

# ANEMBO RESERVE FIRE REGIME MANAGEMENT PLAN



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This report is based upon best practise management and ecological principles. Concerns have been raised that sufficient resources may not be available to implement this plan in its entirety.

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## Glossary of Terms

<b>APZ</b>	An Asset Protection Zone (APZ) is an area around a development offering protection to reduce the bush fire hazard. It can consist of an Inner Protection Area (IPA) and an Outer Protection Area (OPA). Hazard reduction techniques can include slashing, raking, bush regeneration and burning.
<b>Biodiversity fire regime thresholds</b>	These thresholds are a range of appropriate fire frequency intervals, intensities and seasons to sustain the ecology of each vegetation community. Where fire regimes are outside the threshold, significant declines in species populations can be expected, particularly if the fire regime prevails over greater than 50% of the community area.
<b>Ecosystem</b>	An interactive system between living organisms (plants and animals) and their non living surroundings.
<b>FEZ</b>	Fire Exclusion Zones (FEZ) are areas that contain fire intolerant species. Fires in these areas should be avoided and quick fire suppression should occur in the case of fire.
<b>Fine fuels</b>	Bark, grass, leaves and twigs less than six millimetres in diameter.
<b>Fire regime</b>	The history of fire in a particular area, including the frequency, intensity and season of burning.
<b>Fuel</b>	Any material capable of being ignited and sustaining fire. Such as grass, live vegetation, leaf litter and bark. Generally measured in tonnes per hectare of dry weight.
<b>Hazard reduction</b>	Works designed to attain planned resource management objectives, primarily the reduction of fire threat. Activities include: <ul style="list-style-type: none"> <li>• Manual and mechanical thinning of vegetation (NOT broad scale clearing)</li> <li>• Controlled burning of a predetermined area, carried out under specified weather and environmental conditions</li> </ul>
<b>Inter-fire period</b>	The period of time between successive burns.
<b>IPA</b>	Inner Protection Areas (IPA) are parts of an Asset Protection Zone (APZ). They are designed to eliminate the threat of fire radiation to the development, and use techniques such as slashing, shrub clearing, and construction of barriers or hazard reduction burning to reduce fuel loads.

<b>LMZ</b>	Land Management Zones (LMZ) are broader areas of the landscape, which do not satisfy the criteria for Strategic Fire Management Zones (SFMZ) or Asset Protection Zones (APZ). Fire in these areas should be managed to meet conservation objectives for species, habitats, populations and cultural heritage values.
<b>Minimum Fire Threshold</b>	The minimum fire frequency permitted before a decline in biodiversity is expected.
<b>Maximum Fire Threshold</b>	The maximum fire frequency permitted before a decline in biodiversity is expected.
<b>OPA</b>	Outer Protection Areas (OPA) are parts of an Asset Protection Zone (APZ). They are designed to reduce the speed and intensity of an approaching bush fire. Techniques such as hazard reduction burning or selective shrub clearing are used to reduce fuel load.
<b>Prescribed burning</b>	A controlled burn to a predetermined area, carried out under specified weather and environmental conditions, designed to achieve planned resource management objectives.
<b>Quick succession</b>	Events occurring within five years of each other.
<b>SFAZ</b>	Strategic Fire Advantage Zones (SFAZ) are usually adjacent to, and compliment, Asset Protection Zones (APZ). They are managed to protect community assets and ecological sustainability.
<b>Treatment Area</b>	Area of land subject to removal or reduction of fuel by manual or mechanical means, or by prescribed burning.
<b>Wildfire</b>	An unplanned fire.

## Executive Summary

Anembo Reserve is located in Sydney's north, within the suburb of Duffys Forest. The reserve covers approximately 22 hectares, containing important habitat for a range of threatened and non-threatened native species. Including one flora and four threatened fauna species identified within the reserve.

Internal land uses include a horse riding exercise arena, a picnic area including BBQ seating and play ground facilities. The plan also addresses a proportion of land surrounded by the reserve, reserved for the Bush Fire Brigade. This area contains a building, shed and car parking area. Surrounding land uses include Ku-ring-gai Chase National Park and rural residential development.

The existing trail system within the reserve is considered sufficient to provide for adequate response to fire events and is to be maintained.

Due to Anembo Reserve's direct adjacency to Ku-ring-gai Chase National Park and the lack of any defined on ground management boundaries; the Management Plan has been prepared with the consideration of proposed management within Ku-ring-gai Chase National Park.

The Plan divides the reserve into management zones which include Asset Protection Zones (APZ) and Land Management Zones (LMZ). Existing tracks, natural features and cleared areas have been used for fire management boundaries where available.

The Plan contains a prescribed operations schedule that specifies treatments, timing and other characteristics. It prescribes burning adjacent to the horse riding exercise arena in 2006 and the easterly half of the reserve in 2010. Additional management actions include weed control and hand removal of fuels within areas of build up.

# 1 Introduction

Eco Logical Australia was contracted by Warringah Council in March 2005 to prepare a 10 year Fire Management Plan from 2006 to 2016 for Anembo Reserve.

Warringah Council will be referred to as Council within this document.

## 1.1 Reserve Outline

Anembo Reserve is located in Sydney's north, within the suburb of Duffys Forest. The reserve covers approximately 22 hectares in area, most of which supports good condition native vegetation. See Figure 1 for site location.

The reserve has a high conservation value, containing important habitat for a range of threatened and non-threatened native species.

Surrounding land uses include Ku-ring-gai Chase National Park and rural residential development.

The flat ridgetop section of the reserve is subject to a high level of horse and human use, with a large horse riding exercise arena and a number of existing tracks and fire trails occurring within the reserve. Other internal uses and amenities include a picnic area near the reserves entrance, with seating, BBQ and play ground facilities.

Anembo reserve consists of land owned by the Department of Lands, under Care Control and Management (CCM) of Council.

The reserve surrounds lands owned by the Department of Lands under CCM of Council, reserved for the Bush Fire Brigade. This area contains a building, shed and car parking area.

## 1.2 Management Plan Objectives

- To provide recommendations for:
  - New fire management zones
  - Suitable alternatives for fuel management
  - Strategies to protect the existing infrastructure located within the reserve
  - Strategies to protect persons and property within, or immediately adjacent to the reserve
- Creation of:
  - Comprehensive fire history for the reserve
  - A plan that is acceptable to and can be implemented by Council and the NSW Rural Fire Service (RFS)
  - An ecologically based strategy for fuel management, incorporating the requirement for:
    - Mosaic burn patterns
    - Fire regimes inline with vegetation community thresholds, endangered ecological communities and identified threatened species, as well as locally or regionally significant species

- A strategy to enable the effective planning of Hazard Reduction (HR) burns with regard to:
  - Endangered ecological communities
  - Endangered populations
  - Threatened, locally or regionally significant species
  - Aboriginal sites and culturally significant features known to exist within the reserve
  - Assets and infrastructure

### **1.3 Report Structure**

The Fire Management Plan for Anembo Reserve comprises two separate documents:

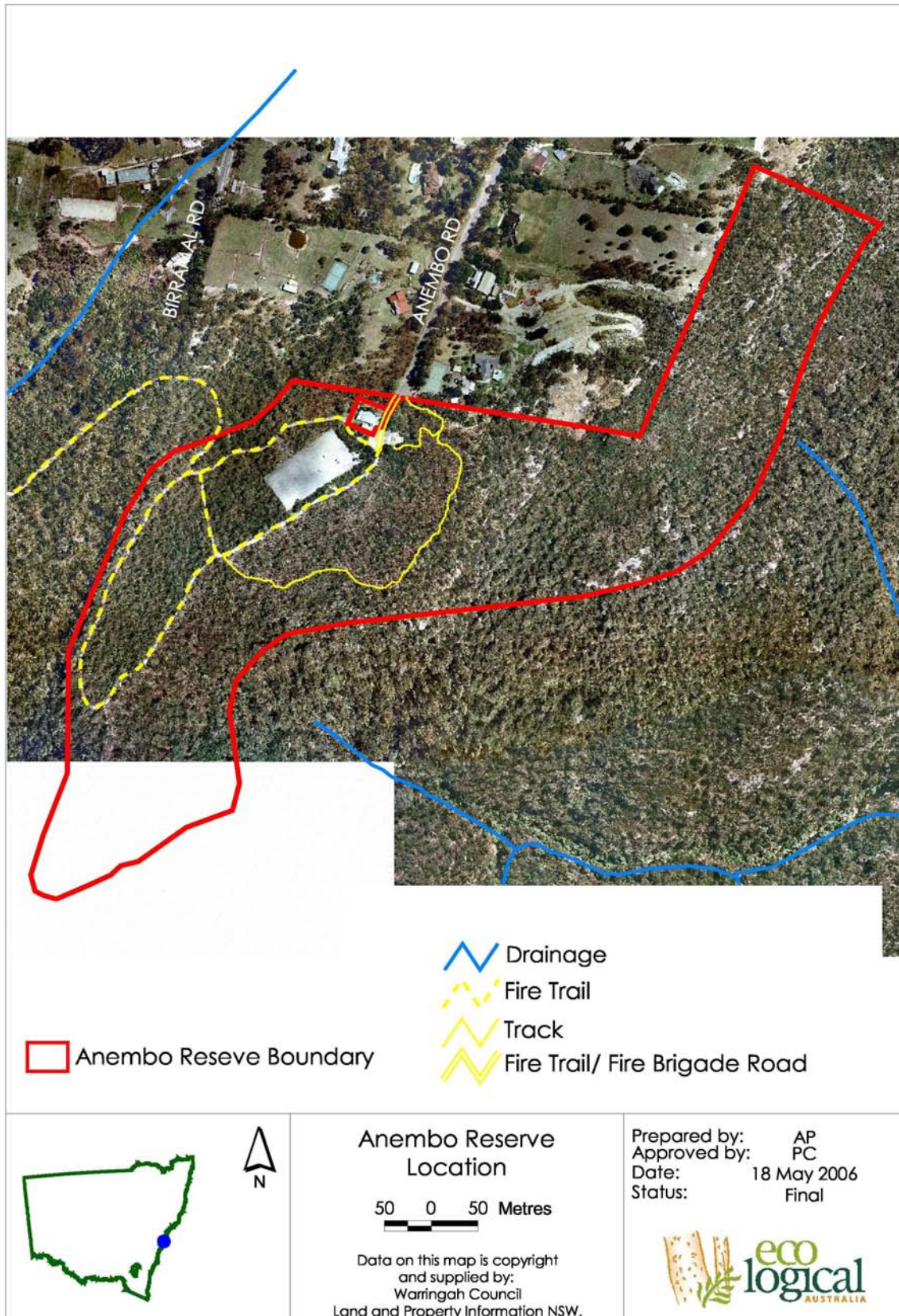
- 1) This report
- 2) An A0 sized poster showing a series of relevant maps and tables

This report identifies the fire management framework, fire related issues and risks within the reserve, and provides an operational schedule and performance measures. It is intended that this written report be used in conjunction with the "Anembo Reserve Fire Regime Management Poster" (Appendix 7, ELA 2006).

### **1.4 Assumptions**

Vegetation fuel loads and structure were derived from Vegetation Mapping by P & J Smith (2003). Whilst limited opportunistic on-ground validation of vegetation communities was undertaken, it was assumed this mapping was generally accurate.

Figure 1 Site Location



## **2 Legislative and Planning Instruments**

Fire management activities on the site are constrained by numerous Acts, plans and guidelines. The most relevant documents are reviewed below.

The majority of the legislation and planning instruments listed below impact HR planning requirements. Further information regarding this process may be seen in the 'Warringah Local Government Area Hazard Reduction Guidelines' (Appendix 6).

### **2.1 Crown Lands Act 1989 & Local Government Act 1993**

This Plan of Management will meet the requirements of the Local Government Act 1993, with regards to:

- Defining objectives and performance targets
- Stating the means by which objectives and performance targets will be met
- Stating the means by which performance will be measured
- Observing the requirements of any threat abatement plans and recovery plans made under the Threatened Species Conservation Act

All plans of management for this reserve require consideration of the Crown Lands Act 1989. This includes the requirement that the following principles be followed:

- Environmental protection principles are observed in relation to the management and administration of Crown land
- Natural resources of Crown land (including water, soil, flora, fauna and scenic quality) are conserved wherever possible
- Where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity
- Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles

### **2.2 Management Strategy for Weed Control and Fire Management Access Zones<sup>1</sup>**

This document, created in 1996, sets out aims and objectives for the management of fire and weeds within the Warringah Council Local Government Area (LGA).

Fire management objectives include:

- Ensuring that fire management access zones are of dimensions that can be maintained in the long term
- Ensuring that methods of construction and maintenance of fire management access zones are environmentally sensitive
- Carrying out of community education in conjunction with Fire Control, and of fire hazard reduction techniques
- Co-ordinating with Fire Control on the fire hazard reduction issues

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<sup>1</sup> Council has acknowledged that this document is outdated and that changes are required to bring it up to current standards.

These objectives have been considered during the creation of this plan.

### **2.3 Rural Fires Act 1997**

The objectives of the Rural Fires Act (RF Act) 1997 are to provide for:

- The prevention, mitigation and suppression of fires
- Coordination of bush fire fighting and prevention
- Protection of people and property from fires
- Protection of the environment

The RF Act requires the creation of a Bush Fire Co-ordinating Committee and a Bush Fire Risk Management Plan (outlined below).

Obligations are imposed on Council and other land management agencies to:

- Protect life and property
- Prevent fire from leaving land vested in or under its control
- Implement the provisions of Bush Fire Management Plans

### **2.4 Warringah Pittwater Bush Fire Risk Management Plan**

Required under Section 52 of the RF Act, the Warringah Pittwater Bush Fire Risk Management Plan outlines the importance of bush fire management zones to assist in reducing bush fire risk and damage to assets. The plan also emphasises fire management priorities. Where areas are faced with an extreme bush fire risk, it will be given the highest management priority and allocation of resources.

The plans are required to consider threatened species conservation and may restrict or prohibit the use of fire and other fire hazard reduction activities. This is particularly relevant for threatened species habitat.

The responsibility to implement asset protection is placed on the owners of the land which is subject to the bush fire threat. It is also Council's responsibility to ensure that the owners or occupiers of private property have taken the required steps to reduce bush fire hazards on their land. This can be enforced by the RFS through Section 66 of the RF Act.

Council is responsible for environmental assessment of land prior to commencing any fire management activities (on Council owned or managed land). This is achieved through issuing a Bush Fire Hazard Reduction Certificate, obtained under the Environmental Planning and Assessment Act 1979 (EP&A Act), or through the Bush Fire Environment Assessment Code (RFS 2006).

### **2.5 Bush Fire Environment Assessment Code**

This code provides a stream-lined environmental assessment process for use in determining applications for Bush Fire Hazard Reduction Certificates and provides

standards for the conduct of HR works for areas zoned under the Bush Fire Risk Management Plan (WPBFMC 2000).

The code consists of and refers to standards and guidelines that relate to the conduct and planning of managed hazard reduction activities.

Requirements for the code are specified under Section 100J of the RF Act, including land restrictions and exclusions for environmentally sensitive areas (Sections 2 and 3, BFEAC 2006).

The land covered by Anembo Reserve is zoned Asset Protection Zone (APZ) (for approximately 100m from the residential interface); with remainder of the reserve zoned as a Land Management Zone (LMZ) under the Bush Fire Risk Management Plan (WPBFMC 2000). The reserve is not considered to be restricted or excluded land; as such the existing Bush Fire Environment Assessment Code (RFS 2006) does apply to this reserve.

## **2.6 Planning for Bush Fire Protection 2001**

Planning for Bush Fire Protection (PBP), prepared by the Rural Fire Service and Planning NSW, is the key bush fire planning document for the state. The document identifies requirements and strategies for new developments to help protect them from bush fire hazards. It details the location and depth of asset protection zones, fire trails and perimeter roads, water supply and building standards in bush fire risk areas.

## **2.7 National Parks and Wildlife Act 1974**

Aboriginal and cultural heritage sites are protected under this Act, as well as threatened flora, fauna and endangered ecological plant communities. The Department of Environment and Conservation (DEC) are named as the responsible authority under the Act, which extends to the protection of items outside the reserve system.

## **2.8 Environment Protection & Biodiversity Conservation Act 1999**

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) stipulates that approval from the Commonwealth Environment Minister is required if a development is likely to have a significant impact on matters considered to be of National Environmental Significance.

The Atlas of NSW Wildlife (DEC 2004) was utilised to identify known threatened flora within 5km and threatened fauna within 10km of the reserve.

## **2.9 Environmental Planning and Assessment Act 1979**

The NSW EP&A Act is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals and activities.

## **2.10 Threatened Species Conservation Act 1995**

The NSW *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 or an activity (such as mechanical hazard reduction) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

Threatened flora within 5km and threatened fauna within 10km of the reserve have been identified (see Appendix 2) and the fire ecology requirements of those species considered.

## **2.11 Noxious Weed Act 1993**

This Act requires Council to control noxious weeds and destroy notifiable weeds within areas under its control; and ensure that private landholders do the same.

Weeds identified within this plan are considered noxious and as such require removal under this Act.

## **2.12 Rivers and Foreshores Improvement Act 1948**

The NSW *Rivers and Foreshores Improvement Act 1948* (RFI Act) aims to provide effective controls on activities that could harm sensitive waterway and foreshore environments. The Act has provisions that require a permit for excavations, fill and other works within 40m of the top of the bank for rivers, estuaries and lakes as it is recognised that they can have significant detrimental environmental impacts on habitat, water quality, flooding and erosion. This Act exempts 'local authorities' from the need to obtain a permit.

A Part 3a permit would be required under the RFI Act for works listed above. The RFI Act is soon to be repealed and replaced by the *Water Management Act, 2002* but the provisions under this Act are likely to be similar to the RFI Act. A notable exception, however, is that 'local authorities' will no longer be exempt from the need to obtain a permit.

## **2.13 State Environmental Planning Policy 19 (SEPP 19) – Bushland in Urban Areas**

SEPP 19 is designed to protect bushland in public open space zones and reserves, as part of preservation for natural heritage, or for recreational, educational and scientific purposes. It ensures that bush preservation is given a high priority when local environmental plans for urban development are prepared. Under SEPP 19 'bushland' means land on which there is vegetation that is either a remainder of the natural vegetation of the land or, if altered, is still representative of the structure and floristic integrity of the natural vegetation.

This reserve is zoned as public open space. As such future Hazard Reduction work must address this legislation.

### **3 Bush Fire Risk**

#### **3.1 Bush Fire History**

Fire history mapping including both Wildfire and Hazard Reduction burning was supplied by Warringah Council, the Department of Environment and Conservation and the NSW Rural Fire Service. Fire history data for these agencies ranged in date from 1952 to 2005.

Additional written fire history data was obtained from the NSW Fire Brigade consisting of records for Hazard Reduction burning over the last 5 years and unplanned vegetation fires for the past 10 years.

Fire history mapping prior to 2000 was often not undertaken or consisted of approximate desktop estimates. As such past fire history data may be incomplete.

Field validation of fire history data has been carried out in order to increase the reliability of data. Spatial accuracy for existing data was found to be low, particularly for older fires.

Fires recorded within the boundaries of Anembo Reserve boundaries occurred between 1952 and 2002. Small spot fires mapped outside the reserve were not included in the analysis.

An analysis of available mapped fire history data showed that 100% of Anembo Reserve has been burnt since 1952. This included a number of wildfires originating from Ku-ring-gai Chase National Park and HR burns undertaken within the reserve and adjacent areas.

See "Anembo Reserve Fire Regime Management Poster" (Appendix 7, ELA 2006) for a map of recorded fire history.

#### **3.2 Fuel Load Assessment**

An assessment of fuel loads has been undertaken in ArcView GIS, using a program add-on to predict fuel loads, based on vegetation type and time since fire. This software, prepared for NPWS (Conroy 1994), uses fuel accumulation curves for structural vegetation types. The information was then analysed in relation to time since last fire to provide an estimate of fuel loads across the study area.

This information has been used to assist in the identification of priority areas for hazard reduction burns. As new fires occur and vegetation regenerates fuel loads will vary.

Fuel modelling has been based on fire history data from 1952 to the 2005 fire season and Warringah Vegetation Mapping (P & J Smith 2003) (See Figure 2).

Predicted fuel loads for the reserve are shown in Figure 3.

### 3.2.1 Limitations

The following is a basic list of the limitations of the fuel model:

- The model is based on topography, vegetation mapping and fire history. Any inaccuracies or gaps in the data will be persistent throughout the fuel model.
- Current fire history records do not include any indication of fire intensity. The model assumes a starting fuel load of 0 tonnes per hectares. After any fire this is unlikely and in the case of a cool burn, much of the available fuel may remain.
- Fire history records before the mid 1980s were not systematically recorded
- Years of drought and very poor ridge-top soil conditions may result in a much slower rate of vegetation growth and fuel accumulation.
- Areas of cleared or highly disturbed vegetation were excluded from the fuel load assessment.
- In some areas manual Hazard Reduction (HR) works have not been mapped. This has resulted in higher fuel load predictions than that which is actually on the ground.

### 3.2.2 Algorithms

The following vegetation fuel classes are used:

- 1 = grass (not included in model at this stage)
- 2 = shrub / heathland
- 3 = woodland
- 4 = open forest
- 5 = rainforest (not included in model)
- 0 = cleared, disturbed, not vegetated, swamp, reedland, saltmarsh (not included in model)

The following fuel accumulation algorithms are used:

Shrubland:  $F = 40 - (e^{-0.01169 * T} * 36.6345)$

Woodland:  $F = 22.3 - (e^{-0.1634 * T} * 16.878)$

Forests:  $F = 23 - (e^{-0.112 * T} * 16.346)$

Where:

F = Fuel Load in tonnes/hectare

T = Time since last fire (in years)

## 3.3 Assets at Risk from Fire

### 3.3.1 Built and Cultural Assets

Built assets within the reserve include fences, a large horse riding exercise arena, information board, picnic tables, play ground equipment and BBQ facilities.

The Duffys Forest Rural Fire Brigade building also exists within land owned by the Department of Lands under CCM of Council, reserved for the Bush Fire Brigade.

Identification of cultural assets including known European and Aboriginal Heritage sites has been undertaken using information from the Aboriginal Heritage Information

Management System (AHIMS – May 2005), the National heritage register and the Bush Fire Risk Management Plan (WPBFMC 2000, Appendix D). AHIMS data has been provided in digital GIS format and is intended to flag known cultural heritage issues for consideration during HR planning.

No known items of Aboriginal or European heritage were identified within the reserve.

### 3.3.2 Natural Heritage Assets

Information on natural heritage values has been sourced from the following:

- Atlas of NSW Wildlife (DEC 2004)
- Warringah Vegetation Mapping (P & J Smith 2003, supplied in digital format by Council)
- Warringah Natural Area Survey, Vegetation Communities and Plant Species (P & J Smith 2003)
- Draft Fauna survey for Anembo Reserve, Duffys Forest (EEC 2003)

#### 3.3.2.1 Vegetation Communities

No EPBC Act listed communities or any considered as Endangered Ecological Communities (EECs) under the TSC Act occur within the reserve.

Table 1 contains a list of communities, their legal status in NSW, and their priority within Warringah LGA (P & J Smith 2003). See Figure 2 for vegetation communities, Appendix 1 for an explanation of vegetation priority and Section 4.6 for fire requirement information. A transparent overlay of vegetation communities may also be seen in Appendix 6.

**Table 1 Vegetation Communities of Anembo Reserve**

<b>Vegetation Community</b>	<b>Map Code</b>	<b>State Legislative Status (TSC Act 1995)</b>	<b>LGA Priority</b>
Bloodwood-Scribbly Gum Woodland	RR	Not listed	3
Peppermint-Angophora Forest	GG	Not listed	3
Sandstone Heath	HH	Not listed	3

Figure 2 Vegetation Communities

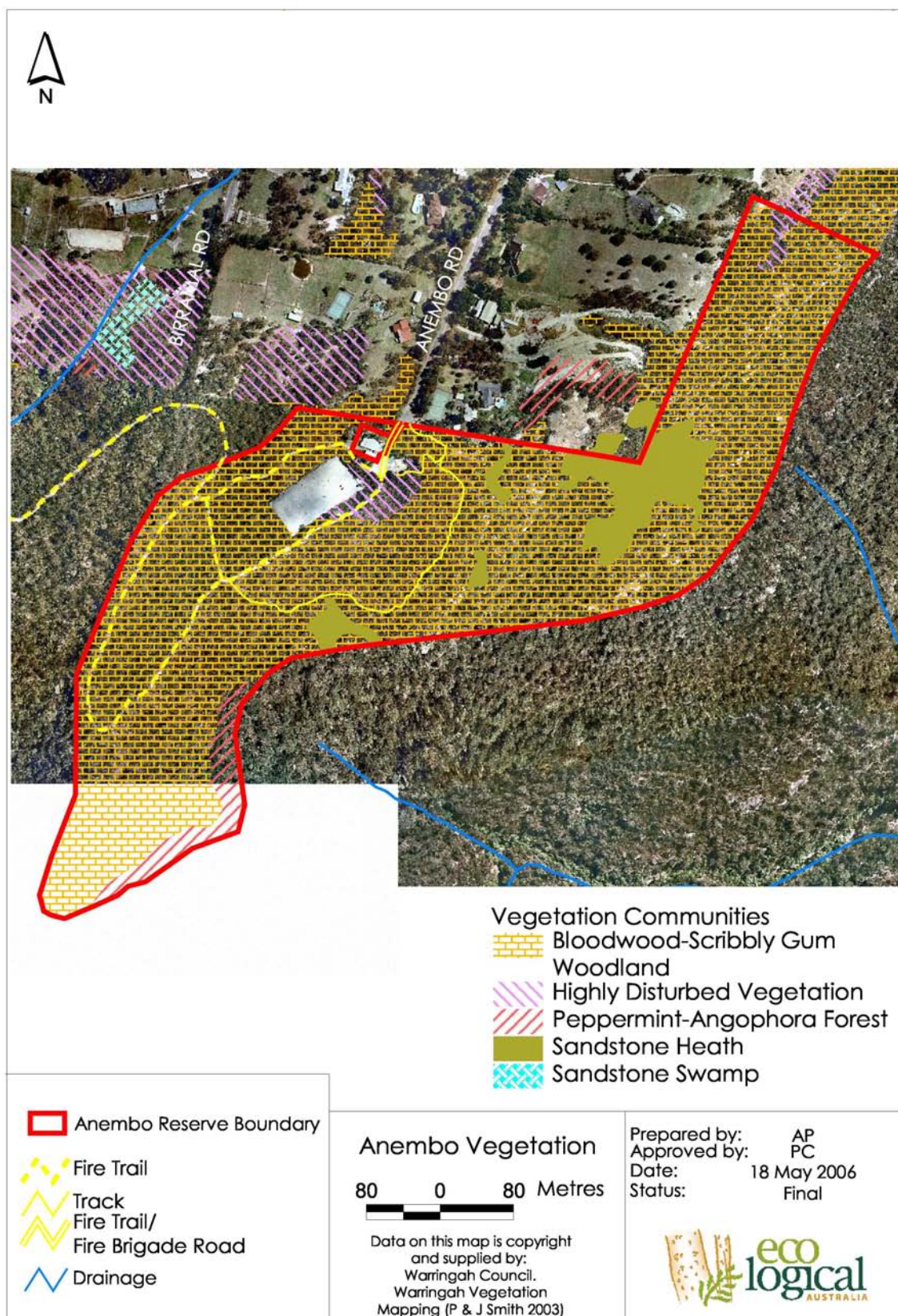
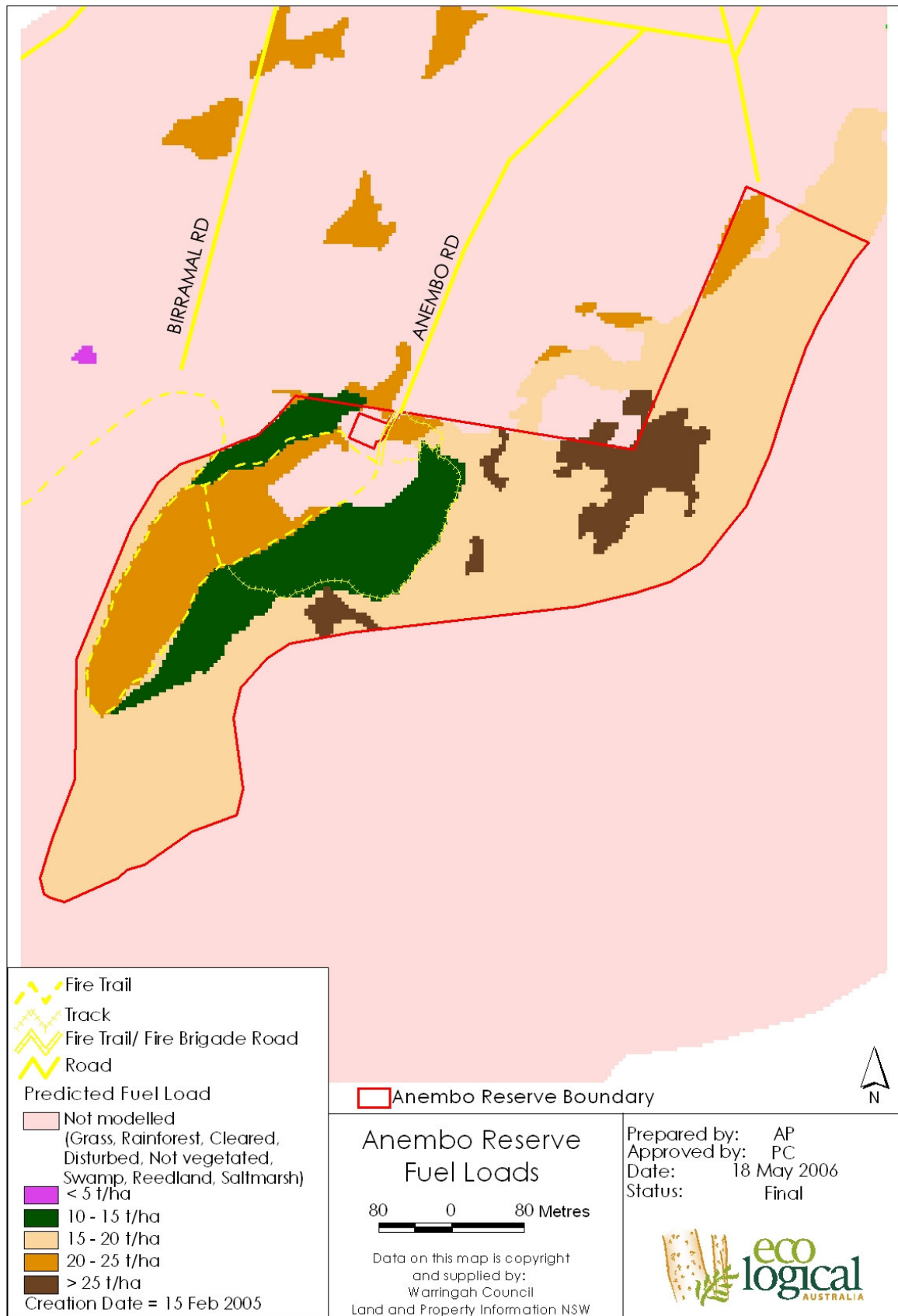


Figure 3 Predicted Fuel Loads



### **3.3.2.2 Managed Regeneration Areas**

Whilst no established regeneration areas were observed during field surveys conducted as part of this plan, consideration should be given to the vulnerability of bush regeneration areas within the reserve at HR planning stage as well as during wildfire response, where possible.

### **3.3.2.3 Threatened and Significant Flora and Fauna**

A search of the Atlas of NSW Wildlife was conducted for:

- Threatened flora listed under the TSC Act 1995, and flora indicated by P & J Smith (2003) as being nationally, regionally or locally significant. Search area was within 5km of the Reserve; and
- Threatened fauna listed under the TSC Act 1995, and fauna indicated by P & J Smith (2005) as being nationally, regionally or locally significant. Search area was within 10km of the Reserve.

Additional species records were obtained from the 'draft fauna survey for Anembo Reserve' (EEC 2003).

Species identified within the radius' above may be seen in Appendix 2 and includes:

- 26 threatened fauna species
- 25 national, regional or locally significant fauna species
- 12 threatened flora species
- 26 national, regional or locally significant flora species

*Eucalyptus camfieldii* was the only threatened flora species identified within the reserve.

Threatened fauna species identified within the reserve include, the Grey-headed Flying-fox, Rosenberg's Goanna, Red-crowned Toadlet and the Eastern Pygmy Possum.

It is considered likely that other species recorded within 10km also utilise the area, particularly the Southern Brown Bandicoot, Powerful Owl and Giant Burrowing Frog (EEC 2003).

Fire requirements for threatened flora and fauna identified within the reserve were considered during creation of the operational schedule. This included requirements identified within relevant recovery plans for each species.

Protection of locally and regionally significant species as well as threatened species identified as occurring outside the reserve is aimed at maintaining the structure and floristic integrity of the plant communities within which they occur.

Additional management requirements for all species identified (see Appendix 2) should be considered during HR planning including fire intensity, burn season, escape routes and internal burning boundaries to ensure protection of breeding areas and habitat.

Fire ecology requirements of threatened flora within 5km and threatened fauna within 10km of the reserve have been assessed and provided to Council within the Warringah Reserve Threatened Flora/Fauna Fire Ecology spreadsheets (ELA 2005a, ELA 2005b).

Additional information including species habitat distribution/condition and population age (for flora species) is required to enable effective HR planning. As such field assessment at HR planning stage is advised.

To assist in future management, it is recommended that Council obtain mapping of:

- Potential refuge areas for amphibians, reptiles and mammals (considering the existence of barriers such as fences).
- Distribution and abundance of habitat features for which protective measures can be implemented, including:
  - Ephemeral areas
  - Hollow bearing trees/ significant stands

## **4 Fire Management Issues**

### **4.1 Fire Management Boundaries**

The reserve boundary used within this plan has been compiled from cadastral data.

Normally a fire management plan will only apply to the subject reserve. However land reserved for the Bush Fire Brigade, located within the reserve, has been included within prescribed fire management zones in order to provide logical management and increased protection to assets.

### **4.2 Management Responsibilities**

Fire management within the areas is co-ordinated on a landscape scale by the Warringah Pittwater Bush Fire Management Committee (BFMC). This committee is responsible for providing a coordinated, agreed approach to major issues in preparing plans for operations, and bush fire risk management within the district and is made up of Warringah Council, DEC and other key stakeholders.

Overall management of the reserve is the sole responsibility of Warringah Council. The RFS is responsible for fire suppression efforts in the reserve and for mapping any fires that occur.

This plan has divided the reserve into a number of different management zones. Zones adjoining or including private/commercial properties may require landowner's co-operation. Council have no responsibility for land not under their management.

Due to Anembo Reserves direct adjacency to Ku-ring-gai Chase National Park and the lack of any defined on ground management boundaries, co-operation is required between Council, DEC and the RFS to achieve effective management.

Requirements for co-management include:

- Fire management planning
- HR conduct (within directly adjacent areas)
- Access management, with Anembo providing fire trail access into Ku-ring-gai Chase National Park
- Weed and feral species control

#### **4.3 Fire Trails and Tracks**

The existing trail system within the reserve is considered sufficient to provide for adequate response to fire events to protect assets located within the reserve.

Maintenance of existing trails, however, is required particularly for areas leading into Ku-ring-gai National Park.

Provision/maintenance of fire trails within adjacent rural residential properties inline with PBP (RFS 2001) standards is also recommended.

Fire trail management should be undertaken in accordance with the Bush Fire Coordinating Committees' Policy (no. 1/03), Guidelines for the Classification of Fire Trails and Guidelines for Fire Trail Signage (BFCC 2003). Additionally a Fire Trail Register is maintained by the BFMC.

Signage maps showing trails within the reserve are recommended.

#### **4.4 Introduced Species Management**

##### **Weed management**

Weed management has been considered as a component of proposed fire management within Anembo Reserve.

Interactions between fire and weed species include:

- Increased fuel levels, with some weed species being particularly flammable (Eg. Pampas grass)
- Decreased likelihood of effective burn intensities, due to fire retardant species (Eg. Privet and mesic species)
- Potential for weed mortality by fire
- Encouraged proliferation of weeds, due to seed stimulation and ecological conditions post fire

Weed information was collected opportunistically as a component of field surveys (see Figure 4). Species lists are not considered comprehensive with weed recording focusing upon species which have potentially high impacts upon either ecological diversity, human health or fire impacts.

To ensure appropriate weed management, weed control should be considered during HR planning. This should include an assessment of:

- Removal of weed species over natives during creation of APZ areas

- Pre-fire weed preparation requirements. Factors to consider include weed type, species, moisture content and desired fire intensity

Management of weeds within APZ areas must incorporate ecological, stabilisation, and fire considerations.

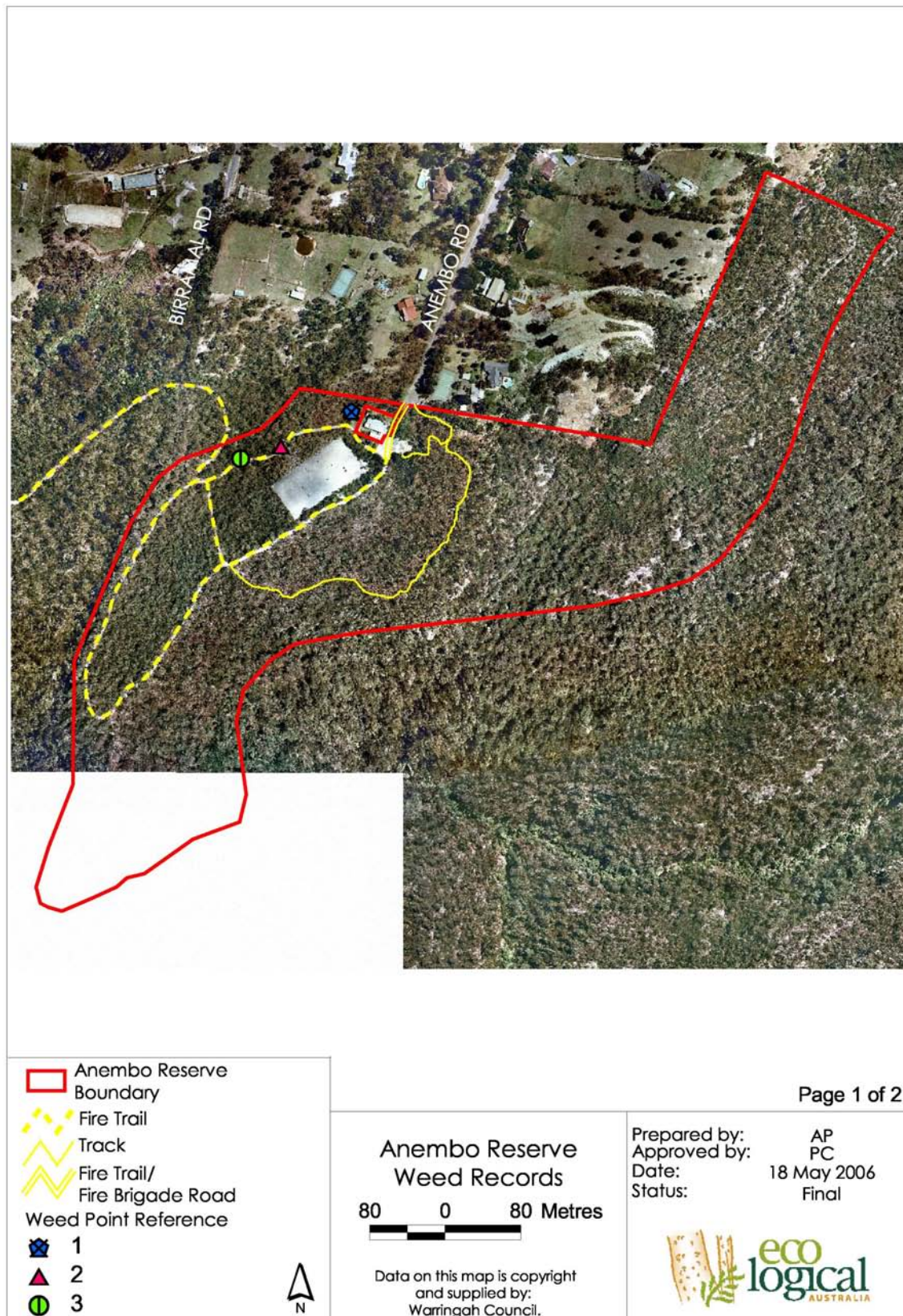
Appropriate techniques are to be employed to prevent weed dispersal by mowers etc and the removal of dead vines from trees, as these features can act as wicks for fire to spread into canopy.

### **Feral fauna management**

Fire may increase the impact of feral fauna species through a reduction in protective ground cover for prey species. As such control of feral species should be considered during HR planning works.

Control should target species such as rabbits, feral cats and foxes simultaneously, to prevent increased predation on native species, particularly the Southern Brown Bandicoot (known to exist within the wider area). Flora and fauna surveys within the reserve in 2003 (EEC 2003) observed the existence of rabbits.

Figure 4 Recorded Weed Presence Within Anembo Reserve



**Weed Management Explanation**

- Weed mapping consisted of point and area records.
- Where area records align with APZ areas, weeds within APZ and within directly adjacent bushland have been recorded.
- Approximately 10m mapping accuracy.
- Comments on litter build up and site safety have been provided within some locations.
- *Melaleuca nodosa* is threatened in Warringah.
- Targeted weeds should include:
  - ◆ Pampas grass - due to its high flammability,
  - ◆ *Lantana* - creates high fuel loads (contributing to hotter bushfires); and
  - ◆ *Pittosporum undulatum* - an opportunistic species; high densities increase canopy density, contributing to crown fires.
  - ◆ Noxious species

Weed Point Reference	Weed Species
1	Pampas grass (seed heads already removed from most), <i>Lantana</i> , <i>Sporobolus</i> Sp, Whisky grass
2	Pampas grass
3	Crofton, Whisky grass

Anembo Reserve  
Weed Records

Prepared by: AP  
Approved by: PC  
Date: 9 September 2005  
Status: Final

Page 2 of 2



## **4.5 Fire Management Zones**

The Fire Management Zones used in this plan are based on those used in the Warringah Pittwater Bush Fire Risk Management Plan (WPBFMC 2000). The description, aims and prescription for these zones are described below.

### **4.5.1 Asset Protection Zones (APZ)**

#### Description

- Area surrounding a development and managed to reduce bush fire hazard
- Often has inner protection area (IPA) and outer protection area (OPA)
- APZ widths and fuel reduction treatment will be determined by slope and existing nature of assets
- Reduction techniques will include:
  - raking and slashing
  - bush regeneration, involving initial weed removal and long term weed management. This method should be combined with hand removal of ground fuels and manual removal of shrub and middle storey layers
  - burning

#### Aims

- To protect human life and property
- To protect highly valued assets

#### Prescriptions

- To maintain reduced ground fuel loads and maintain understorey to less than 50cm in height, with discontinuous shrub and canopy layers, by:
  - removal/ suppression of weeds
  - thinning of regrowth
  - hand removal
  - raking and slashing
- A combination of prescriptions may be appropriate depending upon the slope and naturalness of the vegetation
- APZ areas may be burnt as appropriate dependant on management issues
- Trees should not over-hang buildings

#### **4.5.2 Land Management Zone (LMZ)**

##### Description

- Broader areas of the landscape, incorporating those areas not satisfying the criteria for inclusion in Strategic Fire Management Zones or Asset Protection zones
- Reduction techniques will include:
  - burning
  - weed control

##### Aims

- Protection of natural and cultural heritage values
- Maintenance of ecological processes

##### Prescription

- Fire management to meet conservation objectives for species, habitats, populations and cultural heritage values, including:
  - to control breaches in minimum fire thresholds and address maintenance of fire age (vegetation age) mosaic, including maximum fire thresholds
  - implementation of cultural heritage and threatened species management within areas where cultural heritage and threatened species sites are known or likely to occur

#### **4.5.3 Strategic Fire Advantage Zones (SFAZ)**

##### Description

- Usually adjacent to and complementing asset protection zones
- Managed to protect community assets and ecological sustainability
- Reduction techniques will include:
  - burning
  - manual fuel reduction techniques, such as raking, slashing, hand removal of ground fuels and manual removal of shrub and canopy layers. Emphasis placed on weed species where appropriate.
  - weed control

##### Aims

- To restrict fire movement into and out of reserves
- Reduce the speed and intensity of fire
- Reduce the potential for spot fire development

#### Prescription

- A general prescription for maximum fine fuel loading within a range of 8 – 18 tonnes per hectare
- To be managed consistently with the following applications:
  - to provide fuel reduced areas which enable the protection of assets by fire fighters when Asset Protection Zones are not in place
  - to complement Asset Protection Zones where insufficient protection is provided
  - to provide fuel reduced zones in areas of high ignition potential (eg along roads, rail lines, power lines etc) to slow the development of fires, reduce their spread, and provide for safe suppression
  - to provide strategically located fuel reduced areas to reduce the vulnerability of assets which are susceptible to fire
  - to attain a fire regime consistent with the requirements for the preservation of biodiversity within vegetation communities

#### **4.5.4 Fire Exclusion Zones (FEZ)**

##### Description

- Areas containing fire intolerant species and assets

##### Aims

- To exclude fires (both wildfires and hazard reduction burning) due to the presence of fire intolerant assets, including:
  - fire intolerant vegetation communities
  - riparian buffers
  - cultural/historic sites

##### Prescription

- Exclude fire and undertake rapid suppression of unplanned fires to maintain fire intolerant species and assets.

#### **4.6 Biodiversity Fire Regime Thresholds**

Biodiversity fire regime thresholds are intended to ensure there is no loss of biodiversity through senescence or insufficient recruitment as a result of fires being too frequent. Additionally, varying inter-fire periods across the landscape ensures greater heterogeneity of lifecycles and growth stages, enhancing habitat value.

Minimum and maximum inter-fire periods have been defined for vegetation communities known to occur within the reserve. These are shown in Table 3.

Revegetation areas within the reserve have not been included within this assessment process. Due to the potentially young age of these communities it is noted that

prescribed biodiversity thresholds may have detrimental effects. These factors need to be considered during future HR planning conducted prior to burning.

An evaluation of fire history and biodiversity fire regime thresholds for mapped vegetation communities has been undertaken for the entire reserve. The current fire threshold status and resultant ecological fire requirements for vegetation within the reserve have been determined and may be seen in Figures 5 and 6 respectively. An explanation of these categories can be seen in Table 2.

The information above has been considered in determining the prescribed operation schedule (see Section 5).

Where the minimum inter-fire threshold has not been reached (i.e. it has not been burnt too frequently), an indication of the number of burns permitted within the life of the plan has been provided.

Fire should be excluded from areas where the minimum inter-fire threshold has been reached.

Where the minimum inter-fire threshold has been exceeded (that is, it has been burnt too frequently), strategies to facilitate recovery should be implemented. These may include:

- If wildfire occurs, the area burnt should be minimised through immediate response and rapid suppression.
- Use of prescribed burning to reduce the threat of wildfire whilst maintaining varying fire ages.

When identifying if an area had breached, reached or not reached its minimum inter-fire threshold the precautionary approach was adopted. It was not possible, with the data available, to identify whether a fire had occurred at the start or end of a calendar year. This is due to the fact that some fires are recorded by fire season, which actually occurs over 2 calendar years. Therefore, when calculating the minimum inter-fire threshold, areas on the fringe of the threshold were included. For example, if an area had a minimum threshold of >2 fires in <5 years, and was burnt in 1999, and 2004, we would identify this area as having reached its minimum threshold, even though the fires may have actually occurred 6 years apart (E.g. January 1999 and December 2004). This precautionary approach means areas for future burning were not identified if they were on the verge of reaching their minimum threshold.

Where frequent fire is identified in a Recovery Plan as a threatening process, relevant pre-existing Threat Abatement Plans should be implemented.

**Table 2 Ecological Threshold and Ecological Fire Requirement Explanation**

<b>Ecological Thresholds</b>	<b>Explanation</b>	<b>Ecological Fire Requirements</b>
Threshold breached	This includes areas of vegetation where fire frequency has either been too infrequent, or too frequent for the maintenance of optimum biodiversity, as recommended within vegetation community fire thresholds.	<ul style="list-style-type: none"> <li>• Actions for areas will depend upon whether the minimum threshold (i.e. burnt too frequently) or the maximum threshold (i.e. not burnt frequently enough) has been reached.</li> </ul> <p><u>Minimum threshold breached:</u> Suppression priority. Exclude prescribed burning for a minimum of 10 years in forest, heathland / tall shrubland and woodland.</p> <p>For other community types prevent successive fires until community is within threshold.</p> <p><u>Maximum threshold breached:</u> Prescribed burning to be undertaken ensuring sufficient areas of old age class communities are left within the park. Managed as for Prescribed Fire Management Zone (see Section 5.1).</p>
Threshold reached	This includes areas of vegetation where fire occurrence has reached the limit of identified vegetation community fire thresholds.	<p><u>Minimum threshold reached:</u> Prevent successive fires until community is within threshold.</p> <p><u>Maximum threshold reached:</u> Monitor vegetation community to determine age distribution. Prescribed burning may be undertaken, ensuring sufficient areas of old-age class communities are left within the park. Managed as for Prescribed Fire Management Zone (see Section 5.1).</p>
Threshold not reached	This includes areas of vegetation where fire has occurred at a frequency within the identified vegetation community fire thresholds.	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.

<b>Ecological Thresholds</b>	<b>Explanation</b>	<b>Ecological Fire Requirements</b>
Nearing maximum, no fire recorded	This includes areas of vegetation where a fire has not been recorded in the data provided. Area should be managed to ensure that a mosaic of fire ages within the area exist.	<ul style="list-style-type: none"> <li>• Actions for areas will depend upon whether the minimum threshold (i.e. burnt too frequently) or the maximum threshold (i.e. not burnt frequently enough) has been reached.</li> </ul> <p>Prescribed burning to be undertaken, ensuring sufficient areas of old age class communities are left within the park. Managed as for assigned fire management zone - see Section 5.1).</p>
Threshold not reached (reached >10 years ago)	This includes areas of vegetation where a fire has occurred at a frequency within the identified vegetation fire thresholds, however the threshold was reached in the past (i.e. >10 years ago).	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.
Threshold not reached (breached >10 years ago)	This includes areas of vegetation where a fire has occurred at a frequency within the identified vegetation fire thresholds, however the threshold was breached in the past (i.e. >10 years ago).	An indication of the number of fires permitted within the life of the plan before threshold is reached is provided.
Not addressed	This includes water bodies and areas mapped as highly disturbed or cleared vegetation. These areas have no identified vegetation community fire thresholds.	Not applicable.

Figure 5 Vegetation Fire Threshold

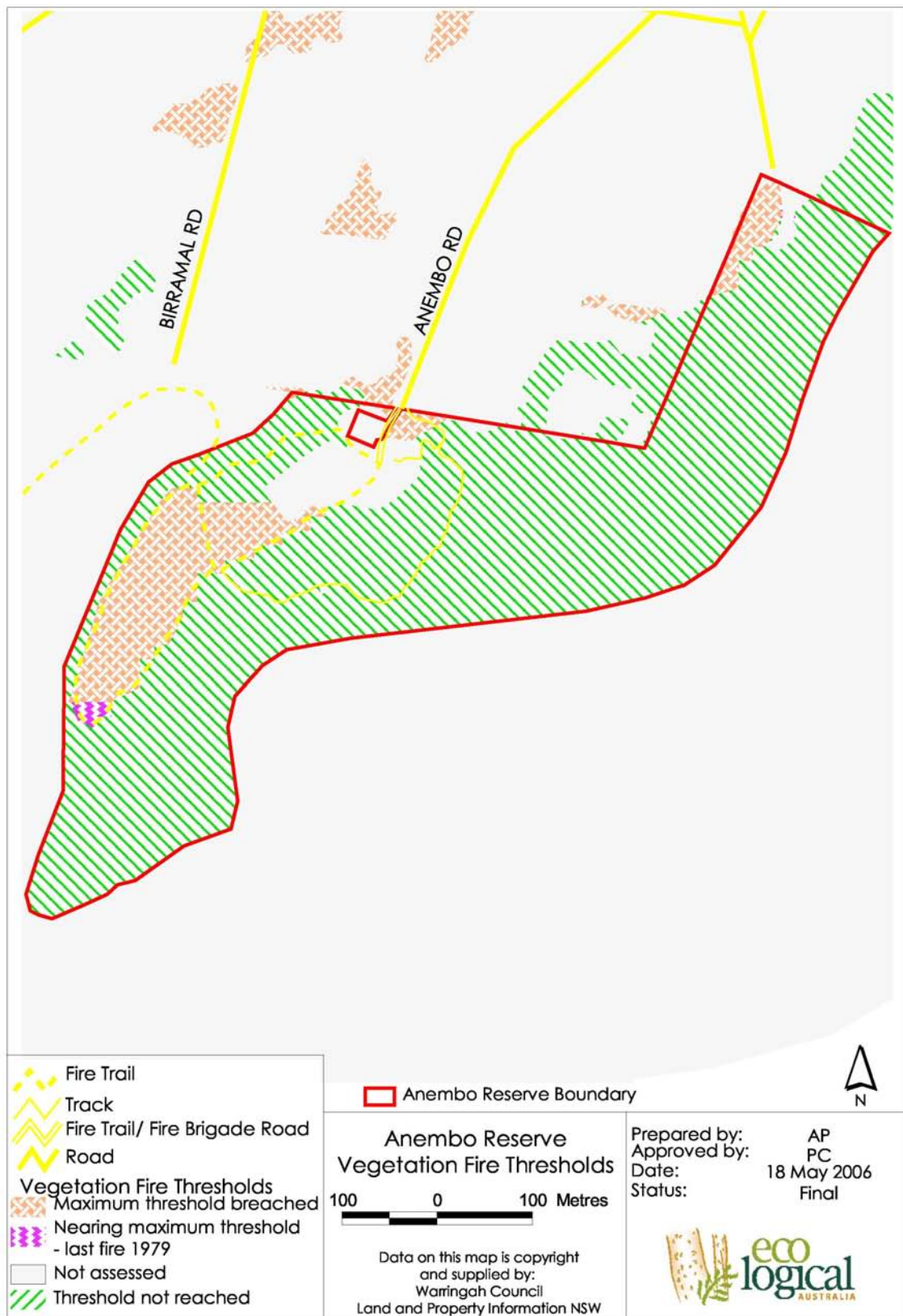
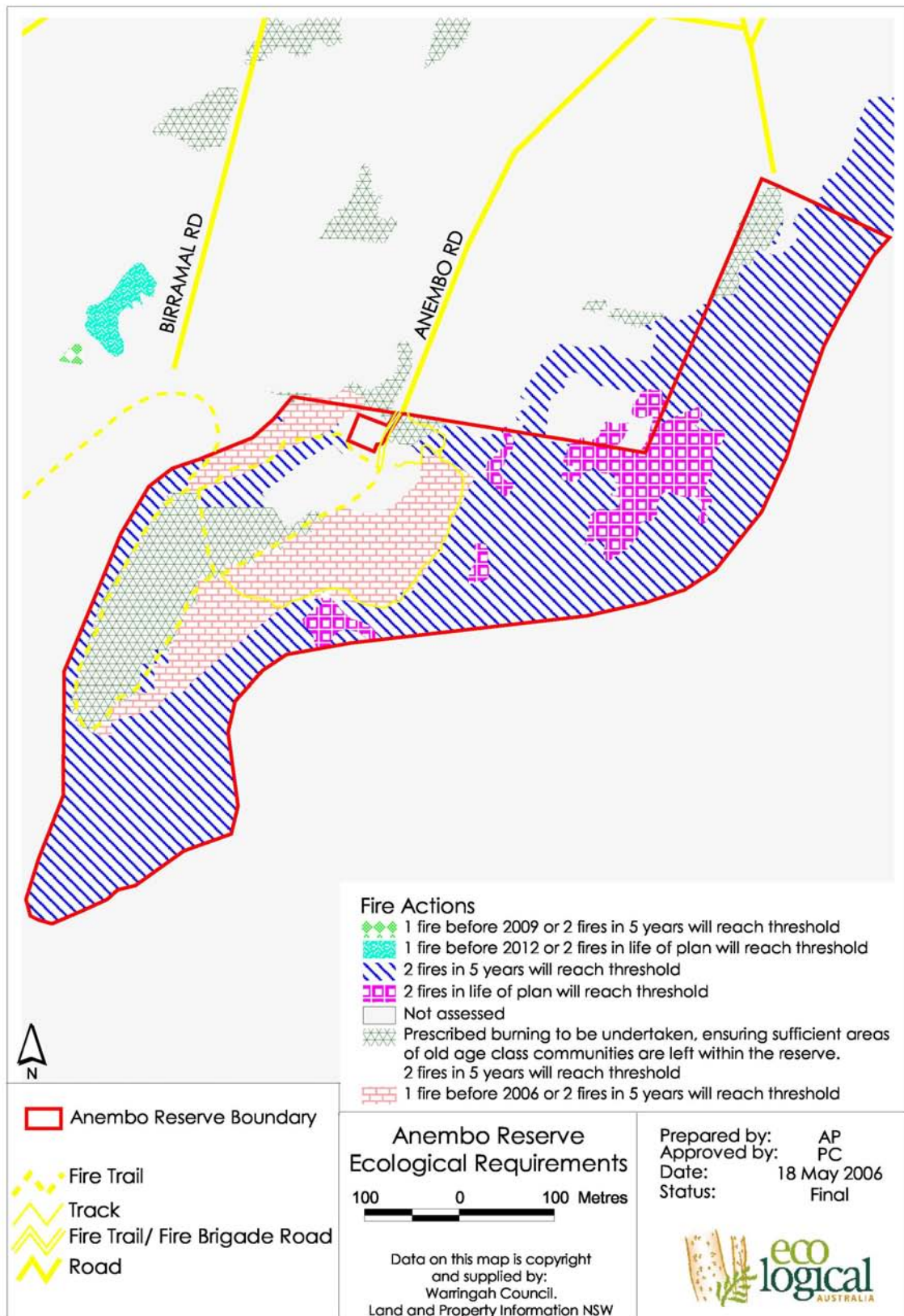


Figure 6 Ecological Fire Requirements



**Table 3 Biodiversity Fire Regime Thresholds for Vegetation Communities identified within Anembo Reserve**

<b>Vegetation Community</b>	<b>Priority</b>	<b>Minimum Fire Interval</b>	<b>Maximum Fire Interval</b>	<b>Fire Restrictions</b>	<b>Reference</b>
Bloodwood-Scribbly Gum Woodland	3	> 2 successive fires in < 5yr intervals	>30	Decline predicted if successive fires occur which totally scorch or consume the tree canopy. Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (WPBFMC 2
Peppermint-Angophora Forest	3	> 2 successive fires in < 5yr intervals	>30	Decline predicted if successive fires occur which totally scorch or consume the tree canopy. Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (WPBFMC 2
Sandstone Heath	3	>2 in quick succession in 8 yr interval, 3 in quick succession each 15 to 30yrs interval	>30		(WPBFMC 2000)

## 5 Operational schedule

The Ku-ring-gai and Garigal National Parks Fire Management Plan (DEC 2005a) has been supplemented by the Ku-ring-gai Chase National Park and Mt Ku-ring-gai Aboriginal Area – Bush Fire Management Strategy (DEC 2005b). This strategy has proposed both zones and burn years within Anembo and the adjacent Ku-ring-gai Chase National Park. These proposals have been considered during the creation of this plan.

Consultation between Council, the RFS and DEC within the next 10 years will be required to review alterations, HR planning and conduct of proposed works.

The operational schedule is explained below and is made up of:

- Prescribed Fire Management Zones
- Prescribed Works Schedule

This may be seen in:

- Figure 7 and 8
- Table 4
- The “Anembo Reserve Fire Regime Management Poster” (Appendix 7, ELA 2006)

### 5.1 Prescribed Fire Management Zones

The following fire management zones have been applied to areas within the Anembo Reserve boundary (see Figure 7, Section 4.5):

- Asset Protection Zones (APZ)
- Land Management Zones (LMZ)

Prescribed APZ widths may be seen in Table 4.

In order to minimise impacts and to allow for effective management, existing tracks, natural features and cleared areas have been used for fire management boundaries where available.

Unlike the DEC proposals, field validation has been conducted to assist in the determination of zone boundaries. To this effect zone boundaries have been altered to match those proposed by DEC where appropriate.

### 5.2 Prescribed Works Schedule

The prescribed works schedule lists the actions required by Council to facilitate implementation of this Plan's objectives.

Prescribed burning within the LMZ has been proposed for selected areas where biodiversity fire regime thresholds are near to or have been exceeded (that is, if the vegetation has not been burned for a long time and is in danger of senescing and losing biodiversity values). Assessed threshold explanation, status and proposed action status can be seen in the following:

- Sections 4.6
- Figure 5 and 6
- Table 2

Proposed HR burning within LMZ 2 is to be conducted as a joint DEC, Council and RFS burn.

The proposed burn in LMZ 3 should avoid the area mapped as ENVIRONMENTAL HAZARD. This area contains a large amount of rubber residue and would be detrimental to both human and bushland health if burnt.

Water quality within the reserve should be protected by the restriction of fire or through limiting fire intensity from within 20 metre of watercourses where possible.

Figure 7 Prescribed Fire Management Zones

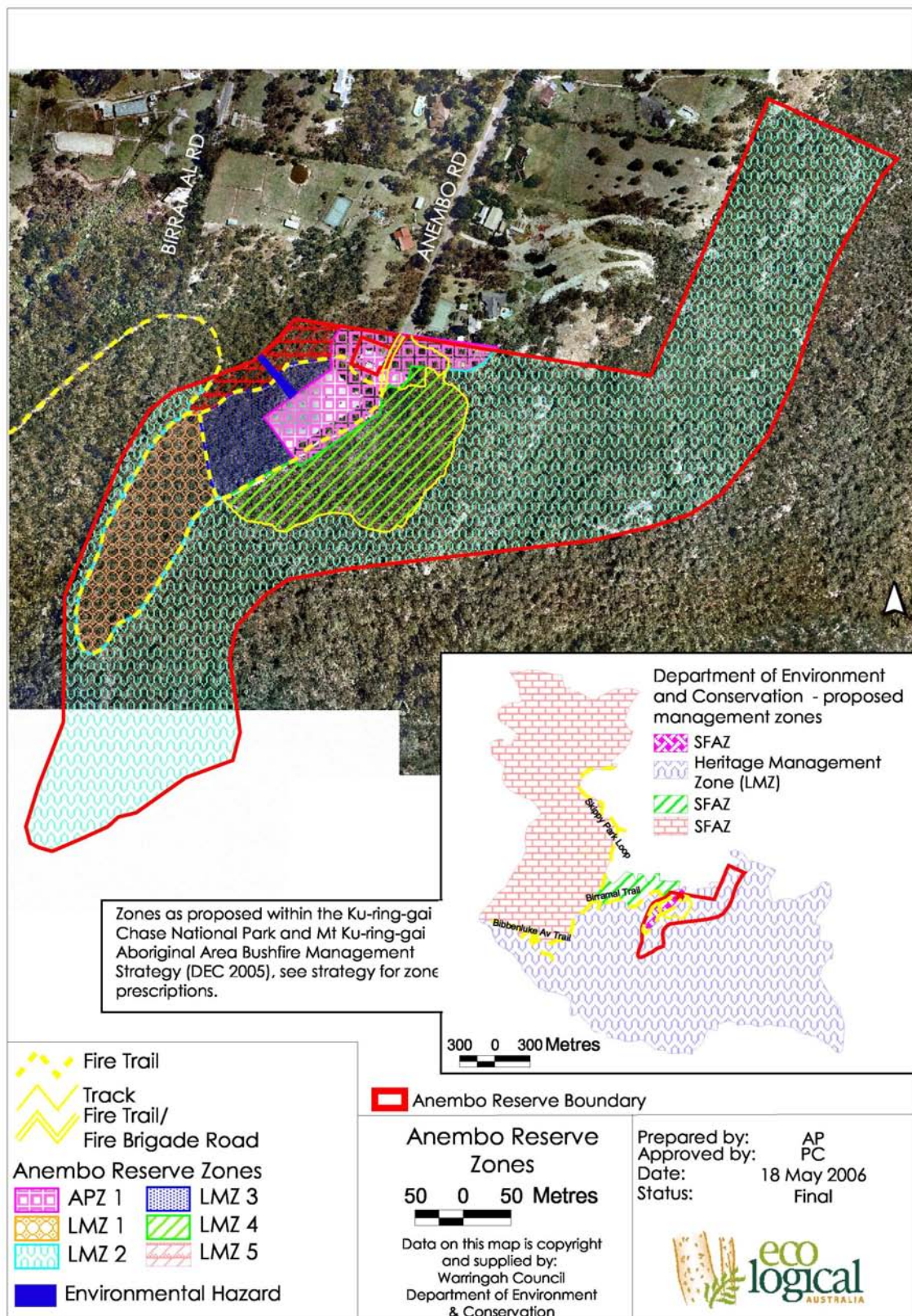


Figure 8 Prescribed Works Schedule

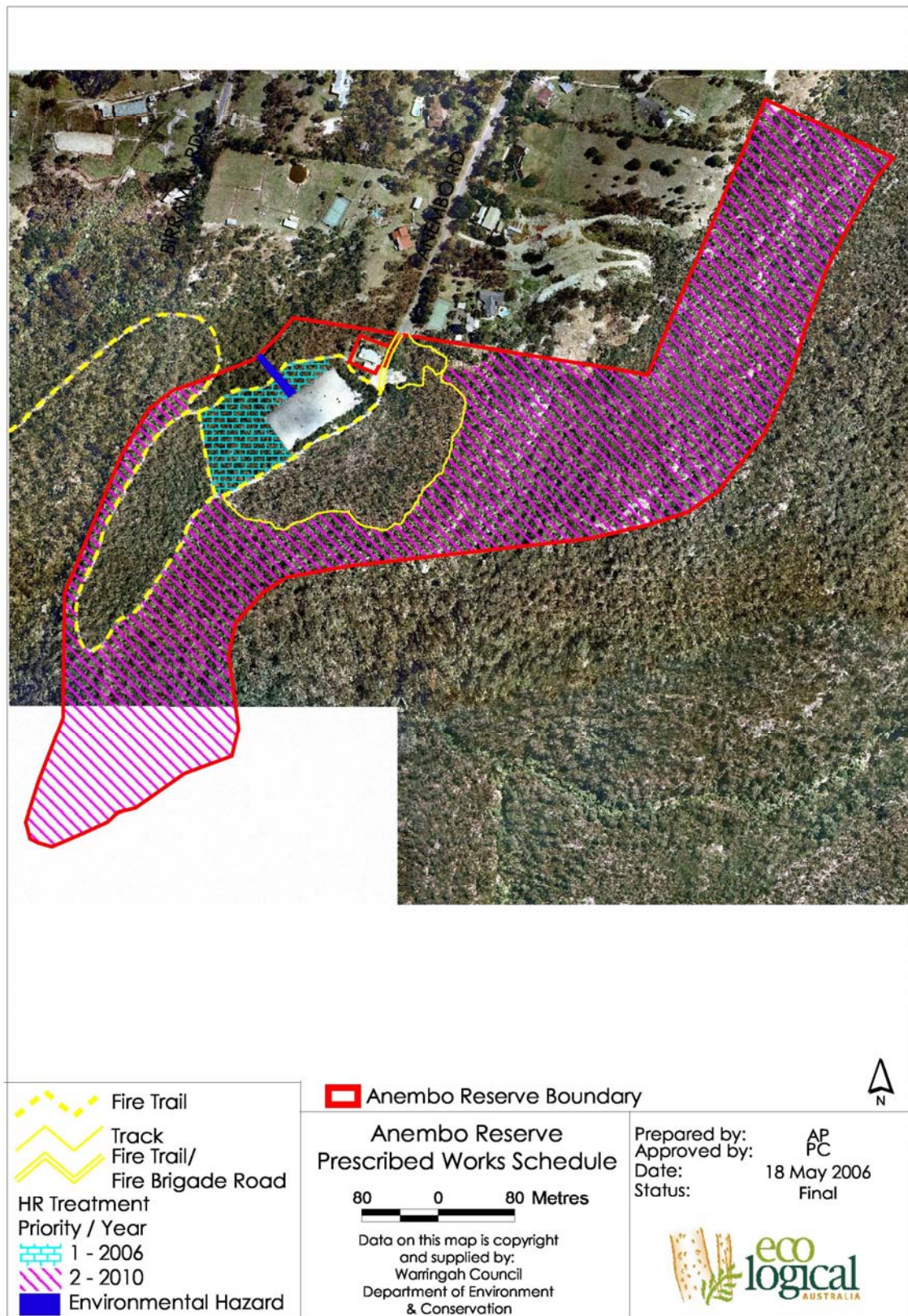


Table 4 Prescribed Operation Schedule for Anembo Reserve

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities <sup>▲</sup>	Land Tenure	APZ Widths
APZ 1	APZ	Initial weed removal and long term weed suppression, slashing/hand removal of fuels within areas of build up	Removal of Pampas grass and Lantana	-	Subject to Council's FMAZ program priorities ♦	Fences, horse riding exercise arena, information board, picnic tables, play ground equipment, BBQ facilities, Duffys Forest Rural Fire Brigade building	-	Department of Lands CCM Warringah Council reserved for Bush Fire Brigade	Based on 30m from assets
LMZ 1	LMZ	-	-	-	-	-	-	Department of Lands, CCM Warringah Council	-
LMZ 2	LMZ	Burning	Liaison with the Warringah Pittwater Bush Fire Management Committee and the Department of Environment and Conservation required regarding the proposed burn year	2	2010	Gate, fences	Red-crowned Toadlet, Heath Monitor, Eastern Pygmy Possum	Department of Lands, CCM Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities <sup>▲</sup>	Land Tenure	APZ Widths
LMZ 3	LMZ	Burning	Exclude area containing rubber - ENVIRONMENTAL HAZARD, Liaison with the Warringah Pittwater Bush Fire Management Committee and the Department of Environment and Conservation required regarding the proposed burn year.	1	2006	-	<i>Eucalyptus camfieldii</i>	Department of Lands, CCM Warringah Council	-
LMZ 4	LMZ	-	-	-	-	-	-	Department of Lands, CCM Warringah Council	-
LMZ 5	LMZ	-	Exclude area containing rubber - ENVIRONMENTAL HAZARD	-	-	Gate, fences	-	Department of Lands, CCM Warringah Council	-

\* Year of burn may vary due to weather and environmental conditions and resource availability

◆ Fire Management Access Zone (FMAZ) priorities dependent on available funds

**Note:**

- No Aboriginal or Cultural Heritage sites recorded in reserve
- It is considered likely that other fauna species recorded within 10km also utilise the area, particularly the Southern Brown Bandicoot, Powerful Owl and Giant Burrowing Frog
- Significant species *Eucalyptus luehmanniana* found within LMZ 2

## **6 Performance measures**

### **6.1 Environmental Assessment of Scheduled Works**

All works proposed within the fire management plan will be assessed for environmental and heritage impacts at the HR planning stage. This will be conducted either under the EP&A Act through a REF or under the Bush Fire Environmental Assessment Code (See Section 2.5). The "Warringah Local Government Area Hazard Reduction Guidelines" (Appendix 4) may be used to assist this process.

### **6.2 Monitoring Fire Regimes and Changes to Biodiversity**

Fire records should be updated as fire incidents occur.

Alteration to fire threshold status resultant from fire occurrences after June 2005 should be assessed annually and at the beginning of HR planning to determine potential management requirements.

This assessment should involve a comparison of required and actual vegetation community and threatened species thresholds and require:

- Updated fire records
- Determination of fire age
- Consideration of required threshold
- Assessment of current threshold status

Assessment of vegetation community threshold status was undertaken in 2005 (see Section 4.6) and is included within:

- Figure 5 and 6
- Digital data provided to Council

### **6.3 Fire Management Plan Review**

The goal of this plan is to guide the management of fire in Anembo Reserve for the next 10 years and to provide a sustainable balance between asset protection and ecosystem management.

#### **Prescribed works schedule assessment**

Assessment of the prescribed works schedule (Section 5.2) and the Warringah Reserve Threatened Flora/Fauna Fire Ecology spreadsheets (ELA 2005a, ELA 2005b) should be undertaken on an annual basis and during HR planning. This should include:

- Incorporation of additional developments in the management of native flora and fauna with respect to fire
- Alterations in fire thresholds (see Section 6.2)

**Fire management plan evaluation**

It is recommended that an evaluation of this plan be conducted at the end of 10 years. The evaluation should involve stakeholder (RFS and DEC) assessment and include:

*Quantitative assessment:*

- Minimum fire thresholds not exceeded
- Number of hectares burnt outside ecological threshold for HR and wildfires
- Maintenance of a mosaic of fire age (vegetation age)
- Maintenance of fuel free and fuel reduced APZ's
- All activities proposed within the Prescribed Work Schedule accepted by the NSW Rural Fire Service (RFS)

*Qualitative assessment:*

- Provision of effective and user friendly instructional guidelines to enable other planning processes. Including:
  - Proficient/successful HR planning
  - Prevention of fire damage to infrastructure
  - Prevention of fire damage to threatened, locally or regionally significant species, endangered populations or endangered ecological communities
  - Protection of Aboriginal and culturally significant sites from fire damage
  - Visit current social attitudes to determine success of proposed management strategies
  - Evaluate feasibility and practicality of prescribed operational schedule

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## Appendix 1 – Vegetation Priority Explanation

Priority 1	EEC (under <i>TSC Act 1995</i> ), or represent potentially important habitat for threatened flora or fauna species (listed under <i>TSC Act 1995</i> ). Particularly if the community is absent or poorly represented in Garigal and Ku-ring-gai Chase National Parks.
Priority 2	Important for conservation of biodiversity at the local level. Communities with a restricted distribution in the Warringah LGA and are absent or poorly represented in Garigal and Ku-ring-gai Chase National Parks. Stands of these communities warrant first priority if they support populations of threatened fauna or flora species.
Priority 3	Communities that are well represented in Garigal and Ku-ring-gai Chase National Parks and common in Warringah. Stands of these communities warrant first priority if they support populations of threatened fauna or flora species.

**Source:** P & J Smith 2003

## Appendix 2 – Known Threatened Flora Within 5km and Threatened Fauna Within 10km of Anembo Reserve

**Table 1 Known threatened flora within 5km of Anembo Reserve\***

Scientific Name	Common Name	Recorded Within Reserve
<i>Callistemon linearifolius</i>		
<i>Darwinia biflora</i>		
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	X
<i>Grammitis stenophylla</i>		
<i>Grevillea caleyi</i>		
<i>Lasiopetalum joyceae</i>		
<i>Leptospermum deanei</i>		
<i>Microtis angusii</i>		
<i>Pimelea curviflora</i> var. <i>curviflora</i>		
<i>Syzygium paniculatum</i>		
<i>Tetratheca glandulosa</i>		

\* **Source:** DEC 2004

**Table 2 Known threatened fauna within 10km of Anembo Reserve**

Scientific Name	Common Name	Recorded Within Reserve	Source
<i>Botaurus poiciloptilus</i>	Australasian Bittern		DEC 2004
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo		DEC 2004
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo		DEC 2004
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	X	DEC 2004
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll		DEC 2004
<i>Esacus neglectus</i>	Beach Stone-curlew		DEC 2004
<i>Heleioporus australiacus</i>	Giant Burrowing Frog		DEC 2004
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)		DEC 2004
<i>Ixobrychus flavicollis</i>	Black Bittern		DEC 2004
<i>Lathamus discolor</i>	Swift Parrot		DEC 2004
<i>Litoria aurea</i>	Green and Golden Bell Frog		DEC 2004
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subsp.)		DEC 2004
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat		DEC 2004
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat		DEC 2004
<i>Neophema pulchella</i>	Turquoise Parrot		DEC 2004
<i>Ninox strenua</i>	Powerful Owl		DEC 2004
<i>Pandion haliaetus</i>	Osprey		DEC 2004
<i>Phascolarctos cinereus</i>	Koala		DEC 2004
<i>Polytelis swainsonii</i>	Superb Parrot		DEC 2004
<i>Pseudophryne australis</i>	Red-crowned Toadlet	X	EEC 2003
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	X	EEC 2003
<i>Ptilinopus superbus</i>	Superb Fruit-Dove		DEC 2004
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat		DEC 2004
<i>Tyto novaehollandiae</i>	Masked Owl		DEC 2004
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	X	EEC 2003
<i>Xanthomyza phrygia</i>	Regent Honeyeater		DEC 2004

## Appendix 3 – Known Significant Flora Within 5km and Significant Fauna Within 10km of Anembo Reserve

**Table 1 Known significant flora within 5km of Anembo Reserve\***

Scientific Name	Common Name	Significance	Recorded Within Reserve	Source
<i>Amperea xiphoclada</i> var. <i>papillata</i>		Nationally significant species		DEC 2004
<i>Angophora crassifolia</i>		Nationally significant species		DEC 2004
<i>Astrotricha floccosa</i>		Biogeographically significant		DEC 2004
<i>Austromyrtus tenuifolia</i>		Biogeographically significant		DEC 2004
<i>Boronia fraseri</i>		Nationally significant species		DEC 2004
<i>Boronia serrulate</i>	Rose Boronia	Nationally significant species		DEC 2004
<i>Centaurium spicatum</i>	Spike Centaury	Threatened in northern Sydney		DEC 2004
<i>Chorizandra sphaerocephala</i>		Threatened in northern Sydney		DEC 2004
<i>Corybas undulates</i>	Tailed Helmet Orchid	Nationally significant species		DEC 2004
<i>Corymbia maculata</i>		Threatened in northern Sydney		DEC 2004
<i>Crowea saligna</i>		Biogeographically significant		DEC 2004
<i>Darwinia diminuta</i>		Nationally significant species		DEC 2004
<i>Darwinia procera</i>		Nationally significant species		DEC 2004
<i>Dillwynia elegans</i>		Biogeographically significant		DEC 2004
<i>Eucalyptus capitellata</i>	Brown Stringybark	Threatened in northern Sydney		DEC 2004
<i>Eucalyptus luehmanniana</i>	Yellow-top Ash	Nationally significant species	X	DEC 2004, EEC 2003
<i>Eucalyptus racemosa</i>	Narrow-leaved Scribbly Gum	Biogeographically significant		DEC 2004
<i>Gahnia erythrocarpa</i>		Biogeographically significant		DEC 2004
<i>Grevillea speciosa</i>	Red Spider Flower	Biogeographically significant		DEC 2004
<i>Logania pusilla</i>		Threatened in northern Sydney		DEC 2004
<i>Lomandra brevis</i>		Nationally significant species		DEC 2004
<i>Lomandra fluviatilis</i>		Nationally significant species		DEC 2004
<i>Microtis parviflora</i>	Slender Onion Orchid	Threatened in northern Sydney		DEC 2004

Scientific Name	Common Name	Significance	Recorded Within Reserve	Source
<i>Persoonia pinifolia</i>	Pine-leaved Geebung	Biogeographically significant		DEC 2004
<i>Phyllota grandiflora</i>		Biogeographically significant		DEC 2004
<i>Plantago debilis</i>		Threatened in northern Sydney		DEC 2004

**Table 2 Known significant fauna within 10km of Anembo Reserve\***

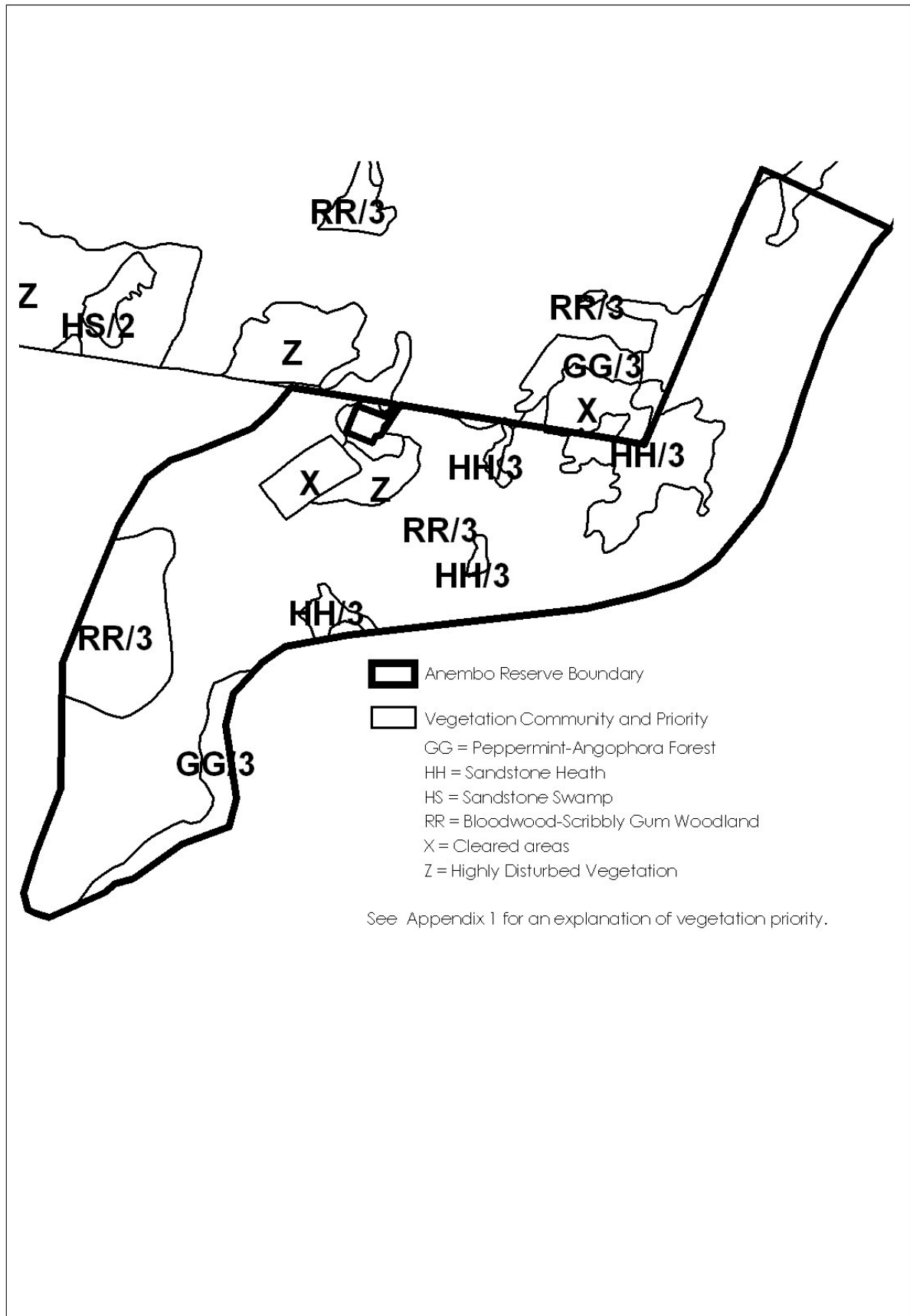
Scientific Name	Common Name	Significance
<i>Acrobates pygmaeus</i>	Feathertail Glider	Threatened in Warringah
<i>Antechinus swainsonii</i>	Dusky Antechinus	Threatened in northern Sydney
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory
<i>Boiga irregularis</i>	Eastern Brown Tree Snake	Threatened in northern Sydney
<i>Diplodactylus vittatus</i>	Eastern Stone Gecko	Threatened in northern Sydney
<i>Furina diadema</i>	Red-naped Snake	Threatened in northern Sydney
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory
<i>Hirundapus caudacutus</i>	White-throated Needletail	Migratory
<i>Hydromys chrysogaster</i>	Water-rat	Threatened in northern Sydney
<i>Lialis burtonis</i>	Burton's Snake-lizard	Threatened in Warringah
<i>Limnodynastes dumerilii</i>	Bullfrog	Threatened in northern Sydney
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	Threatened in northern Sydney
<i>Litoria freycineti</i>	Freycinet's Frog	Threatened in northern Sydney
<i>Monarcha melanopsis</i>	Black-faced Monarch	Migratory
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Migratory
<i>Notechis scutatus</i>	Mainland Tiger Snake	Threatened in northern Sydney
<i>Origma solitaria</i>	Rockwarbler	Biogeographically Significant
<i>Phyllurus platurus</i>	Broad-tailed Gecko	Biogeographically Significant
<i>Pogona barbata</i>	Eastern Bearded Dragon	Threatened in Warringah
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	Threatened in northern Sydney
<i>Pseudophryne bibronii</i>	Bibron's Toadlet	Threatened in northern Sydney
<i>Rattus lutreolus</i>	Swamp Rat	Threatened in northern Sydney
<i>Rhipidura rufifrons</i>	Rufous Fantail	Migratory
<i>Sericornis magnirostris</i>	Large-billed Scrubwren	Threatened in northern Sydney
<i>Sterna caspia</i>	Caspian Tern	Migratory

\* **Source:** DEC 2004

## **Appendix 4 – Warringah Local Government Area Hazard Reduction Guidelines**

## **Appendix 5 – Fire Management Plan Methodology**

## Appendix 6 –Vegetation Community Overlay



## **Appendix 7 – Anembo Reserve Fire Regime Management Poster**