

RED HILL FIRE 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

APZ	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.
Biodiversity fire regime thresholds	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.
Ecosystem	An interactive system between living organisms (plants and animals) and their non living surroundings.
FEZ	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.
Fine fuels	Bark, grass, leaves and twigs less than six millimetres in diameter.
Fire regime	The history of fire in a particular area, including the frequency, intensity and season of burning.
Fuel	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.
Hazard reduction	Works designed to attain planned resource management objectives, primarily the reduction of fire threat. Activities include: <ul style="list-style-type: none"> • Manual and mechanical thinning of vegetation (NOT broad scale clearing) • Controlled burning of a predetermined area, carried out under specified weather and environmental conditions
Inter-fire period	The period of time between successive burns.
IPA	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.

LMZ	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.
Minimum Fire Threshold	The minimum fire frequency permitted before a decline in biodiversity is expected.
Maximum Fire Threshold	The maximum fire frequency permitted before a decline in biodiversity is expected.
OPA	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.
Prescribed burning	A controlled burn to a predetermined area, carried out under specified weather and environmental conditions, designed to achieve planned resource management objectives.
Quick succession	Events occurring within five years of each other.
SFAZ	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.
Treatment Area	Area of land subject to removal or reduction of fuel by manual or mechanical means, or by prescribed burning.
Wildfire	An unplanned fire.

Executive Summary

Red Hill is located in Sydney's Northern Beaches district, approximately 18km from the centre of Sydney. The 5.3 hectare reserve facilitates educational and recreational activities such as bushwalking, picnicking and bike riding. Surrounding land uses include residential development and undeveloped crown land.

The area has a high conservation value, with threatened flora species *Tetratheca glandulosa* and two rare species *Platysace stephensonii* and *Lomandra brevis* being recorded, as well as known habitat for a number of threatened fauna species. No Endangered Ecological Communities (EECs) were found to occur within the reserve.

The existing trail system within the reserve does not meet current best practice. Due to ecological and topographical constraints, as well as past planning decisions, retrospective implementation of fire trails is not considered to be practical. Therefore, access to the reserve for bushfire planning and management shall be managed through; use of existing fire trails, access thorough adjacent residential dwellings and APZ management to allow effective personnel access.

The Management Plan divides the reserve into management zones which include Asset Protection Zones (APZ), Strategic Fire Advantage Zones (SFAZ) and Land Management Zones (LMZ). Existing tracks, natural features and cleared areas have been used for fire management boundaries where available, with proposed management zones covering both Council and privately owned land.

The Plan contains a Prescribed Operations Schedule that specifies treatments, timing and other characteristics. It prescribes numerous hazard reduction burns between 2007 and 2015 as well as slashing, 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 Red Hill.

1.1 Reserve Outline

Red Hill is located in Sydney's Northern Beaches district, approximately 18km from the centre of Sydney. The 5.3 hectare reserve contains the highest point in Warringah, consisting of a plateau with 360° view. See Figure 1 for site location.

Red Hill has high conservation value, containing valuable habitat for a range of threatened and non-threatened native species. Educational and recreational activities such as bushwalking, picnicking and bike riding, form the primary uses within the reserve.

Surrounding land uses include residential development and undeveloped crown land.

Internal assets include a wooden bridge, drainage structures, chairs, water taps, gates and a car park.

The reserve consists of "Community Land" owned by Warringah Council, managed under the Local Government Act 1993.

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 ecological based strategy for fuel management, incorporating the requirement for:
 - Mosaic burn patterns
 - Fire regimes in line 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 Red Hill 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 "Red Hill 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 that 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 4).

2.1 Local Government Act 1993

The NSW *Local Government Act 1993* provides for management of land within a Local Government Area. Under the Act, plans of management must be prepared for 'community land'. Plans should address a variety of factors including biodiversity conservation and management. Councils must adopt a specific plan of management for community land affected by a recovery plan, threat abatement plan or containing critical habitat identified under the TSC Act.

Red Hill is managed as "Community land" under this Act and has a current Plan of Management (KED 2000).

2.2 Red Hill and Golden Grove Parks Plan of Management

This plan was adopted on 25 July 2000 as required under the Local Government Act, 1993 and provides a frame work for managing Red Hill including actions and a landscape concept plan.

The plan identified the urban/bushland interface within the south eastern section of the reserve as High Bush fire Risk and recommends further investigation of risk and management zones in accordance with the Warringah Pittwater Bush fire Risk Management Plan (WPBFMC 2000).

Relevant objectives adopted within the plan following community consultation include:

- Preserve the natural environmental qualities of the area
- Manage and protect the Red Hill and Golden Grove Parks for future generations
- Create a safe healthy and attractive environment
- Manage the parks within the broader perspective of the regional integrated open space system
- Promote ecologically sustainable principles

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

2.3 Management Strategy for Weed Control and Fire Management Access Zones¹

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).

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

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

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

2.4 Rural Fires Act 1997

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

- The prevention, mitigation and suppression of fires
- Coordination and prevention of bush fire fighting
- 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

2.5 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).

2.6 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 Red Hill is 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.

2.7 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.

2.8 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.

2.9 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.

2.10 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.

2.11 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.

2.12 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.

2.13 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.

2.14 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 floristics 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. Past fire history data may therefore 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.

Within Land Management Zone 1 and 2 field validation included the assessment of time since last fire, using growth characteristics of *Banksia ericifolia* (in accordance with Jenkins *et al* 2005 and Lamont 1985) to determine the extent of the 1994 wildfire (see Figure 7 for zone locations and Appendix 5 for methodology limitations). Time since fire within LMZ 1 and 2 was determined to be 24 and 19 years respectively.

Fires mapped within the boundaries of Red Hill occurred between 1993 and 2005. Small spot fires mapped outside the reserve were not included in the analysis.

An analysis of available mapped fire history data showed that approximately 54% of Red Hill Reserve has been burnt since 1952. The most recent fire event occurred in 2005. Fire seems to have been concentrated in the south and west of the reserve.

See the "Red Hill Fire Regime Management Poster" (Appendix 7, ELA 2006) for a map of recorded fire history, including approximate *Banksia ericifolia* locations.

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 this 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.
- The 2005 fire within LMZ 1, was not included within fuel load assessments

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:

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

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

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

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 on-site include drainage structures, a wooden bridge, chairs, tables, gates and a car park.

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 Bush Fire Risk Management Plan (WPBFMC 2000) and the Red Hill Plan of Management (KED 2000). AHIMS data has been provided in digital GIS format and is intended to flag known cultural heritage issues for consideration during HR planning.

Whilst no known items of Aboriginal or European heritage were identified within the reserve, a number of Aboriginal sites have been recorded within the surrounding areas. The management plan (KED 2000) also notes that the existence of the Governor Philip Memorial near the sites reflects the importance of highland areas to early settlers and explorers.

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)
- Flora and fauna Assessment of Red Hill and Golden Grove Parks at Beacon Hill (P & J Smith 1998)

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.

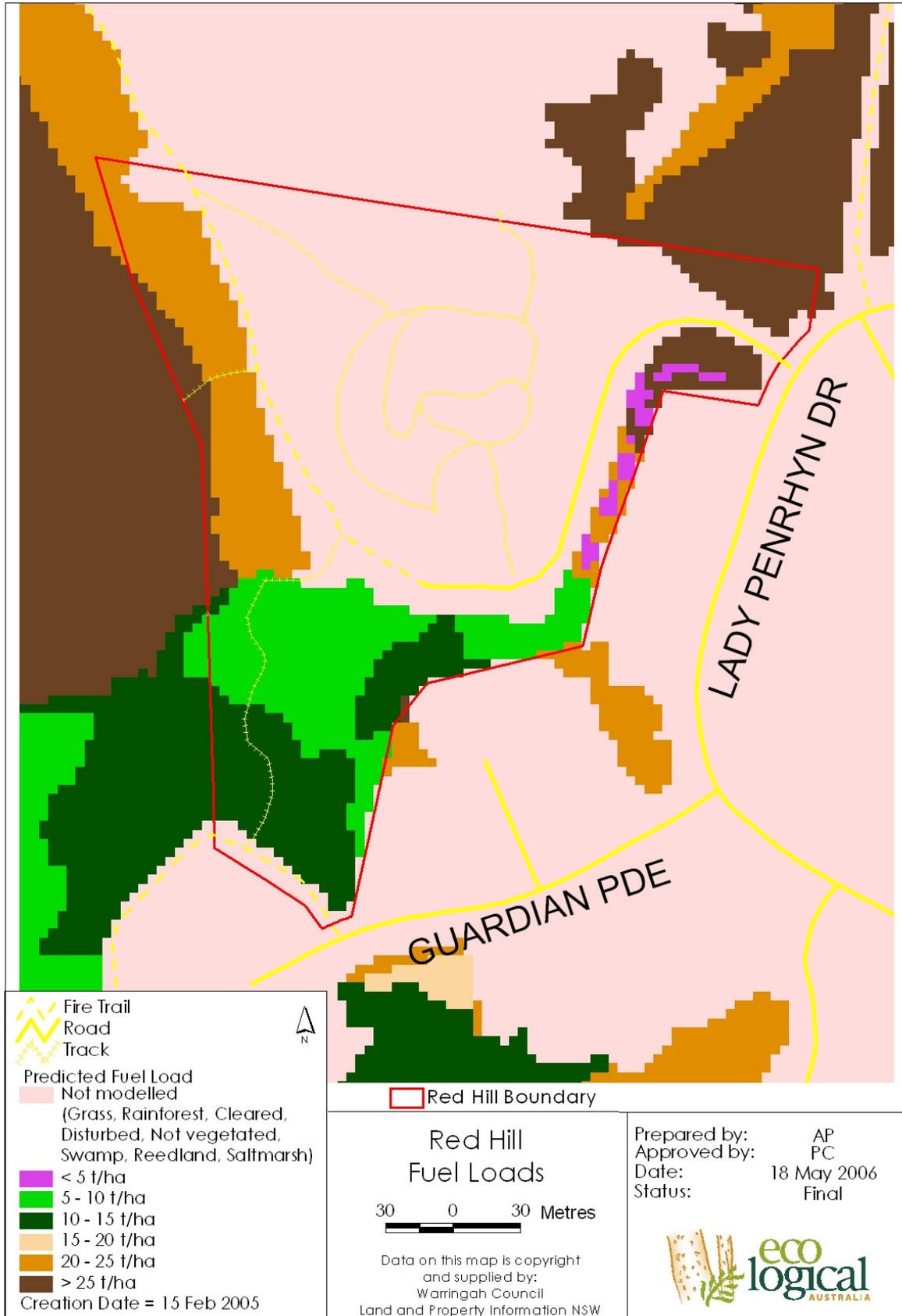
Table 1 Vegetation Communities of Red Hill

Vegetation Community	Map Code	State Legislative Status (TSC Act 1995)	LGA Priority
Bloodwood-Scribbly Gum Woodland	RR	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 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.

Species identified within the above proximity may be seen in Appendix 2 and include:

- 40 threatened fauna species
- 45 national, regional or locally significant fauna species
- 7 threatened flora species
- 24 national, regional or locally significant flora species

The threatened flora species *Tetratheca glandulosa* and two rare species *Platysace stephensonii* and *Lomandra brevis* have been recorded within the reserve. In addition to this two termite mounds have been recorded, indicating the presence of Heath Monitor (*Varanus rosenbergi*) habitat. Numerous bandicoot diggings (likely to be either the Southern Brown Bandicoot or the Long Nosed Bandicoot) have also been observed within the reserve.

Fire requirements for threatened flora and fauna identified within the reserve were considered during creation of the operational schedule. These 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, was 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. This includes 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. Field assessment is therefore advised at HR planning stage.

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 owned by adjacent residents 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 NSW Fire Brigade (FB) and RFS are 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; those including private properties may require landowner's cooperation. Council have no responsibility for land not under their management.

4.3 Fire Trails and Tracks

The existing trail system within the reserve does not provide sufficient access in line with PBP and best practice management. In order to satisfy such requirements trails would need to be established between the reserve and residential houses, along the eastern edge of the reserve.

However, ecological and topographical constraints, as well as past planning decisions, render retrospective implementation of fire trails impractical in this case.

Access is to be managed by:

- APZ management to allow effective personnel access as required

- Use of residential dwellings
- Use of existing fire trails

Maintenance of mapped fire trails within the reserve and adjacent crown land areas should be undertaken. Signage maps showing trails within the reserve are 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.

4.4 Introduced Species Management

Weed management

Weed management has been considered as a component of proposed fire management within Red Hill.

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; weed recording focused on 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 equipment such as mowers, and the removal of dead vines from trees, as these features can Council as wicks for fire to spread into canopy.

Feral fauna management

Fire may increase the impact of feral fauna species by a reduction in protective ground cover for prey species. Control of feral species should therefore 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).

No evidence of feral species were observed during field surveys.

Figure 4 Recorded Weed Presence Within Red Hill



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	Comments
1	<i>Acacia saligna</i>	
2	Whisky grass	
3	Pampas grass	
4	Pampas grass	
5	Pampas grass, <i>Pittosporum undulatum</i>	
6	Lantana	Small single individual
7	Pampas grass	
8	<i>Acacia saligna</i>	Single individual
9	Lantana	Small infestation

Red Hill
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

- APZ areas may be burnt as appropriate dependant on management issues

IPA:

- To maintain minimum ground fuel loads by raking and slashing to less than 40cm in height, with discontinuous shrub and canopy layers. Reduction techniques will include:
 - removal/ suppression of weeds
 - thinning of regrowth
 - hand removal
 - raking and slashing
- Trees should not over-hang buildings

OPA:

- To maintain reduced ground fuel loads and maintain understorey to less than 50cm in height. Reduction techniques will include:
 - removal/ suppression of weeds
 - thinning of regrowth
 - hand removal

- raking and slashing

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. This assessment did not include the 2005 fire event in LMZ 1.

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:

- immediate response and rapid suppression in the event of a wildfire, to minimise the burnt area
- Use of prescribed burning to reduce the threat of wildfire whilst maintaining varying fire ages

When identifying if an area has 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 (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 (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

Ecological Thresholds	Explanation	Ecological Fire Requirements
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.	<p>• 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.</p> <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 reserve. 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 reserve. 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.

Ecological Thresholds	Explanation	Ecological Fire Requirements
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"> • 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. <p>Prescribed burning to be undertaken, ensuring sufficient areas of old age class communities are left within the reserve. 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

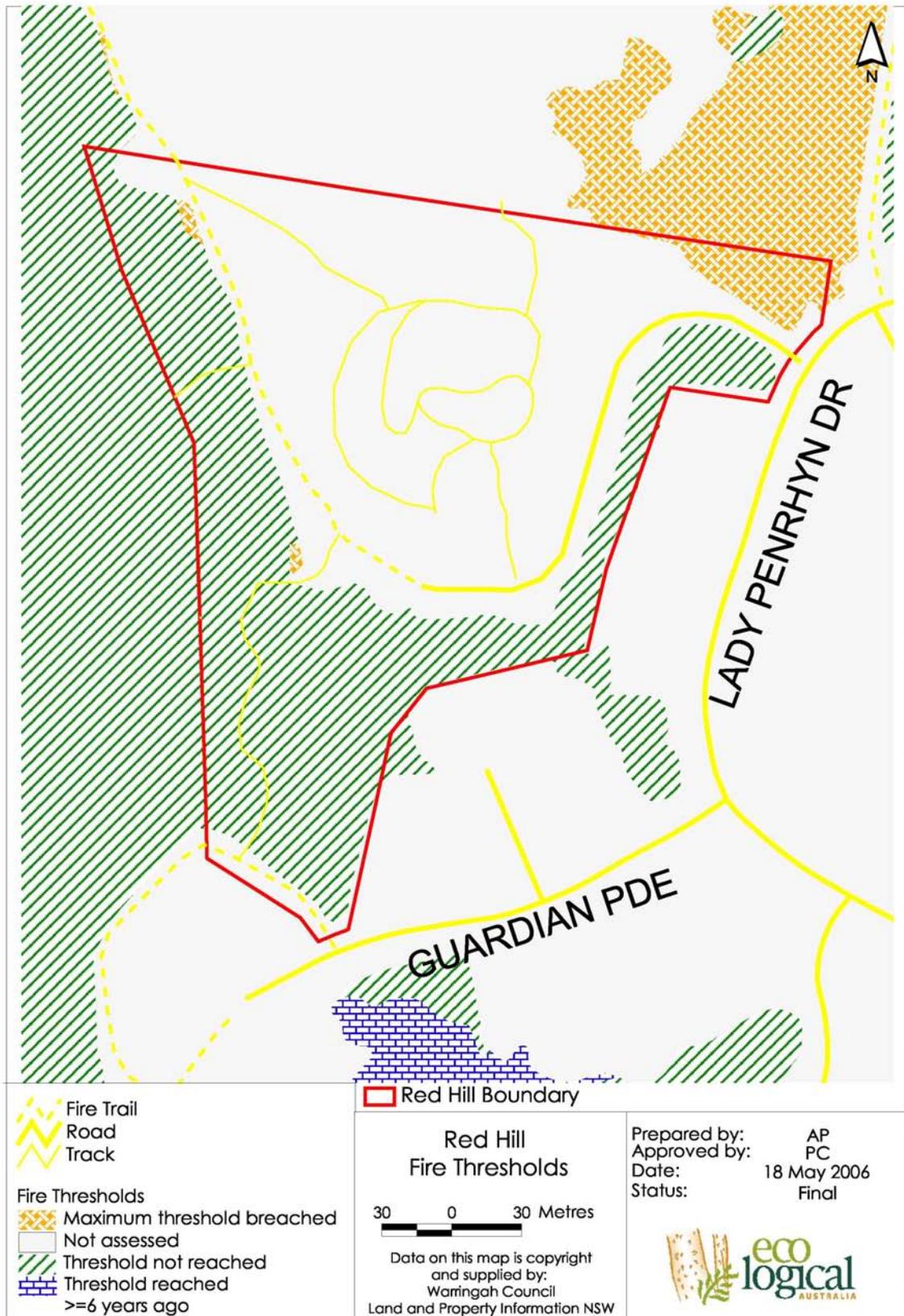


Figure 6 Ecological Fire Requirements

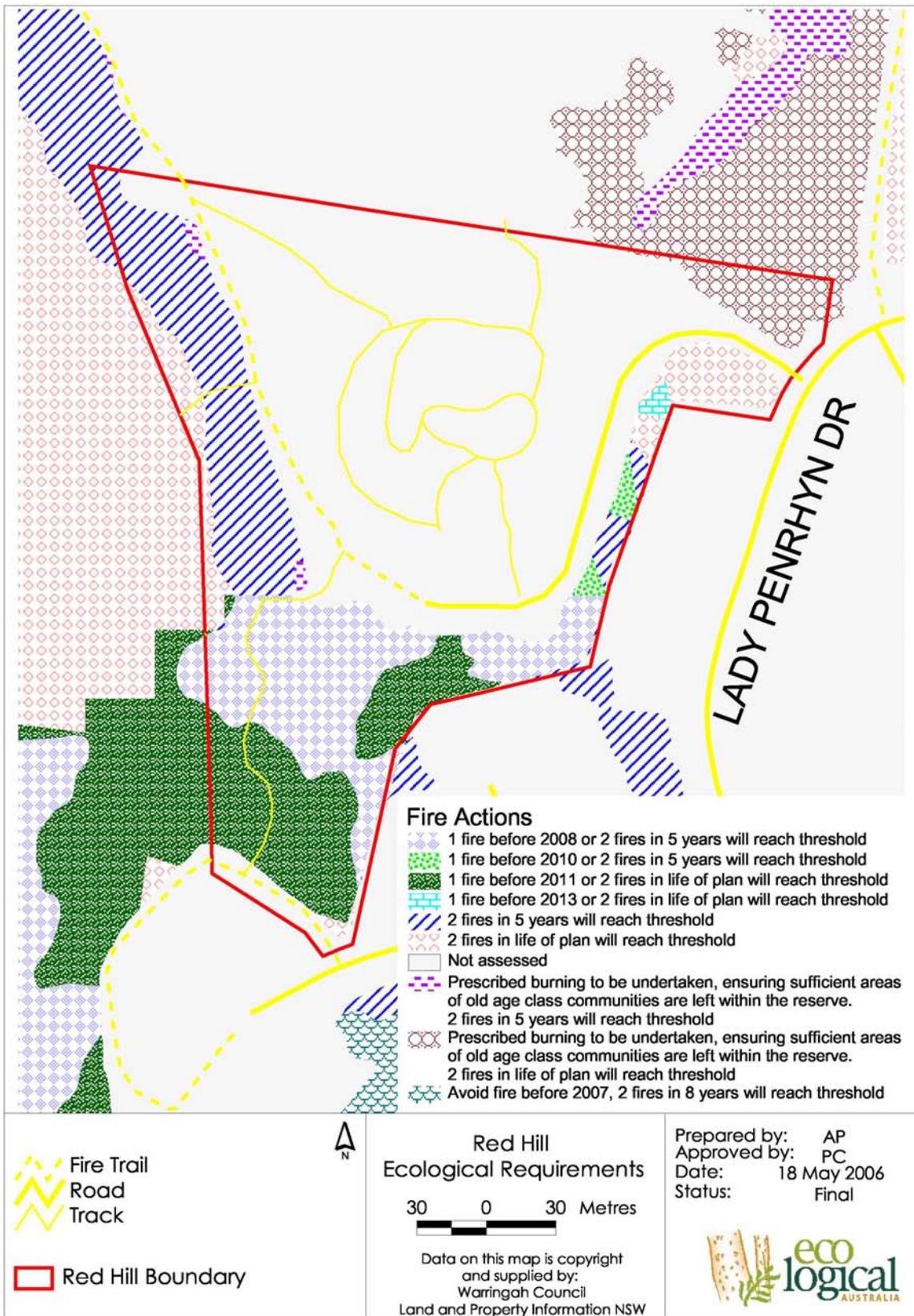


Table 3 Biodiversity Fire Regime Thresholds for Vegetation Communities identified within Red Hill

Vegetation community	Priority	Minimum Fire Interval	Maximum Fire Interval	Fire Restrictions	Reference
Bloodwood-Scribbly Gum Woodland	3	> 2 successive fires in < 5yr intervals	>30	Decline predicted if successive fires occur within which tree canopy totally scorch or consumed.	(Bradstock NPWS 1996 cited in Conacher Travers Pty Ltd 2002), (WPBFMC 2000)
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 operational schedule is explained below and is made up of the:

- Prescribed Fire Management Zones
- Prescribed Works Schedule

This may be seen in:

- Figure 7 and 8
- Table 4
- The "Red Hill Fire Regime Management Poster" (Appendix 7, ELA 2006)

5.1 Prescribed Fire Management Zones

The following fire management zones have been identified:

- Asset Protection Zones (APZ)
- Land Management Zones (LMZ)
- Strategic Fire Advantage Zones (SFAZ)

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.

5.2 Prescribed Operational Schedule

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

An assessment of the proposed works should be undertaken at HR planning stage, to reassess the requirement for proposed works. This should review the occurrence of:

- Wildlife
- Additional development, resulting in a reduction/ removal of requirement for treatment

In order to maintain **SFAZ** within prescribed fuel load limits whilst maintaining ecological integrity:

- Dominant vegetation types were identified within each SFAZ
- The maximum prescribed fuel load for each SFAZ was then entered into the fuel accumulation model (see Section 3.2.1 and 3.2.2) to provide a guide for required burn year
- The burn year was evaluated against identified ecological fire thresholds (see 4.6) and known threatened species fire intervals (see ELA 2005a and ELA 2005b)

Prescribed burning within **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

A review of fuel loads within SFAZ 2 is required in 2014 in order to determine if the 2015 proposed burn is required, to maintain the zone below its maximum fuel loading of 18 tonnes per ha.

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

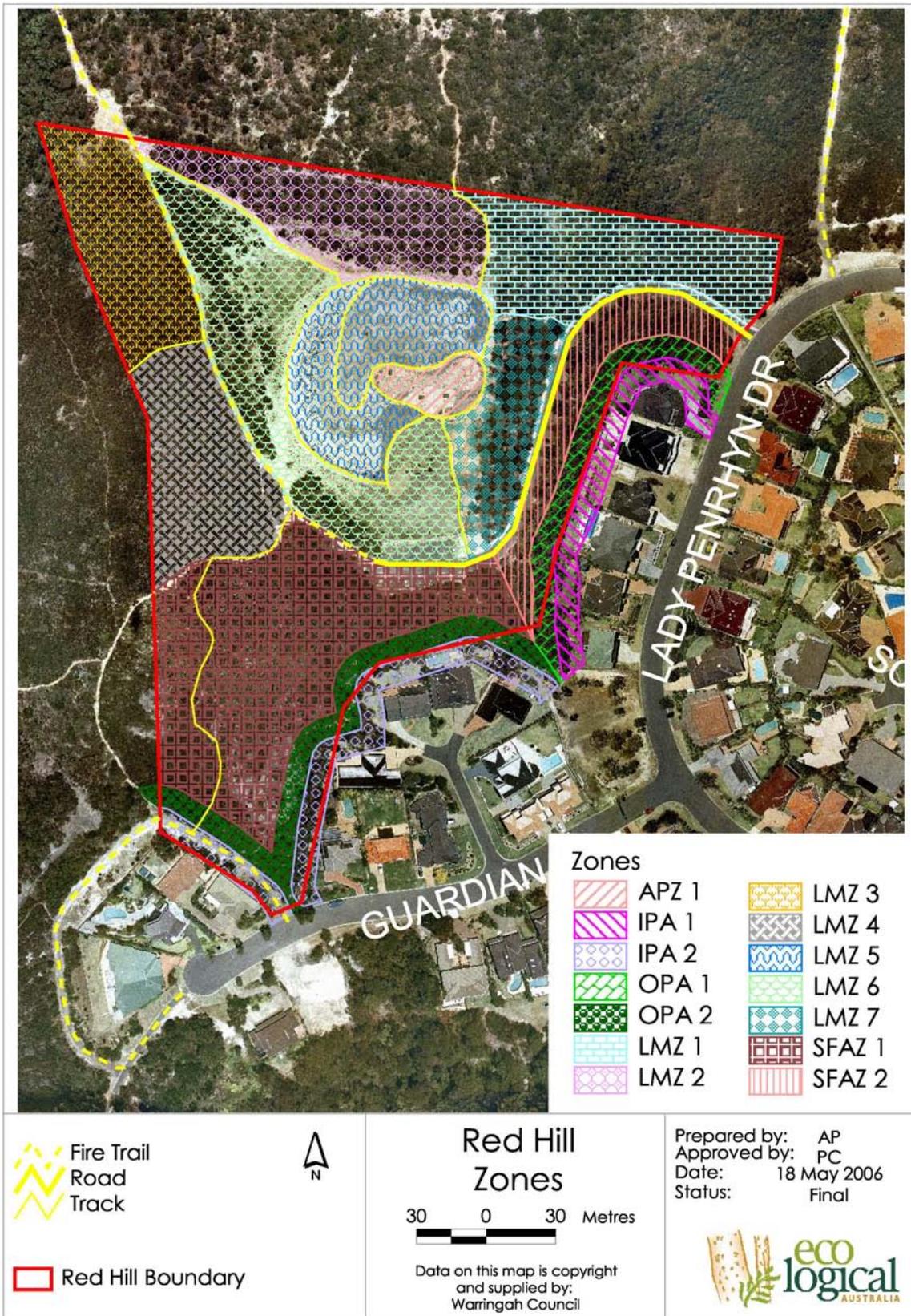


Figure 8 Prescribed Works Schedule

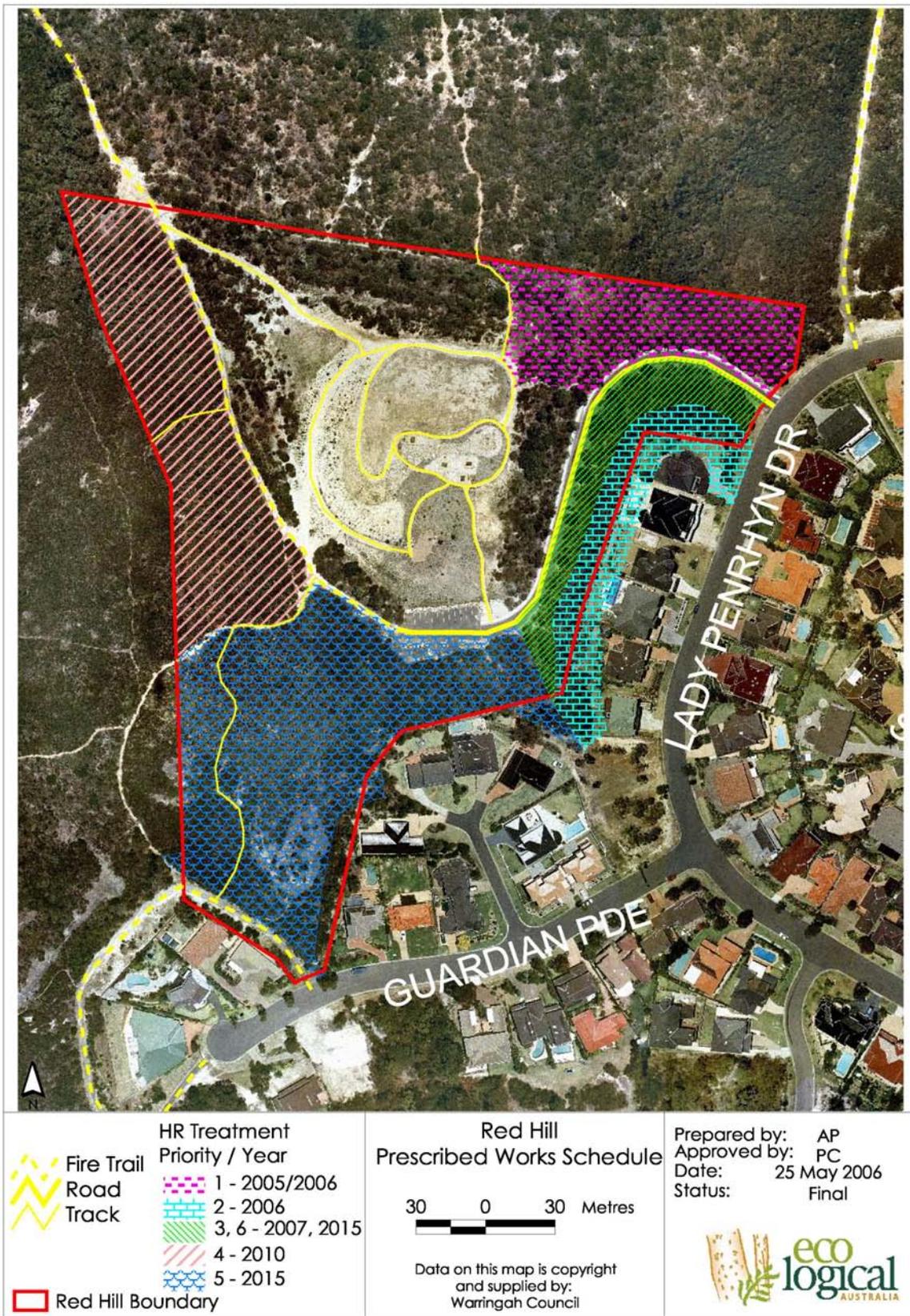


Table 4 Prescribed Operation Schedule for Red Hill

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Land Tenure	APZ Widths
APZ 1	APZ	Slashing/hand removal of fuels within areas of build up, long term weed suppression	-	-	Subject to Council's FMAZ program priorities♦	Wooden bridge, table, chairs	-	Warringah Council	APZ applied to logical fire trail boundary
IPA 1	APZ	Initial weed removal and long term weed suppression, slashing/hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 2 - Manual works	Removal of dead <i>Banksia ericifolia</i>	2	2006	-	-	Warringah Council, private land	10m Inner Protection Area, 10m Outer Protection Area
IPA 2	APZ	Initial weed removal and long term weed suppression, slashing/hand removal of fuels within areas of build up	-	-	Subject to Council's FMAZ program priorities♦	-	-	Warringah Council, private land	10m Inner Protection Area, 10m Outer Protection Area
OPA 1	APZ	Initial weed removal and long term weed suppression, slashing/hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 2 - Manual works	Removal of dead <i>Banksia ericifolia</i>	2	2006	-	-	Warringah Council	10m Inner Protection Area, 10m Outer Protection Area
OPA 2	APZ	Initial weed removal and long term weed suppression, slashing/hand removal of fuels within areas of build up. Treatment to be undertaken for Priority 4 - Burning	-	5	2015	-	-	Warringah Council	10m Inner Protection Area, 10m Outer Protection Area

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Land Tenure	APZ Widths
LMZ 1	LMZ	Burning and weed control	-	1	2005/2006	Car park, gate, drainage structure	-	Warringah Council	-
LMZ 2	LMZ	-	-	-	-	Gate	-	Warringah Council	-
LMZ 3	LMZ	Burning	-	4	2010	Gate	Termite mound - heath monitor habitat	Warringah Council	-
LMZ 4	LMZ	Burning	-	4	2010	-	-	Warringah Council	-
LMZ 5	LMZ	-	-	-	-	-	-	Warringah Council	-
LMZ 6	LMZ	-	-	-	-	Car park, gate	-	Warringah Council	-
LMZ 7	LMZ	-	-	-	-	Car park, gate, drainage structure	-	Warringah Council	-
SFAZ 1	SFAZ	Burning and weed control	-	5	2015	Timber bollards, sleepers/ stairs, car park, gate	<i>Tetratheca glandulosa</i>	Warringah Council	-

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities	Land Tenure	APZ Widths
SFAZ 2	SFAZ	Burning	Removal of dead <i>Banksia ericifolia</i>	3, 6	2007, 2015	-	Termite mound - heath monitor habitat	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:

- Significant species *Platysace stephensonii* and *Lomandra brevis* found within SFAZ 1. *Persoonia hirsuta* identified within areas outside the reserve.
- Potential habitat for Southern Brown Bandicoot, Red-crown Toadlet and Heath Monitor (termite mounds present).
- No Aboriginal or Cultural Heritage sites recorded in reserve

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 an 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 Red Hill 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 Red Hill

Table 1 Known threatened flora within 5km of Red Hill

Scientific Name	Common Name	Recorded Within Reserve	Source
<i>Acacia bynoeana</i>	Bynoe's Wattle		DEC 2004
<i>Chamaesyce psammogeton</i>			DEC 2004
<i>Genoplesium baueri</i>			DEC 2004
<i>Grevillea caleyi</i>			DEC 2004
<i>Persoonia hirsuta</i>			Anecdotal sighting by Skelton N (details through Warringah Council pers. comm.)
<i>Pimelea curviflora</i> var. <i>curviflora</i>			DEC 2004
<i>Syzygium paniculatum</i>			DEC 2004
<i>Tetralthea glandulosa</i>		X	DEC 2004, P & J Smith 1998

Table 2 Known threatened fauna within 10km of Red Hill *

Scientific Name	Common Name
<i>Botaurus poiciloptilus</i>	Australasian Bittern
<i>Calidris alba</i>	Sanderling
<i>Calidris tenuirostris</i>	Great Knot
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo
<i>Cercartetus nanus</i>	Eastern Pygmy-possum
<i>Charadrius leschenaultii</i>	Greater Sand Plover
<i>Charadrius mongolus</i>	Lesser Sand Plover
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Diomedea exulans</i>	Wandering Albatross
<i>Esacus neglectus</i>	Beach Stone-curlew
<i>Gygis alba</i>	White Tern
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher
<i>Haematopus longirostris</i>	Pied Oystercatcher
<i>Heleioporus australiacus</i>	Giant Burrowing Frog
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)
<i>Ixobrychus flavicollis</i>	Black Bittern
<i>Lathamus discolor</i>	Swift Parrot
<i>Litoria aurea</i>	Green and Golden Bell Frog
<i>Macronectes giganteus</i>	Southern Giant-Petrel
<i>Macronectes halli</i>	Northern Giant-Petrel
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat
<i>Ninox strenua</i>	Powerful Owl
<i>Pandion haliaetus</i>	Osprey
<i>Phascolarctos cinereus</i>	Koala
<i>Phoebastria fusca</i>	Sooty Albatross
<i>Pseudophryne australis</i>	Red-crowned Toadlet
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove
<i>Ptilinopus superbus</i>	Superb Fruit-Dove
<i>Puffinus assimilis</i>	Little Shearwater
<i>Puffinus carneipes</i>	Flesh-footed Shearwater
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Sterna albifrons</i>	Little Tern
<i>Sterna fuscata</i>	Sooty Tern
<i>Thalassarche cauta</i>	Shy Albatross
<i>Thalassarche melanophris</i>	Black-browed Albatross
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Varanus rosenbergi</i>	Rosenberg's Goanna
<i>Xanthomyza phrygia</i>	Regent Honeyeater

* **Source:** DEC 2004

* No species identified within the reserve

Appendix 3 – Known Significant Flora Within 5km and Significant Fauna Within 10km of Red Hill

Table 1 Known significant flora within 5km of Red Hill

Scientific Name	Common Name	Significance	Recorded Within Reserve	Source
<i>Angophora crassifolia</i>		Nationally significant species		DEC 2004
<i>Angophora hispida</i>	Dwarf Apple	Biogeographically significant		DEC 2004
<i>Arthrochilus prolixus</i>		Threatened in northern Sydney		DEC 2004
<i>Boronia fraseri</i>		Nationally significant species		DEC 2004
<i>Boronia thujona</i>		Biogeographically significant		DEC 2004
<i>Corybas undulatus</i>	Tailed Helmet Orchid	Nationally significant species		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>Eucalyptus luehmanniana</i>	Yellow-top Ash	Nationally significant species		DEC 2004
<i>Eucalyptus robusta</i>	Swamp Mahogany	Threatened in northern Sydney		DEC 2004
<i>Eucalyptus stricta</i>	Mallee Ash	Threatened in northern Sydney		DEC 2004
<i>Gonocarpus salsoloides</i>		Nationally significant species		DEC 2004
<i>Grevillea speciosa</i>	Red Spider Flower	Biogeographically significant		DEC 2004
<i>Lomandra brevis</i>		Nationally significant species	X	DEC 2004, P & J Smith 1998
<i>Lomandra fluviatilis</i>		Nationally significant species		DEC 2004
<i>Melaleuca thymifolia</i>		Threatened in northern Sydney		DEC 2004
<i>Melichrus procumbens</i>	Jam Tarts	Threatened in northern Sydney		DEC 2004
<i>Persoonia pinifolia</i>	Pine-leaved Geebung	Biogeographically significant		DEC 2004
<i>Plantago hispida</i>		Threatened in northern Sydney	X	DEC 2004, P & J Smith 1998
<i>Rulingia hermanniifolia</i>		Nationally significant species		DEC 2004
<i>Scaevola calendulacea</i>		Threatened in northern Sydney		DEC 2004
<i>Platysace stephensonii</i>		ROTAP listed	X	KED 2000

Table 2 Known significant fauna within 10km of Red Hill*

Scientific Name	Common Name	Significance
<i>Anous stolidus</i>	Common Noddy	Migratory
<i>Antechinus swainsonii</i>	Dusky Antechinus	Threatened in northern Sydney
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory
<i>Arenaria interpres</i>	Ruddy Turnstone	Migratory
<i>Boiga irregularis</i>	Eastern Brown Tree Snake	Threatened in northern Sydney
<i>Calidris ruficollis</i>	Red-necked Stint	Migratory
<i>Charadrius bicinctus</i>	Double-banded Plover	Migratory
<i>Chlidonias leucopterus</i>	White-winged Black Tern	Migratory
<i>Diplodactylus vittatus</i>	Eastern Stone Gecko	Threatened in northern Sydney
<i>Egretta sacra</i>	Eastern Reef Egret	Migratory
<i>Furina diadema</i>	Red-naped Snake	Threatened in northern Sydney
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	Migratory
<i>Heteroscelus incanus</i>	Wandering Tattler	Migratory
<i>Hirundapus caudacutus</i>	White-throated Needletail	Migratory
<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>Limosa lapponica</i>	Bar-tailed Godwit	Migratory
<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>Numenius madagascariensis</i>	Eastern Curlew	Migratory
<i>Origma solitaria</i>	Rockwarbler	Biogeographically Significant
<i>Philomachus pugnax</i>	Ruff	Migratory
<i>Phyllurus platurus</i>	Broad-tailed Gecko	Biogeographically Significant
<i>Plegadis falcinellus</i>	Glossy Ibis	Migratory
<i>Pluvialis squatarola</i>	Grey Plover	Migratory
<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>Puffinus griseus</i>	Sooty Shearwater	Migratory
<i>Puffinus pacificus</i>	Wedge-tailed Shearwater	Migratory
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater	Migratory
<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>Stercorarius longicaudus</i>	Long-tailed Jaeger	Migratory
<i>Stercorarius pomarinus</i>	Pomarine Jaeger	Migratory
<i>Sterna caspia</i>	Caspian Tern	Migratory
<i>Sterna hirundo</i>	Common Tern	Migratory
<i>Sterna paradisaea</i>	Arctic Tern	Migratory
<i>Tringa nebularia</i>	Common Greenshank	Migratory
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Migratory
<i>Anous stolidus</i>	Common Noddy	Migratory

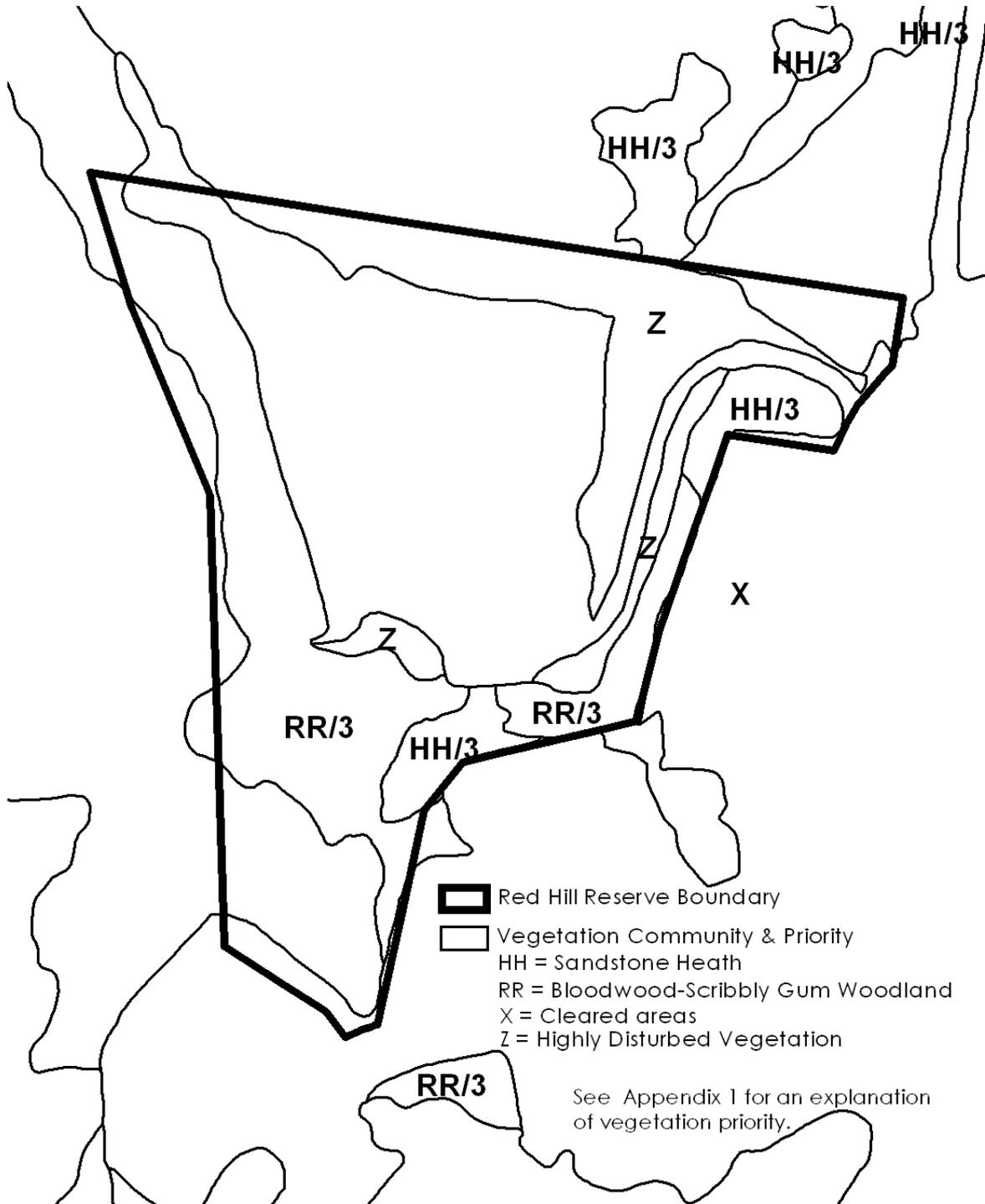
* **Source:** DEC 2004

* No species identified within the reserve

Appendix 4 – Warringah Local Government Area Hazard Reduction Guidelines

Appendix 5 – Fire Management Plan Methodology

Appendix 6 –Vegetation Community Overlay



Appendix 7 – Red Hill Fire Regime Management Poster