



Area 20 Precinct

Bushfire Rezoning Assessment

Prepared for
Department of Planning (DoP)

November 2010



DOCUMENT TRACKING

ITEM	DETAIL
Project Name	Area 20 Precinct Planning – Bushfire Assessment Study
Project Number	144-018
File location	G:\Synergy\Projects\0144\0144-0018 Area 20 Precinct Planning - Bushfire Assessment Study\Reports\Final Reports\Area 20 - Bushfire - Rezoning Final October 2010
Prepared by	AP
Approved by	DP
Status	Final
Version Number	6
Last saved on	12 November 2010

ACKNOWLEDGEMENTS

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

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Executive Summary

This report considers the bushfire hazard affecting the Area 20 Precinct of the North West Growth Centre and identifies limitations to development, 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 flat topology across the majority of the site and low fuel accumulation levels associated with the woodland vegetation that is prevalent. This report demonstrates that development at the subject site can meet the requirements of *Planning for Bushfire 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.

Asset Protection Zones (APZ) 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 size of each zoning parcel is large enough to accommodate the required APZs.

In the majority of cases, APZs can be wholly contained within the perimeter road easement and standard 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.

Water supply will be reticulated, 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 *AS 3959-2009 Construction of Buildings in Bushfire Prone Areas (SAI Global, 2009)*.

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 Area 20 Precinct (hereafter referred to as the Precinct) to inform the Precinct planning process and for inclusion in the rezoning. The results of this assessment will directly support the preparation of necessary planning documentation.

The objectives of the report are to:

1. Ensure statutory requirements for bushfire protection are identified and can be 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 site.

The report assesses the potential bushfire hazard across the site, in the context of existing remnant vegetation. It then identifies planning requirements as per *Planning for Bushfire Protection* (PBP) (NSW RFS 2006b).

Management of Asset Protection Zones (APZ) 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 2006 are also presented as are requirements for staged development.

1.2 STUDY AREA

The Precinct is in Rouse Hill, Western Sydney, within the eastern portion of the North West Growth Centre (Figure 1). The Precinct is bounded by Windsor Road, Schofields Road, and the western ridgeline beyond Second Ponds Creek. The Precinct is around 245 hectares in size.

The Precinct currently consists primarily of low density rural residential properties. Vegetation exists in remnant patches interspersed with highly modified paddocks and backyards with scattered canopy trees.

1.3 PROPOSED LAND USES

The North West Structure Plan (Source: www.gcc.nsw.gov.au 09/01/2009) has identified the Precinct as suitable for higher density housing. As such it is assumed that most of the Precinct will be given a residential zoning. Key exceptions will be the North West Railway Corridor, Rouse Hill Regional Park, Second Ponds Creek corridor, Cudgegong Reserve, schools, general open space and drainage network. The following is a list of the proposed land uses for the site shown on the indicative layout plan (Figure 5):

- Local Centre
- Mixed Use
- Light Industrial
- Very Low Density Residential

- Low Density Residential
- Medium Density Residential
- Medium to High Density Residential
- School
- Parks
- Sporting Fields
- Drainage & Infrastructure
- Riparian Corridor
- North West Railway Corridor
- Commuter Carpark
- Roads
- Neighbourhood Services

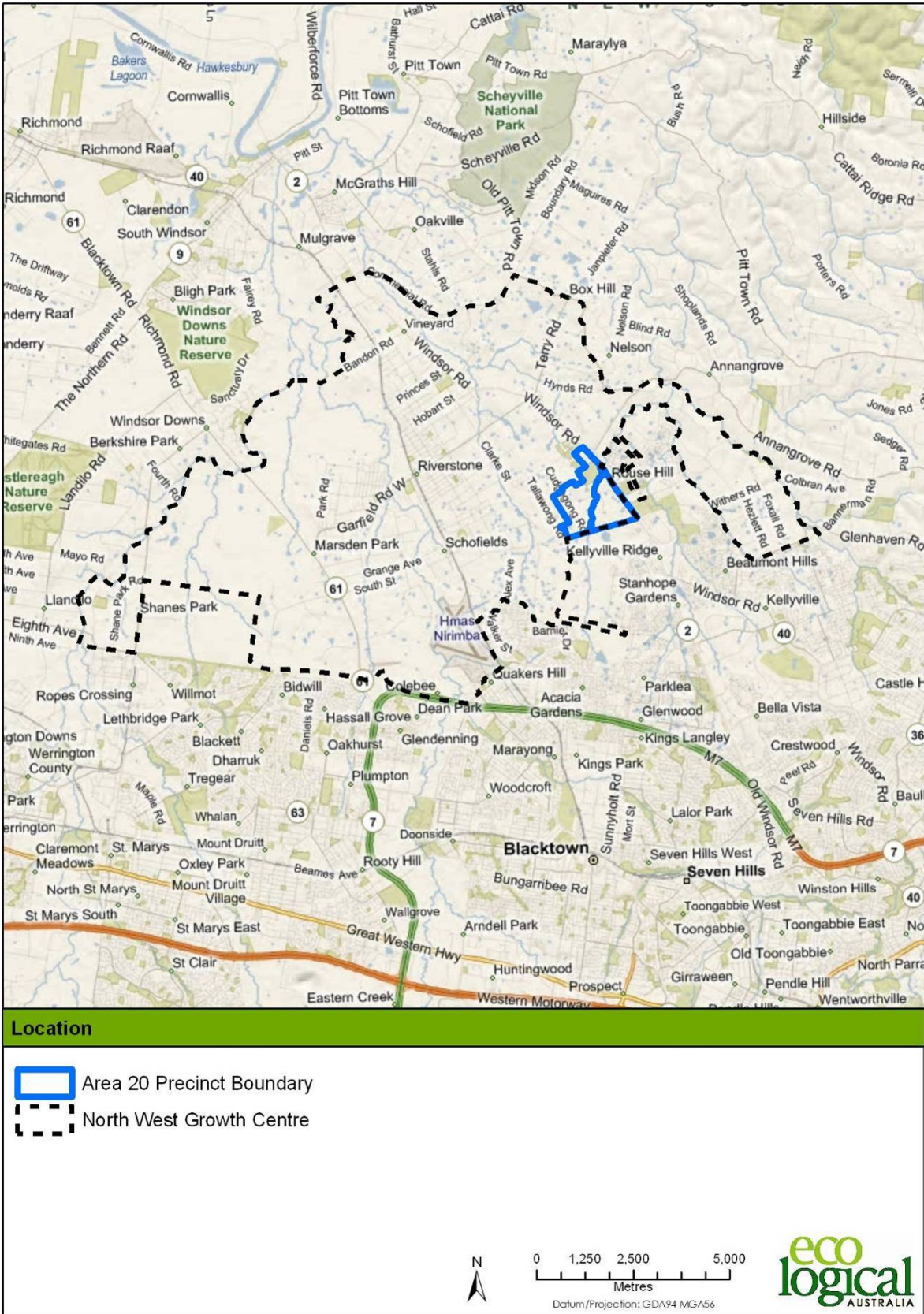


Figure 1: Location of Area 20 Precinct

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 Bushfire Protection 2006

Precinct Planning requires consultation with the NSW RFS. As such Precinct Planning aims to satisfy the requirements of *Planning for Bushfire 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; and
- Introduction of controls on the placement of combustible materials in asset protection zones.

2 Bushfire Hazard Assessment

The bushfire hazard affecting the Precinct was assessed during site inspections and using recent aerial photographs for at least a distance of 140m 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.

Vegetation

Vegetation was assessed according to Keith (2004) (Figure 2). Intact bushfire prone vegetation on the study site currently consists of patches of native vegetation communities that classify to the vegetation formations of Woodland, Forested Wetland and Forest.

The remaining land consists primarily of grazed farmland and rural-residential lots with highly managed understory and little or no midstorey trees or shrubs. As such, these areas were not mapped as being bushfire prone. However, if the current management practices for these areas were to cease or change, these areas would increase in fuel load and need to be considered as bushfire hazards.

Slope

Slope was assessed across the site using 2m contour data supplied by DoP (Figure 2). Slope was generally less than 5 degrees across the entire site.

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 3 shows the relative hazard rating across the site as well as an indication of the required APZs for these areas. Table 1 and Figure 2 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 down hill, where bushland is located upslope from development a 'very low' hazard ranking is appropriate.

In interpreting the hazard assessment map, consideration needs to be given to potential future areas of vegetation. It is assumed that once development begins, some areas will be reserved for vegetation conservation, some cleared, and others regenerated. The hazard assessment is based on the current vegetation situation. As such, if currently cleared areas are identified for regeneration (during development proposals) then bushfire issues will need to be adequately incorporated into planning for regeneration areas if it is perceived that they will be regenerated to a level that would be considered a bushfire hazard.

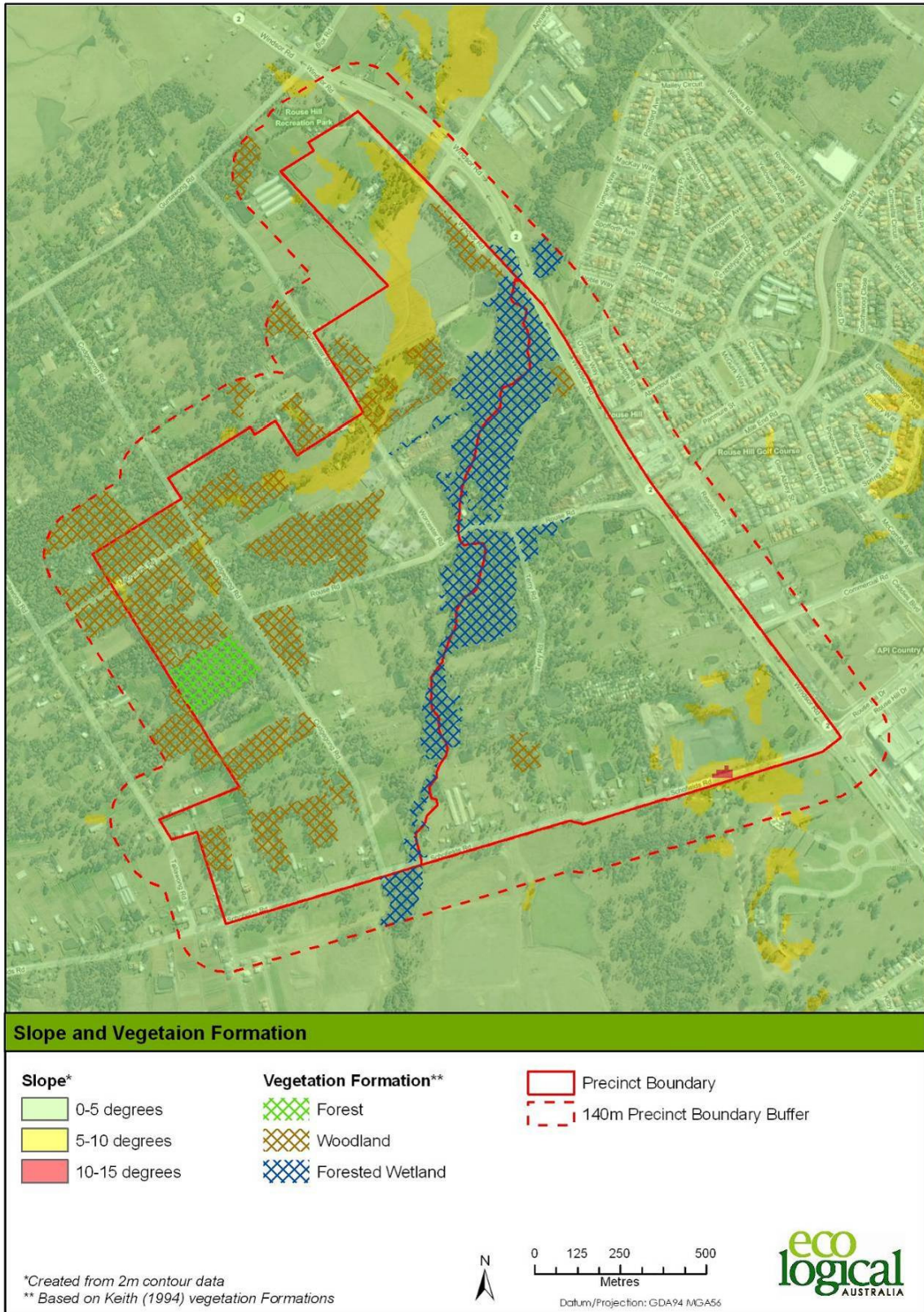
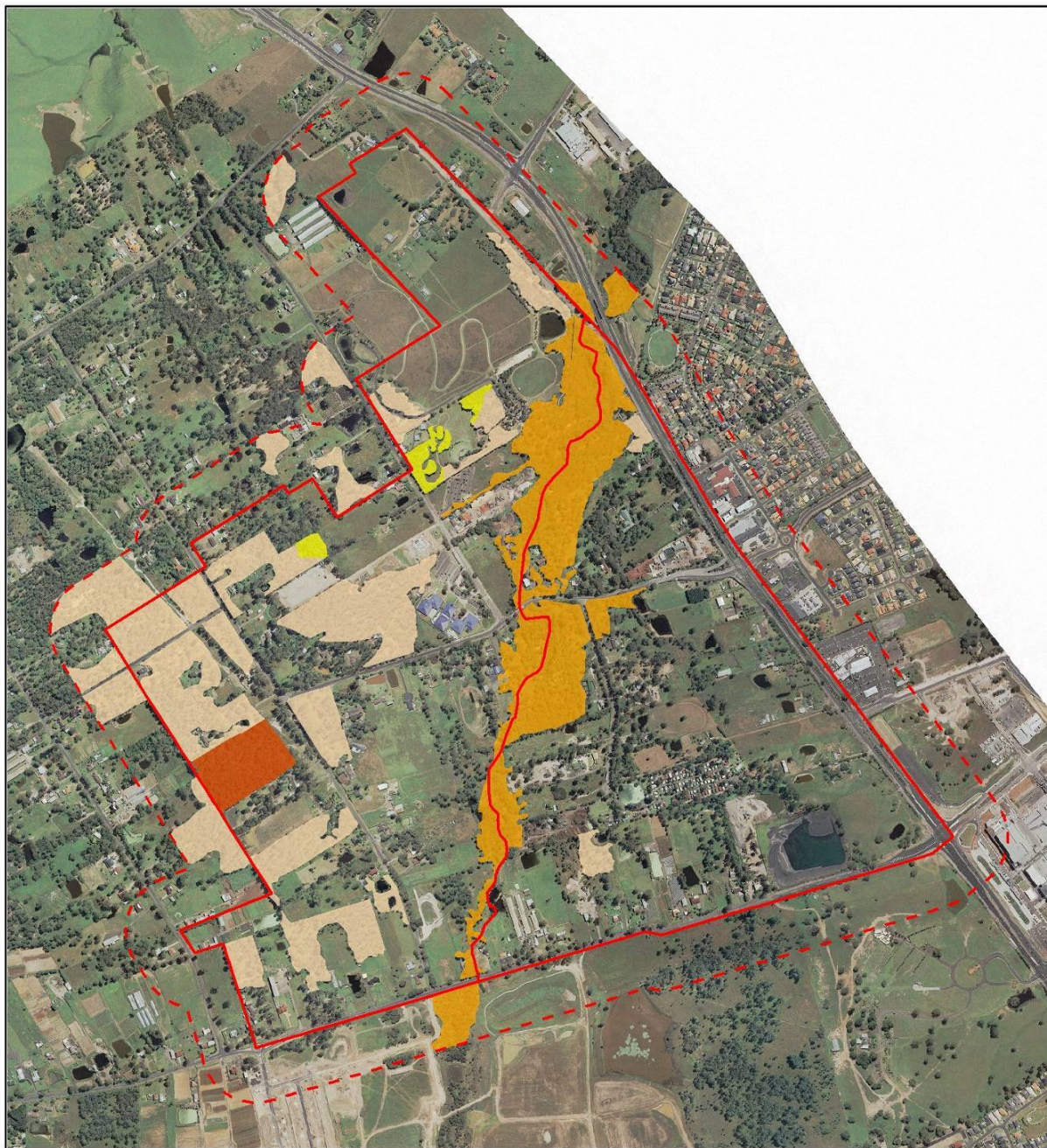




Figure 2: Slope and Vegetation Formations

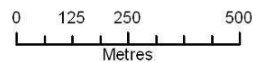


Hazard Assessment and Required APZ Distances

Hazard Rating	Required APZ [^]	
Low:	15m (10m*)	 Precinct Boundary  140m Precinct Boundary Buffer
↓	20m (10m*)	
	20m (15m*)	
	High:	

[^] Required APZ distance according to PBP 2006. Based on existing slope and vegetation formation.

* Distances shown in brackets are the APZ distances if vegetation is upslope of development



Datum/Projection: GDA94 MGA56



Figure 3: Bushfire Hazard Assessment and Asset Protection Zones

3 Planning for Bushfire Protection (2006) Assessment

3.1 ASSESSMENT FRAMEWORK

The following section outlines how the various types of development proposed for the site (through the rezoning) will be assessed if the proposed rezoning is approved.

3.1.1 Residential

Residential development will be assessed under section 100B of the RF Act and a Bush Fire Safety Authority (BFS) 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 defendable 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).*

Within the Precinct there is one existing school 'Rouse Hill Anglican College', one proposed primary school and one existing caravan park. 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

There is some Light Industrial proposed for the south west of the Precinct and a 'neighbourhood services' area proposed for the centre of the Precinct. 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;

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

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, radiant heat, smoke and embers.

The width of APZs is based on a combination of;

- Vegetation formation
- Slope
- Topographic position (i.e. if the asset is above, or below the hazard)
- 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 bushfire prone vegetation meets the ‘Woodland’ vegetation formation classification according to Keith (2004). In addition, there is ‘Forested Wetland’ vegetation following the riparian zone which runs through the centre of the site and a single patch of ‘Forest’ vegetation formation within Cudgegong Reserve.

APZs meeting ‘acceptable solution’ requirements for residential development have been assessed across the Precinct (Figure 5) 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).

Table 1 PBP 2006 APZ Requirements for Residential Development*

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

Under PBP 2006, APZs only comprise Inner Protection Areas (IPA). If the minimum APZs identified below are implemented, residential buildings immediately adjacent to the APZ will require construction

to BAL40 of AS3959-2009. If lower construction standards are desirable, APZ widths should be increased to those shown in tables 4 and 5.

The size of each zoning parcel shown on the indicative Layout Plan (Figure 5) is adequate to accommodate the required APZs. The surface area of each parcel interfacing the hazard has been minimised.

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 provision of a simple layout for a perimeter road with frequent direct access to the internal road system will provide easy and rapid access/egress in the case of an emergency. In addition, the perimeter road should radiate away from the bushfire hazard. Specifications for public roads and property access roads are outlined in the following sections.

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 which lies 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)

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 70m (unobstructed) from the public road system.
- Any building located more than 200m from a public through road must provide one alternative property access road.
- Access roads should have a minimum width of 4 meters.

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.

Water supply to the site will be provided via a 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

<i>Development Type</i>	<i>Water Requirements</i>
<i>Residential Lots (<1,000m²)</i>	5,000 l/lot
<i>Rural-residential Lots (1,000m² - 10,000 m²)</i>	10,000 l/lot
<i>Large Rural/Lifestyle Lots (>10,000m²)</i>	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 5 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 5 below.

Table 4: AS395 Bushfire Attack Level (BAL) Construction Requirements for Residential Development adjacent to Woodland.

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

Table 5: AS395 Bushfire Attack Level (BAL) Construction Requirements for Residential Development adjacent to Forest or Forested Wetland.

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

If the proposed rezoning is approved, then an assessment of construction standards will be required for any development application concerning residential dwellings.

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 100m of bushland. These measures are equally important for residential, 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 Woodland vegetation with patches of Forest vegetation. Vegetation within the APZ area (Figure 5) 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 months;
- 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, eg Scoria, pebbles, recycled crushed bricks.
- planting trees and shrubs such that:
 - the branches will not overhang the roof;
 - the tree canopy is not continuous; and
 - there is a windbreak in the direction from which fires are likely to approach.

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 within the riparian corridor, Cudgegong Reserve and a number of neighbourhood parks 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
- 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 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 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. 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. In addition, Prescribed Burning is not permitted in vegetation adjacent to Second Ponds Creek within 20 m (NSW RFS, 2006c).

Table 6: Recommended Interfire Periods

<i>Keith (2004) Classification</i>	<i>Minimum Fire Interval</i>	<i>Maximum Fire Interval</i>	<i>Source</i>
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 RFS and NSW Fire Brigade stations surrounding the site was completed in order to determine their proximity to the subject site (see Table 7 below).

Table 7: Local Fire Stations

Name	Location	Distance*
Rouse Hill (RFS)	402 Withers Rd, Rouse Hill NSW	2.0km
Schofields (RFS)	Railway Tce, Schofields NSW	3.4km
Kellyville (Fire Brigades)	1 Poole Rd, Kellyville NSW	3.6km

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 4. In the current emergency response situation the Rouse Hill and Schofields NSW RFS Brigades are likely to be the first stations to reach the Precinct. Rouse Hill station has easy access to the site via Mile End Road. Schofield's station has easy access to Schofields Road which runs along the southern boundary of the site.

The proximity of emergency services to the precinct seems adequate, however consultation with the RFS and NSW Fire Brigade 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.

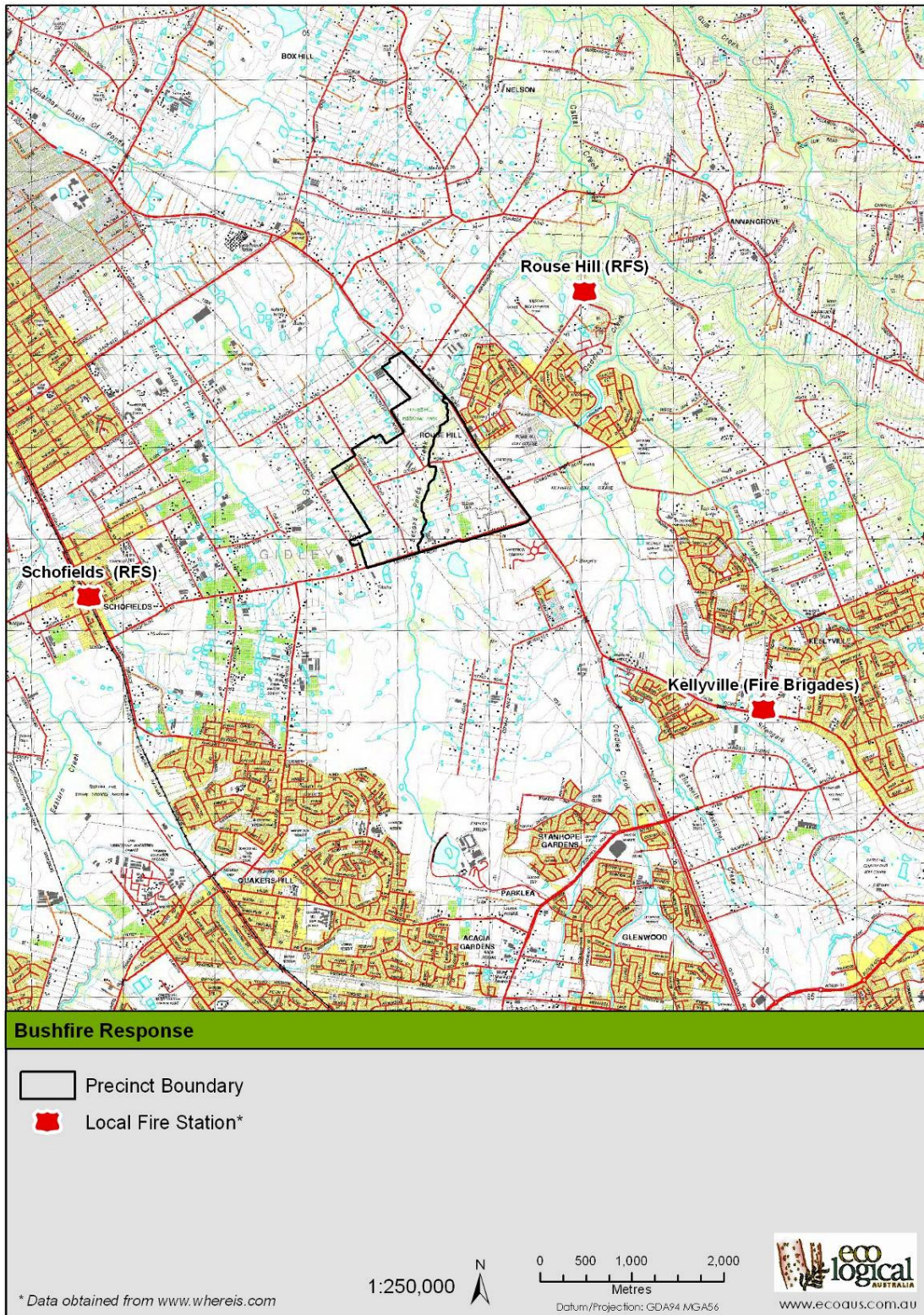


Figure 4: Emergency response

6 Planning Controls

Based on the recommendations contained within PBP 2006 the following planning principles are recommended for rezoning the Precinct to residential zoning;

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; and
6. Introduce controls on the placement of combustible materials in asset protection zones.

7 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 APZs established upfront.

Notwithstanding the above, it is expected that development will begin in the eastern portion of the precinct due to the marketability of this area. 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, 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 3) 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 Area' mapping (BPA mapping), the trigger for assessment under the EP&A Act and the RF Act will also change. It is recommended that Council review BPA mapping following development stages.

8 Indicative Layout Plan Assessment

The draft zoning layout for the Area 20 Precinct – Draft Indicative Layout Plan – (herein referred to as the ILP), can be seen in Figure 5. The ILP is meant as a draft to show the feasibility of the proposed zonings and may change. The following table (Table 8) assesses the draft ILPs ability to meet the planning principles of PBP (NSW RFS 2006b).

Table 8: Planning principles of the ILP

Planning Principals of PBP (NSW RFS 2006b)	ILP Assessment
<p>Provision of a perimeter road with two way access which delineates the extent of the intended development</p>	<p>The indicated carriageway widths shown on the Indicative Layout Plan are a minimum of 16m wide. This width will allow the meeting of the minimum 8 meters kerb to kerb width required for perimeter roads under PBP 2006 for emergency access/egress. All roads are two way.</p> <p>The ILP provides perimeter roads around the majority of residential areas.</p> <p>The ILP shows many roads providing access/egress to the precinct from all directions. Many alternate escape routes exist if any roads are cut off by fire or blocked by traffic. This access and egress to and from the precinct is considered adequate.</p> <p>Internal access throughout the precinct is adequate as the roads are through roads with no dead ends.</p> <p>There is one major road crossing proposed over Second Ponds Creek. The design of this crossing will need to be in accordance with PBP 2006 guidelines for internal roads and bridges i.e. bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes.</p>
<p>Provision, at the urban bushland interface, for the establishment of adequate asset protection zones for future housing</p>	<p>It is anticipated that in most situations required APZs can be wholly contained within the perimeter road easement and standard setbacks (6 metres). Where perimeter roads are not proposed, lots should be of sufficient size to accommodate the required APZ.</p> <p>APZ requirements can be met with the ILP and will need to be incorporated into urban design.</p>
<p>Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads</p>	<p>The size of each zoning parcel is more than adequate to accommodate the required APZs. Minimum lot depths are not specifically known at this stage, however, lots should be developed to allow for the incorporation of the required APZs. This appears possible based on the ILP provided.</p>
<p>Minimising the perimeter of the area of land, interfacing the hazard, which may be</p>	<p>The ILP incorporates a simple design with the development/hazard interface generally following straight lines to minimise the interface.</p>

developed	
Introduction of controls which avoid placing inappropriate developments in hazardous areas	<p>Light Industrial zonings are proposed for the south west of the precinct. These zonings have been placed at least 100m from the nearest hazard.</p> <p>One new school is proposed along with one existing Anglican school which is being retained.</p> <p>The new school is located adjacent to a neighbourhood park and this park will need to be managed to an APZ standard. Therefore the school will be located at least 80m from the nearest bushfire hazard to the west and will be separated from the hazard by residential lots and two roads. This separation distance easily exceeds the required 60m setback that is specified within PBP2006.</p> <p>The existing school is located close to the proposed riparian zone, with the closest existing building to the hazard is separated by at least 50m. The required setback that is specified within PBP2006 for SFPP developments is 60m. Any future developments at the school will require careful consideration of type, sighting and emergency evacuation. It is recommended that this school develops an emergency evacuation plan (that deals with bushfire) if one does not exist already.</p>
Introduction of controls on the placement of combustibles in asset protection zones.	<p>For the most part, the bulk of APZ areas will be located within the proposed road network. The remainder of the APZ areas will need to be identified and a planning provision established to ensure they area created and maintained according to RFS guidelines. 88b instruments are commonly used to facilitate this outcome.</p>



Figure 5: Indicative Layout Plan and Required APZ Distances

9 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 APZ requirements have been mapped across the Precinct. The size of each zoning parcel is adequate to accommodate the required APZs.

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. Further, it has been found that development is indeed possible at the subject site from a bushfire planning perspective.

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.

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 will be able to 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) with any proposed residential developments.

The Draft ILP has been assessed and overall the ILP is considered to be well designed in terms of bushfire protection.

- The majority of APZs can be wholly contained within the perimeter road easement and standard residential setbacks (6 metres). In addition, the ILP appears appropriate for where this cannot be provided.
- Access is good, with sufficiently wide two way roads and many alternate options for access and egress.
- Schools are located a sufficient distance from the bushfire hazard.
- The residential/bushland interface has been minimised where possible.

Formalised bushfire assessments will be required to facilitate the development approvals process if the proposed rezoning is approved and proceeds to subdivision.

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Appendix 1 – PBP 2006 Public 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 suppression.

	<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.
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