP)	15m (50m SFPP)
Downslope			
>0 – 5	15m (50m SFPP)	25m (70m SFPP)	20m (60m SFPP)
>5 – 10	20m (60m SFPP)	35m (85m SFPP)	25m (75m SFPP)
>10 - 15	25m (70m SFPP)	50m (100m SFPP)	35m (90m SFPP)
>15 - 18	30m (75m SFPP)	60m (100m SFPP)	45m (95m SFPP)

* PBP currently under review and residential APZs may align with the distance to achieve BAL-29 under AS 3959-2009 *Construction of buildings in bushfire-prone areas*. This will result in an increase in APZ by approximately 4 to 7 m for hazards in the Precinct depending on the combination of slope and vegetation type.

Under PBP 2006, APZs for Forest vegetation consist of both an Inner Protection Area (IPA) and an Outer Protection Area (OPA), whilst APZs for other vegetation structures comprise only of an IPA. In the instance of residential development, the APZ is generally 50% IPA – situated closest to the asset, and 50% OPA – situated closest to the unmanaged hazard.

If the minimum APZs identified above are implemented, residential buildings immediately adjacent to the APZ will require construction to BAL-40 of AS3959-2009. If lower construction standards are desirable, APZ widths should be increased to those shown in Table 4 and Table 5.

Generally the implementation of required APZs should be wholly contained within the proposed lot or subject land for which they are benefitting or protecting. However, there are certain circumstances where APZs can consist of managed areas outside of a given location – with managed open space areas, managed service easements and established infrastructure, such as roadways, all suitable for consideration as part of a required APZ. In the case of the Precinct, Figure 4 shows that the site is potentially impacted by some Forest vegetation immediately on the south eastern side of Camden Valley Way, within the adjoining Leppington East Precinct. In this instance, the presence of a formal arterial roadway in Camden Valley Way could be considered to provide the necessary APZ or setback distance required for the Leppington Precinct in these locations – effectively meaning that potentially no further APZs would be required for development occurring adjacent to this boundary of the precinct.

3.2.2 Emergency Access/Egress

Emergency access/egress relates to the provision of safe access, egress and defensible spaces for emergency services. It also relates to emergency management arrangements such as procedures and routines for evacuation and consideration of safe havens.

Specific management and evacuation plans may be required at a later stage especially where SFPP developments are proposed. Additionally, emergency management arrangements may need to be discussed with the RFS specifically in regard to the capacity of existing resources to service the Precinct.

For this Precinct the ILP has provided a reasonably simple, well-ordered layout that includes some perimeter roads to both the external areas of the precinct and the internal hazard areas. The proposed road network provides frequent direct access to other portions of the precinct via an internal layout that will provide easy and rapid access/egress arrangements for both residents and emergency services. In addition, due to the relatively isolated nature of the hazard areas within the precinct, the internal road network provides multiple alternate egress routes away from the bushfire hazard into areas that are not considered as bushfire prone.

Specifications for public roads and property access roads are outlined in the following sections.

3.2.2.1 Public roads

Public roads include both the perimeter road and the internal road system. The intent is to provide safe operational access to structures and water supply for emergency services personnel, while residents are seeking to evacuate from an area. Key requirements include size (safe/efficient access/egress) and suitable location of water supply points (such that they are readily accessible during bushfire events).

Internal roads must comply with the widths specified in *AS2890.2-2002* reproduced in Table 2 below.

Table 2: Internal Road Specifications

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

Perimeter road requirements are identified below and full specifications are included in **Appendix 1**;

(i) Location:

The perimeter road is required to lie between (or within) the Asset Protection Zone and the boundary of the allotments. A perimeter road should be the preferred option where possible.

(ii) Purpose:

- Provide fire fighters with easier access to structures, allowing more efficient use of fire fighting resources
- Provide a safe retreat for fire fighters; and

- Provide a clear control line from which to conduct hazard reduction or back burning operations

(iii) Specifications:

- The perimeter road should preferably provide 2 way access (carriageway 8 metres kerb to kerb)

*Comply with the design specifications relating to slope, capacity etc. identified in PBP 2006 (reproduced in **Appendix 1**).*

3.2.2.2 Property Access

PBP 2006 states that property access is access from the public road system onto private land and to the habitable building by fire fighters. The intent is to provide safe access to/from the public road system for fire fighters providing property protection during a bushfire and for occupants faced with evacuation.

Property access road requirements are identified below and full specifications are included in Appendix 2:

- Short access roads are preferable; therefore buildings should be located as close as possible to the public road system
- No access requirements apply to an urban development where the furthest part of the building is no farther than 70 metres (unobstructed) from the public road system
- Any building located more than 200 metres from a public through road must provide one alternative property access road; and
- Access roads should have a minimum width of 4 metres.

3.2.3 Supply of Services

The purpose of this measure is to provide adequate supply of water for the protection of buildings during and after the passage of a bushfire, and to locate gas and electricity services so as not to contribute to the risk of fire to a building.

It is anticipated that the water supply to the site will be provided via a reticulated ring main system. The ring main system must be of sufficient pressure and fire hydrants located to comply with *AS 2419.1-2005 Fire Hydrant Installations (SAI Global, 2005)*.

If the reticulated water supply is unable to attain the required pressure, then a dedicated static water supply reserve must be created and maintained. The quantity of water required is determined on the basis of lot size and density and is shown in Table 3 below.

Table 3: Static Water Requirements

Development Type	Water Requirements
Residential Lots (<1,000m ²)	5,000 l/lot
Rural-residential Lots (1,000m ² - 10,000 m ²)	10,000 l/lot
Large Rural/Lifestyle Lots (>10,000m ²)	20,000 l/lot

Electricity and gas services should be located such that they do not pose a hazard to surrounding bushland and buildings, or provide an obstacle for emergency service personnel. Ideally they would be located underground. Overhead powerlines must undergo regular inspection to ensure that no part of a tree is closer than the distances set out in 'Vegetation safety clearances' issued by energy Australia (NS179, April 2002).

3.2.4 Construction Standards

Construction of new residential dwellings must comply with the Appendix 3 of PBP 2006 and AS3959-2009 *Construction of Building in Bushfire Prone Areas* (SAI Global, 2009). The APZs recommended in **Figure 4** provide the minimum setback required to keep development outside of the flame zone. As such, if lower construction standards are desirable, setback/APZ widths should be increased beyond those shown.

Required setbacks for various construction levels are shown in Table 4 and Table 5 below.

Table 4: AS3959 Bushfire Attack Level (BAL) Construction Requirements for Residential Development adjacent to Forest and Forested Wetland Vegetation

Slope	BAL - FZ	BAL - 40	BAL - 29	BAL - 19	BAL - 12.5
Upslope/flat					
All	<19m	19m - <25m	25m - <35m	35m - <48m	48m - <100m
Downslope					
>0 – 5 degrees	<24m	24m - <32m	32m - <43m	43m - <57m	57m - <100m
>5 – 10 degrees	<31m	31m - <39m	39m - <53m	53m - <69m	69m - <100m
>10 - 15 degrees	<39m	39m - <49m	49m - <64m	64m - <82m	82m - <100m

Table 5: AS3959 Bushfire Attack Level (BAL) Construction Requirements for Residential Development adjacent to Woodland Vegetation

Slope	BAL - FZ	BAL - 40	BAL - 29	BAL - 19	BAL - 12.5
Upslope/flat					
All	<12m	12m - <16m	16m - <24m	24m - <33m	33m - <100m
Downslope					
>0 – 5 degrees	<15m	15m - <21m	21m - <29m	29m - <41m	41m - <100m
>5 – 10 degrees	<20m	20m - <26m	26m - <37m	37m - <50m	50m - <100m
>10 - 15 degrees	<25m	25m - <33m	33m - <45m	45m - <60m	60m - <100m

Exemptions are available with regards to the consideration of bushfire requirements at the Development Application or Complying Development stage for individual dwellings. These exemptions apply within bushfire-prone portions of the precinct that have received subdivision approval from the RFS. At the time of subdivision approval stage, an endorsement of the subdivision-wide Bushfire Attack Level (BAL) ratings is provided by the RFS. Once compliance with all conditions of the BFSA approval is achieved, all future dwellings are eligible for exemption from the further assessment of bushfire requirements by obtaining a Post-subdivision BAL Certificate (PSBC). A PSBC can be obtained via applying to the RFS or through a qualified bushfire consultant, such as is available through Eco Logical (FPAA Accredited).

4 Management Requirements

The best bushfire mitigation measures and design can be undone by poor landscaping and property maintenance. It is recommended that the measures described in Appendix 5 of PBP 2006 be adopted in all lots within 100 metres of bushland. These measures are equally important for residential, SFPP, commercial / industrial and public zoned lots. A summary of these measures is described below:

4.1.1 APZ Creation/Maintenance

The site is currently dominated by pastureland with remnants of Woodland and Forest vegetation. Vegetation within the APZ area and any remnants or landscaping within the development area should be managed by the owner of the land in line with the following:

- Tree canopy separation (by at least 2 metres where possible)
- Discontinuous shrub layer (clumps or islands of shrubs not rows)
- Vertical separation between vegetation strata
- Tree canopies not overhanging structures
- Management and trimming of trees and other vegetation in the vicinity of power lines and tower lines in accordance with the specifications in “*Vegetation Safety Clearances*” issued by Energy Australia (NS179, April 2002)
- Retain low ground covers:
 - Mowing / brush cutting / slashing during the summer month
- Use of non-combustible mulch e.g. stones.

Where landscaping is to include plantings, local provenance stock is recommended. Emphasis should be placed on species that are less flammable, particularly in close proximity to any buildings.

4.1.2 Vegetation Management

Landscaping around buildings should adhere to the following:

- 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, e.g. 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.

4.1.3 Building Maintenance

- 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 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; and
- Woodpiles, chemical storage, sheds and other combustible materials are located downslope and well away from buildings.

4.2 Protected Vegetation

Vegetation occurring within the riparian corridor, and potentially within other portions of the Precinct, will be retained and in some cases revegetated. Vegetation that is retained or regenerated is to be managed for biodiversity protection, and as such APZs are not permitted within these areas. Fire is an important ecological process, and as such must be integrated with long term environmental management. As such, it is recommended that a conservation and bushfire management plan be prepared for these areas prior to any construction.

The main factors contributing to bushfire management relate to;

- Fire frequency
- Fire seasonality; and
- Fire intensity.

It is important to ensure that fire regimes are varied spatially across the site, and temporally at any one point, the objectives being;

- Ensuring a variety of fire interval periods are present across the site
- Ensuring that the season, intensity and frequency of burns are varied at any one area.

This is referred to as mosaic management and is aimed at ensuring a diversity of life cycles are present across the site and that a homogenous fire regime is avoided that may benefit certain species at the expense of others.

4.2.1 Fire Frequency

Fire frequency is usually presented as fire interval periods. The minimum fire interval period is the minimum amount of time between fires that will enable sufficient recruitment and recharge of seed banks. Maximum fire interval period refers to the maximum amount of time between fires before senescence may begin. Table 6 below provides the recommended maximum and minimum fire intervals for the vegetation communities within the study area. Successive fires at the minimum recommended fire interval may have a severe impact on species diversity, therefore, fire regimes erring towards the maximum interval are recommended.

Any areas within the Precinct that will be actively regenerated should be excluded from fire for a minimum of 15 years to allow for the development of a soil seed bank.

Table 6: Recommended Interfire Periods

Keith (2004) Classification	Minimum Fire Interval	Maximum Fire Interval	Source
Grassy Woodland	5 years	40years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management. NSW NP&WS
Shrubby Dry Sclerophyll Forests	7 years	30 years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management. NSW NP&WS
Wet Sclerophyll Forests	25 years	60 years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management. NSW NP&WS

4.2.2 Fire Seasonality

Fire seasonality needs to integrate with the lifecycles of native species, and preferably be counter to the requirements of exotic species. As such ecological burns are recommended between the periods of August and January to coincide with native plant life cycles (DEC 2005). However, due to bushfire danger periods it may not be practical to burn over the summer months, hence the window of opportunity narrows to August – November. Occasional autumn burns may also be implemented.

Burning may also be complemented with slashing of grasses, preferably immediately prior to flowering of exotic annual grasses.

4.2.3 Fire Intensity

Hotter burns are preferable as they may encourage native species over exotic species. However, this will be significantly limited by the amount of fuel available for burning and constraints on burning during the hotter months. More moderate burns are recommended for steeper slopes to reduce the potential for exposure of mineral earth and subsequent erosion.

5 Emergency Response

An assessment of the NSW Rural Fire Service (RFS) and NSW Fire & Rescue brigade stations surrounding the site was completed in order to determine their proximity and emergency response and capability to the subject site (see Table 7 below).

Table 7: Local Fire Stations

Name	Location	Distance*
Leppington (RFS)	Ingleburn Road, Leppington NSW	0.0km
Austral (RFS)	Ninth Avenue, Austral NSW	3.7km
Horningsea Park (Fire & Rescue)	162 Greenway Drive, Horningsea Park NSW	3.8km
Casula (RFS)	1 Maple Road, Casula NSW	8.4km
Ingleburn (Fire & Rescue)	41 Carlisle Street, Ingleburn NSW	11.7km

Notes: *Distance from the station location, via the current road network, to the closest point of the site.

The location of fire stations in relation to the study site is indicated in Figure 5. In the current emergency response situation the Leppington and Austral NSW RFS Brigades in conjunction with Horningsea Park Fire & Rescue are likely to be the first stations to reach the Precinct. Leppington station is located on the northern boundary inside the site and Austral station has direct access to the site via Edmondson Avenue and Rickard Road. Horningsea Park has access to the subject lands via Camden Valley Way.

The proximity of emergency services to the precinct seems adequate, however consultation with the RFS and NSW Fire and Rescue may be required to confirm whether existing stations can adequately service the proposed development site (or otherwise) as well as the need for additional resources at these existing stations.



6 ILP Constraints Analysis

6.1 Study aims

Eco Logical conducted a constraints analysis of bushfire prone lands within the Leppington Precinct, in response to the final ILP and precinct planning. The aims of the study were to:

- ensure statutory requirements for bushfire protection are met;
- achieve innovative management of bushfire and vegetation issues;
- undertake an assessment of potential bushfire hazards within and adjacent to the Precinct;
- determine the best bushfire protection measures in line with the requirements of *Planning for Bush Fire Protection 2006* (PBP 2006) (NSWRFS 2006); and
- provide advice on Asset Protection Zones (APZs) and construction standards in accordance with *Planning for Bush Fire Protection 2006* (PBP 2006) (NSWRFS 2006).

The report assesses bushfire hazards and protection measures for the current and future development of the Precinct. Recommendations have been made regarding APZs, indicative building construction standards, emergency access/egress, water supplies, and other measures to protect development from the potential impact of bushfires.

Bushfire planning requires consideration of the matters raised in PBP 2006. This document aims to provide for the protection of human life and to minimise impacts on property from the threat of bushfire, while having due regard to development potential, on-site amenity and protection of the environment. It also provides planning controls for building in bushfire prone areas as well as guidance on effective bushfire protection measures

6.2 Bushfire Hazard Assessment

Development in bushfire prone areas requires consideration of the overall threat to a site and the way occupants are potentially able to cope in the event of a bushfire. This allows an effective approach to designing appropriate bushfire protection measures for future development.

The bushfire hazards affecting the Precinct were determined through site inspections, desktop assessment and the ILP. The study identified bushfire hazards both inside and adjacent to the Precinct.

6.3 Planning Controls

Based on the recommendations contained within PBP 2006 the following planning principles have guided the development of the final ILP and Precinct Plan. These controls should also be considered in any future rezoning, subdivision or residential development purposes:

- Provision of a perimeter road with two way access which delineates the extent of the intended development
- Provision, at the interface, for the establishment of adequate Asset Protection Zones for future housing
- Specifying minimum residential lot depths to accommodate Asset Protection Zones for lots on perimeter roads
- Minimising the perimeter of the area of land, interfacing the hazard which may be developed

- Introduce controls which avoid placing inappropriate developments in hazardous areas; and
- Introduce controls on the placement of combustibile materials in Asset Protection Zones

6.3.1 Asset Protection Zones (APZs)

APZs are areas located between bushfire hazards and development in order to reduce flame contact and radiant heat impacts. The APZ widths determined by Eco Logical for the Leppington Precinct are in accordance with PBP 2006 standards and are shown in Figure 6.

The proposed APZs are focussed around the drainage / riparian network with the largest widths occurring around Kemps Creek (10 to 25 metres either side of the riparian area) and areas adjoining vegetated areas outside of the Precinct. Ecological has also recommended the use of temporary APZs during any staged development within the Precinct.

6.3.2 Emergency Access / Egress

Emergency access and egress relates to the provision of safe access, egress and defendable spaces for emergency services. It also relates to emergency management arrangements including evacuation procedures and safe areas.

Provision of a simple layout with perimeter roads and frequent direct access to the internal road system will provide sufficient access/egress in the case of an emergency. Public roads should provide safe operational access to structures and water supply. Perimeter roads will be required at APZ bushland interface locations where a significant bushfire hazard exists. However, minor drainage corridors present a lower risk and should not require a perimeter road. Property access roads will also need to provide safe access for emergency services and provide protection to properties and occupants during a bushfire.

6.3.3 Services

Water supply to protect buildings during and after the passage of a bushfire is to be provided via a ring main system complying with *AS 2419.1 – 2005 Fire Hydrant Installations*. Dwellings in rural or environmental zones which do not have access to a hydrant will need to have a dedicated static water supply in the form of a tank. Electricity and gas services should be located so as not to pose a hazard to surrounding bushland and buildings or restrict emergency access.

6.3.4 Construction Standards

Development must comply with *AS3959 – 2009 Construction of Buildings in Bushfire Prone Areas* and adhere to bushfire attack levels (BALs). Indicative BALs have been provided in the report however site specific BALs are to be considered at the development application stage for particular buildings based on the bushfire hazard at that time and the design of the building.

6.3.5 Special Fire Protection Purpose (SFPP)

Precinct Planning will need to provide for the special characteristics and needs of occupants of SFPPs. SFPPs are identified by PBP 2006 as a category of land use that requires more stringent consideration of bushfire protection measures due to the vulnerable nature of the occupants of such establishments. Such land uses include schools, child care centres, tourist facilities, establishments for the mentally impaired, housing for elderly people and group homes.

Several 'Indicative School Locations' have been provided within the Leppington Precinct. The proposed schools are considered SFPP development and have been planned for accordingly through the design of APZs and the indicative road layout.

6.4 Implications for Precinct Planning

Bushfire hazard has been assessed across the Precinct and found to be low for the majority of the Precinct, based on the gentle slopes and low fuel accumulation of the vegetation present. On the basis of the Bushfire Assessment, indicative APZ requirements have been provided, however it is difficult to accurately map given that the extent of vegetation clearance within the Precinct is not yet known.

The ILP has been designed so that the majority of APZs fall within open space areas or over the adjoining road network to reduce the impact on the development potential of the Precinct. The indicative road layout also places considerable weight on evacuation procedures through the implementation of perimeter roads and a well-connected road system that avoids roundabouts and dead end streets, with appropriate links and crossings into neighbouring areas.

The Precinct Plan has been prepared so that it generally complies with the aims and objectives of PBP 2006. The bushfire assessment report concludes that the ILP is capable of supporting adequate APZs, provides efficient and effective access/egress capabilities and has potential to support adequate water supply. A number of existing fire stations are in close proximity to the Precinct and are considered likely to be able to adequately service the area.

Planning for bushfire protection will need to take into account the needs of future development and the reduction in bushfire hazard resulting from the clearing of vegetation as development progresses.

The development of the Precinct will occur progressively over a period of many years. This means that, over this period, bushfire risk will change as vegetation is cleared or reinstated. Consideration of bushfire risk will therefore need to respond to these changing conditions, and consider the particular risks to development sites at the time development is proposed, and with consideration of the current and future development potential of adjoining land. The DCPs should include provisions to address this issue. Formalised bushfire assessments will be required to facilitate the development approvals process once the Precinct is rezoned.

6.5 Development Staging

The staging of any development should be considered from a bushfire perspective such as to minimise the risks to the development during construction. Ideally, lots fronting the bushland interface would be developed first and Asset Protection Zones established upfront.

Where relevant (i.e. adjacent to bushland), temporary APZs should be established around each stage of the development and identified in a section 88b instrument (in accordance with the *Conveyancing Act 1919*), which would then cease once the adjacent stage of the development is undertaken. APZ widths could be identified on a site basis, based on the APZ requirements (Figure 6) which corresponds directly with the APZ categories identified in Table 1.

As the bushfire hazard will change during various stages of development, due to the creation of new vegetation, removal of old vegetation and creation of new lots, 'Bushfire Prone Land' mapping (BPL mapping), the trigger for assessment under the EP&A Act and the RF Act will also change. It is recommended that Council review BPL mapping following development stages.

Figure 6: ILP Bushfire Constraints

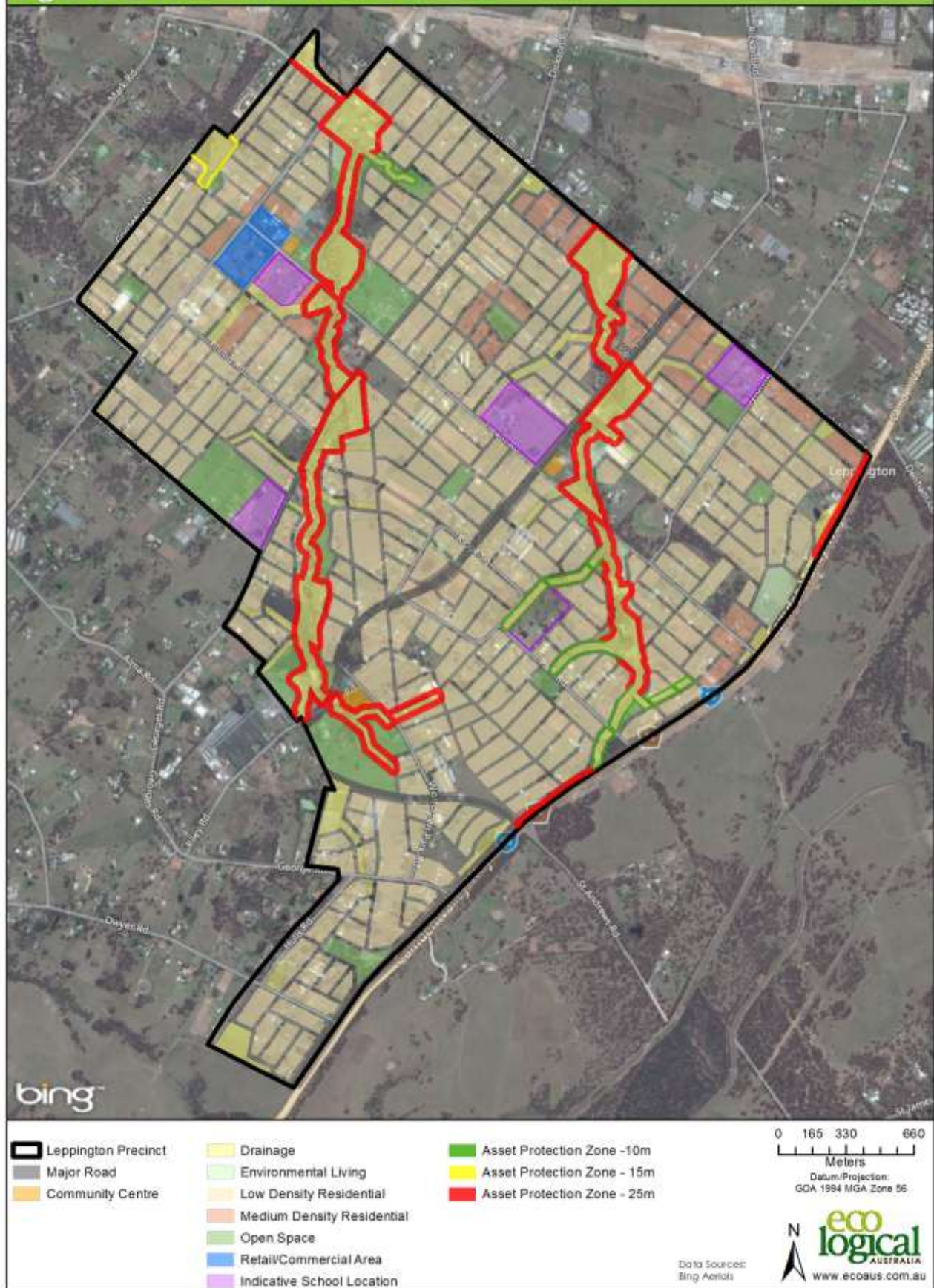


Figure 6: ILP Bushfire Constraints Plan

7 Conclusions

Bushfire hazard has been assessed across the Precinct and found to be low, based on the gentle slopes and low fuel accumulation of the vegetation present. On the basis of this assessment, indicative Asset Protection Zone requirements have been mapped across the Leppington Precinct.

A number of strategies have been provided in the form of planning controls such that the risk from bushfire can be minimised and future rezoning or development approval processes can be streamlined. Further, it has been found that development of the anticipated land uses within the subject site, from a bushfire planning perspective, are considered suitable.

A number of existing fire stations are in close proximity to the Leppington Precinct and are considered likely to be able to adequately service the area.

A number of strategies have been provided in this report such that the risk from bushfire can be mitigated. The main strategies suggested include:

- Ensure adequate setback from bushfire prone vegetation (APZs)
- Integrate non-combustible infrastructure within APZs such as roads, easements and parking areas. The majority of APZs should be contained within perimeter roads and front yard setbacks
- Ensure adequate access and egress from the site through a well-designed road system
- Consider the adequacy of water supply and the delivery of other services (gas and electricity)
- Provide temporary APZs during any staged development
- Consider SFPP and other development types
- Provide for effective and ongoing management of APZs; and
- Consider construction standards (AS3959) implications for future developments.

The ILP and Precinct Plan have been prepared based on the advice and constraints contained within this report. In relation to the furthering of the planning processes as they relate to the future uses of the Precinct, it is considered appropriate that more detailed assessment and consideration of the relevant bushfire protection strategies across the Precinct should be undertaken. This further assessment should include a more comprehensive review of the ILP and subsequent planning controls, to ensure they are well designed in terms of bushfire protection outcomes.

Formalised bushfire assessments will also be required to facilitate the development approvals process if the future rezoning proceeds to land subdivision. For future development of individual dwellings, exemptions for the further consideration of bushfire requirements may apply, in accordance with Clause 273 of the *Environmental Planning and Assessment Regulations 2000*, and as detailed in section 4.1.5 of this report.

8 References

(DEC) Department of Environment and Conservation (NSW) 2005. *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland*. Department of Environment and Conservation (NSW), Sydney.

Energy Australia (2002) "Vegetation Safety Clearances" (NS179).

Keith (2004) *Ocean Shores to Desert Dunes*. Department of Environment and Conservation. Hurstville NSW.

NPWS 2004. *Guidelines for Ecologically Sustainable Fire Management*, NSW Biodiversity Strategy.

NSW RFS, 2006a. *Guideline for Bush Fire Prone Land Mapping*. Version 3. NSW Rural Fire Service.

NSW RFS, 2006b. *Planning for Bush Fire Protection. A guide for Councils, Planners, Fire Authorities and Developers*.

NSW RFS (2006c). *The Bush Fire Environmental Assessment Code for New South Wales*.

SAI Global (1994). AS 2419.1-1994 *Fire Hydrant Installations*.

SAI Global (2009 incorporating Amendment 3, 2012). AS3959-2009 *Construction of Building in Bushfire Prone Areas*.

Appendix 1 – PBP 2006 Public Road Specifications

Performance Criteria	Acceptable solutions
The intent may be achieved where:	
<ul style="list-style-type: none"> • firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources) 	<ul style="list-style-type: none"> • public roads are two-wheel drive, all weather roads.
<ul style="list-style-type: none"> • public road widths and design that allow safe access for firefighters while residents are evacuating an area 	<ul style="list-style-type: none"> • urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle). • the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas. • traffic management devices are constructed to facilitate access by emergency services vehicles. • public roads have a cross fall not exceeding 3 degrees. • all roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard. • curves of roads (other than perimeter roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress. • the minimum distance between inner and outer curves is six metres. • maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient. • there is a minimum vertical clearance to a height of four metres above the road at all times.
<ul style="list-style-type: none"> • the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles. 	<ul style="list-style-type: none"> • 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.
<ul style="list-style-type: none"> • roads that are clearly sign- posted (with easily distinguishable names) and buildings/properties that are clearly numbered. 	<ul style="list-style-type: none"> • public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression.

Performance Criteria	Acceptable solutions
	<ul style="list-style-type: none"> public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.
<ul style="list-style-type: none"> there is clear access to reticulated water supply 	<ul style="list-style-type: none"> public roads up to 6.5 metres wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression. one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.
<ul style="list-style-type: none"> parking does not obstruct the minimum paved width 	<ul style="list-style-type: none"> parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are located within the parking bays. public roads directly interfacing the bushfire hazard vegetation provide roll top kerbing to the hazard side of the road.

Appendix 2 – PBP 2006 Property Access Specifications

Performance Criteria	Acceptable solutions
The intent may be achieved where:	
<ul style="list-style-type: none"> access to properties is provided in recognition of the risk to fire fighters and/ or evacuating occupants. 	<ul style="list-style-type: none"> at least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200 metres from a public through road
<ul style="list-style-type: none"> the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles. all weather access is provided. 	<ul style="list-style-type: none"> bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge).
<ul style="list-style-type: none"> road widths and design enable safe access for vehicles 	<ul style="list-style-type: none"> a minimum carriageway width of four metres for rural-residential areas, rural landholdings or urban areas with a distance of greater than 70 metres from the nearest hydrant point to the most external part of a proposed building (or footprint). <p><i>Note: 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).</i></p> <ul style="list-style-type: none"> in forest, woodland and heath situations, rural property access roads have passing bays every 200 metres that are 20 metres long by two metres wide, making a minimum trafficable width of six metres at the passing bay. a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches. internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12 metre outer radius. curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress. the minimum distance between inner and outer curves is six metres. the crossfall is not more than 10 degrees. maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads. <p><i>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.</i></p> <ul style="list-style-type: none"> access to a development comprising more than three dwellings have formalised access by dedication of a road and not by right of way.

**HEAD OFFICE**

Suite 4, Level 1
2-4 Merton Street
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA

Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

COFFS HARBOUR

35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH

Suite 1 & 2
49 Ord Street
West Perth WA 6005
T 08 9227 1070
F 08 9322 1358

DARWIN

16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601
F 08 8941 1220

SYDNEY

Level 6
299 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9264 0717

NEWCASTLE

Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

ARMIDALE

92 Taylor Street
Armidale NSW 2350
T 02 8081 2681
F 02 6772 1279

WOLLONGONG

Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 4268 4361

BRISBANE

Suite 1, Level 3
471 Adelaide Street
Brisbane QLD 4000
T 07 3503 7191
F 07 3854 0310

ST GEORGES BASIN

8/128 Island Point Road
St Georges Basin NSW 2540
T 02 4443 5555
F 02 4443 6655

NAROOMA

5/20 Canty Street
Narooma NSW 2546
T 02 4476 1151
F 02 4476 1161

MUDGEE

Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1230
F 02 6372 9230

GOSFORD

Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1220
F 02 4322 2897

1300 646 131
www.ecoaus.com.au