

JJ MELBOURNE HILLS MEMORIAL RESERVE AND ADJOINING COMMUNITY LAND FIRE REGIME MANAGEMENT PLAN



Report prepared for:
Warringah Council
(Project No. 57-14)

May 2006

Document Tracking

Item	Detail	Signature
Project Name	Warringah FMP Finalisation (Batch 1 & 2)	
Project Number	57 – 14	
Prepared by	Penny Colyer	Alistair Patton
Prepared by	Darren James	Cate Gillies
Approved by	SH	
Status	Final	
Version Number	2	
File location	G:\Current_Projects\Councils\Warringah\Warringah FMP Finalisation (Batch 1 & 2) (57-14)	
Date	19 May 2006	

Acknowledgements

This document has been prepared by and is copyright of Eco Logical Australia Pty Ltd. Eco Logical Australia wishes to thank the following people for their input into the project:

Warringah Council: Steve Atkins, Stuart Withington

Rural Fire Service: George Sheppard

Department of Environment and Conservation: Tony Auld

Disclaimer

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

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

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.

Contents

GLOSSARY OF TERMS	1
EXECUTIVE SUMMARY	3
1 INTRODUCTION	4
1.1 RESERVE OUTLINE	4
1.2 MANAGEMENT PLAN OBJECTIVES	4
1.3 REPORT STRUCTURE.....	5
1.4 ASSUMPTIONS.....	5
2 LEGISLATIVE AND PLANNING INSTRUMENTS	7
2.1 LOCAL GOVERNMENT ACT 1993.....	7
2.2 JJ MELBOURNE HILLS MEMORIAL RESERVE AND ADJOINING COMMUNITY LAND, PLAN OF MANAGEMENT	7
2.3 MANAGEMENT STRATEGY FOR WEED CONTROL AND FIRE MANAGEMENT ACCESS ZONES	7
2.4 RURAL FIRES ACT 1997	8
2.5 BUSH FIRE ENVIRONMENT ASSESSMENT CODE.....	8
2.6 PLANNING FOR BUSH FIRE PROTECTION 2001	9
2.7 NATIONAL PARKS AND WILDLIFE ACT 1974	9
2.8 ENVIRONMENT PROTECTION & BIODIVERSITY CONSERVATION ACT 1999	9
2.9 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979	9
2.10 THREATENED SPECIES CONSERVATION ACT 1995	9
2.11 NOXIOUS WEED ACT 1993.....	10
2.12 STATE ENVIRONMENTAL PLANNING POLICY 19 (SEPP 19) – BUSHLAND IN URBAN AREAS	10
3 BUSH FIRE RISK	11
3.1 BUSH FIRE HISTORY	11
3.2 ADJACENT AREAS.....	11
3.3 FUEL LOAD ASSESSMENT.....	12
3.3.1 <i>Limitations</i>	12
3.3.2 <i>Algorithms</i>	13
3.4 ASSETS AT RISK FROM FIRE	13
3.4.1 <i>Built and Cultural Assets</i>	13
3.4.2 <i>Natural Heritage Assets</i>	14
3.4.2.1 <i>Vegetation Communities</i>	14
3.4.2.2 <i>Managed Regeneration Areas</i>	17
3.4.2.3 <i>Threatened Flora and Fauna</i>	17
4 FIRE MANAGEMENT ISSUES	18
4.1 FIRE MANAGEMENT BOUNDARIES	18
4.2 MANAGEMENT RESPONSIBILITIES	18
4.3 FIRE TRAILS AND FOOT TRACKS	18
4.4 INTRODUCED SPECIES MANAGEMENT	19
4.5 FIRE MANAGEMENT ZONES.....	19
4.5.1 <i>Asset Protection Zones (APZ)</i>	20
4.5.2 <i>Land Management Zone (LMZ)</i>	20
4.5.3 <i>Strategic Fire Advantage Zones (SFAZ)</i>	21
4.5.4 <i>Fire Exclusion Zones (FEZ)</i>	22
4.6 BIODIVERSITY FIRE REGIME THRESHOLDS	22
5 OPERATIONAL SCHEDULE	29
5.1 PRESCRIBED FIRE MANAGEMENT ZONES	29
5.2 PRESCRIBED WORKS SCHEDULE	29
6 PERFORMANCE MEASURES	36

6.1	ENVIRONMENTAL ASSESSMENT OF SCHEDULED WORKS	36
6.2	MONITORING FIRE REGIMES AND CHANGES TO BIODIVERSITY.....	36
6.3	FIRE MANAGEMENT PLAN REVIEW	36
7	REFERENCES	38

APPENDIX 1 – VEGETATION PRIORITY EXPLANATION

APPENDIX 2 – KNOWN THREATENED FLORA WITHIN 5KM AND THREATENED FAUNA WITHIN 10KM OF JJ MELBOURNE HILLS MEMORIAL RESERVE AND ADJOINING COMMUNITY LAND

APPENDIX 3 – KNOWN SIGNIFICANT FLORA WITHIN 5KM AND SIGNIFICANT FAUNA WITHIN 10KM OF JJ MELBOURNE HILLS MEMORIAL RESERVE AND ADJOINING COMMUNITY LAND

APPENDIX 4 – WARRINGAH LOCAL GOVERNMENT AREA HAZARD REDUCTION GUIDELINES

APPENDIX 5 – FIRE MANAGEMENT PLAN METHODOLOGY

APPENDIX 6 –VEGETATION COMMUNITY OVERLAY

APPENDIX 7 – JJ MELBOURNE HILLS MEMORIAL RESERVE AND ADJOINING COMMUNITY LAND FIRE REGIME MANAGEMENT POSTER

Tables

Table 1	Vegetation Communities of JJ Melbourne Hills Memorial Reserve and Adjoining Community Land.....	14
Table 2	Ecological Threshold and Ecological Fire Requirement Explanation.....	24
Table 3	Biodiversity Fire Regime Thresholds for Vegetation Communities Identified within JJ Melbourne Hills Memorial Reserve and Adjoining Community Land	28
Table 4	Operation Schedule for JJ Melbourne Hills Memorial Reserve and Adjoining Community Land.....	33

Figures

Figure 1	Site Location.....	6
Figure 2	Vegetation Communities.....	15
Figure 3	Predicted Fuel Loads.....	16
Figure 4	Vegetation Fire Threshold	26
Figure 5	Ecological Fire Requirements.....	27
Figure 6	Prescribed Fire Management Zones	31
Figure 7	Prescribed Works Schedule.....	32

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

JJ Melbourne Hills Memorial Reserve and Adjoining Community Land is located within the suburb of Terrey Hills and covers approximately 47 hectares. The reserve supports varied flora and fauna including the following threatened plants; *Grevillea caleyi*, *Epacris purpurascens* var. *purpurascens* and *Tetratheca glandulosa*; no threatened animal species were recorded within the reserve.

The reserve is used extensively for recreation activities with five sporting and recreational clubs (including the Forest Hills Pony Club, the Manly Warringah BMX Club, the Manly Warringah Field Archers, the Manly Warringah Cycle Club and the Manly District Dog and Kennel Club). Surrounding land uses include a Telecommunications Area (including Pittwater Trig Station), Kimbriki Recycling and Waste Disposal Centre, Warringah Pittwater Emergency Control Centre, commercial uses and residential dwellings.

The current fire trail layout offers sufficient access to primary fire break areas (provided that access is maintained), thus, no new trails have been proposed. Additional fire break areas may be achieved through maintenance of vegetation under existing power lines, running along Kamber Road (including the road reserve) between Garigal National Park and JJ Melbourne Hills Memorial Reserve.

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 2006 and 2014 as well as weed control and hand removal of fuels within areas of build up.

1 Introduction

Eco Logical Australia was contracted by Warringah Council in March 2004 to prepare a 10 year Fire Regime Management Plan from 2006 to 2016 for JJ Melbourne Hills Memorial Reserve and Adjoining Community Land.

1.1 Reserve Outline

JJ Melbourne Hills Memorial Reserve and Adjoining Community Land is located within the suburb of Terrey Hills. It covers approximately 47 hectares, of which 89% consists of native vegetation. See Figure 1 for site location.

The reserve is used extensively for recreation activities with five sporting and recreational clubs, including:

- Forest Hills Pony Club
- Manly Warringah BMX Club
- Manly Warringah Field Archers
- Manly Warringah Cycle Club
- Manly District Dog and Kennel Club

Surrounding land uses include a Telecommunications Area (including Pittwater Trig Station), Kimbriki Recycling and Waste Disposal Centre, Warringah Pittwater Emergency Control Centre, Commercial uses and residential dwellings.

The Reserve consists entirely of Community Land owned by Council.

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 Regime Management Plan for JJ Melbourne Hills Memorial Reserve and Adjoining Community Land comprises two separate documents:

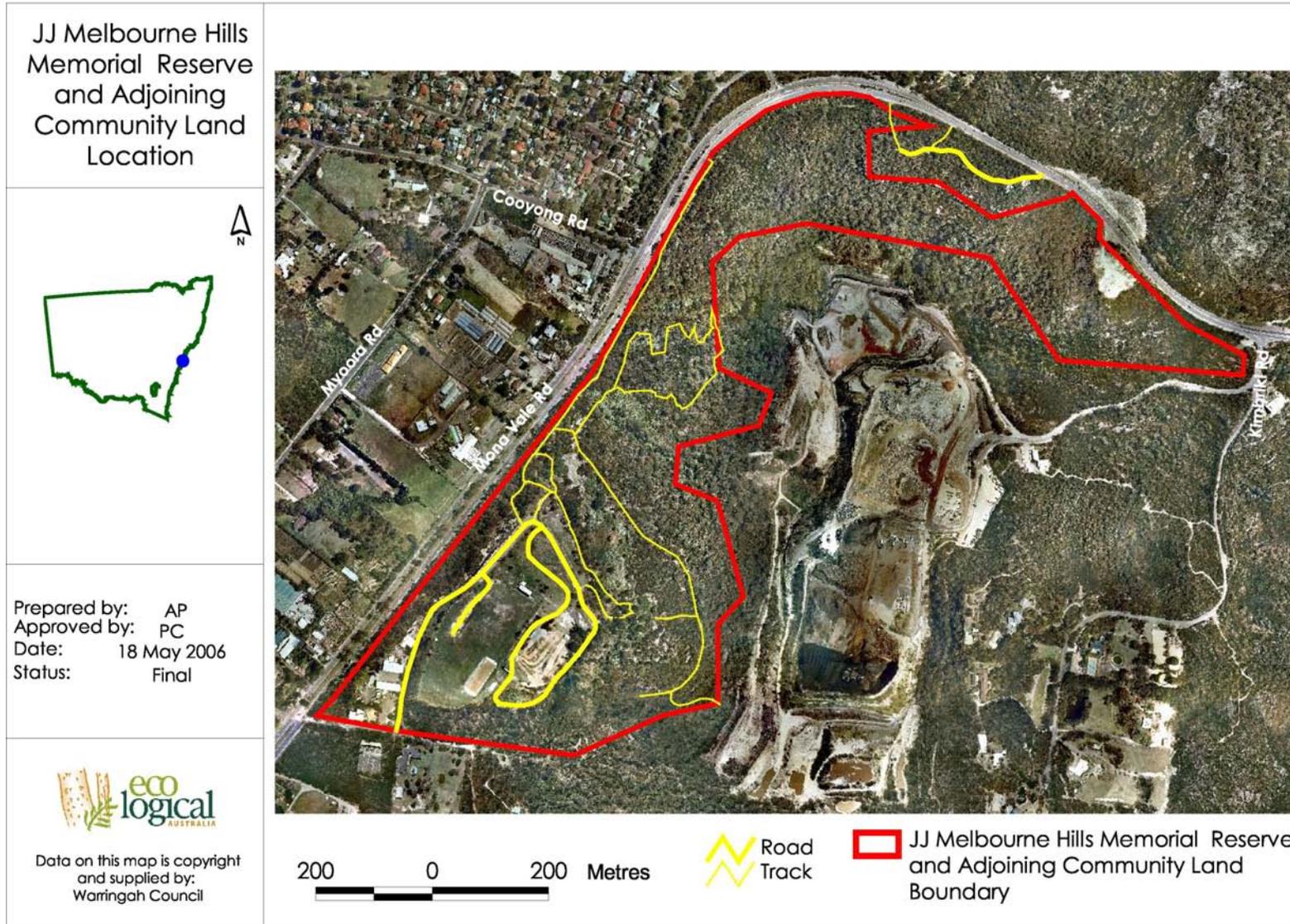
- 1) This report
- 2) An A0 sized poster showing a series of relevant maps and tables

This report identifies the fire management framework, identifies and assesses fire related issues and risks within the reserve and provides an operational schedule and performance measures. It is intended that this written report is used in conjunction with the "JJ Melbourne Hills Memorial Reserve and Adjoining Community Land 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'. The 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.

JJ Melbourne Hills Memorial Reserve and Adjoining Community Land is managed as "Community Land" under this Act and has a current Plan of Management (LandArc 2001 – see below for review).

2.2 JJ Melbourne Hills Memorial Reserve and Adjoining Community Land, Plan of Management

This plan was created by LandArc and adopted in 24 July 2001 as required under the *Local Government Act, 1993* and provides a frame work for managing JJ Melbourne Hills Memorial Reserve and Adjoining Community Land including strategies and work schedules.

With reference to fire management, the plan recommends:

- That existing fire trails and access for emergency service vehicle be maintained but that no increase/widening of fire trails be undertaken within Duffys Forest Endangered Ecological Community
- Coordination with NSW RFS to implement an education program and ensure appropriate bush fire hazard reduction / public safety measures are undertaken by the respective clubs within and adjoining the reserve
- Integrating of environmental and biodiversity programs with objectives of fire management policy

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).

Fire management objectives include:

- Ensuring that fire management access zones are of dimensions that can be maintained in the long term

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

- 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 (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 also outlines the responsibilities of land owners to manage their land for bush fire protection and provides a mechanism for the approval of hazard reduction works, through the issue of a bush fire hazard reduction certificate.

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 the reserve and the adjoining Community Land is zoned as Asset Protection Zones (APZ) and 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) 2001, 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 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.

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.

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 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.

Management of noxious weeds observed within the reserve is required under this Act.

2.12 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 of the natural vegetation.

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 and the NSW Rural Fire Service. Field validation, completed in January 2005, was undertaken to increase the reliability of the data. Spatial accuracy for data was found to be low, particularly for older fires.

Additional fire history data was assessed, including:

- Digital data from the Department of Environment and Conservation (incorporated into fire mapping, post site validation)
- Written data 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 (provided to Council)

Fire history data from all sources ranged in date from 1952 to 2005.

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.

Fires recorded within JJ Melbourne Hills Memorial Reserve and Adjoining Community Land boundaries occurred between 1979 and 2001. Small spot fires mapped outside the reserve were not included in the analysis.

An analysis of available mapped fire history data showed that 38.5% of land within the mapped reserve boundary for JJ Melbourne Hills Memorial Reserve and Adjoining Community Land has been burnt since 1952.

The most recent fire event occurred in 2001. Fire seems to have been concentrated in the north and along the western boundary of the reserve.

An analysis of fire history and correspondence with DEC (Tony Auld pers. comm) suggests that the primary fire threat to the management area exists from wildfires crossing out of Ku-ring-gai Chase National Park and into Community Land within the Tumble Down Dick Hill area along the northern boundary.

See "JJ Melbourne Hills Memorial Reserve and Adjoining Community Land Fire Regime Management Poster" (Appendix 7, ELA 2006) for a map of recorded fire history.

3.2 Adjacent areas

JJ Melbourne Hills Memorial Reserve and adjoining Community Land is located adjacent to Ku-ring-gai Chase National Park to the north (divided by Mona vale Road) and Garigal National Park to the south; there by increasing the fire threat to the reserve.

The Ku-ring-gai and Garigal National Parks Fire Management Plan (DEC 2005) has classified the areas surrounding the reserve and adjoining Community Land as Heritage Area Management Zones and Strategic Fire Management Zones (see NPWS

2005a for prescriptions). The plan states that prescribed burning schedules will be developed in consultation with relevant Bush Fire Management Committees, as such no burning has been proposed at this stage.

Further fire management planning within this area may be seen within the Garigal National Park Draft Fire Management Strategy (DEC 2005a) and the Ku-ring-gai Chase National Park and Mt Ku-ring-gai Aboriginal Area Bush Fire management strategy (DEC 2005b).

3.3 Fuel Load Assessment

An assessment of fuel loads has been undertaken within the ArcView GIS using an extension to predict fuel loads based on vegetation type and time since fire. This software uses fuel accumulation curves for structural vegetation types prepared for NPWS (Conroy, 1994). This 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. Clearly, as new fires occur and vegetation regenerates fuel loads will vary.

Fuel modelling has been based on fire history data from 1952-1953 to 2004 -05 fire season and vegetation as mapped by P & J Smith (2003). Predicted fuel loads for the reserve are shown in Figure 3.

It should be noted that high levels of weed infestation currently exist within the reserve, resulting in increased ground cover and fuel loads. Examples of this may be seen along the southern border of the Reserve, running along the Kamber road (including the road reserve) between Garigal National Park and JJ Melbourne Hills Memorial Reserve and Adjoining Community Land.

3.3.1 Limitations

The following are 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 hectare. 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

3.3.2 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)

3.4 Assets at Risk from Fire

3.4.1 Built and Cultural Assets

The reserve contains numerous built assets including the Forest Hills Pony Club house, riding arena, and a shed attached to the BMX track. Protection of these assets has been incorporated within zone management requirements.

The reserve also contains lower level assets such as fencing, power lines and signage. Consideration to the protection of such assets should be given prior to the conduct of HR burning.

Heritage sites have been identified from the Aboriginal Heritage Information Management System (AHIMS – DEC 2004a) and Council data. This information has been provided in digital GIS format and is intended to flag known cultural heritage issues for consideration during the HR planning process.

No items of European heritage were identified.

No items of Aboriginal heritage were identified within the reserve. However the numerous items of Aboriginal significance found around the reserve may indicate that unidentified heritage items may exist. Surrounding Aboriginal heritage items include (LandArc 2001):

- Art and engraving sites and rock shelters with potential archaeological deposits have been found in a small valley immediately south of the reserve
- Art and occupation sites adjacent to the Water Quality Management Area of the Kimbriki Recycling and Waste Disposal Centre

3.4.2 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)
- JJ Melbourne Hills Memorial Reserve and Adjoining Community Land Plan of Management (LandArc 2001)

3.4.2.1 Vegetation Communities

The reserve contains one vegetation type that is listed as an Endangered Ecological Community (EEC) under the TSC Act. No EPBC Act listed communities occur within the mapped reserve boundary

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 and Appendix 1 for an explanation of vegetation priority.

Table 1 Vegetation Communities of JJ Melbourne Hills Memorial Reserve and Adjoining Community Land.

Vegetation Community	State Legislative Status (TSC Act 1995)	LGA Priority
Bloodwood-Scribbly Gum Woodland	Not Listed	3
Peppermint-Angophora Forest	Not Listed	3
Sandstone Heath	Not Listed	3
Silvertop Ash-Brown Stringybark	EEC - Duffys Forest vegetation community in the Sydney Basin Bioregion	1

Figure 2 Vegetation Communities

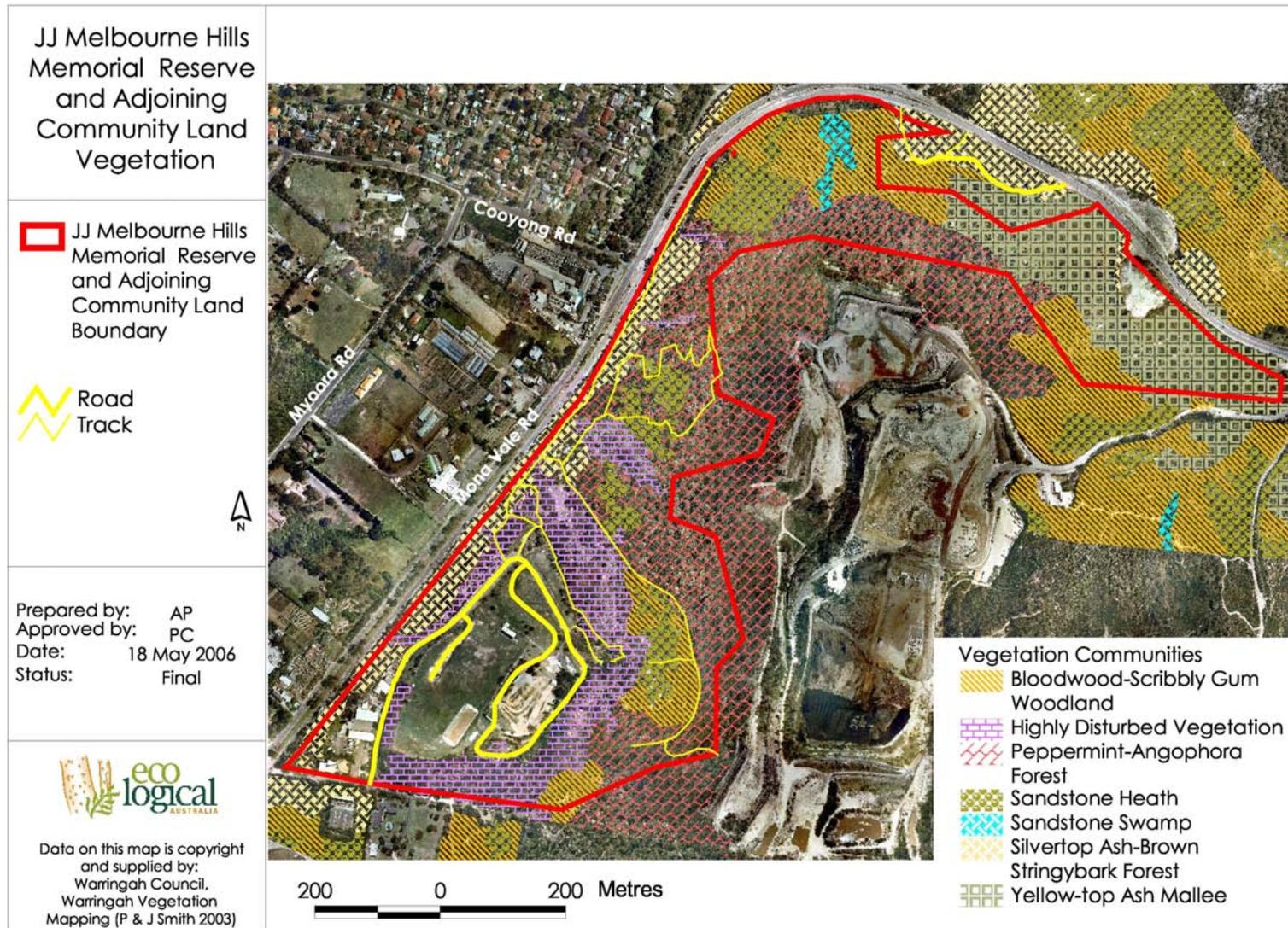


Figure 3 Predicted Fuel Loads



3.4.2.2 Managed Regeneration Areas

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.

3.4.2.3 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 Appendixes 2 – 3 and include:

- 43 threatened fauna species
- 45 national, regional or locally significant fauna species
- 9 threatened flora species
- 24 national, regional or locally significant flora species

Three threatened flora species, *Grevillea caleyi*, *Epacris purpurascens* var. *purpurascens* and *Tetratheca glandulosa* were found to occur within the mapped reserve boundary. No fauna species were recorded within this area.

Fire requirements for threatened species identified within the mapped reserve boundary 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 park is aimed at maintaining the structure and floristic integrity of the plant communities within which they occur.

Additional management requirements for species identified 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 both cadastral and reserve management boundaries (as proposed by LandArc, 2001). Areas where the reserve management boundary is seen to deviate outside of the cadastral boundary have been included.

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. NSW 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. Zones which adjoin or include private/commercial properties may require landowner's co-operation. Council have no responsibility for land not under their management.

4.3 Fire Trails and Foot Tracks

Signage maps showing trails within the reserve is recommended. This is supported by the reserve Plan of Management (LandArc 2001).

The current fire trail layout is sufficient to provide access to primary fire break areas. Provided that access is maintained:

- Adjacent to Warringah Pittwater Emergency Control Centre (within APZ 3 – Figure 6)

- To remaining bushland areas adjacent to Kimbriki Recycling and Waste Disposal Centre

To this effect no new trails 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.

Additional break areas may be achieved through maintenance of vegetation under existing power lines, running along Kamber Road (including the road reserve) between Garigal National Park and JJ Melbourne Hills Memorial Reserve.

4.4 Introduced Species Management

Weed management

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

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 act 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.

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). These zones are briefly 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 story 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
- Trees should not over-hang buildings
- APZ areas may be burnt as appropriate dependant on management issues

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:
 - control of 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 fire 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 mapped reserve boundary have not been included within this assessment process. This includes regeneration works undertaken within the Duffys Forest Endangered Ecological Community. 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 area within the mapped reserve boundary. The current fire threshold status and resultant ecological fire requirements for vegetation within the reserve have been determined and may be

seen in Figures 4 and 5 respectively. An explanation of these categories can be seen in Table 2.

The information above has been considered in determining the 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 (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

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>Ecological Fire Requirements</p> <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><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 4 Vegetation Fire Threshold

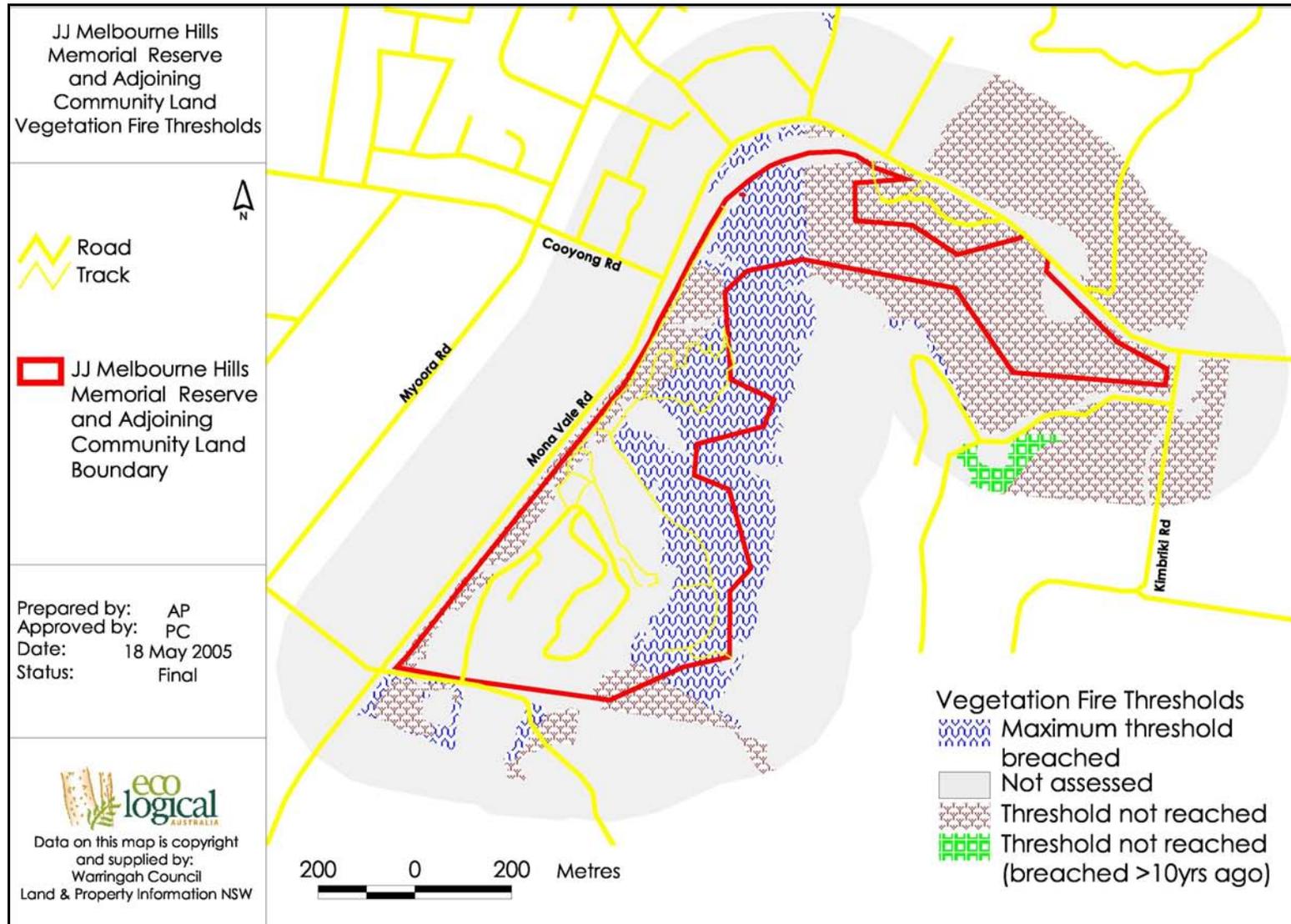


Figure 5 Ecological Fire Requirements

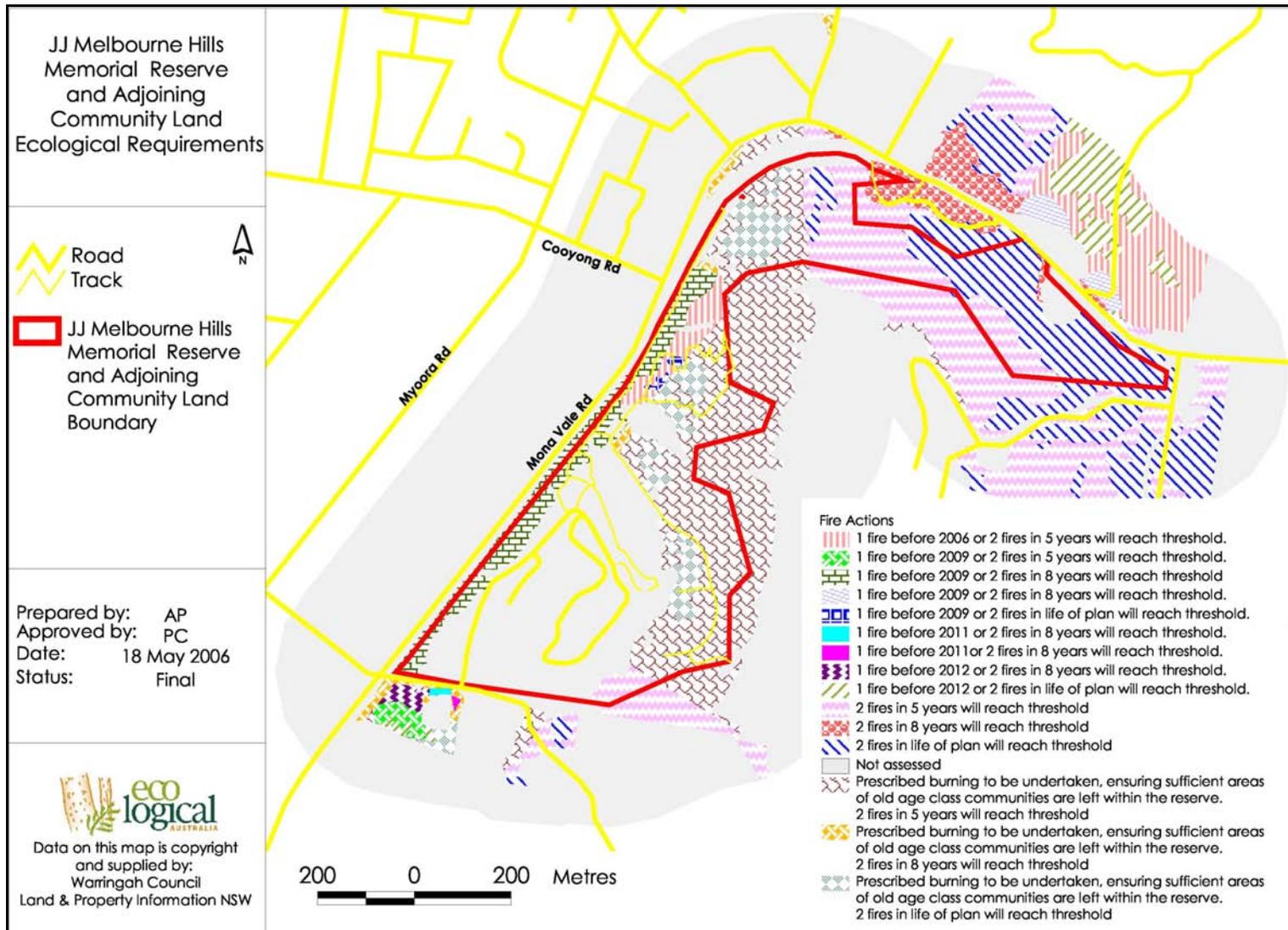


Table 3 Biodiversity Fire Regime Thresholds for Vegetation Communities Identified within JJ Melbourne Hills Memorial Reserve and Adjoining Community Land

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 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 2000)
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 2000)
Sandstone Heath	3	>2 in quick succession in 8 yr interval, 3 in quick succession each 15 to 30yrs interval	>30		(WPBFMC 2000)
Silvertop Ash-Brown Stringybark	1	> 2 successive fires in < 5yr intervals	>30		(WPBFMC 2000)

5 Operational Schedule

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

- Prescribed Fire Management Zones; and
- Prescribed Works Schedule.

This may be seen in:

- Figure 6 and 7;
- Table 4; and
- The "JJ Melbourne Hills Memorial Reserve and Adjoining Community Land Fire Regime Management Poster" (Appendix 7, ELA 2006).

5.1 Prescribed Fire Management Zones

The following fire management zones have been applied (see Figure 7, Section 4.5):

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

SFAZ and LMZ have been divided up into fire management zones, to ensure the maintenance of fire age mosaic and required threshold regimes.

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.

These areas include both Council owned land and private property, so co-operation of all landowners will be required for the successful implementation of this plan.

5.2 Prescribed Works 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

Fuel accumulation models (see section 3.3) were evaluated for the dominant vegetation types within each SFAZ. The calculated fuel load prescriptions and predicted fuel accumulation rates were evaluated against identified ecological fire thresholds (see 4.6). Where possible SFAZ were designed to minimise impacts upon incompatible thresholds.

For areas identified as **SFAZ**, adherence to prescribed fuel loads have been assigned priority over maintenance of ecological fire thresholds.

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 4, 5
- Table 2

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 6 Prescribed Fire Management Zones

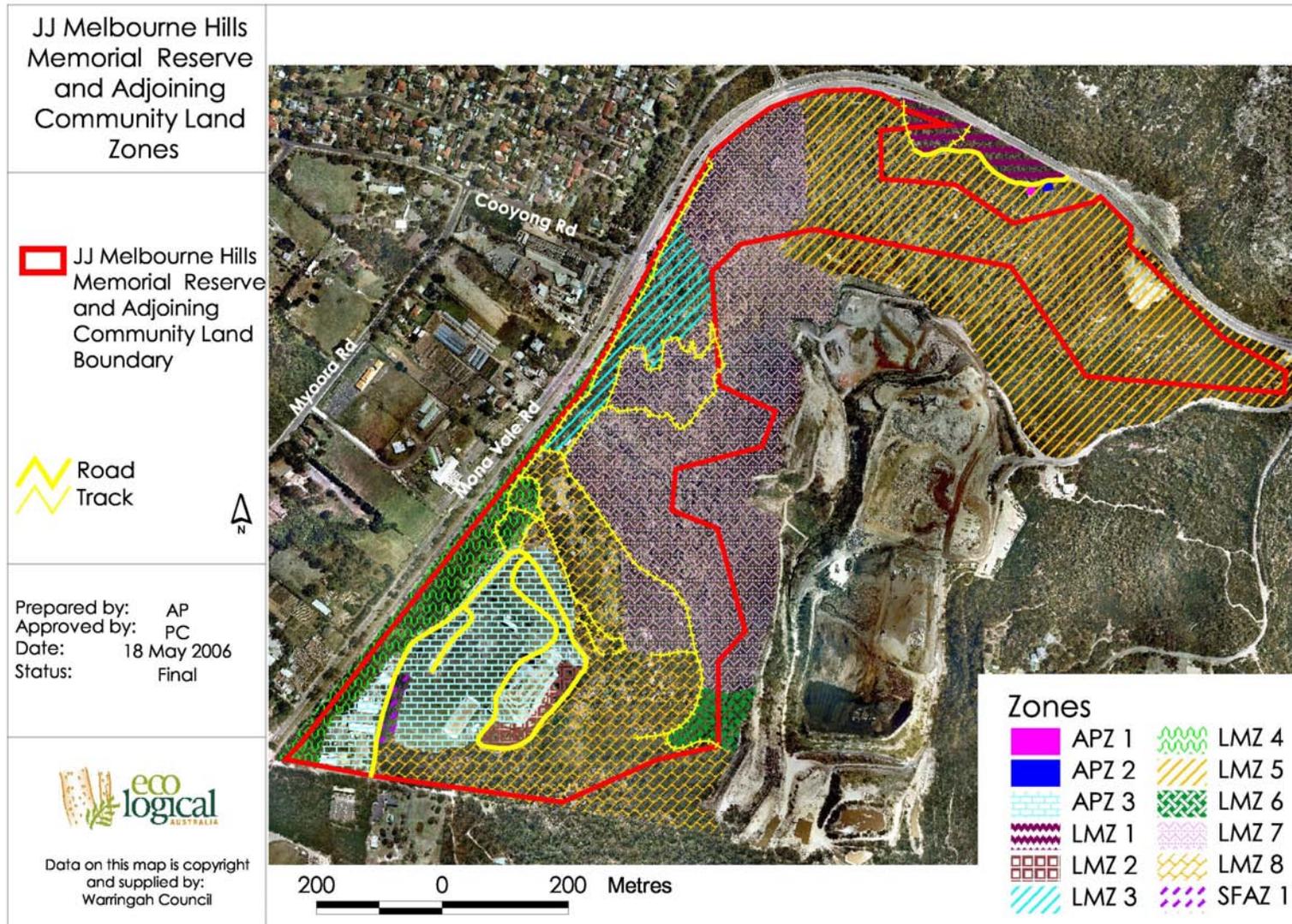


Figure 7 Prescribed Works Schedule

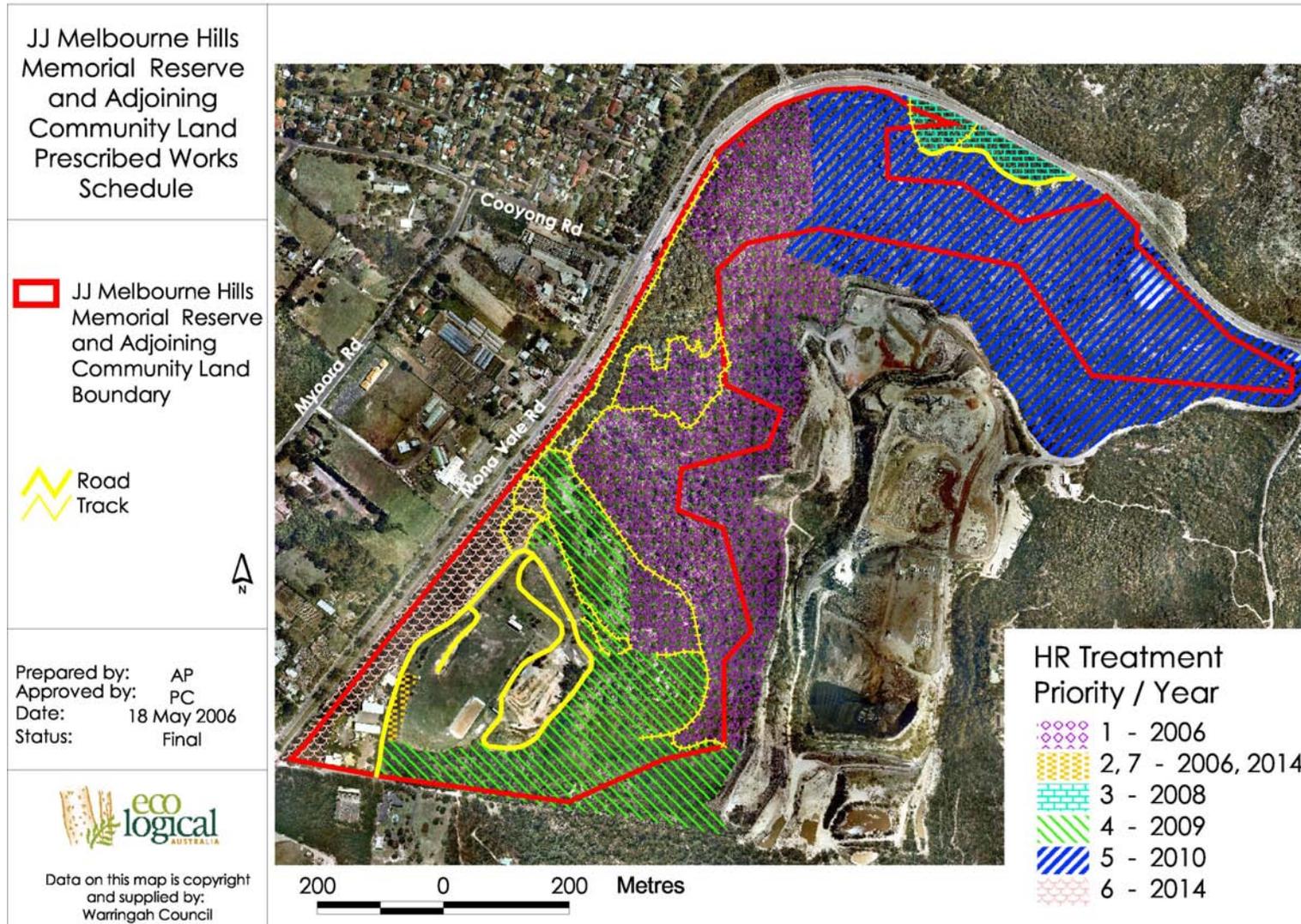


Table 4 Operation Schedule for JJ Melbourne Hills Memorial Reserve and Adjoining Community Land

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	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 [♦]	Telecommunications Equipment and Towers; Pittwater Trig Station; Powerlines	-	Warringah Council, managed as Community Land	As existing assets allow
APZ 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 [♦]	Telecommunications Equipment and Towers; Pittwater Trig Station; Powerlines	-	Warringah Council, managed as Community Land	As existing assets allow
APZ 3	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 [♦]	Tracks; Roads; Automatic Weather Station; Car Park; Forest Hills Pony Club - Club house; Open arena/Jumps; BMX and Cycling Track and Shelter; Warringah Pittwater Emergency Control Centre	<i>Grevillea caleyi</i>	Warringah Council, managed as Community Land; Telstra	As existing assets allow
LMZ 1	LMZ	Burning	At HR planning stage asses if area has been bunt since writing of this plan. If yes don't burn. If no - survey area to determine <i>Grevillia caleyi</i> locations	3	2008	Tracks; Roads; Powerlines	<i>Grevillea caleyi</i> , <i>Tetratheca glandulosa</i> , Duffys Forest Endangered Ecological Community; Silvertop Ash-Brown Stringybark Forest	Warringah Council, managed as Community Land	-

Fire Regime Management Plan For JJ Melbourne Hills Memorial Reserve and Adjoining Community Land
19/05/2006

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities [^]	Land Tenure	APZ Widths
LMZ 2	LMZ	-	-	-	-	Tracks	-	Warringah Council, managed as Community Land	-
LMZ 3	LMZ	-	-	-	-	Tracks	Duffys Forest Endangered Ecological Community: Silvertop Ash-Brown Stringybark Forest	Warringah Council, managed as Community Land	-
LMZ 4	LMZ	Burning	At HR planning stage asses if area has been bunt since writing of this plan. If yes don't burn. If no - survey area to determine <i>Grevillia caleyi</i> locations	6	2014	Tracks	<i>Grevillea caleyi</i> ; <i>Epacris purpurascens</i> var. <i>purpurascens</i> ; Duffys Forest Endangered Ecological Community: Silvertop Ash-Brown Stringybark Forest	Warringah Council, managed as Community Land	-
LMZ 5	LMZ	Burning	At HR planning stage asses if area has been bunt since writing of this plan. If yes don't burn. If no - survey area to determine <i>Grevillea caleyi</i> locations	5	2010	Tracks; Roads	<i>Grevillea caleyi</i> , Duffys Forest Endangered Ecological Community: Silvertop Ash-Brown Stringybark Forest	Warringah Council, managed as Community Land	-
LMZ 6	LMZ	Burning	-	1	2006	Tracks	-	Warringah Council, managed as Community Land	-

Fire Regime Management Plan For JJ Melbourne Hills Memorial Reserve and Adjoining Community Land
19/05/2006

Name	Zone Type	Treatment	Management	HR Treatment Priority*	HR Treatment Year	Assets	Threatened Species and Endangered Ecological Communities [▲]	Land Tenure	APZ Widths
LMZ 7	LMZ	Burning	-	1	2006	Tracks	Duffys Forest Endangered Ecological Community: Silvertop Ash-Brown Stringybark Forest	Warringah Council, managed as Community Land	-
LMZ 8	LMZ	Burning	-	4	2009	Tracks; Roads; Powerlines	-	Warringah Council, managed as Community Land	-
SFAZ 1	SFAZ	Manual	-	2, 7		-	-	Warringah Council, managed as Community Land	-

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

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

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 4, 5
- 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 11 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 11 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

7 References

Bush Fire Coordinating Committee (BFCC), 2003. Policy No. 01/03. Adopted by the Bush Fire Coordinating Committee. [online]. Available: http://www.rfs.nsw.gov.au/dsp_content.cfm?CAT_ID=537 (May 16, 2006).

Conacher Travers Pty Ltd 2002. *Berowra Valley Regional Park Fire Management Plan*. Unpublished.

Department of Environment and Conservation (DEC) (2004), *Atlas of NSW Wildlife*. Search conducted on 26 July 2004.

Department of Environment and Conservation (DEC) (2004a), *Aboriginal Heritage Information Management System (AHIMS)*, search conducted on August 2004.

Department of Environment and Conservation NSW (DEC) (2005). *Ku-ring-gai and Garigal National Parks Fire Management Plan*. National Parks and Wildlife Division of the NSW Department of Environment and Conservation DEC, Sydney North Region.

Department of Environment and Conservation NSW (DEC) (2005a). *Garigal National Park Draft Fire Management Strategy*. National Parks and Wildlife Division of the NSW Department of Environment and Conservation DEC, Sydney North Region.

Department of Environment and Conservation NSW (DEC) (2005b). *Ku-ring-gai Chase National Park and Mt Ku-ring-gai Aboriginal Area Bush Fire management strategy*. National Parks and Wildlife Division of the NSW Department of Environment and Conservation DEC, Sydney North Region.

Eco Logical Australia (ELA) (2005a). *Warringah Reserve Threatened Fauna Fire Ecology spreadsheets*. Unpublished data.

Eco Logical Australia (ELA) (2005b). *Warringah Reserve Threatened Flora Fire Ecology spreadsheets*. Unpublished data.

Eco Logical Australia (ELA) (2005c). *Warringah Reserve Vegetation Fire Ecology spreadsheets*. Unpublished data.

Eco Logical Australia (ELA) (2005d). *Fire Management Plan Methodology Report*. Unpublished data.

Eco Logical Australia (ELA) (2006). *JJ Melbourne Hills Memorial Reserve and Adjoining Community Land Fire Regime Management Poster*. Unpublished poster.

Eco Logical Australia (ELA) (2006a). *Warringah Local Government Area Hazard Reduction Guidelines*. Unpublished data.

LandArc (2001). *JJ Melbourne Hills Memorial Reserve & Adjoining Community Land, Terrey Hills: Plan of Management*. Plan for Warringah Council. Adopted 24 July 2001.

NSW Rural Fire Service (RFS) (2001). *Planning for Bush fire Protection. A guide for Councils, Planners, Fire Authorities, Developers and Home Owners.* NSW Rural Fire Service, Rosehill.

NSW Rural Fire Service (RFS) (2006). *Bush fire Environment Assessment Code for Asset Protection and Strategic Fire advantage Zones.* Rural Fire Service.

P & J Smith Ecological Consultants (2003). *Warringah Natural Area Survey: Vegetation Communities and Plant Species.* Unpublished report for Warringah Council.

P & J Smith Ecological Consultants (2005). *Warringah Natural Area Survey: fauna species.* Unpublished report for Warringah Council.

Warringah Council (1996). *Management Strategy for Weed Control and Fire Management Access Zones - A component of the Warringah's Urban Bushland Boundaries Management strategy.* Unpublished report for Warringah Council.

Warringah Pittwater Bush Fire Management Committee (WPBFMC) (2000). *Bush Fire Risk Management Plan.* Unpublished Report.

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 JJ Melbourne Hills Memorial Reserve and Adjoining Community Land

Table 1: Known threatened flora within 5km of JJ Melbourne Hills Memorial Reserve and Adjoining Community Land*

Scientific Name	Common Name	Recorded Within Reserve
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		X
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	
<i>Genoplesium baueri</i>		
<i>Grevillea caleyi</i>		X
<i>Leptospermum deanei</i>		
<i>Microtis angusii</i>		
<i>Pimelea curviflora</i> var. <i>curviflora</i>		
<i>Syzygium paniculatum</i>		
<i>Tetradthea glandulosa</i>		X

* **Source:** DEC 2004

Table 2: Known threatened fauna within 10km of JJ Melbourne Hills Memorial Reserve and Adjoining Community Land*

Scientific Name	Common Name
<i>Botaurus poiciloptilus</i>	Australasian Bittern
<i>Calidris alba</i>	Sanderling
<i>Calidris tenuirostris</i>	Great Knot
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo
<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>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subsp.)
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Ninox strenua</i>	Powerful Owl
<i>Pandion haliaetus</i>	Osprey
<i>Phascolarctos cinereus</i>	Koala
<i>Phoebastria fusca</i>	Sooty Albatross
<i>Polytelis swainsonii</i>	Superb Parrot
<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 melanophrys</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 JJ Melbourne Hills Memorial Reserve and Adjoining Community Land

Table 1 Known significant flora within 5km of JJ Melbourne Hills Memorial Reserve and Adjoining Community Land*

Scientific Name	Common Name	Significance	Recorded Within Reserve
<i>Amperea xiphoclada</i> var. <i>papillata</i>		Nationally significant species	
<i>Angophora crassifolia</i>		Nationally significant species	
<i>Angophora hispida</i>	Dwarf Apple	Biogeographically significant	
<i>Arthrochilus prolixus</i>		Threatened in northern Sydney	
<i>Austromyrtus tenuifolia</i>		Biogeographically significant	
<i>Boronia fraseri</i>		Nationally significant species	
<i>Boronia serrulata</i>	Rose Boronia	Nationally significant species	
<i>Boronia thujona</i>		Biogeographically significant	
<i>Callistemon salignus</i>	Willow Bottlebrush	Threatened in Warringah	
<i>Corybas undulatus</i>	Tailed Helmet Orchid	Nationally significant species	
<i>Corymbia maculata</i>		Threatened in northern Sydney	
<i>Crowea saligna</i>		Biogeographically significant	
<i>Darwinia diminuta</i>		Nationally significant species	
<i>Darwinia procera</i>		Nationally significant species	
<i>Eucalyptus capitellata</i>	Brown Stringybark	Threatened in northern Sydney	
<i>Eucalyptus luehmanniana</i>	Yellow-top Ash	Nationally significant species	X
<i>Eucalyptus robusta</i>	Swamp Mahogany	Threatened in northern Sydney	
<i>Grevillea speciosa</i>	Red Spider Flower	Biogeographically significant	
<i>Lomandra brevis</i>		Nationally significant species	
<i>Lomandra fluviatilis</i>		Nationally significant species	
<i>Melaleuca thymifolia</i>		Threatened in northern Sydney	
<i>Melichrus procumbens</i>	Jam Tarts	Threatened in northern Sydney	
<i>Microtis parviflora</i>	Slender Onion Orchid	Threatened in northern Sydney	
<i>Persoonia pinifolia</i>	Pine-leaved Geebung	Biogeographically significant	

* Source: DEC 2004

Table 2 Known significant fauna within 10km of JJ Melbourne Hills Memorial Reserve and Adjoining Community Land*

Scientific Name	Common Name	Significance
<i>Acrobates pygmaeus</i>	Feathertail Glider	Threatened in Warringah
<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>Eudyptula minor</i>	Little Penguin	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>Heteroscelus brevipes</i>	Grey-tailed Tattler	Migratory
<i>Heteroscelus incanus</i>	Wandering Tattler	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>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>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>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

* **Source:** DEC 2004 * No significant species identified within the reserve or adjoining Community Land

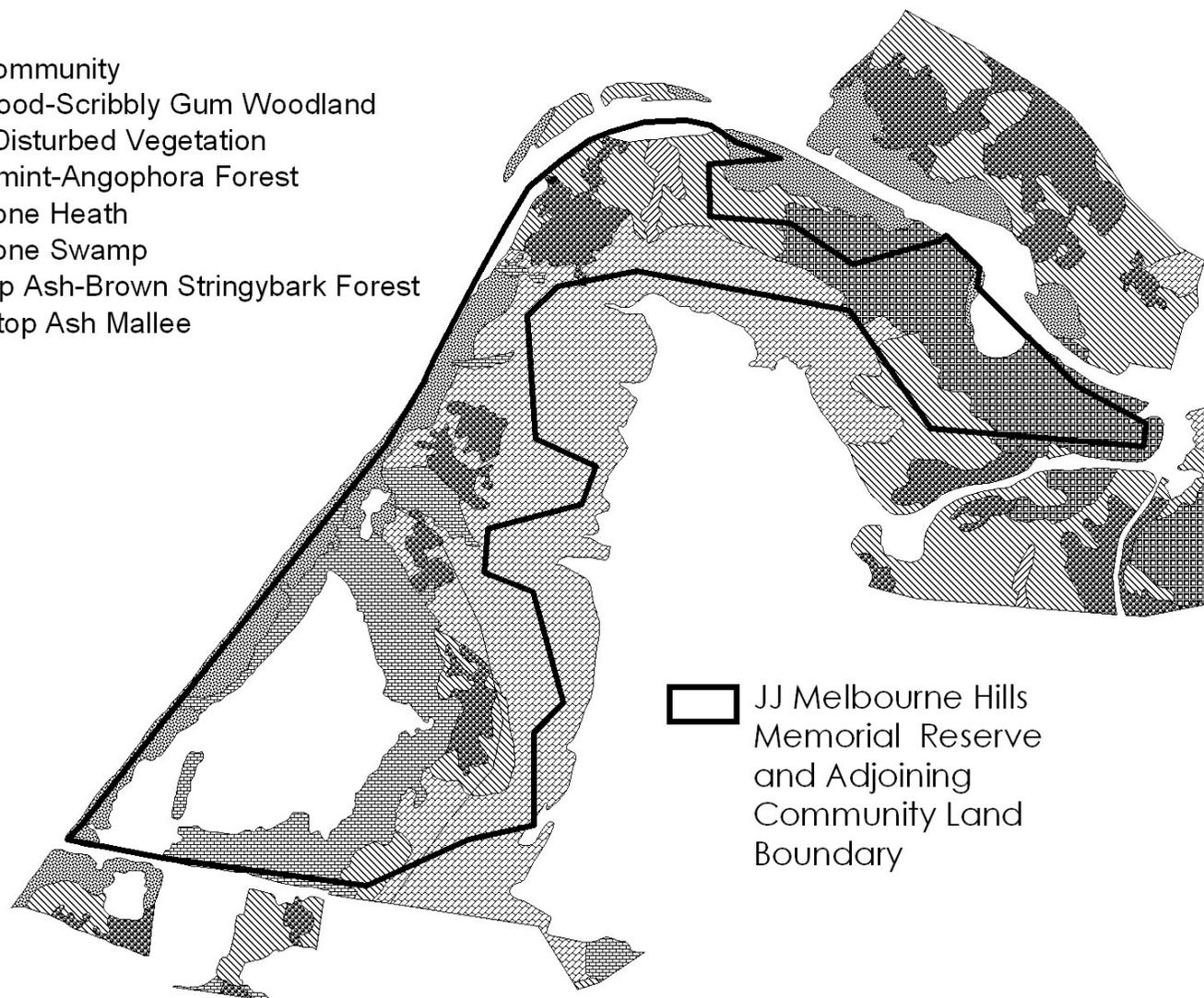
Appendix 4 – Warringah Local Government Area Hazard Reduction Guidelines

Appendix 5 – Fire Management Plan Methodology

Appendix 6 –Vegetation Community Overlay

Vegetation Community

-  Bloodwood-Scribbly Gum Woodland
-  Highly Disturbed Vegetation
-  Peppermint-Angophora Forest
-  Sandstone Heath
-  Sandstone Swamp
-  Silvertop Ash-Brown Stringybark Forest
-  Yellow-top Ash Mallee



 JJ Melbourne Hills Memorial Reserve and Adjoining Community Land Boundary

Appendix 7 – JJ Melbourne Hills Memorial Reserve and Adjoining Community Land Fire Regime Management Poster