

Turner Road Bushfire Study

Final Report

(Project No. 144 – 001)

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Executive Summary

This report considers the bushfire hazard located across the Turner Road precinct and identifies any limitations to development, suggested modifications to the Indicative Layout Plan (ILP), integrated bushfire and environmental management actions and the location of emergency response facilities.

The bushfire hazard across the site is generally considered to be low, reflecting the gently slopes, narrow linear nature of vegetation and low fuel accumulation levels associated with woodland vegetation structures.

Asset Protections Zones (APZ), a key component of bushfire planning and the issue which often has the greatest impact on development yields have been addressed according to the specifications contained within *Planning for Bushfire Protection 2006* (PBP 2006). PBP 2006 has the option to implement 'acceptable solutions' (prescriptions) or 'alternative solutions'. This bushfire study has placed an emphasis on 'acceptable solutions' and where appropriate has identified elements that may contribute to the development of appropriate alternatives.

Generally speaking, an APZ of 15 metres is likely to be required adjacent to bushland across the site, with flat areas only requiring an APZ of 10 metres in width. For a variety of reasons, the provision of a perimeter road is deemed essential, it is anticipated in most situations that APZs can be wholly contained within the perimeter road easement and standard front yard setbacks (6 metres). Therefore, for urban design inputs, it is likely that provision of an adequate perimeter road system will meet setback, access and egress requirements.

Vegetation within neighbourhood parks and Category 3 riparian zones is to be managed as a 'fuel reduced area'. Further setbacks from these areas are not considered to be necessary.

Water supply is to be via a ring main system, engineered to the requirements of *AS 2419.1-1994 Fire Hydrant Installations (SAI Global, 1994)*.

With regards to construction, later stages of site development will need to consider the requirements of Appendix 3 of PBP 2006 and *AS3959-1999 Construction of Building in Bushfire Prone Areas (SAI Global, 1999)*.

Specifications for management of ecological bushfire regimes have also been provided, emphasising the need to implement regimes consistent with the *Bushfire Environmental Assessment Code (RFS 2006a)*.

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1. Introduction

1.1 Background

Eco Logical Australia was contracted by the Growth Centres Commission (GCC) to undertake an assessment of bushfire hazards and planning requirements at the Turner Road precinct in south western Sydney.

This report aims to identify potential bushfire constraints to future development of the site, which falls within the Camden LGA.

The objectives of this report are to;

1. Ensure statutory requirements for bushfire protection are met; and
2. 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 sites.

This report assesses the potential bushfire hazard across the site, in the context of the potential for revegetation of conservation areas in particular (such as the core riparian zones and buffers). It then identifies planning requirements as per *Planning for Bushfire Protection 2006* and critically reviews the application of additional planning measures identified in the *Bushfire Hazard Management Report* (BES, 2003) prepared during the *Managing Sydney's Urban Growth Project*.

Management of Asset Protection Zones and environmental areas are considered before a review of the Indicative Layout Plan (ILP) identifies areas and issues that require further consideration.

The location of emergency response facilities is mapped and the potential for future emergency response resources is discussed. Potential planning controls that integrate with *Planning for Bushfire Protection 2006* are also presented as are requirements for staged development.

1.2 Study Area

The Turner Road Precinct is located immediately north of Turner Road and is bounded on the west by Camden Valley Way and to the East by the Sydney Water Canal. Much of the site is largely cleared and is an active farm. There are a number of smaller landholdings along Turner Road with a primarily rural/residential use.

Remnant vegetation is primarily confined to South Creek, with occasionally paddock trees dispersed throughout the site. Smaller areas of regenerating native vegetation are located throughout the site.

The precinct is gently undulating and slopes generally towards the South Creek which dissects the site from the south-east corner of the site to a point on the western boundary of the site. The smaller landholding along Turner Road slope towards the south and drain to the Narellan Creek catchment.

1.3 Legislative Requirements

1.3.1 *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), are integrated with the EP&A Act.

1.3.2 *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.

1.3.3 *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, 2002.

LEP requirements in relation to bushfire are identified through Direction 19, under Section 117 of the RF Act. This direction effectively points to the need to satisfy the requirements of *Planning for Bushfire Protection* (NSW RFS, 2001).

Of important note for this development is that the Rural Fire Service (RFS) will have a concurrence role in the assessment and approval of later subdivision proposals. This is by way of issuing a 'Bushfire Safety Authority' under section 100B of the RF Act.

The document *Planning for Bushfire Protection* (NSW RFS, 2006) in combination with *AS3959 -1999 Construction in Bushfire Prone Areas* and the *Building Code of Australia* identify the key criteria that need to be addressed in bushfire planning. These are also the key criteria upon which the RFS determine if a Bushfire Safety Authority will be issued.

1.3.4 *State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (SEPP – SRGC)*

This SEPP aims to coordinate the release of lands for development in the North West and South West Growth Centres of Western Sydney. It provides for the release of precincts by the Minister, approval of developments by Local Councils and referral of developments to the Growth Centres Commission (GCC). The SEPP is silent on bushfire planning matters; however it does define what development is permissible within conservation zones, any bushfire issues that require development consent may therefore not be permissible within conservation zones.

2. Hazard Assessment

Currently the bulk of the site is cleared grazing land, with isolated paddock trees and narrow linear stands of remnant vegetation along riparian zones. A number of small regenerating stands of Cumberland Plains Woodland are located throughout the site.

In the future, areas of the site will be subject to revegetation. To assist in considering the potential future hazard across the site, the entire site has been assessed as being woodland, the most likely form of revegetation that would be taking place.

The following slope categories based on a woodland vegetation structure have been used to identify **relative** potential future bushfire hazard across the site;

- 0 = very low
- >0° – 5° = low
- >5° – 10° = moderate
- >10° – 15° = high
- >15° – 18° = very high
- >18° = extreme

In order to address the potential threat from outside of the precinct, the study area boundary was extended for 100m for the purposes of this assessment. The approach taken to hazard assessment is effectively a terrain assessment and assumes a homogenous vegetation structure across the site – in this way it is designed to inform APZ requirements where revegetation is instigated.

When interpreting this analysis, consideration also needs to be given to the relative topographic position of bushland and development. The above categories assume that bushland is downslope from development. As fires burn much slower and at a much lower intensity when travelling down hill, where bushland is located upslope from development a 'very low' hazard ranking is appropriate.

In comparing the broad bushfire hazard across the site with other environments across the state, the entire site is considered to have a low-moderate bushfire hazard rating due to the low fuel accumulation associated with woodland vegetation and gentle topography.

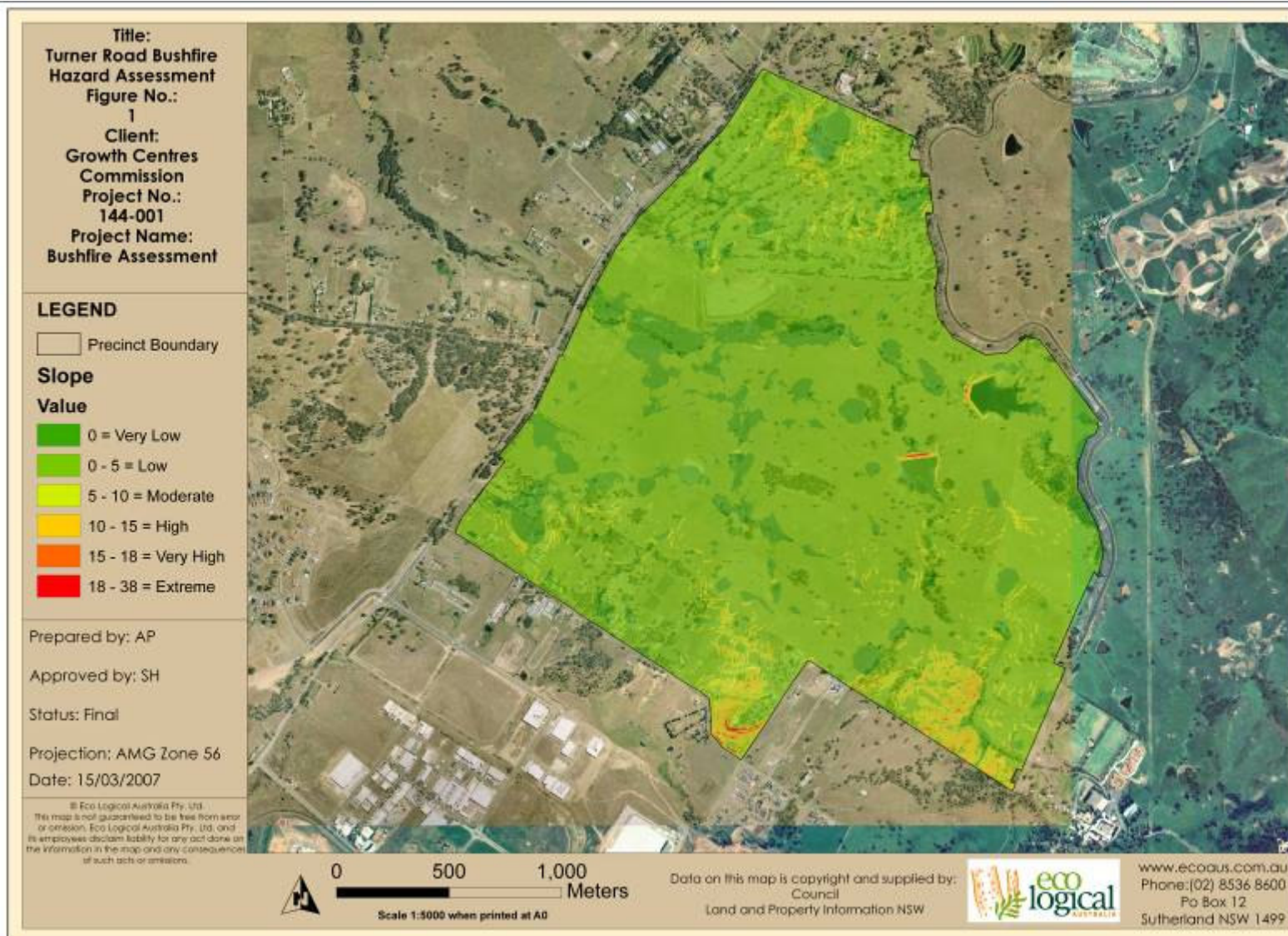


Figure 1. Hazard Assessment (relative terrain based)

3. Review of *Bushfire Hazard Management (BES, 2003) Report*

A component of the project brief includes review of the document *Bushfire Hazard Management (BES, 2003)* (hereon referred to as the BHM Report), which was prepared for the *Managing Sydney's Urban Growth* project. The BHM report incorporates the following key principles;

1. Asset Protection Zones (APZ) and buffering requirements for strategic areas (including juxtaposition of particular types of development with bushland areas);
2. Spatial patterns of remnant bushland and it's relationship to future development and bushfire hazard management (including recommendations for the preferred size, shape, orientation and separation distance of patches of bushland);
3. Management of remnant and planted bushland areas (including discussion on hazard reduction techniques and planning requirements);
4. Access and egress routes;
5. Evacuation considerations;
6. Water supply; and,
7. Preferred method of staging development.

Overall, the BHM report is considered to provide a sound basis for bushfire planning at a regional level and provides a suitable level of detail for application at the precinct planning level. Whilst much of the document overlaps with PBP 2006 it also provides a series of additional planning and design principles that fill 'gaps' in PBP 2006.

In the context of this site, the BHM report does not contribute significantly to bushfire planning beyond the requirements of PBP 2006. Specifically, recommendations relating to vegetation spatial patterns, access/egress routes and evacuation considerations would be important elements of urban design in a precinct where the bushfire threat was considered to be high.

However, across Turner Road, the bushfire threat is generally considered to be low. This is due to the gentle slopes, linear nature of vegetation proposed for retention and low fuel loads associated with the vegetation communities in this area. As such, additional urban design and planning requirements beyond PBP 2006 are not considered to be necessary.

4. Planning for Bushfire Protection (2006) Assessment

Through consultation with the RFS, it was identified that assessment of the site should be undertaken according to the specifications of the Planning for Bushfire Protection 2006 (PBP 2006), which is scheduled for gazettal in early 2007. PBP 2006 differs considerably from PBP 2001 in that there are 'acceptable solutions' and the opportunity to provide 'alternative solutions'.

Acceptable solutions are effectively prescriptions that if followed will meet performance criteria. Where these performance criteria cannot be met or reduction in elements such as APZs or perimeter road widths is desired, there is the opportunity to provide 'alternative solution' that may be acceptable as long as they can clearly demonstrate that performance criteria can still be achieved.

Alternative solutions are highly site and proposal specific and are beyond the scope of this report.

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

1. Asset Protection Zones (APZs)
2. Emergency access/egress
3. Water supply
4. Construction standards
5. Infrastructure

4.1 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, radiant heat, smoke and embers.

The width of APZs is based on a combination of;

- Vegetation structure
- Slope
- Topographic position (i.e. if the asset is above, or below the hazard)

Vegetation across the precinct consists predominantly of grassland/pasture. Bushfire prone vegetation also exists and is concentrated along riparian zones and ridge lines. The bulk of this vegetation meets the 'Woodland' classification. APZs meeting 'acceptable solution' requirements are identified below. Under PBP 2006, APZs only comprise Inner Protection Areas (IPA). If the minimum APZs identified below are implemented, buildings immediately adjacent to the APZ will require construction to Level 3 of AS3959-1999. If lower construction standards are desirable, APZ widths should be increased beyond those shown in table 2 below.

Neighbourhood parks and Category 3 riparian zones are to be managed as 'fuel reduced' areas. Providing perimeter roads are constructed, no additional APZs are considered necessary for these areas.

Potential 'alternative solutions' for APZs may include increasing construction standards of buildings or implementing appropriate fuel management regimes within vegetated areas. Asset Protection Zones should be located within the defined limits of the of the development site and not within the CRZ (GCC Development Code 2006).

Table 1: Planning for Bushfire Protection APZ Requirements

Slope (degrees)	Woodland		Forested Wetlands	
	Residential (metres)	Special Protection (metres)	Residential (metres)	Special Protection (metres)
Upslope/flat	10	40	15	50
Downslope				
>0 – 5	15	50	20	60
>5 – 10	20	60	25	75
>10 – 15	25	70	35	90
>15 – 18	30	75	45	95

4.2 Emergency Access/egress

Broadly speaking, emergency access/egress relates to the provision of a perimeter road or perimeter trail with direct access to the internal road system. Adjacent to bushfire hazards, the internal road system should be kept simple to allow for rapid access/egress in the case of a bushfire emergency and provide a system that radiates away from the bushfire hazard.

Perimeter road/trail requirements are identified below;

(i) Location:

The perimeter road or fire trail often lies between the Outer Protection Area and the boundary of the allotments. It may form part of the Inner Protection Area. A perimeter road should be the preferred option where possible.

(ii) Purpose:

- provide firefighters with easier access to structures, allowing more efficient use of firefighting resources;
- provide a safe retreat for firefighters; 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 of this report)
- If a perimeter fire trail is preferred to a perimeter road, the fire trail should:

- be located within a perimeter reserve a minimum of 6m wide (4m wide trail & 1m wide cleared area each side of the trail), with the reserve maintained in accordance with the specifications for an Inner Protection Area;
- the trail should be constructed in accordance with the design criteria established in Planning for Bushfire Protection.
- the fire trail must be trafficable by firefighting vehicles under all weather conditions;
- the fire trail should link into the street network (if applicable) at regular intervals via an access track constructed in accordance with the design criteria established in Planning for Bushfire Protection.
- the fire trail should be maintained and in a serviceable and accessible condition at all times by the owner of the land.

Should a narrower perimeter road be preferred, this may be possible subject to the provision of parking bays and placement of no stopping signs along narrower stretches, this would be considered an 'alternative solution' by the RFS.

4.3 Water Supply

Water will be supplied to the precinct via a ring main system.

The ring main system must be of sufficient pressure and fire hydrants located to comply with *AS 2419.1-1994 Fire Hydrant Installations (SAI Global, 1994)*.

There may be potential for the use of reticulated recycled water to be used for fire fighting purposes, further consultation with the RFS will be required if reticulated recycled water becomes available within the precinct. The RFS do not currently have a formal policy relating to the use of recycled water for fire fighting activities.

4.4 Construction Standards

Construction of new dwellings must comply with the Appendix 3 of PBP 2006 and *AS3959-1999 Construction of Building in Bushfire Prone Areas (SAI Global, 1999)*.

4.5 Infrastructure

This primarily relates to the provision of electricity and gas to the development. These should be located underground to avoid damage by bushfire.

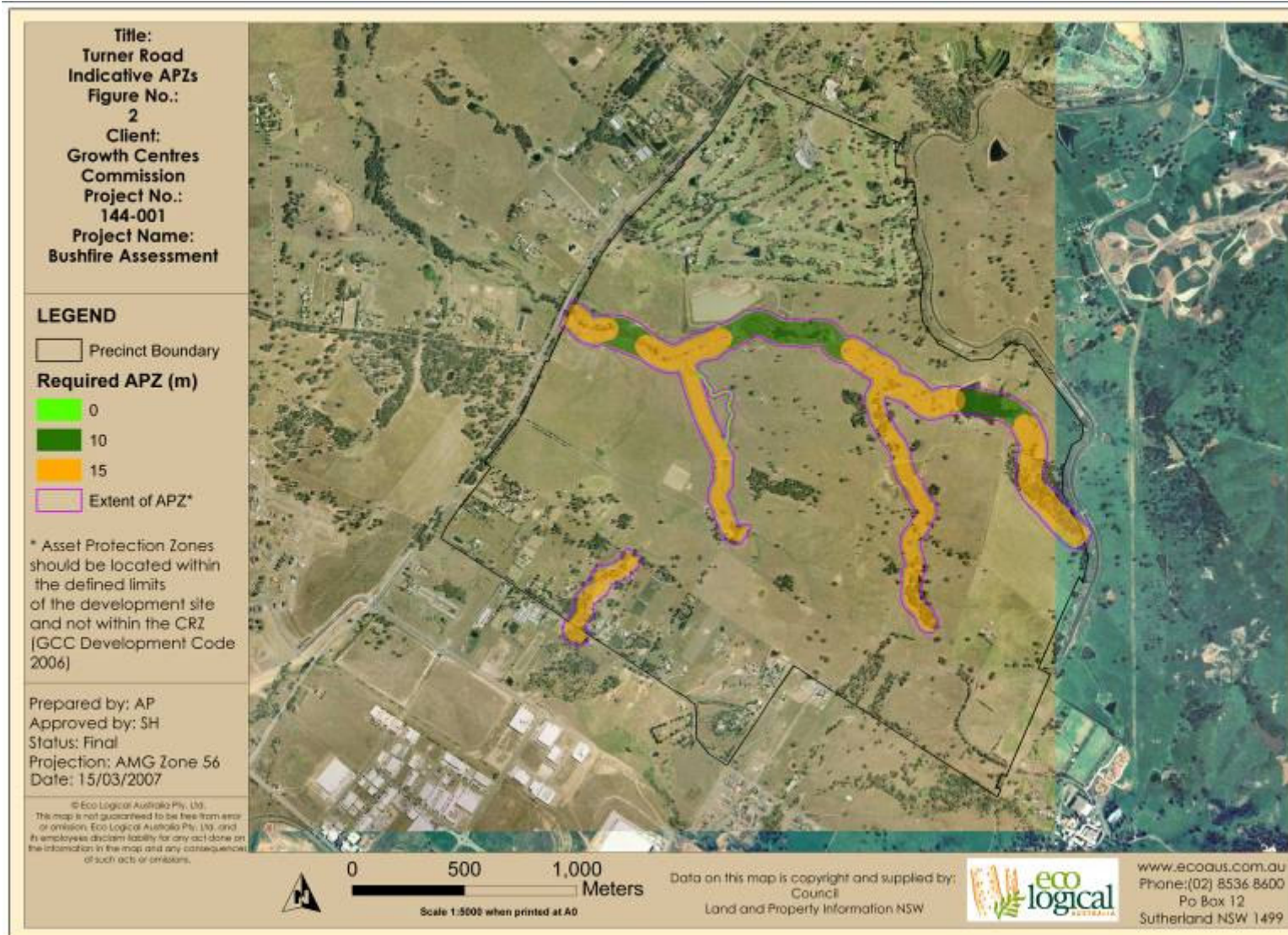


Figure 2. Asset Protection Zones

5. Management

5.1 Asset Protection Zones

APZs are to be located in the following areas and subject to the following management regimes;

Location	Management Regime
Road Reserve	Roadways are to be maintained as paved areas including adjacent footpaths and cycleways. Where they are adjacent to retained vegetation street trees are to have a minimum 2 metre gap between the canopy when fully grown. Shrubs are not to be planted directly under trees, but may be planted in gaps between trees. Groundcover should be either mown grass, woodchip or plant species that do not grow more than 10cm in height or are subject to a management regime that keeps them under 10cm height. Where native tussock grasses are used these should be in clumps.
Allotments	APZs located within allotments are to be identified through a Section 88b instrument. Management is to comprise primarily of mown lawns and landscaped areas. No trees are permitted to overhang dwellings and shrubs must be located a minimum of 2 metres from dwellings. Landscape clumps should not be more than 10m ² in size, a minimum separation distance of 2m should occur between clumps.
Neighbourhood Parks and Category 3 streams (where retained and restored)	<p>Neighbourhood parks and Category 3 streams are to be managed in a manner consistent with an Outer Protection Area (OPA), where they are adjacent to residential areas. Where they are adjacent to schools or other Special Protection Developments they are to be managed as an Inner Protection Area (IPA). It is recognised that many of these areas are located in a manner that provides for retention of remnant trees, management emphasis has therefore been placed upon how the understorey is to be landscaped.</p> <p>Generally, no more than 30% of neighbourhood parks should be subject to landscaping, the remainder of the park is to be grassed and subject to regular mowing. It is recommended that native landscape areas are not placed on the boundary of lots, unless it is where they border a road.</p> <p>Category 3 streams are to include a low cover of native grasses, sedges or mown lawn. Trees are to have a minimum canopy separation and shrubs are to be planted in clumps and are not to be located below trees.</p>

5.2 Protected Vegetation

Protected vegetation, primarily that associated with Category 1 and 2 streams is to be managed for biodiversity protection, APZs are not permitted within these areas. Fire is an important ecological process, and as such must be integrated with long term environmental management.

The main factors contributing to environmental management relate to;

- Fire frequency
- Fire seasonality
- 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;

1. Ensuring a variety of interfire periods are present across the site
2. 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 avoiding a homogenous fire regime that may benefit certain species at the expense of others.

5.2.1 Fire Frequency

Fire frequency is usually presented as interfire periods. The minimum interfire period is the minimum amount of time between fires that will enable sufficient recruitment and recharge of seedbanks. Maximum interfire period refers to the maximum amount of time between fires before senescence may begin.

Short interfire periods encourage species that have short lifecycles (eg annuals and grasses) over species that take longer to reach reproductive stages (trees and many shrubs). Short interfire periods are therefore preferable where a predominantly grassy/herbaceous understorey is desirable.

In Cumberland Plain Woodland the following is generally observed:

- Short interfire periods – results in grassy understorey, often dominated by *Themeda*
- Long interfire periods – often results in dominance by *Bursaria* and little diversity/abundance of ground cover species

A variety of differing opinions are available on interfire periods, the most relevant to this site and their preferred periods are identified in DEC (2005).

Table 2 Interfire Periods

Source	Type	Woodlands
Recovering Bushland on the Cumberland Plain (DEC 2005)	Cumberland Plain	4 -12 years
	Woodland	
Bushfire Environmental Assessment Code (RFS, 2006)	Cumberland Plain	No fire more than once every 7 years
	Woodland	
	Sydney Coastal Riverflat Forest	No fire more than once every 25 years

5.2.2 *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.

5.2.3 *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.

6. ILP Assessment

As identified in Chapter 3 the majority of APZs will be able to be contained within perimeter roads and front yard setbacks. Areas for further consideration and potential additional bushfire protection measures include;

Location	Notes
Schools (all lands)	These require APZs that are more than double the width of those required for residential areas. Larger APZs may be achieved without modifying the ILP through orientating schools so that sports fields are located within the APZ.
Employment lands	PBP 2006 generally applies to residential and special protection developments. However, consideration should be given to installing a perimeter road system where vegetation is located adjacent to employment lands.
Childcare Facilities	These are not show on ILPs. It is recommended that these are not placed near bushfire hazards. Like schools they require large APZs

7. Emergency Response

The following surrounding RFS and NSW Fire Brigades have been mapped;

Type	Location
NSW Brigades	Narellan
NSW Brigades	St Andrews
NSW Brigades	Ingleburn
NSW Brigades	Horningsea Park
NSW Brigades	Liverpool
NSW Brigades	Bonnyrigg Heights
NSW Brigades	Smithfield
RFS	Narellan
RFS	Cobbitty
RFS	Catherine Field
RFS	Bringelly

In the current emergency response situation the Narellan RFS Brigade is likely to be the first RFS Brigade to reach the precinct as it has direct access along Camden Valley Way.

Narellan is the closest NSW Brigades station located approximately 2 km from the southern west corner of the precinct, and approximately 4 km from the far northern boundary of the precinct.

Whilst the precinct is still an RFS district, once the urban form is established, it will need to be serviced by the NSW Brigades. A simple analysis, applying a 4km radius to existing NSW Brigade locations indicates that the precinct is likely to be adequately serviced by the Narellan Brigade.

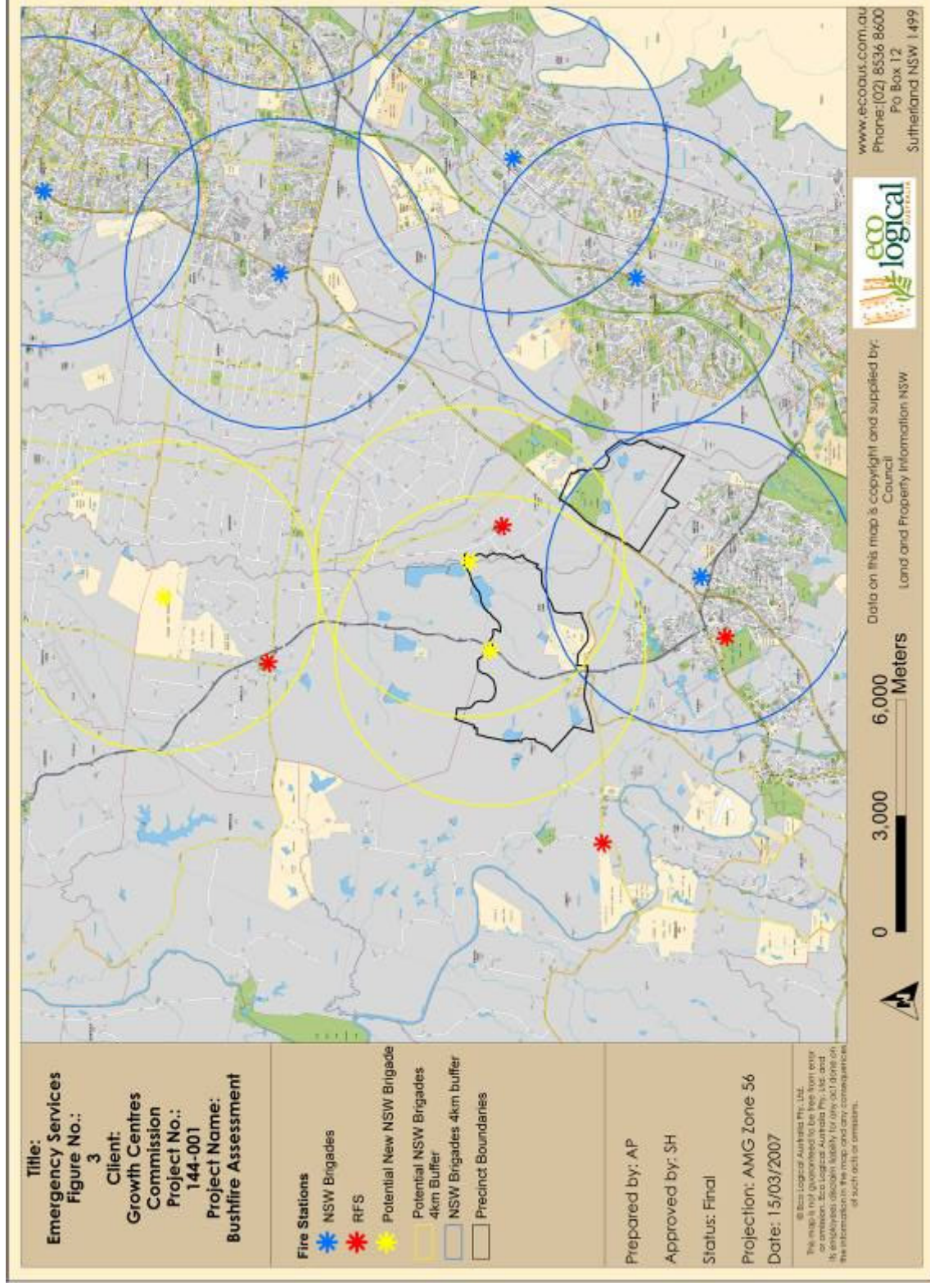


Figure 3. Emergency Resource Locations

8. Planning Controls

Based on the recommendations contained within PBP 2006 the following planning principles are recommended;

1. Provision of a perimeter road with two way access which delineates the extent of the intended development;
2. Provision, at the interface, for the establishment of adequate asset protection zones for future housing
3. Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads
4. Minimising the perimeter of the area of land, interfacing the hazard which may be developed
5. Introduce controls which avoid placing inappropriate developments in hazardous areas
6. Introduce controls on the placement of combustible materials in asset protection zones

PBP 2001 identifies a series of recommended clauses for inclusion in LEPs, these clauses are suitable for consideration at the precinct planning stage;

Objectives

- To prevent loss of life and property due to bushfires, by discouraging the establishment of incompatible uses in bushfire-prone areas
- To encourage sound management of bushfire-prone areas

When these principles apply

These principles will apply when a council is required to prepare an amending SEPP that permits land which is bushfire-prone to be developed. Such land would be identified by the council in accordance with Planning for Bushfire Protection (PBP).

What a council should do if these principles apply

A council should not prepare the amending SEPP unless it is justified by an environmental study. When preparing an environmental study, the council should consider *Planning for Bushfire Protection*.

If an amending SEPP proposes to permit development of land which, has been found to be bushfire-prone, the plan should, as appropriate:

- provide an Asset Protection Zone (APZ) incorporating at a minimum:
 - 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
 - an Outer Protection Area managed for hazard reduction, and located on the bushland side of the perimeter road
- contain provisions for two way access which links to the road or fire trail network
- minimise the perimeter of the area of land, interfacing the hazard, which may be developed
- introduce controls which avoid placing inappropriate developments in hazardous areas

- introduce controls on the placement of combustible materials within the Inner Protection Area

The NSW Rural Fire Service should be consulted in the preparation of the LEP which affects a bushfire-prone area.

Suggested Clause

The following extract from Shoalhaven Council LEP, 1985 demonstrates how bushfire protection provisions can be incorporated into LEPs:

Sub-Clause (1)

In deciding whether to grant consent to any development on land which in its opinion is likely to be affected by bushfire, the Council must take into account whether:

- a) the development is likely to have a significant adverse effect on the implementation of any strategies for bushfire control and fuel management adopted by council;
- b) a significant threat to the lives of residents, visitors or emergency services personnel may be created or increased as a result of the development or the access arrangements to and from the development;
- c) the increased demand for emergency services during bushfire events created by the development would lead to a significant decrease in the ability of the emergency services personnel to effectively control major bushfires; and;
- d) the measures adopted to avoid or mitigate the threat from bushfire, including siting of the development, design of structures and materials used, clearing of vegetation, fuel free and fuel reduced areas and landscaping and fire control aids such as roads and water supplies are inadequate for the locality or would result in unacceptable environmental impacts.

Sub-Clause (2)

In exercising its consideration of sub-clause (1), the council shall have regard to, and as much as possible, be satisfied that the provisions of Planning for Bushfire Protection, as produced by the NSW Rural Fire Service, have been met.

9. Development Staging

Given other urban design and economic constraints it is likely that bushfire will have limited influence on the staging of the development. Ideally, lots fronting the bushland interface would be developed first and APZs established upfront.

Notwithstanding the above, temporary APZs should be established around each stage of the development and identified in a section 88b instrument, 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 hazard assessment map Figure 1 which corresponds directly with the APZ categories identified in Table 1. Where bushland is located upslope from developments, an APZ of 10 metres should be applied.

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 Area' mapping (BPA mapping), the trigger for assessment under the EP&A Act and the RF Act will also change. It is recommended that BPA mapping is reviewed following development stages.

10. 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.

NSW RFS, 2001. *Planning for Bushfire Protection. A guide for Councils, Planners, Fire Authorities, Developers and Home Owners.*

NSW RFS, 2006. *Planning for Bushfire Protection. A guide for Councils, Planners, Fire Authorities, Developers and Home Owners.*

NSW RFS 2006a. Bushfire Environmental Assessment Code.

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

SAI Global (1999). AS3959-1999 Construction of Building in Bushfire Prone Areas

Appendix 1 – PBP 2006 Perimeter Road Specifications

Performance Criteria	Acceptable solutions
<p>The intent may be achieved where:</p>	
<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

	<p>suppression.</p> <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 bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.