CONACHER TRAVERS

environmental consultants

fuel management plan

BEVIAN ROAD CONCEPT APPLICATION
BEVIAN ROAD, ROSEDALE

SEPTEMBER 2007

FUEL MANAGEMENT PLAN (FMP)

BEVIAN ROAD CONCEPT APPLICATION
LOT 2 DP 627034, LOT 2 DP 623340
LOTS 11, 29, 32, 72, 102, 118, 119 AND 213 DP 755902
BEVIAN ROAD, ROSEDALE

Conacher Travers

Bushfire and Environmental Consultants
A.B.N. 49 083 610 173

Central Coast Office
40 The Avenue, Mt Penang Parklands,
Central Coast Highway, Kariong NSW 2250
PO Box 7128, Kariong NSW 2250
(ph) 4340 0677 (fax) 4340 2367
email: ecology@conachertravers.com.au

Document No	Issue	Description	Author	Approved by Director
6052FMP	September 2007	Final	EC	JT

EXECUTIVE SUMMARY

Background

This Fuel Management Plan (FMP) has been prepared by *Conacher Travers Pty Ltd* on behalf of *Marsim (*trading as *Nature Coast Developments Pty Ltd*) for the Masterplan covering Lot 2 DP 627034, Lot 2 DP 623340, Lots 11, 29, 32, 72, 102, 118, 119 and 213 DP 755902 Bevian Road, Rosedale, hereafter referred to as 'the subject site' or 'the site'. The subject site occupies an area of 173.59 hectares and is situated within the Eurobodalla Local Government Area (LGA) (refer Figure 1). Figure 1 depicts the property location, whilst Figure 2 provides an aerial appraisal of the site.

The Bevian Road Concept Application seeks the approval of two specific plans referred to collectively as 'The Concept Approval Plans'. These are:

- 'The Constraints Map' (Figure 3 attached) – a plan of the net developable area
- 'The Plan of Subdivision' (Figure 4 attached) – an 806 lot residential subdivision and 15 community lots. NB: this is a concept layout only; a detailed DA will be lodged once the concept has been approved.

The FMP has been prepared in accordance with the '*Planning for Bushfire Protection Guidelines'* (NSW RFS 2006) and the key bushfire issue outlined within the Director Generals Requirements (DGRs), issued by the NSW Department of Planning (DoP) in December 2006.

The relevant DGR to this FMP is:

No.	Director General Requirement	Relevant section of this report
8	**Hazard Management and Mitigation**	
8.2	*Prepare a plan of management for fuel management including the provision and maintenance of APZs, natural area, buffer zones and revegetation*	Addressed in Fuel Management Plan

The FMP has been prepared to facilitate the management of the bushfire hazards that occur within the subject site. It brings together various policies, guidelines and specifications relevant to the fire management of Rosedale, and has been designed to be used as a reference by the current and future land managers.

This plan focuses on the reduction of fuel loads within:

- Land that is intended for development
- Land where there is an ongoing requirement to manage hazard levels due to neighbouring responsibilities and
- Land that is subject to revegetation works or that is to be retained as part of the riparian restoration program.

Other land may be identified as being subject to strategic fuel management as required.

The implementation of this fuel management plan will be the responsibility of *Marsim (*trading as *Nature Coast Developments Pty Ltd*) for the foreseeable future.

The broad aims of bushfire protection are to take all practical steps to minimise potential damage to the proposed development from fire, minimise the spread of fires once they commence and promote co-operative fuel management and fire suppression with other fire control authorities and nearby landholders.

More specifically, the objectives are to:

- Protect life and property from wildfires
- Allow for effective evacuation
- Provide safe working platforms for fire fighting operations
- Provide safe and suitable housing for residents
- Prevent the spread of wildfires
- Exclude fire from environmentally sensitive areas and
- Maintain biodiversity.

Fuel Management Strategies

The bushfire protection measures put in place for the subject site have been categorised into 3 zones (Schedule 2).

1. Asset Protection Zones – protection of high risk assets including residential, cultural and built assets.
2. Heritage Management Zones – Environmental Protection including aboriginal heritage, ecologically significant features and other culturally significant features.
3. Strategic Fire Management Zones - Strategic control and constrainment of bushfires.

The land within the proposed development footprint is to be managed as an asset protection zone to an Inner Protection Area standard. Strategic fuel management zones are provided adjoining the inner protection area. The remaining land within the subject site is considered a Heritage Management Zone managed for conservation purposes.

A 30m wide corridor managed to an Inner Protection Area (IPA) standard applies to the north western access road (Bevian Road) that links Zone 1 to George Bass Drive in the east. A 20m wide corridor managed to IPA standard applies to the main access road to the south.

Where roads pass through bushland vegetation, corridors of between 10 meters and 20 meters wide (IPA standard) will also be provided to the internal road network to provide an access link between each zone. These access corridors are depicted in Schedule 1.

The strategies identified as practical for Rosedale (Section 4.1) are:

1. Staged Fuel Reduction (underscrubbing and selective fuel removal)
2. Prescribed ecological burns
3. Trail construction
4. Watering
5. Radiation zone construction standards
6. Monitoring of fuel loads

The strategies also consist of the main management tasks to implement the Fuel Management Plan and to gain approval from the NSW Rural Fire Service (RFS) to undertake Hazard Reduction Works in accordance with the RFS Hazard Reduction Code.

Contract Management Specifications

The contract management pertains to those tasks that need to be undertaken by contractors / supporting organisations to implement the Fuel Management Plan. Generally the work tasks have been categorised into:

i) Fuel Management Co-ordination – appointment of a co-ordinator responsible for:

   a. Submitting Hazard Reduction Applications with supporting documents i.e. (Hazard Reduction Plan including Burn Program).
   b. Engagement and supervision of contractors including preparation of contract briefs, fuel monitoring, liaison and auditing.
   c. Liaison with Council, community and regulation authorities.

ii) Hazard Reduction Works – Contract works addressing:

   a. Slashing of APZ's
   b. Selective fuel removal
   c. Trail maintenance
   d. Ecological burns
   e. Environmental protection works

iii) Monitoring and Review of the Fuel Management Plan

a. Review on an annual basis, amend and resubmit for approval as required
b. Monitoring fuel loads
c. Monitoring ecological impacts of fuel management works, including changes in biodiversity and threatened species' distribution and abundance

Slashing of APZ's and selective fuel removal are the two main contract tasks undertaken by an appropriately qualified contractor. Any works undertaken within Environmentally Sensitive areas e.g. Swamp Oak Open Forest (EEC), need to be undertaken by a bush regeneration qualified contractor in accordance with vegetation retention criteria relevant to the type of fuel management zone.

Fuel reduction works undertaken within Heritage Management Zones are not required to comply with vegetation retention criteria of Inner and Outer Protection Areas. However, fuel reduction can be undertaken in selected areas by localised fuel removal and ecological pile burns to remove the build-up of significant fuel loads. The management focus of the Heritage Management Zone is the protection of biodiversity and the structural integrity of the vegetation community typical to the site.

iv) Community Facilitations and Support

Within urban areas it is indeed possible to generate community involvement in the management of reserves, heritage areas of high public profile. Within new urban areas it takes approximately 5-10 years to generate practical levels of volunteers focusing on tasks of 'interest'. Using events such as Clean up Australia Day, Planet Ark and Tree Planting Days and establishing volunteer bushfire venues, means that volunteer participation can be achieved with commensurate support.

Support includes:

a. Provision of tools and equipment
b. Provision of insurance covering volunteers
c. Supporting social events such as BBQ's, etc
d. Provision of training
e. Co-ordination of working bees
f. Preparation of newsletters, fact sheets
g. Provision of specialist expertise
h. Preparation of bushcare plans
i. Promoting projects and seeking volunteer participation.

In regards to contract management, various support staff will be needed as required to support any proposed community participation program.

Conclusion and Recommendations

This Fuel Management Plan identifies the approach used to minimise fuel loads and the impact of hazard reduction works in environmentally sensitive areas. The approach is fundamentally based on the measurement and monitoring of fuel loads and subsequently specifying the level of fuel removal sensitive to the site's ecological attributes.

Fuel removal is based upon whether an area is classified as an Inner Protection Area or an Outer Protection Area, not based on whether the site contains Swamp Oak Open Forest, Freshwater wetland or Dry Gully rainforest. However fuel management in OPAs that encroach on Endangered Ecological Communities (EEC's) aim to have as little impact as possible.

Within the Swamp Oak Open Forest, fuel management will be undertaken sensitively with appropriately qualified contractors / personnel to promote biodiversity and to protect significant ecological functions. The area of Swamp Oak Open Forest directly associated with the wetland edge will not be impacted.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

PART C FUEL MANAGEMENT PROGRAM

PART A – BACKGROUND INFORMATION AND MANAGEMENT ISSUES

SECTION 1.0 - INTRODUCTION

This Fuel Management Plan (FMP) has been prepared by *Conacher Travers Pty Ltd* on behalf of *Marsim (*trading as *Nature Coast Developments Pty Ltd*) for the Masterplan covering Lot 2 DP 627034, Lot 2 DP 623340, Lots 11, 29, 32, 72, 102, 118, 119 and 213 DP 755902 Bevian Road, Rosedale, hereafter referred to as 'the subject site' or 'the site'.

The subject site occupies an area of 173.59 hectares and is situated within the Eurobodalla Local Government Area (LGA) (refer Figure 1). An aerial appraisal of the subject site and surrounding location is provided at Figure 2.

The FMP has been prepared to facilitate the management of the bushfire hazards that occur within the subject site. This Plan is a document that identifies management procedures for hazardous fuels within the bushland landscape of the subject site.

Fuel management works includes prescription burning and physical management for ecological conservation, property protection, fire trail maintenance and hazard reduction to lessen potential burn intensity.

Information relating to this process has been compiled in this document to serve as a practical guide to managing the environmental and ecological values of this landscape.

1.1 LAND OWNER

The land owner for the purpose of this plan is *Marsim (*trading as *Nature Coast Developments Pty Ltd*).

*Marsim (*trading as *Nature Coast Developments Pty Ltd*) will undertake the actions required of this plan in accordance with the schedules, programs, guidelines and instructions within this plan.

1.2 SCOPE

The scope of this Plan has taken into account the two key elements of bushfire management planning, i.e.:

- The protection of lives and property and
- The protection of the ecological (plants & animals) and heritage elements of the landscape.

Under any future development consent conditions and through the requirements of Section 63 of the *Rural Fires Act 1997*, the land managers of the subject site have a community obligation to protect life and property, as well as valuable natural assets. In general terms, fuel management aims to:

- Carry out hazard reduction to protect life and property
- Carry out hazard reduction to protect the broad range of forest resources and assets from the effects of uncontrolled wildfire and
- Implement infrastructure works that allow fuel management to occur (e.g. construction and maintenance of fire trails and the provision of financial resources to enable maintenance works to occur).

1.3 LOCAL GOVERNMENT AREA POLICIES AND PLANS

- The Eurobodalla *Shire Council* has the responsibility for undertaking planning for bushfire management and supporting co-ordinated fire fighting activities / hazard management activities in the Eurobodalla local government area.
- *Eurobodalla Bush Fire Risk Management Plan* (2002) details bush fire land management zones for the Eurobodalla Shire.
- The Eurobodalla LEP is the key land use planning instrument in the Eurobodalla Local Government Area. The development property contains land that has been zoned as:
  - 1(c) – Rural Small Holdings
  - 1(a) – Environmental Constraints
  - 10 – Urban Expansion
  - 7(a) – Environmental Protection (Wetlands)

1.4 STATE GOVERNMENT LEGISLATION

Planning for Bushfire Protection 2006 - The Rural Fire Service produced this guideline for assisting development planning in bushfire prone areas. The document entitled *'Planning for Bushfire Protection (2006)* outlines a range of considerations that need to be addressed in planning for bushfire protection.

The guide is to be accounted for as part of a development application and rezoning. It also provides councils and developers with detailed information on bushfire protection; from plan-making to development design, development control, construction certificates and property maintenance.

- Rosedale Development Control Plan –is the key development control plan that has been prepared specifically for Rosedale.

- The *Threatened Species Conservation Act* (1995) provides for the protection of threatened flora and fauna in NSW. All works of a fire mitigation nature must address the environmental consequences of activities such as hazard management. Also, '*High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition'* is listed as a Key Threatening Process in the *TSC Act* (1995). Those species listed under this Act, which have been recorded within the subject site include: Powerful Owl (*Ninox strenua*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)* and Yellow-bellied Glider (*Petaurus australis).* In addition, three (3) endangered ecological communities, Swamp Oak Floodplain Forest (SOFF), Riverflat Eucalypt Forest on Coastal Floodplains (RFEFCF) and Freshwater Wetlands on Coastal Floodplains (FWCF) were also recorded within the subject site.

- The *Native Vegetation Act* (2003) provides for the protection of native vegetation. The Act incorporates native vegetation clearing controls. Clearing of native vegetation is exempted if authorised under the *Rural Fires Act* (1997) or in areas zoned as residential land.

- The *Environmental Planning and Assessment Act* (1979) specifies that risks to people, property and the biophysical environment from bushfire risk are matters that must be considered in a development application.

- Other legislation affecting fire management planning and practice, includes the *National Parks and Wildlife Act, Crimes Act, Local Government Act, Environmental Planning and Assessment Act, Clean Air Act, Occupational Health and Safety Act.*

1.4.1 State Government Plans & Policies

- The *NSW Biodiversity Strategy* (NPWS 1997) was developed by the New South Wales Government and defines a collaborative approach to biodiversity conservation. Its over-riding goal is '*to protect the native biological diversity of NSW and maintain ecological processes and systems'*. Inappropriate fire regimes have been identified as one of the seven key threatening processes that are affecting the biological diversity of NSW.

- The *Riparian Policy* (1992) was produced by the Department of Land and Water Conservation (now, Department of Natural Resources). It addresses matters relevant to riparian lands, vegetation corridors and protected lands. The issues of catchment management are a key management concern for Council and the State Government Committees appointed to manage riparian and catchment matters. As certain areas requiring fuel management coincide with riparian areas, the recommendations of this Fuel Management Plan have been developed having regard to this Policy.

1.5 NATIONAL GOVERNMENT LEGISLATION

- The *Environmental Protection and Biodiversity Conservation Act* (1999) provides for the protection of Commonwealth listed species. There are no Commonwealth listed threatened flora or fauna species within the site. However, the site comprises one (1) preliminary listed endangered ecological community, Dry Gully Rainforest. The preliminary listing of this community means that no further consideration is required. Nevertheless, this community will be retained and protected within a conservation precinct and will not be impacted by fuel management procedures.

1.6 FIRE FIGHTING SERVICES

There is a NSW Rural Fire Service station located at Malua Bay approximately 3.5 kilometres (by road) from the property in a north easterly direction. NSW Rural Fire Service would have a response time of approximately 10-15 minutes to service the development if they are not assisting elsewhere.

The next nearest NSW Rural Fire Station is located at Broulee approximately 7 kilometres (by road) from the property in a southerly direction. The NSW Rural Fire Service station would have a response time of approximately 10-15 minutes to service the development if they are not assisting elsewhere.

SECTION 2.0 - BUSHFIRE MANAGEMENT

Bushfire management is the application of bushfire protection planning whilst maintaining a bushland environment for the residents and habitat optimisation for plants and animals. It facilitates the management of hazardous fuels on a regular and perpetual basis in an ecologically responsible manner.

Bushfire management starts by providing appropriate design / standards for all development works and activities across the Rosedale landscape. This can be achieved through the provision of adequate asset protection, roads and fire trails, water supply, fire fighting infrastructure, building design / construction and education programs that will facilitate ongoing public awareness of bushfire issues.

2.1 AIMS AND OBJECTIVES

The broad aims of bushfire protection are to take all practical steps to minimise potential damage to the proposed development within Rosedale from fire, minimise the spread of fires once they commence and promote co-operative fuel management and fire suppression with other fire control authorities and nearby landholders.

More specifically, the objectives are to:

- Protect life and property from wildfires
- Allow for effective evacuation
- Provide safe working platforms for fire fighting operations
- Provide safe and suitable housing for residents
- Prevent the spread of wildfires
- Exclude fire from environmentally sensitive areas and
- Maintain biodiversity

Other benefits of active bushfire management activities include:

- The opportunity to provide practical training in fire behaviour, fire safety and the use of fire control techniques and equipment,
- The establishment of good liaison and working relationships with neighbours, Rural Fire Service, Council and other authorities, in cooperative hazard reduction burns along common boundaries,
- A possible reduction of resources required to suppress fires contained by effective hazard reduction.

A Bushfire Protection Assessment (*Conacher Travers*, 2007f) has been undertaken to review the elements that comprise the overall threat upon the subject site.

2.2 THE COMPONENTS OF FUEL

Fuel is generally defined as being organic matter up to 25mm in diameter that is deposited on or attached to the ground surface. Fuel can be further subdivided into surface fuel (fuel deposited on the ground surface) and near-surface fuel (aerial).

Fuel includes litter, twigs, branches, shrubs, grasses, leaves and bark. Tree bark and canopy biomass is also a significant fuel source during a fire event.

Fine fuels are generally less than 6mm in diameter and it is these fuels that burn first in any bushfire event.

Twigs up to 25mm in diameter are the dominant coarse fuel component. Leaves, fragmented and partly decomposed organic material, twigs, shrubs, grasses and bark also comprise the fine fuel components.

Large fuel components (i.e. >25mm) is important in relation to fire damage and fire control in that, once ignited, it burns for a long time and generates a high level of heat. The ignition of large fuels has a role in generating and maintaining a convection column, which contributes to fire spread through long-distance spotting of coarse fuels (State Forests).

2.3 FUEL ACCUMULATION

Litterfall is the process in which organic material falls to the forest floor to form part of the forest fuel.

Fine fuel accumulation is dependent on the rate of litter fall and the rate of decomposition on the forest floor. A dynamic equilibrium is reached when litter fall is balanced by the amount of decomposition e.g. Smooth-barked Apple forest achieves equilibrium at 25 t/ha.

Research undertaken by the NPWS in 1991 (Conroy), for the *Sydney Fire Prevention Association*, found that fuel accumulation rates for the Sydney Region amounted to 7 t/ha after 3 years following fire in woodland and forest communities; and after 6 years for shrubland communities.

The study also found that total fine fuel (a combination of litterfall and shrub fuels), which is potentially a better measure of bushfire hazard, reached 7 t/ha 1-2 years after fire in all of the broad vegetation groups in the Sydney Region. This means that high fuel levels are achieved quickly in some of the vegetation types occurring within the Rosedale property.

2.4 FUEL MANAGEMENT

The fragmented nature of the vegetation within and surrounding the Rosedale property provides an effective landscape for hazard reduction operations. Vegetation adjoining the site to the north and north west, which forms Mogo State Forest, provides a greater threat due to the extent and density of cover. Additionally, the topography at these aspects of the site reaches steeper gradients increasing the potential for bushfire attack.

Fuel management is principally aimed at the fine fuel rather than the large fuel component. Large fuels sustain fire in unmanaged fuels, but do not carry or spread wildfire in the absence of fine fuels.

Fuel management prevents fuel weights from reaching the upper level of their equilibrium range and limits the vertical arrangement and continuity of fine fuels.

Low intensity fuel reduction burning will reduce fine fuel weight by up to 75% with 35% to 60% cover being achieved in most successful burns.

After low intensity burning, the fine fuel weight will recover to 70-80% of the pre-burn weight in about 2-3 years. High intensity wildfire generally reduces fine fuel weight by more than 75% and a high proportion (approaching 100%) of the area is generally burnt over.

The regularity of undertaking such practice every 2-3 years may exceed the physical and financial resource capacity to implement this work and cause significant impact upon biodiversity through overuse of fire as a management tool. However, the use of ecological burns should be undertaken every 7-15 years as appropriate to the respective vegetation community to promote the regeneration of native species.

2.5 FIRE BEHAVIOUR

The factors contributing to fire behaviour are described by Cheney (1981). Fire behaviour is strongly influenced by the availability and arrangement of fuel and by the prevailing weather. Fuel, heat and oxygen are all needed to maintain a fire. Removal or reduction of any of these will either extinguish it or slow its spread.

The intensity of fires depends on weather, topography and fuel conditions. The land manager only has the ability to manipulate fuel conditions such as the manipulation of fuel loads. The manipulation of fuel loads by careful burning in periods of low fire danger, reduces the possibility of ignition, allows wildfire damage to be moderated and facilitates wildfire control activities.

Fire danger rating systems have been developed to indicate the chances of a fire starting and its rate of spread, intensity and difficulty of suppression, according to various combinations of temperature, wind speed, relative humidity and drought effects.

The McArthur Forest Fire Danger Index (FDI) Rating System generates a numerical 100-point Fire Danger Index (FDI) and a 5 class descriptive rating of fire danger, based on a number of climatic variables.

The FDI, together with specific information on fuel weight, topography and forest type, allows predictions of fire behaviour to be made. Such predictions include rate of spread, flame height (and scorch) and spotting distance. Spotting distance is an important consideration in fire management, since the bark characteristics of many tree species give them a high spotting potential.

2.6 FUEL TYPES

Vegetation communities for the Rosedale property have been categorised in line with a methodology devised by the Southern Regional Fire Association (1994).

This methodology involved the grouping of vegetation associations into similar fine fuel characteristics based on three fuel groups Low, Moderate and High.

Vegetation communities identified within the subject site are listed in Table 2 and depicted on Figure 5 and include: Spotted Gum/Ironbark Open Forest, Blackbutt Woodland, Dry Gully Rainforest, Banksia Scrub, Aquatic Herbfield, Swamp Oak Open Forest, Disturbed Swamp Oak Open Heath, Natural Freshwater Wetland, Grassland with Scattered Trees, Disturbed Redgum Open Woodland, Closed Swamp Paperbark Scrub and Disturbed Swamp Paperbark Open Heath

There are variations within three of the nine vegetation communities. Grassland with Scattered Trees covers the majority of the site.

Table 1 - Fuel Types Calculated for Rosedale

Fuel Category	Vegetation Communities	Characteristics of Fuel Group
High	Spotted Gum/Ironbark Open Forest Banksia Scrub Disturbed Swamp Oak Open Heath Disturbed Swamp Paperbark Open Forest	Will generally ignite and burn quickly and intensely during an average fire season. Continuous fuel from ground to canopy in high quantities.

Table 1 - Fuel Types Calculated for Rosedale

Fuel Category	Vegetation Communities	Characteristics of Fuel Group
Moderate	Blackbutt Woodland Disturbed Redgum Open Woodland Closed Swamp Paperbark Scrub	Potential for high intensity bushfires. Generally have live fuel shrub understorey which will burn under a broad range of conditions. Moderate to high surface fuel levels and open canopies allow sunlight and wind to quickly dry available fuels.
Low	Dry Gully Rainforest, Aquatic Herbfield, Natural Freshwater Wetland Grassland with Scattered Trees. Swamp Oak Open Forest.	Moist, low-medium quantity fuels or very high fuels; unlikely to contribute to high intensity fires during an average season. If part of a forest community then it can burn with significant intensity.

2.7 IMPLEMENTATION OF FUEL MANAGEMENT STRATEGIES

The responsibility for these works is with the land owner on private lands (e.g. *Marsim* - trading as *Nature Coast Developments Pty Ltd*) or the relevant public authority on public lands (e.g. DECC, Council).

The responsibility for fuel management will initially be with *Marsim (*trading as *Nature Coast Developments Pty Ltd*). Given the proposed management of the subject site under a Community Management Title, once lands are developed and lots are sold, fuel management responsibilities will be redirected to the jurisdiction of individual landowners within their lots and a Community Association for the remaining, communal portions of the site.

Community Management Title subdivision provides a mechanism for the common management and implementation of ongoing fuel management activities by a group of landowners. The detailed operational requirements and responsibilities for fuel management are included in a Community Management Statement that forms part of the Community Plan of Subdivision.

Covenants, under Section 88b of the *Conveyancing Act 1919* also provide a mechanism for defining the fuel management requirements on individual lots.

2.8 FUEL MANAGEMENT FOR CONSERVATION

Due to the nature of the development and the small portion of existing vegetation, a diversity of fire regimes will be required in order to maintain the native biodiversity. A reduction in species numbers and diversity is likely if fire regimes of relatively fixed intensity, frequency and extent prevail without interruption.

The majority of the fuel management within the Rosedale development will be undertaken by mechanical means to the performance standards of an inner protection area. Therefore, the use of hazard reduction burning will be limited to areas that are ecologically sensitive or where management by mechanical means is not practical. Hazard reduction burns within these ecologically sensitive areas should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

SECTION 3.0 - THE BUSHFIRE CONTEXT

There are many factors which influence the potential impact of a bushfire upon a landscape. Climatic influences create the potential intensity and speed of a fire whilst topographic conditions assist in easing or stopping the path of a fire. The fire behaviour potential therefore has a marked bearing on the actual bushfire threat upon a locality.

The protection and ongoing management of the natural resources of the property are also primary in the assessment of bushfire management options for the Rosedale landscape.

3.1 LANDSCAPE CONTEXT

The subject site (refer Figure 1) is located near Barlings Beach and situated on the northern side of George Bass Drive, approximately 1.5 km to the west of Rosedale and 1.5 km to the north-east of Tomakin. Approximate Australian Map Grid (AMG) coordinates for the site are 247500E and 6033000N. The site encompasses an area of 173.59 hectares.

The subject site is bounded by Mogo Stage Forest to the west and northwest, rural development and fragmented bushland to the east and George Bass Drive to the south. The subject site occurs south of Batemans Bay and north of the Tomaga River within the Eurobodalla Local Government area (LGA).

Two existing residences are located in the north east of the subject site adjoining Bevian Road. A nursery that is no longer operational is located to the south west of the residences extending to cattle yards and sheds further south. A pump station is located in the drainage line to the south of the nursery.

A series of ten (10) dams have been constructed throughout the subject site. Four dams are located in the northern drainage line that flows to the east, three in the drainage line to the south of the nursery, one to the east below the Banksia Scrub vegetation (“The Knoll”), one within the Swamp Oak Open Forest to the west of Bevian Road and one to the west of the Blackbutt Woodland vegetation community.

3.2 NATURAL LANDSCAPE DESCRIPTIONS

Topography and Drainage

The subject site is naturally divided into two catchments by a ridgeline which traverses the site in an east west direction. The topography across the site is gently undulating to steep land and contains a network of drainage lines. Gradients of the subject site range from steep (20^{o}) in the upper drainage lines to less than 5^{o} within the floodplain of the Bevian

Swamp. The approximate elevation ranges from less than 10m AHD within the Bevian Swamp to 100m (AHD) on the ridge within the north-western section of the subject site.

The northern section of the subject site contains the upper tributaries of Saltwater Creek which discharge over Barlings Beach into the South Pacific Ocean. The catchment drains from several small drainage lines which flow generally to the south east to Saltwater Creek. There are two farm dams located on this drainage line in the north of the subject site. To the south of the old nursery there is another tributary of Saltwater Creek which initially flows in a southerly direction and contains one farm dam in the upper reaches of this tributary. The creek then turns to the east in which two more farm dams have been constructed. To the south another tributary of Saltwater Creek flows in an easterly direction from Bevian Road into a small farm dam. From this farm dam two smaller drainage lines, which were dry at the time of the survey, flow in different directions one to the north east and one to the south east into Saltwater Creek.

The catchment of the southern section of the subject site flows into the Bevian Swamp. One drainage corridor is located to the north west of the Bevian Swamp and contains a small farm dam after which the drainage line is not defined and the topography flattens out and becomes a floodplain. The south eastern section of the subject site contains a floodplain of the Bevian Swamp with no defined drainage corridor located in this area.

Vegetation

The subject site has been subjected to extensive clearing, with most of the natural vegetation being removed. The majority of the subject site consists of pasture with scattered trees and fragmented areas of remnant vegetation along the peripheries. Cleared areas of the subject site are currently being used for cattle grazing. Impacts of grazing are also evident within the more accessible vegetation remnants.

The majority of the subject site has been cleared for agricultural purposes. Native open forest forms the eastern, north eastern and north western sections of the property. Native vegetation is also present around the Bevian Swamp in the southern section of the subject site. Two areas of remnant Swamp Oak Open Forest exist within the floodplain to the north and northwest of the Bevian Swamp. A remnant patch of Banksia Scrub vegetation exists upon a hill known locally as “The Knoll”, located in the central section of the property.

Surrounding lands contain native vegetation, with the property adjoining Mogo State Forest along the north western boundary. Lands to the north, east and south west contain native vegetation and are currently used for rural residential purposes. To the south east there is cleared land which is currently a sewage treatment plant. To the south across George Bass

Drive is Barlings Beach Caravan Park and native vegetation adjoins the Caravan Park to the east.

The nearest conservation reserves are Illawong and Broulee Island Nature Reserves located approximately 5 km to the south. Murramarang National Park is located approximately 15km to the north of the subject site.

Mogo State Forest adjoins the western and north western boundaries of the subject site and covers an area of approximately 15,500 ha.

Overall the vegetation within the site is considerably disturbed. Nine (9) identified vegetation communities and three (3) vegetation community variants have been identified onsite with varying levels of disturbance (refer Table 2 and Figure 5). The communities include variations of Open Forest, Woodland, Dry Gully Rainforest, Banksia Scrub, Aquatic Herbfield, Grassland with Scattered Trees, Open Woodland and Closed Scrub.

Table 2 - Vegetation communities within the subject site

Vegetation Community Title	Dominant Species
Spotted Gum/Ironbark Open Forest	*Corymbia maculata* (Spotted Gum) *Eucalyptus fibrosa* (Broad-leaved Ironbark) *Eucalyptus muelleriana* (Yellow Stringybark)
Blackbutt Woodland	*Eucalyptus pilularis* (Blackbutt) *Corymbia maculata* (Spotted Gum) *Eucalyptus fibrosa* (Broad-leaved Ironbark) *Eucalyptus muelleriana* (Yellow Stringybark)
Dry Gully Rainforest (Preliminary EEC under the *EPBC Act* 1999)	*Alphitonia excelsa* (Red Ash) *Claoxylon australe* (Brittlewood) *Cassine australis* *Acmena smithii* (Lilly Pilly) *Glochidion ferdinandi* (Cheese Tree).
Banksia Scrub	*Acacia irrorata* subsp. *irrorata* (Blueskin) *Acacia longifolia* (Sydney Golden Wattle) *Acacia melanoxylon* (Blackwood) *Allocasuarina littoralis* (Black She-oak) *Banksia integrifolia* (Coast Banksia)
Swamp Oak Open Forest (EEC under the *TSC Act* 1995)	*Casuarina glauca* (Swamp Oak) *Eucalyptus botryoides* (Bangalay)
Disturbed Swamp Oak Open Heath (EEC under the *TSC Act* 1995)	*Casuarina glauca* (Swamp Oak) - <1m in height

Table 2 - Vegetation communities within the subject site (Cont.)

Vegetation Community Title	Dominant Species
Aquatic Herbfield	*Blechnum cartilagineum* (Gristle Fern) *Centella asiatica* (Swamp Pennywort) *Eleocharis sphacelata,* (Tall-spike Rush) *Juncus usitatus* (Common Rush) *Ottelia ovalifolia* (Swamp Lily) *Paspalum distichum* (Water Couch) *Persicaria decipiens*
*Natural Freshwater Wetland (EEC under the *TSC Act* 1995)	*Blechnum cartilagineum* (Gristle Fern) *Centella asiatica* (Swamp Pennywort) *Eleocharis sphacelata,* (Tall-spike Rush) *Juncus usitatus* (Common Rush) *Ottelia ovalifolia* (Swamp Lily) *Paspalum distichum* (Water Couch) *Persicaria decipiens*
Grassland with Scattered Trees	*Corymbia maculata* (Spotted Gum) *Eucalyptus globoidea* (White Stringybark) *Eucalyptus fibrosa* (Broad-leaved Ironbark) *Eucalyptus longifolia* (Wollybutt) *Eucalyptus tereticornis* (Forest Red Gum)
Disturbed Redgum Open Woodland (EEC under the *TSC Act* 1995)	*Eucalyptus tereticornis* (Forest Red Gum) *Melaleuca ericifolia*
Closed Swamp Paperbark Scrub (EEC under the *TSC Act* 1995)	*Casuarina glauca* (Swamp Oak) *Melaleuca ericifolia*
* Disturbed Swamp paperbark Open Heath (EEC under the *TSC Act* 1995)	*Melaleuca ericifolia* - <1m in height
* Denotes vegetation community variation	

3.3 FIRE HISTORY

Fire history is a useful tool in the assessment of fire behaviour potential and fire pathways. In the assessment of fire history the following sources were targeted.

Eurobodalla Bushfire Risk Management Plan

The Eurobodalla Bushfire Risk Management Plan was prepared by the Rural Fire Service jointly with other agencies in the region and a Draft dated 21 February 2002 advertised for public comment. The Plan was adopted by the NSW Commissioner under the Rural Fires Act 1997 on June 20 2002. This plan sets out specific responses to a range of management issues.

Many of Council's obligations under the Rural Fires Act 1997 are carried out by the Rural Fire Service under a Service Level Agreement. Following formal adoption of the Bushfire Risk Management Plan, this agreement was reviewed and amended during 2002/03 and signed off on August 8 2003. A new agreement has been developed between the Rural Fire Service District Team, Eurobodalla and Bega Valley Shire Councils. This will be implemented commencing September 2006.

Site Inspection and Ground Truthing

The site has been inspected and ground truthed by John Travers and Michael Sheather-Reid of *Conacher Travers* on several occasions between 2006 and 2007. Upon these inspections there was no evidence that would suggest that the site had been recently affected by a significant bushfire.

PART B – GUIDELINES

SECTION 4.0 - PROTECTION OF ASSETS AND INFRASTRUCTURE

Developing in bushfire prone areas requires consideration of the overall threat upon a site and the way occupants of a site / dwelling(s) are able to cope in the event of a bushfire. To assess the bushfire threat that is likely to occur and affect this property, and the eventual dwelling occupiers, a review of the elements that comprise the overall threat needs to be completed.

These elements include the presence of hazardous fuels on site, the extent of the bushfire risk and the expected level of vulnerability of any proposed dwellings and other infrastructure. A bushfire protection assessment (*Conacher Travers*, 2007f) was undertaken to review these elements, the findings of which are presented on Schedule 1.

Following on from the bushfire protection assessment, the fuel management plan will aim to protect not only the lives and / or property of residents within the Rosedale development, but also the infrastructure that supports the built environment and or used to manage the natural environment.

The built environment normally includes dwellings, sheds, roads, fire trails, community open space facilities, fencing, signage, gates, drainage infrastructure and asset protection zones.

4.1 FUEL MANAGEMENT STRATEGIES

In areas adjacent to high value assets and where life and property are at risk, the objective of strategic fuel management is to maximise fire suppression in the event of a wildfire. Fuel management in these zones aims to allow a direct method of wildfire suppression under most weather conditions.

Across the Rosedale property, fuel reduction objectives will be met by establishing asset protection zones and implementing hazard reduction burns where appropriate.

In most areas of the subject site, hazard reduction burning will be excluded due to the community assets present both within and around the retained / revegetation areas. However, hazard reduction burning is the most efficient and cost effective method of fuel management, allowing protection of a broad range of assets.

Research undertaken by *Conacher Travers* in 2003-2004 revealed that in woodland and forest communities, fuel can be manipulated to achieve the performance standard of an Inner Protection Area (IPA) or Outer Protection Area (OPA) without significant impact upon vegetation diversity or abundance. APZ standards are discussed in Section 4.2.

Fuel management can be undertaken via various means and costs are significantly different for each treatment option. The methods annexed to this report include slashing, mowing, burning (including localised pile burning) and physical clearing.

Other fuel management strategies may be prescribed in very limited circumstances. These include:

1. Grazing: using animals to eat vegetation and therefore reduce fuel loads.
2. Pruning: removing the lower branches of tress to create a vertical fuel discontinuity to reduce the chance of surface fires developing into crown fires.
3. Fuel Replacement: replacing highly flammable vegetation types with less flammable vegetation types.
4. Selective tree removal: removing selected trees to reduce the continuity of tree canopies to reduce the chance of crown fire development.

4.2 MANAGEMENT OF ASSET PROTECTION ZONES

The management responsibility of asset protection zones will generally be implemented as follows:

- Where asset protection zones fall within lots, these will be managed by the Lot owner

- Where asset protection zones fall on community land they will be managed under community title

The area in which the fuel reduction occurs for protection of an asset is referred to as an asset protection zone. The asset protection zone can be further classified into two sub-zones with each having a specific role. These sub-zone areas are called the Inner Protection Area (IPA) and the Outer Protection Area (OPA).

The IPA is managed as a fuel free zone while the OPA is managed as a fuel reduced zone. This means that the fuel free zone has little fuel available to be consumed in the event of a fire whilst the fuel reduced zones has less than normal fuel levels that could be consumed in the event of a fire.

The performance standards of an inner protection area and an outer protection area are outlined Section 4.2.1 and 4.2.2.

4.2.1 Inner Protection Area (IPA)

This area is *almost free* of all fuels and usually takes the form of grassy areas, car parks, roads, concrete areas, tracks or trails. It does not imply or require the wholesale removal of every tree.

This zone is intended to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fuel. This area also allows airborne embers to fall safely without igniting further outbreaks. This zone also provides a safe fire fighting position and is operationally important for implementation of clear fire control lines.

A recommended performance standard for the fuel load of an Inner Protection Area is between 0-4 t/ha. Shrubs may occur within an Inner Protection Area commensurate with a spatial distribution of 15-25%. For example an area of 100m^2 (10mx10m) can have up to 25m^2 of this area composed of shrubs.

4.2.2 Outer Protection Area (OPA)

This zone is designed to stop the development of 'intense' fires and the transmission of 'severe' radiated heat.

The OPA assumes all trees will remain but with a modified shrub / grass and litter layer. In some sparse vegetation communities the shrub layer may not require modification.

The fire fighting advantage will manifest in reduced fire intensity. It achieves this by denying fire a significant proportion of the fuel to feed upon. Fuels containing small (or fine) leaves such as Forest Oaks (or similar) are targeted for removal due to the capacity to burn quickly and therefore feed fire up into adjacent trees.

A recommended performance standard for the fuel load of an Outer Protection Area is between 4-6 t/ha. Shrubs, trees and grasses may occur within an OPA commensurate with a spatial distribution of 50-75% i.e. 50-75m^2 within 100m^2.

4.3 PRESENCE OF VEGETATION IN THE INNER PROTECTION ZONE

Grasses may occur within an Inner APZ if they are generally no higher than 50-75mm. Above this height, fuel weights tend to increase exponentially and consequentially cause greater flame heights.

As a general rule different vegetation types have different natural fuel loads in different strata. Thus the specific design of the Inner Protection Area will be dependent on species selection and spatial arrangement and will vary accordingly upon fuel sample analysis.

Trees may occur within an Inner Protection Area if the canopy is not linked. The Rural Fire Service advises that canopy trees should be at least 2 metres apart. It should be noted, however that this may need to be increased up to between 8 and 10 metres apart in some circumstances.

In general though, a canopy should have no vertical or horizontal links with other vegetation. The reason for this is to lessen any chance for fire to extend vertically into the canopy from shrub or understorey vegetation such as *Allocasuarina* or *Casuarinas*; and horizontally between tree canopies.

It is a basic premise in fire behaviour understanding that fire cannot extend into the canopy if there are no surface fuels such as grasses or shrubs to feed fire vertically.

Different tree species display a variety of crown shapes and sizes. For example trees that have a canopy beginning near the ground (such as Forest Oaks (*Allocasuarina*)) can potentially form a continuous link with the ground vegetation and the canopy. In the case of *Allocasuarinas* the whole tree may need to be removed, or at a minimum, the lowest 50% of limbs. The location of the Allocasuarina and its shape with regard to other shrubs will determine the outcome.

In addition trees such as Turpentine (*Syncarpia glomulifera*) have canopies that are tall and elongated. The canopy starts approximately 2.5 metres off the ground surface and can extend to 10-12 metres vertically. In this case the lower limbs are removed to a height of 5m.

In comparison a Blackbutt (*Eucalyptus pilularis*) tree that is 25 metres in height would typically have a canopy between the 15-25 metre zone and regularly has a wide canopy spread of 20-25 metres. A Smooth Barked Apple (*Angophora costata*) has a canopy spread of between 10-25 metres and the canopy zone can very between 3-20 metres vertically. In the case of Blackbutts selected limbs may need to be removed to prevent canopy connection.

The difference in these trees is that the ground fuels do not link to the Blackbutt in a fire event as opposed to the easy linkage with the Turpentine. In essence, a forest canopy cannot burn without fuel to feed that fire.

Another example is open woodland where the low canopy height (usually < 5 metres) merges with the shrubland layer. On a steep slope at the top of a ridge the canopy is much closer to the ground and the presence of ladder fuels enables a fire to get into the canopy very quickly, in fact almost instantaneously.

As such every tree is different and requires different responses from fire managers on how to best apply asset protection. Knowing the relationship between the shrub layer and the tree canopy allows fire managers to design safer areas in the asset protection zones. As a general rule, trees are allowed within an inner protection area at densities of <1 tree every $100m^2$ i.e. 6-18m centres depending on the species.

However, variations are possible. For example, Smooth-barked trees are less of a hazard than heavily barked trees. The latter can cause fire to run up into the canopy and, if there is sufficient wind, the resulting fire can be of high intensity. In the case of Smooth-barked Apple, selected limbs may need to be removed to prevent canopy connectivity.

The density of trees depends on an individual assessment being undertaken to determine the 'type / size of tree', and its resultant potential impact upon a dwelling. Specific assessment of every site should be undertaken to acknowledge the differing types of trees as described above.

4.4 ECOLOGICAL / ENVIRONMENTAL MONITORING

For the purpose of creating a gauge for the success of the Rosedale development, as well as continuing to place primary importance upon the ecological value of the region and maintaining biodiversity for the long term, it will be vitally important to initiate, develop and continue a monitoring program through the Rosedale property, especially during development and the early stages of occupation.

This should include monitoring of vegetative composition, fauna presence, habitat availability and the presence and conservation of threatened species both within the development property and within the surrounding area.

Monitoring activities should report on the following items:

1. Ongoing & regular dialogue with Rural Fire Service, NSW Department of Environment and Climate Change and Eurobodalla Council should occur in respect of development control matters and their relevance to bushfire protection of the site and nearby adjacent areas.
2. Report on changing access capability across the site at the development proceeds.
3. Post burn mapping and monitoring will be undertaken by *skilled representatives* of the owners to determine if the objectives of any fuel management strategies have been achieved.
4. Hazard (fuel) management works have been undertaken in accordance with the objectives of this plan.
5. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species and Endangered Ecological Communities.

6. Ongoing consultation with neighbours in respect of hazard management of the Rosedale development site and adjacent off site protection measures.
7. Post burn monitoring of weed infestation has occurred a follow up plan (if needed) to remove such infestations.
8. Review the *Fuel Management Plan* annually.

4.5 ACCESS ISSUES

Fuel management can only occur where effective access is provided.

As the majority of the areas of both retained vegetation and proposed revegetation are relatively small in size and also generally narrow. Access to and around these areas for fire fighting / hazard management is not an issue for this site.

The proposed road layout within the Rosedale development provides for a perimeter road around the existing vegetation and areas of proposed revegetation works within the development.

The internal road network of the proposed development will provide adequate access / egress for emergency vehicles. Best practice design will ensure minimal dead ends with perimeter roads or fire trails providing strategic advantage in the event of a bushfire.

All access requirements shall be compliant with the provisions of *'Planning for Bushfire Protection, 2006'.*

4.6 BUSH FIRE MANAGEMENT ZONES

Bush fire management zones are used to facilitate broad and specific fire management objectives.

The Rosedale property has been divided up into a number of management zones based on areas of similar environmental, cultural and social characteristics (refer Schedule 2). Bushfire risk and bushfire behaviour also tend to be similar within each zone. Zone descriptions provide information on assets that need protecting and guidelines that need to be considered during bushfire suppression operations.

Table 3 provides fire management objectives that reflect the site requirements. Table 3 may need to be reviewed annually as additional stages of the project are developed.

Three major categories of management zones are used in the plan, these are:

- Asset Protection Zones (APZ)
- Heritage Management Zones (HMZ) – Environmental Protection
- Strategic Fire Management Zones (SFMZ)

Each zone has fire management objectives, strategies, actions and performance criteria specific to the area within its boundary. For example, HMZ's with fire sensitive communities such as Banksia Scrub will have fire management objectives and an APZ on the fire prone side of the residential development. These objectives will integrate management to ensure continued ecological health and the protection of assets.

The boundary of fuel management units is typically delineated by strategically located roads, trails, or tracks or by natural fire barriers such as creeks and water bodies.

It should be noted that threatened species and endangered ecological community locations need to be identified to assist with defining the boundary of fuel management works. All vegetated zones should be treated as potential habitat for such species as threatened bats and birds known to occur on site. These species are highly mobile and will utilise a variety of vegetation on site.

Fuel management within each of the Heritage Management Zones is to be undertaken in accordance with the Ecological Site Management Plan (*Conacher Travers*, 2007b).

Table 3 - Fuel Management Objectives and Strategies for Management Zones

Zone/Area/Features	Objectives	Strategies
Asset Protection Zone 1 (APZ 1) 3.53 ha Located in the north – east corner of the development consisting of the proposed development area Inner protection areas (IPA) are located adjacent all buildings adjoining areas of managed bushland within the site. Inner protection areas will usually include a perimeter road.	To provide adequate buffer for residents, visitors and dwellings within the area from uncontrolled bushfire. To ensure that the presence of fuels, are minimised, therefore reducing the impact of direct flame contact and radiant heat on the development (*Planning for Bushfire Protection, 2006*). To retain up to 25% shrub coverage in strategic locations and to retain trees where possible. To provide egress routes with adequate capacity and emergency assembly points.	Maintain area by mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Annually review fuel loads within these zones prior to the bush fire season and ascertain the need for additional maintenance of the APZ. Selective removal of limbs overhanging buildings. Retain hollow bearing branches. Document accurate details of maintenance works/hazard reduction burns/wildfires within this precinct. Documentation should include the date and extent of the maintenance/hazard reduction burns/wildfires. Hazard reduction burns should include the ignition point(s), weather conditions and success rate. Wildfire burns should include ignition point(s), intensity and control lines. Hazard reduction burns should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Asset Protection Zone 2 (APZ 2) 5.95 ha Located in the north – west corner of the development. This area consists of steep land (12 -15º) which is not generally suitable for development, but subject to detailed slope analysis can be utilised for rural-residential lots. Contains an ecological corridor which is to be managed to OPA standards Inner protection areas will usually include a perimeter road.	To provide adequate buffer for residents, visitors and dwellings within the area from uncontrolled bushfire. To ensure that the presence of fuels, are minimised, therefore reducing the impact of direct flame contact and radiant heat on the development (*Planning for Bushfire Protection, 2006*). To retain up to 25% shrub coverage in strategic locations and to retain trees where possible. To provide public recreation, education and leisure facilities as well as providing a strategic fire advantage zone that is fuel managed. These areas will assist in mitigating the impact of fire through the Rosedale area. To provide a canopy habitat link between the riparian corridor and retained vegetation to the south of the development area. To provide egress routes with adequate capacity and emergency assembly points.	Maintain area by mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Annually review fuel loads within these zones prior to the bush fire season and ascertain the need for additional maintenance of the APZ. Selective removal of hazardous limbs. Retain hollow bearing branches. Document accurate details of maintenance works/hazard reduction burns/wildfires within this precinct. Documentation should include the date and extent of the maintenance/hazard reduction burns/wildfires. Hazard reduction burns should include the ignition point(s), weather conditions and success rate. Wildfire burns should include ignition point(s), intensity and control lines. Hazard reduction burns should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Asset Protection Zone 3 (APZ 3) 27.65 ha Located in the northern central portion of the site consisting of the proposed development area. Inner protection areas (IPA) are located adjacent all buildings adjoining areas of managed bushland within the site. Inner protection areas will usually include a perimeter road.	To provide adequate buffer for residents, visitors and dwellings within the area from uncontrolled bushfire. To ensure that the presence of fuels, are minimised, therefore reducing the impact of direct flame contact and radiant heat on the development (*Planning for Bushfire Protection, 2006*). To retain up to 25% shrub coverage in strategic locations and to retain trees where possible. To provide egress routes with adequate capacity and emergency assembly points.	Maintain area by mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Annually review fuel loads within these zones prior to the bush fire season and ascertain the need for additional maintenance of the APZ. Selective removal of limbs overhanging buildings. Retain hollow bearing branches. Document accurate details of maintenance works/hazard reduction burns/wildfires within this precinct. Documentation should include the date and extent of the maintenance/hazard reduction burns/wildfires. Hazard reduction burns should include the ignition point(s), weather conditions and success rate. Wildfire burns should include ignition point(s), intensity and control lines. Hazard reduction burns should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Asset Protection Zone 4 (APZ 4) 3.60 ha Located in the central west portion of the development. This area consists of steep land (12 - 15º) which is generally not suitable for development, but subject to detailed slope analysis, can be utilised for rural-residential lots. Inner protection areas will usually include a perimeter road.	To provide adequate buffer for residents, visitors and dwellings within the area from uncontrolled bushfire. To provide public recreation, education and leisure facilities as well as providing a strategic fire advantage zone that is fuel managed. These areas will assist in mitigating the impact of fire through the Rosedale area. To provide egress routes with adequate capacity and emergency assembly points. To protect vegetation within landscape beds and adjacent remnant vegetation.	Maintain area by mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Annually review fuel loads within these zones prior to the bush fire season and ascertain the need for additional maintenance of the APZ. Selective removal of limbs considered a hazard. Retain hollow bearing branches. Document accurate details of maintenance works/hazard reduction burns/wildfires within this precinct. Documentation should include the date and extent of the maintenance/hazard reduction burns/wildfires. Hazard reduction burns should include the ignition point(s), weather conditions and success rate. Wildfire burns should include ignition point(s), intensity and control lines. Hazard reduction burns should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Asset Protection Zone 5 (APZ 5) 14.13 ha Located in the centre of the development consisting of the proposed development area. Inner protection areas (IPA) are located adjacent all buildings adjoining areas of managed bushland within the site. Inner protection areas will usually include a perimeter road. Contains some open space areas to be utilised by surrounding residents	To provide adequate buffer for residents, visitors and dwellings within the area from uncontrolled bushfire. To provide egress routes with adequate capacity and emergency assembly points. To protect vegetation within landscape beds and adjacent remnant vegetation. To provide public recreation, education and leisure facilities as well as providing a strategic fire advantage zone that is fuel managed. These areas will assist in mitigating the impact of fire through the Rosedale area.	Maintain area by mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Annually review fuel loads within these zones prior to the bush fire season and ascertain the need for additional maintenance of the APZ. Selective removal of limbs overhanging buildings. Retain hollow bearing branches. Document accurate details of maintenance works/hazard reduction burns/wildfires within this precinct. Documentation should include the date and extent of the maintenance/hazard reduction burns/wildfires. Hazard reduction burns should include the ignition point(s), weather conditions and success rate. Wildfire burns should include ignition point(s), intensity and control lines. Hazard reduction burns should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Location/Issues	Objectives	Strategies
Asset Protection Zone 6 (APZ 6) 37.0 ha Located in the southern portion of the development consisting of the proposed development area Inner protection areas (IPA) are located adjacent all buildings adjoining areas of managed bushland within the site. Inner protection areas will usually include a perimeter road. Contains some open space areas to be utilised by surrounding residents	To provide adequate buffer for residents, visitors and dwellings within the area from uncontrolled bushfire. To provide egress routes with adequate capacity and emergency assembly points. To protect vegetation within landscape beds and adjacent remnant vegetation. To provide public recreation, education and leisure facilities as well as providing a strategic fire advantage zone that is fuel managed. These areas will assist in mitigating the impact of fire through the Rosedale area.	Maintain area by mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Annually review fuel loads within these zones prior to the bush fire season and ascertain the need for additional maintenance of the APZ. Selective removal of limbs overhanging buildings. Retain hollow bearing branches. Document accurate details of maintenance works/hazard reduction burns/wildfires within this precinct. Documentation should include the date and extent of the maintenance/hazard reduction burns/wildfires. Hazard reduction burns should include the ignition point(s), weather conditions and success rate. Wildfire burns should include ignition point(s), intensity and control lines. Hazard reduction burns should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 1(a – l) Spotted Gum / Ironbark Open Forest 35.8 ha The Spotted Gum/Ironbark vegetation community provides important habitat by way of shelter and denning sites for arboreal animals. This corridor is to be revegetated with native species. The locations of this vegetation community are depicted on Schedule 2.	To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation communities within the area. To provide a habitat link between the riparian corridor and retained vegetation adjacent the development area.	Natural regeneration area. Management strategies should be consistent with the Ecological Site Management Plan Exclude prescribed burns, fuel reduction limited to selective removal of timber waste and excessive litter buildup. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 2 Dry Gully Rainforest 0.87ha Dry Gully Rainforest corresponds to the *EPBC Act* preliminary listed endangered ecological community, Dry Rainforest of the South East Forests. This vegetation community occurs as a small fragment in the north western corner of the site and will be conserved within a conservation zone.	To protect and regenerate (where required) the Dry Gully Rainforest within the area. To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation communities within the area. To provide a habitat link between the riparian corridor and retained vegetation adjacent the development area.	Natural regeneration area. Management strategies should be consistent with the Ecological Site Management Plan Exclude prescribed burns, fuel reduction limited to selective removal of timber waste and excessive litter buildup. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 3 Banksia Scrub 2.27 ha Located within Vegetation Corridor 2, the Banksia Scrub vegetation community is considered to be regionally significant. This vegetation community is under threat from processes such as clearing and urban development and will be protected as an Open Space zone within the site.	To protect and regenerate (where required) the Banksia Scrub vegetation within the area. To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation communities within the area. To provide a habitat link to retained vegetation adjacent the development area.	Natural regeneration area. Management strategies should be consistent with the Ecological Site Management Plan Exclude prescribed burns, fuel reduction limited to selective removal of timber waste and excessive litter buildup. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 4 Blackbutt Woodland 3.62 ha Forms part of Vegetation Corridor 2 which crosses the site from east to west. Will be regenerated to provide flora and fauna habitat and to preserve and enhance the ecological values of the site.	To protect and regenerate (where required) the Blackbutt Woodland vegetation within the area. To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation communities within the area. To provide a habitat link to retained vegetation adjacent the development area.	Natural regeneration area. Management strategies should be consistent with the Ecological Site Management Plan Exclude prescribed burns, fuel reduction limited to selective removal of timber waste and excessive litter buildup. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 5(a – c) Swamp Oak Open Forest (TSC Listed EEC) 12.81ha Swamp Oak Open Forest and Freshwater Wetland vegetation correspond with the endangered ecological communities, listed under the NSW Threatened Species Conservation Act 1995, Swamp Oak Floodplain Forest and Freshwater Wetlands on Coastal Floodplains respectively. These vegetation communities are associated with Bevian Wetland and will be conserved within the conservation zone.	To protect and regenerate (where required) the Swamp Oak Open Forest vegetation within the area. To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation community within the area. To provide a habitat link to retained vegetation adjacent the development area. To conserve flora, fauna and biodiversity values of EEC's.	Natural regeneration area. Management strategies should be consistent with the Ecological Site Management Plan Exclude prescribed burns, fuel reduction limited to selective removal of timber waste and excessive litter buildup. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 6 Riverflat Eucalypt Forest on Coastal Floodplains (TSC Listed EEC) 1.78 ha Riverflat Eucalypt Forest on Coastal Floodplains vegetation which corresponds with the endangered ecological community, listed under the NSW Threatened Species Conservation Act 1995, Riverflat Eucalypt Forest on Coastal Floodplains	To protect and regenerate (where required) the Riverflat Eucalypt Forest on Coastal Floodplains vegetation within the area To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation community within the area. To provide a habitat link to retained vegetation adjacent the development area.	Natural regeneration area. Management strategies should be consistent with the Ecological Site Management Plan Exclude prescribed burns, fuel reduction limited to selective removal of timber waste and excessive litter buildup. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 7 **Freshwater Wetland Vegetation** (TSC Listed EEC) 6.34ha Freshwater Wetland vegetation which corresponds with the endangered ecological community, listed under the NSW Threatened Species Conservation Act 1995, Freshwater Wetlands on Coastal Floodplains.	To protect and regenerate (where required) the Freshwater Wetland vegetation within the area To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation community within the area. To provide a habitat link to retained vegetation adjacent the development area.	Natural regeneration area. Management strategies should be consistent with the Ecological Site Management Plan Exclude prescribed burns, fuel reduction limited to selective removal of timber waste and excessive litter buildup. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Heritage Management Zone 8 Grassland with Scattered Trees 4.32 ha Located within the south east corner of the property, the Grassland with Scattered Trees vegetation provides an open space area which can be utilised by residents for recreational activities. This zone also provides suitable foraging habitat for utilisation by predatory birds	To retain the Grassland with Scattered Tree vegetation within the area. To conserve flora, habitat for fauna and ecological biodiversity values within the area. To provide a habitat link to retained vegetation adjacent the development area.	Maintain areas beyond the APZ zones as an outer protection area (OPA).This is achieved by maintaining the OPA through underscrubbing (retain 50-75% of shrub layer) and keeping understorey growth managed (5-8 t/ha). Excessive dead vegetation should be removed as required. The size and type of timber and litter to be removed will be undertaken to retain habitat resources for native fauna and hance maintain overall biodiversity. Biological monitoring results identifying the impacts on general biodiversity; density, abundance and distribution of target threatened species. Document accurate details of maintenance works and wildfires within this precinct. Documentation should include the date and extent of the maintenance and wildfires. Wildfire burns should include ignition point(s), intensity and control lines.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Strategic Fire Management Zone 1 North-east Corner Loop 3.43ha Surrounds APZ 1 To be managed as an IPA for strategic protection of APZ 1	To strategically protect adjoining residents, visitors, dwellings and infrastructure within the development area and threatened fauna from uncontrolled bushfire To reduce fuel in the area to decrease the intensity of an approaching fire and restrict the pathway to crown fuels, reducing the level of direct flame, radiant heat and ember attack (*Planning for Bushfire Protection, 2006*).	Maintain areas beyond the APZ zones as an inner protection area (IPA) adjacent APZ's 1 -6. This is achieved by maintaining the IPA through mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Excessive dead vegetation should be removed as required.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Strategic Fire Management Zone 2 Northern Inner Loop 11.40ha Surrounds APZ's 2 and 3 To be managed as an IPA for strategic protection of APZ's 2 and 3 Contains an ecological corridor which is to be managed to OPA standards	To strategically protect adjoining residents, visitors, dwellings and infrastructure within the development area and threatened fauna from uncontrolled bushfire To reduce fuel in the area to decrease the intensity of an approaching fire and restrict the pathway to crown fuels, reducing the level of direct flame, radiant heat and ember attack (*Planning for Bushfire Protection, 2006*).	Maintain areas beyond the APZ zones as an inner protection area (IPA) adjacent APZ's 1 -6. This is achieved by maintaining the IPA through mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Excessive dead vegetation should be removed as required.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Strategic Fire Management Zone 3 Central Loop 9.50ha Surrounds APZ's 4 and 5 To be managed as an IPA for strategic protection of APZ's 4 and 5	To strategically protect adjoining residents, visitors, dwellings and infrastructure within the development area and threatened fauna from uncontrolled bushfire To reduce fuel in the area to decrease the intensity of an approaching fire and restrict the pathway to crown fuels, reducing the level of direct flame, radiant heat and ember attack (*Planning for Bushfire Protection, 2006*).	Maintain areas beyond the APZ zones as an inner protection area (IPA) adjacent APZ's 1 -6. This is achieved by maintaining the IPA through mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Excessive dead vegetation should be removed as required.
Strategic Fire Management Zone 4 Southern Inner Loop 6.55 ha Surrounds APZ 6 To be managed as an IPA for strategic protection of APZ 6	To strategically protect adjoining residents, visitors, dwellings and infrastructure within the development area and threatened fauna from uncontrolled bushfire To reduce fuel in the area to decrease the intensity of an approaching fire and restrict the pathway to crown fuels, reducing the level of direct flame, radiant heat and ember attack (Planning for Bushfire Protection, 2006).	Maintain areas beyond the APZ zones as an inner protection area (IPA) adjacent APZ's 1 -6. This is achieved by maintaining the IPA through mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Excessive dead vegetation should be removed as required.

Table 3 - Fuel Management Objectives and Strategies for Management Zones (Cont.)

Zone/Area/Features	Objectives	Strategies
Strategic Fire Management Zone 5 Cheese Factory / Spotted Gum/Ironbark Forest 6.55ha The Cheese Factory consists of a historical building with associated landscaping and an attached residence. The factory is to be retained as an example of the historical setting of the period in which it was built. Located on the eastern edge of the property, adjacent Vegetation Corridor 1, the Spotted Gum/Ironbark vegetation community provides important habitat by way of shelter and denning sites for arboreal animals. This vegetation also adds to the visual amenity of the Cheese factory which is to be retained as an example of the European heritage of the area.	To be maintained to preserve the character of the buildings and immediate landscape, in accordance with the historical setting of the period. To conserve flora, habitat for fauna, ecological biodiversity values and the vegetation communities within the area. To provide a habitat link to retained vegetation adjacent the development area.	The lot containing the Cheese Factory and associated building is to be maintained as an IPA. The Spotted Gum/Ironbark Forest is to be managed as an OPA This is achieved by maintaining the IPA through mowing / underscrubbing shrubs (retain 25% coverage) and limiting fine fuels accretion to < 4 t/ha. Within the OPA it is achieved by underscrubbing (retain 50-75% of shrub layer) and keeping understorey growth managed (< 4-6 t/ha). Excessive dead vegetation should be removed as required. Slashing to be undertaken to stimulate new growth and remove old growth. Annually review fuel loads within these zones prior to the bush fire season and ascertain the need for additional maintenance of the APZ. Selective removal of limbs overhanging buildings. Retain hollow bearing branches. Document accurate details of maintenance works/hazard reduction burns/wildfires within this precinct. Documentation should include the date and extent of the maintenance/hazard reduction burns/wildfires. Hazard reduction burns should include the ignition point(s), weather conditions and success rate. Wildfire burns should include ignition point(s), intensity and control lines. Hazard reduction burns should aim to create a mosaic of burnt and unburnt vegetation resulting in greater floral diversity within the site.

PART C – FUEL MANAGEMENT PROGRAM

SECTION 5 - PLAN ADMINISTRATION

5.1 MANAGEMENT OF WORKS

The works programmed for the next five years will initially be managed by *Marsim (*trading as *Nature Coast Developments Pty Ltd*) until such time as the Community Association is established to implement the Fuel Management Works.

The Fuel Management Program is to be managed by a Bushfire Co-ordinator responsible for timely implementation and co-ordination of all works. The key tasks of the Fuel Management Plan are as follows:

1 Hazard Reduction Applications for
- Asset Protection Zone Works
- Heritage Management Zone Works
- Strategic Fire Management Zone Works

Inclusive of Environmental Assessment and preparation and submission of appropriate supporting documents and applications.

2 Instruction and maintenance of fire trails.

3 Co-ordination of contractors for
- Slashing
- Selective Vegetation Removal
- Tree Trimming
- Ecological Burns
- Protection of Ecological Significant Plants and Fauna Habitat.

4 Fuel load monitoring, reporting and program design.

5 Amendments to operational guidelines.

5.2 ENVIRONMENTAL ASSESSMENT OF SCHEDULED WORKS

A review of any possible environmental impacts shall be prepared for the activities listed in the proposed annual works schedules in accordance with the RFS Hazard Reduction Code.

Any application should be lodged some six months prior to the intended date of the activity in order for the RFS to process the application.

Annexure 1 provides a list of matters that should be compiled in respect of implementation of this fuel management plan.

5.3 APPROVALS REQUIRED TO UNDERTAKE FUEL MANAGEMENT WORKS

Fuel management works includes prescription burning for ecological conservation, fire trail construction and maintenance, and hazard reduction to lessen burn intensity. Approvals need to conform with the Rural Fire Service *Hazard Reduction Code.*

5.4 MONITORING FUEL

Fuel sampling will be required to take place pre and post fuel reduction works and recorded into a database for reporting and future HR application. Periodic fuel sampling will be required as part of zone requirements to determine the need for ecological burns. Fuel sampling will be carried out according to the fuel sampling guidelines attached in Annexure 2.

5.5 MONITORING FIRE REGIMES AND CHANGES TO BIODIVERSITY

Mapping of all fires, both planned and unplanned, will be required to ensure that information is available for effective analysis of fire regimes and or changes to biodiversity.

A Fire Reporting Form is attached as Annexure 3.

5.6 OPERATIONS WORKS SCHEDULE

The operational works schedule specifies the proposed activities in hazard management for asset protection and heritage management.

The Operational Works Schedule for 2005 – 2009 is attached at Annexure 1.

The ability to implement each planned burn will be influenced by seasonal conditions, resources and fire events.

5.7 FIRE MANAGEMENT ACCESS

Trail maintenance will be undertaken as required to maintain access tracks and ground condition. Training will be required to initiate work concepts and standards of care and or construction.

5.8 PLAN REVIEW

There is likely to be a need to review fire management strategies as further information and research into the management of flora and fauna develops. To ensure that regular reviews are undertaken, this fire plan has an operation life span of 5 years until the year 2009. At the completion of this time period, the plan will be formally reviewed. However, given the expected development programme for the Rosedale development this Plan should be reviewed annually during the initial development stages of the project.

5.8.1 Evaluation

The evaluation objectives which are relevant to this Fuel Management Plan are:

- The protection of life and property from the adverse effects of fire.
- The maintenance of reduced hazardous fuel levels in strategic locations associated with the residential settlements.
- The maintenance of biodiversity through the appropriate management of fire regimes.
- The management of existing fire trails.
- The effective communication of management decisions in respect of the fuel management plan and its implementation program.

5.8.2 Life and Property Protection

The achievement of these objectives will be evaluated by:

- Co-operation with the Eurobodalla Bush Fire Management Committee through the provision of public education on fire prevention, preparedness and response for residents of the general Rosedale area.
- Collection and maintenance of accurate fire history records and an evaluation of trends.
- Upgrading and maintenance of the trails to the identified standard.
- A readily implementable Schedule of Works.

5.8.3 Maintenance of Biodiversity

The achievement of biodiversity objectives will be evaluated by:

- Accurate recording of all prescribed burns and wildfires
- Comparing fire history with the fire regimes identified within each zone to determine the adherence to the prescription
- Incidence of fire in the fire sensitive vegetation and or locations
- Recovery of other recently burned vegetation communities

- Success of neighbourhood relations and in particular the incidence of arson activities of accidental fire ignitions
- No loss of threatened species, populations or endangered ecological communities.

The assessment of these objectives will be achieved by implementing the monitoring regime of key indicators. A Project Ecologist is to be engaged to assess the impacts of fire management activities on biodiversity and threatened species. A benchmark monitoring program is implemented to identify baseline biological conditions, diversity and abundance of flora and fauna species. Event-based monitoring is also undertaken to identify the impacts of particular fire management activities on specific areas and species.

If the monitoring regime indicates a significant change in the diversity or abundance of threatened species and general biodiversity, a review of the fire management activities will be undertaken and methods modified to avoid impacting significantly upon any critical species. Should there be unavoidable conflict in the maintenance of a threatened species or EEC, alternative rehabilitation programs will be investigated.

5.9 ANNUAL REPORTING

An annual report on the works will be completed, which will be submitted to:

The Executive Officer
Eurobodalla Bush Fire Management Committee
Rural Fire Service Headquarters

The report will comprise fire reporting forms as attached in Annexure 3 inclusive of a summary of any or all fires that have occurred on site or on the immediate border of the site (private lands, Council lands, National Park lands). The latter will assist in ecological planning on border management issues.

5.10 CONCLUSION AND RECOMMENDATIONS

This Fuel Management Plan identifies the approach used to minimise fuel loads and the impact of hazard reduction works in environmentally sensitive areas. The approach is fundamentally based on the measurement and monitoring of fuel loads and subsequently specifying the level of fuel removal sensitive to the site's ecological attributes.

Fuel removal is based upon whether an area is classified as an Inner Protection Area or an Outer Protection Area, not based on whether the site contains Swamp Oak Open Forest, Freshwater wetland or Dry Gully rainforest. However fuel management in OPAs that encroach on Endangered Ecological Communities (EEC's) aim to have as little impact as possible.

Within the Swamp Oak Open Forest, fuel management will be undertaken sensitively with appropriately qualified contractors / personnel to promote biodiversity and to protect significant ecological functions. The area of Swamp Oak Open Forest directly associated with the wetland edge will not be impacted.

REFERENCES

AMBS (2003) *Flora and Fauna Impact Assessment for the Rosedale Master Plan Area*. Prepared for *Marsim (*trading as *Nature Coast Developments Pty Ltd*).

Australian Fire Authorities Council, March 1996. *'Glossary of Rural Fire Terminology'. Information handout for Fire Managers*, produced by AFAC. Mount Waverly, Vic.

Binns, D. and Kavanagh, R. P. (1990) *Flora and fauna survey of Nalbaugh State Forest (Part) Bombala District, Eden Region, south eastern NSW*. NSW Forestry Commission. Forest Resources Series No. 9.

Birk and Bridges (1989) *Recurrent Fires and Fuel Accumulation in Even Aged Blackbutt (Eucalyptus Pillularis) Forests*. For. Ecol. Management 29: 59-79.

Bradstock et al (1995). *Bushfire risk at the Urban interface estimated from historical weather records: consequences for the use of prescribed fire in the Sydney Region of South-eastern Australia*. Journal of Environmental Management 1998, 52, 259-271.

Bradstock, R.A. (et al) 1996. *Conserving Biodiversity: Threats and Solutions* Surrey, Beatty and Sons Pty Ltd. Sydney.

Briggs, J.D. and Leigh, J.H. (1995) *Rare or Threatened Australian Plants. Revised Edition* (CSIRO: Melbourne).

Bureau of Meteorology (2000). *KBDI readings for Eden and Merimbula (1994-2000).*

Catling, P. C. (1991). *Ecological effects of prescribed burning practices on the mammals of south-eastern Australia.* In Conservation of Australia's Forest Fauna ed. D Lunney, Royal Zoological Society of NSW, Mosman. Ch 30, pp.353-363.

Catling, P.A., Coops, N.C. and Burt, R.J., 2000. *The Distribution and Abundance of Ground-dwelling Mammals in Relation to Time since Wildfire and Vegetation Structure in southeastern Australia*.

Cheney, P. (1981) *Fire Behaviour.* In: Fire and the Australian Biota. A.M. Gill, Groves, R. and Noble I.R. (eds) Australian Academy of Science, Canberra pp151-171.

Cheney, P. (1981). Fire Behaviour. In: *Fire and the Australian Biota.* AM. Gill, Groves, R and Noble, LR (eds). Australian Academy of Science, Canberra. pp. 151-171.

Christensen, P.E.S., Wardell-Johnson, G. and Kimber, P. (1985). Birds and fire in south western forests. In Keast, A., Recher, H.F., Ford, H. and Saunders, D. (eds). *Birds of Eucalypt Forests and Woodlands: Ecology, Conservation and Management.* Surrey Beatty. Sydney. pp.291-299.

Cogger, H.G. (1996) Reptiles *and Amphibians of Australia*. Reed Books Australia.

Conacher Travers (2007b) Ecological Site Management Plan, Bevian Road Concept Application, Bevian Road, unpublished report prepared for *Marsim* (trading as *Nature Coast Developments Pty Ltd*)

Conacher Travers (2007f) Bushfire Protection Assessment, Bevian Road Concept Application, Bevian Road, unpublished report prepared for *Marsim* (trading as *Nature Coast Developments Pty Ltd*)

Conroy, B. (1993) *Fuel Management strategies for the Sydney Region*, In Ross, J (ed) The Burning Question: fire management in NSW, UNE, Armidale.

Dowden, H. (1985). *Preliminary fine fuel curves for a dry forest site in the Blue Mountains.* Unpubl. research report. F.C. N.S.W. 39pp.

Gill, A.M., Groves, R.H., Noble, I.R. (1981) *Fire and the Australian Biota*, Australian Academy of Science, Canberra.

Gilmour, P. (1983) *Vegetation survey of Nadgee Nature Reserve*. NPWS unpublished report.

Gration G, Quin, D. and Andrews S.P. (1993). *Description and Assessment of Forestry Impacts on Fauna of the Urbenville Forestry Management Area.* Austeco Pty Ltd Annidale - Environmental Consultants for State Forests of NSW.

Gunninah (2002) *Flora and Fauna Constraints and Opportunities Assessment. Rosedale, Schofields*. Prepared for *Marsim (*trading as *Nature Coast Developments Pty Ltd*).

Hager, T.C. & Benson, J.S. (1994) *Review of conservation status of vegetation communities in NSW Part* 3. *Assessment of the conservation status of forest plant communities in north eastern NSW* Report to Australian Heritage Commission.

Harden, G. (1993) *Flora of New South Wales* University NSW Press.

Keith, D. and Bedward, M. (1998) *Forest Ecosystem Classification and Mapping for the Eden Comprehensive Regional Assessment*. Report undertaken for the NSW CRA/RFA Steering Committee. Project number NE 18/EH.

Keith, D.A. and Sanders J.M (1990) *Vegetation of the Eden region, South-eastern Australia: Species composition, diversity and structure*. J. Vegetation Science 1:203-232.

Keith, D.A., Bedward, M. and Smith, J. (1995) *Vegetation of the South East Forest of New South Wales*. NSW National Parks and Wildlife Service, unpublished report.

Luke R.H and McArthur A.G (1978) *Bushfires in Australia.* Australian Government Publishing Service, Canberra.

Morrison, D.A., Buckney, R.T., Bewick, B.J., Cary, G.J. (1996) *Conservation conflicts over burning bush in south eastern Australia*. Biological Conservation **76** 167-175.

NPWS (1990) Fire Management Manual.

NPWS (1991) Ed. Conroy R. (1991) *Fuel Management Strategies for the Sydney Region*, Report to the Sydney Regional Fire Association.

NPWS (1991) *Report to Sydney Regional Fire Association Fuel Accumulation Rates in Sydney Region Ed.* Conroy. B.

NPWS (1997) *Draft NSW Biodiversity Strategy: Biodiversity Life's Variety*.

NPWS (1999) Threatened Species Management - Species Information.

NPWS (2000a) Ben Boyd National Park and Bellbird Creek Nature Reserve Draft Plan of Management.

Pizzey, G. & Knight, F. (1997) *A Field Guide to the Birds of Australia* Angus & Robertson.

Richmond, R.R. (1976). *The use of fire in the forest environment.* F.C. N.S.W. 28pp.

Robinson, M. (1996) *A Field Guide to Frogs of Australia* Reed.

Simpson & Day (1996*) Field Guide to the Birds of Australia* Viking.

Southern Regional Fire Association (1994), *Improving Bushfire Management for Southern New South Wales.*

State Forests of NSW (1998) *A field guide to South East Forests of New South Wales.*

State Forests of NSW*. Fire Management Manual* (1995).

State Forests of NSW. *Fuel Management Plan, Walcha District* (1995).

Strahan, R. (1998) *The Mammals of Australia* The Australian Museum.

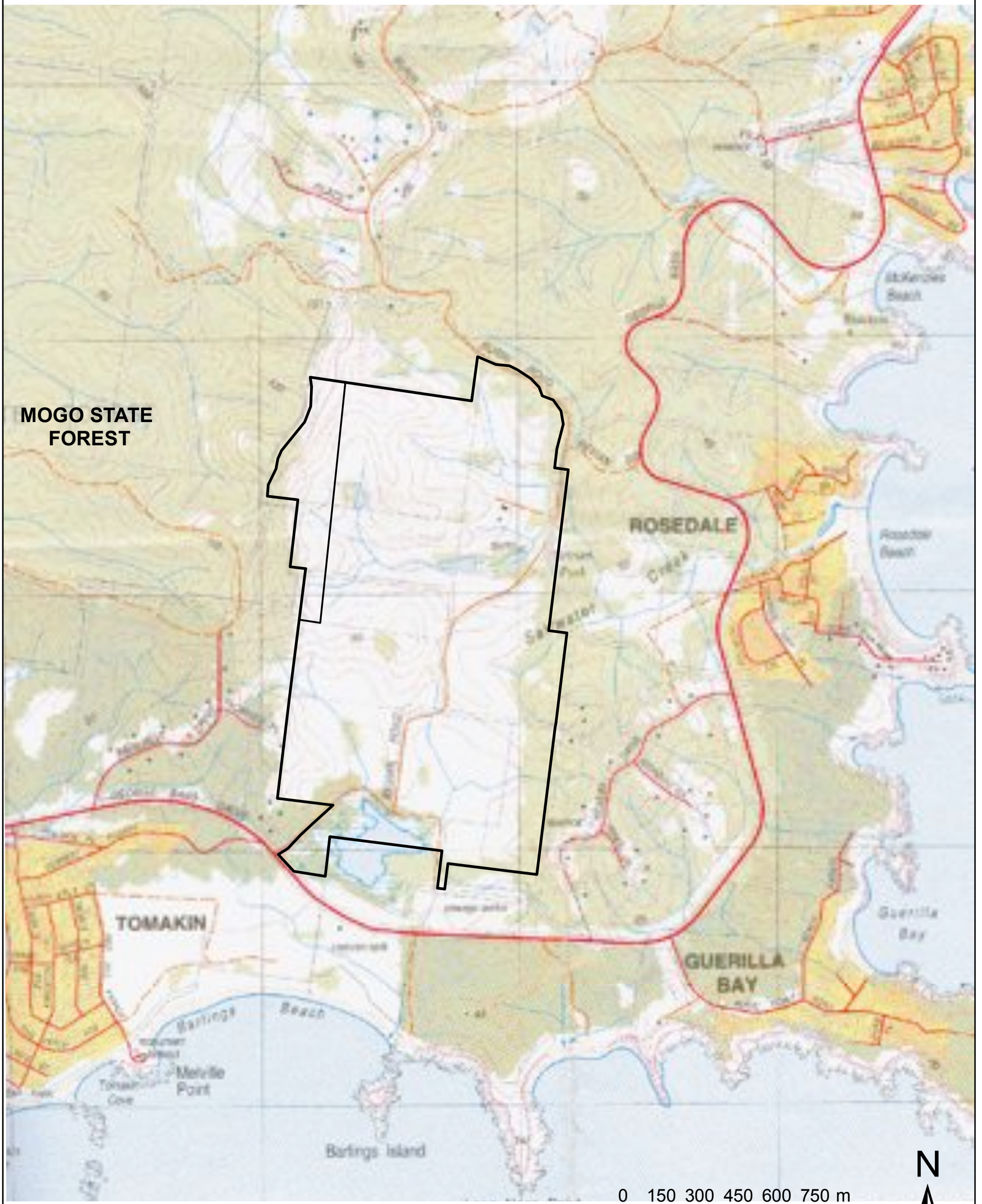
Travers, J. (1989) *The Use of Siro-Plan LUPIS in Fuel Management Planning*. Course paper for Sturt University 1989.

Travers, J. (2004) *Fuel Management of a Demonstration Residential Lot within Wallarah Peninsula Stages 1 – 12.*

Walker (1981). *Fuel dynamics in Australian vegetation.* In "Fire and the Australian Biota", ed. Gill, AM., Groves, R.H., and Noble, I.R. Aust. Academy of Science.

Walker, J. (1981) *Fuel Dynamics in Australian Vegetation* - In: Fire and the Australian Biota. A.M. Gill, Groves, R. and Noble I.R. (eds) Australian Academy of Science, Canberra.

FIGURES



Legend

Property Boundary

Original plan produced in A3 colour

**Subject Site boundary subject to final survey*

CONACHER TRAVERS

Bushfire & Environmental Consultants
40 The Avenue, Mt. Penang Parklands,
Central Coast Highway, Kariong NSW 2250
Ph (02) 4340 0677 Fax (02) 4340 2367
e-mail: ecology@conachertravers.com.au

Figure 1 -
Property Location
Bevian Road, Rosedale

Ver.F1 By.TM 17/10/07 Ref.No.6052

Source: Dept. of Lands 1:25,000 Aerial Photograph,

Legend

Property Boundary

0 200 400 600 800 1,000 m

1:14,000

Original plan produced in A3 colour

N

*Subject Site boundary subject to final survey

Bushfire & Environmental Consultants
40 The Avenue, Mt. Penang Parklands,
Central Coast Highway, Kariong NSW 2250
Ph (02) 4340 0677 Fax (02) 4340 2367
e-mail: ecology@conachertravers.com.au

Figure 2 -

Aerial Appraisal

Bevian Road, Rosedale

Ver.F2 By.TM 17/10/07 Ref.No.6052

Source: Dept. of Lands 1:25,000 Aerial Photograph,

Trees Retained as Part of Development Area

Category 3 Watercourse No. 2

Category 3 Watercourse No. 1

Cheese Factory

Remainder of the vegetation within the site and outside of those vegetation communities indentified in the legend forms Vegetation Community 7 - Grassland with Scattered trees

Trees Retained as Part of Development Area

'The Knoll'

Category 3 Watercourse No. 3

Category 3 Watercourse No. 4

Wetland Buffer 50m

Category 3 Watercourse No. 5

Freshwater Wetland Vegetation is not representative of the SEPP 14 Bevian Wetland

Legend

- Property Boundary
- Wetland Buffer (50m)
- Category 3 Water Courses
- Drainage Lines *Overland Flow Zones*
- 1 Spotted Gum/Ironbark Open Forest
- 2 Blackbutt Woodland
- 3 Banksia Scrub
- 4 Dry Gully Rainforest (Preliminary EEC - EPBC Act)
- 5 Swamp Oak Open Forest (Core Quality Swamp Oak Floodplain Forest - EEC - TSC Act)
- 5a Disturbed Swamp Oak Open Heath (Low Quality Swamp Oak Floodplain Forest - EEC - TSC Act)
- 6 Aquatic Herbfield
- 5a Freshwater Wetland Vegetation (Core Quality Freshwater Wetlands on Coastal Floodplains - EEC - TSC Act)
- 8 Disturbed Redgum Open Woodland (Low Quality Riverflat Eucalypt Forest on Coastal Floodplains - EEC - TSC Act)
- 9 Disturbed Swamp Paperbark Open Heath (Low Quality Swamp Oak Floodplain Forest - EEC - TSC Act)
- 9a Swamp Paperbark Closed Scrub (Core Quality Swamp Oak Floodplain Forest - EEC - TSC Act)
- Bangalay Sand Forest
- Perimeter Asset Protection Zone

0 100 200 300 400 500 m

1:10,000

Original plan produced in A3 colour

N

*Subject Site boundary subject to final survey

All mapped features are approximate and require land survey to confirm the location of Asset Protection Zones relative to developement footprint

CONACHER TRAVERS

Bushfire & Environmental Consultants

40 The Avenue, Mt. Penang Parklands,
Central Coast Highway, Kariong NSW 2250
Ph (02) 4340 0677 Fax (02) 4340 2367
e-mail: ecology@conachertravers.com.au

Figure 3 -

The Constraints Map - Ecological and Bushfire Constraints

Bevian Road, Rosedale

Ver.F3 By.TM 17/10/07 Ref.No.6052

Source: Dept. of Lands 1:25,000 Aerial Photograph,

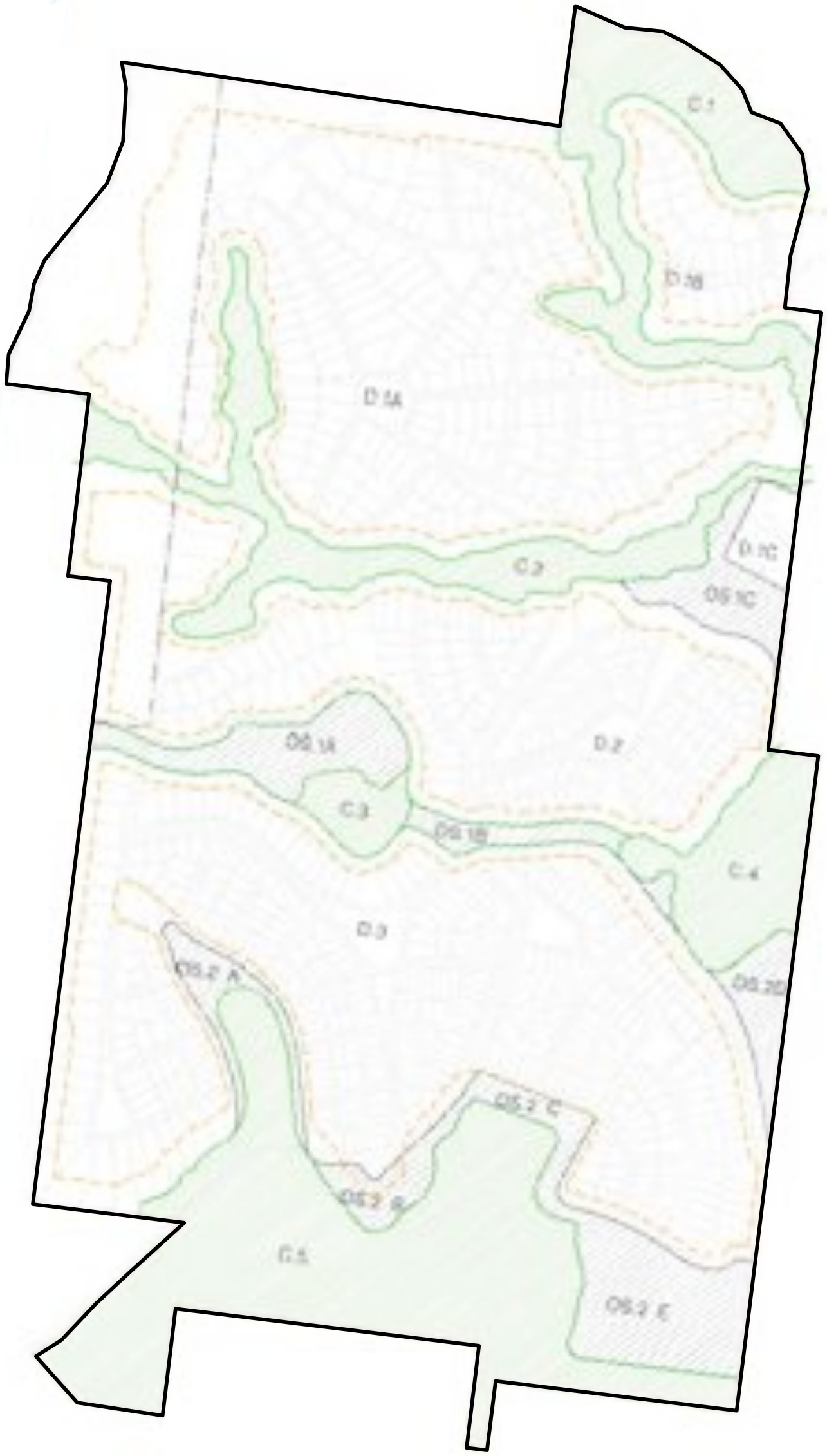
CONACHER TRAVERS

Bushfire & Environmental Consultants
40 The Avenue, Mt. Penang Parklands,
Central Coast Highway, Kariong NSW 2250
Ph (02) 4340 0677 Fax (02) 4340 2367
e-mail: ecology@conachertravers.com.au

Figure 4 -
The Plan of Subdivision
Bevian Road, Rosedale

Ver.F4 By.TM
17/10/07
Ref.No.6052

Source: Dept. of Lands 1:25,000 Aerial Photograph,



0 100 200 300 400 500 m

1:7,000

Original plan produced in A3 colour

N

Legend

Property Boundary

*Subject Site boundary subject to final survey

CONACHER TRAVERS

Bushfire & Environmental Consultants

40 The Avenue, Mt. Penang Parklands,
Central Coast Highway, Kariong NSW 2250
Ph (02) 4340 0677 Fax (02) 4340 2367
e-mail: ecology@conachertravers.com.au

Figure 5 -

Precinct Plan

Bevian Road, Rosedale

Ver.F5
17/10/07
Ref.No.6052

Source: Dept. of Lands 1:25,000, Aerial Photograph

SCHEDULES

SCHEDULE 1 **Bushfire Protection Measures**
SCHEDULE 2 **Fuel Management Zones**

Legend

- Property Boundary
- Perimeter Asset Protection Zone
- Category 3 Water Courses
- Drainage Lines *Overland Flow Zones*
- Passive Recreation Area
- FOREST — Vegetation Formation Classification (PBP 2006)
- Level 1 Construction Standards
- Level 2 Construction Standards
- Level 3 Construction Standards

0 100 200 300 400 500 m

1:8,000

Original plan produced in A3 colour

N

All mapped features are approximate and require land survey to confirm the location of Asset Protection Zones relative to developement footprint

**Subject Site boundary subject to final survey*

CONACHER TRAVERS

Bushfire & Environmental Consultants

40 The Avenue, Mt. Penang Parklands,
Central Coast Highway, Kariong NSW 2250
Ph (02) 4340 0677 Fax (02) 4340 2367
e-mail: ecology@conachertravers.com.au

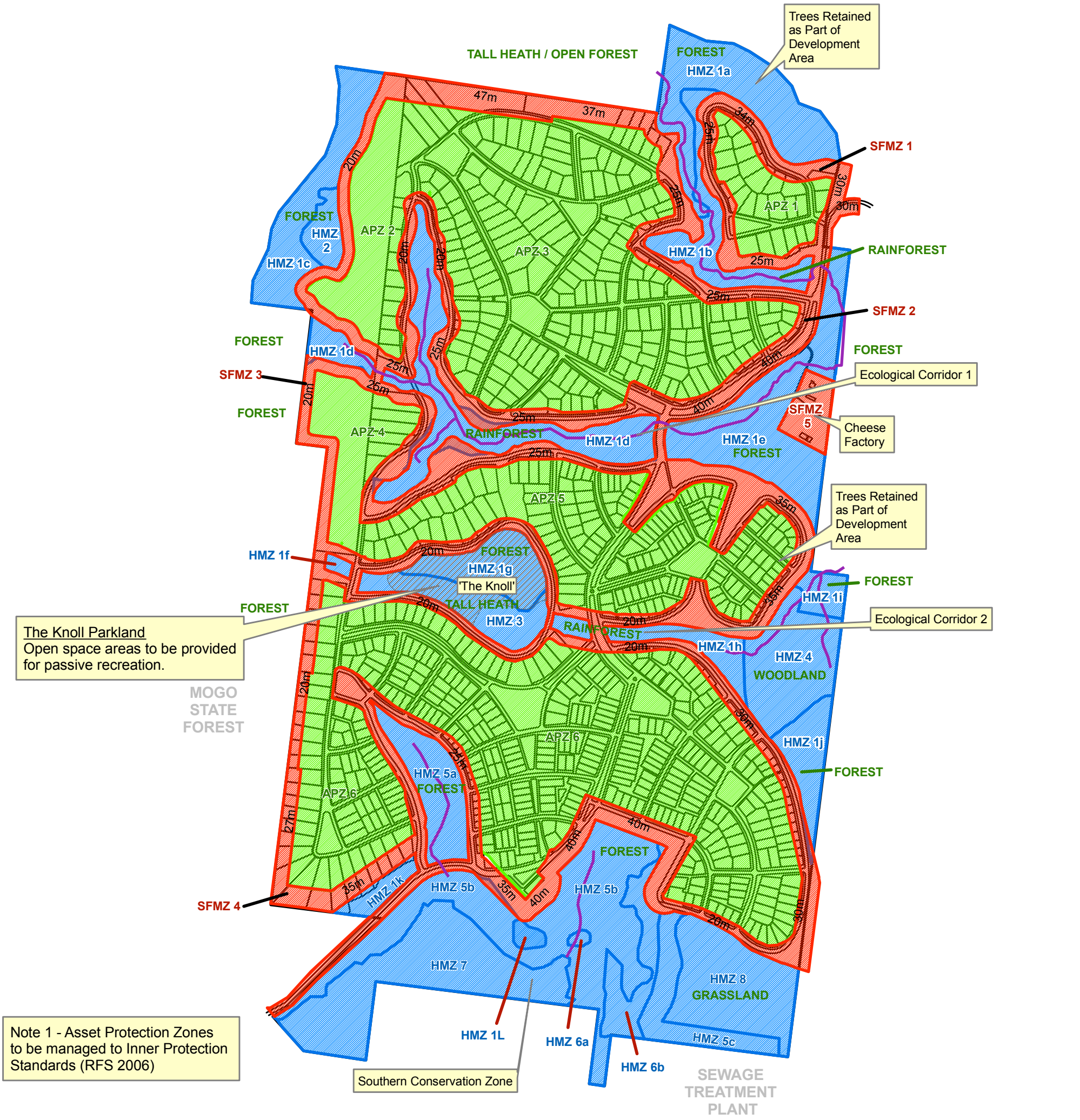
Schedule 1 -

Bushfire Protection Measures

Bevian Rd, Rosedale

Ver.S1 By.TM
22/11/07
Ref.No.6052

Source: Dept. of Lands 1:25,000 Aerial Photograph,



All mapped features are approximate and require land survey to confirm the location of Asset Protection Zones relative to developement footprint

*Subject Site boundary subject to final survey

CONACHER TRAVERS

Bushfire & Environmental Consultants

40 The Avenue, Mt. Penang Parklands,
Central Coast Highway, Kariong NSW 2250
Ph (02) 4340 0677 Fax (02) 4340 2367
e-mail: ecology@conachertravers.com.au

Schedule 2 -
Fuel Management Zones
Bevian Rd, Rosedale

Ver.S2 By.TM
17/10/07
Ref.No.6052

Source: Dept. of Lands 1:25,000 Aerial Photograph,

ANNEXURE 1

Operational Works
Schedule 2005-2009

ANNEXURE 1 – OPERATIONAL WORKS SCHEDULE

The schedule of works includes operations on:

- Works 1 - Environmental assessment procedure
- Works 2 - Fire Trail works
- Works 3 - Asset management works
- Works 4 - Works Timetable
- Works 5 - Operational Guidelines

Details are provided below:

WORKS 1 - Environmental Assessment of Scheduled Works

- An environmental assessment shall be prepared in accordance with the *RFS Hazard Reduction Code*, for each hazard reduction burn, and will be forwarded to the Eurobodalla Rural Fire Service for determination in accordance with the requirements of the Rural Fire Act.

- An example of this assessment is provided by the *Bushfire Protection Assessment* (*Conacher Travers*, 2007f).

WORKS 2 - Trail Maintenance Works

- Fire trail works will be undertaken in accordance with the design specifications outlined in *Planning for Bushfire Protection 2006* and in accordance with construction standards set by *Soil Conservation Service 1985*.

WORKS 3 - Asset Management Works

The following relate to the fire management zones identified on Schedule 2 and should be read in conjunction with that Schedule. Refer to Annexure 5 for an explanation of terms.

WORKS 4 - Works Timetable

The works identified in Works 3 above will be implemented following environmental assessment and approval protocol being undertaken.

A photographic essay will be used to provide historical evidence of works and or standards required.

WORKS 5 - Operational Guidelines

Operational Guidelines are to be prepared for contractors/operators to minimise adverse impacts resulting from the HR works and to maintain co-operation with neighbours, RFS, Council and community organisations.

ANNEXURE 1 – OPERATIONAL WORKS SCHEDULE

The operation guidelines incorporate:

1 Use of machinery.
2 Protocol for implementation of HR works especially ecological / prescribed burns.
3 Community participation protocols.
4 Monitoring of fuel loads.
5 Occupation Health and Safety protocols.
6 Review and reporting.

ANNEXURE 2

Fuel Sampling Guidelines

ANNEXURE 2 – FUEL SAMPLING GUIDELINES

These guidelines are produced by Conacher Travers and are compiled from practical experience (J. Travers), National Parks and Wildlife Service and the CSIRO Bush Fire Behaviour Unit Department of Forestry.

Fuel sampling is required where fuel weights need to be determined to establish a level of hazard. Hazard is simply the availability of fuel. Therefore the more fuel...the more hazard there is.

Fuel measurement samples shall be taken from at least ten separate locations (per hectare) and such sample materials will need to be dry to touch. A sample plot shall need to include all material within the square to bare earth.

In any area where fuel samples are to be gathered, they should be collected at random but with a proviso that various densities or type of vegetation should ideally be gathered; and then an average should be calculated from the samples taken. The square should be thrown and wherever it lands, that is where the sample should be taken. Then;

1. Level the square firmly on the ground and cut all around the inside edge with a sharp knife or scissors.
2. Discard all the fuel outside the square that has been severed.
3. Collect all the fuel within the square up to one metre above the ground including all grasses, ferns, bracken, leaves or needles, bark, twigs and branches whether living or dead.
4. Discard any fuel in excess of 6 mm diameter which is approximately pencil thickness.
5. All remaining fuel should then be carefully placed in a plastic bag, labelled, dried and weighed.
6. Dry in hot sun for 12 hours (bring in overnight to avoid due) or place in an oven for 3 hours on lowest heat setting or place in a vertical type clothes drier for several hours.

Assessment of fuel loading should be carried out by a competent person according to the guidelines above.

Calculation of shrub fuel loads - If a shrub layer is present the following table shows the additional fuel weight to the ground fuels.

Shrub cover	Add to ground fuel measurement	Shrub cover	Add to ground fuel measurement
10-30%	2.5 tonnes / ha	55-75%	7.5 tonnes / ha
35-50%	5.0 tonnes / ha	over 75%	10.0 tonnes / ha

ANNEXURE 2 – FUEL SAMPLING GUIDELINES

Equipment Required

Steel square (500mm x500mm, spring scale, Plastic bags, Conversion chart, Knife or scissors, Notebook and pencil

Conversion Table

20 grams = 1 tonnes / ha	180 grams = 9 tonnes / ha	750 grams = 37 tonnes / ha
40 grams = 2 tonnes / ha	500 grams = 25 tonnes / ha	1000grams = 50 tonnes/ha

Formulae used by NPWS
Fuel weight (load) -based on a sample size of 500mm x 500 mm
Dry weight of samples divided by number of samples then multiplied by 40 = Tonnes/ ha

ANNEXURE 3

Fire Reporting Form

ANNEXURE 3 – FIRE REPORTING FORM

The fire report illustrates the matters that must be addressed.

Fire Number	
Fire name	
Area Burnt	
Date Fire Started	
Expenditure	
Cause	
Source	
Motivation (Accident, negligence or arson)	
Duration of Fire	
Fire Danger Rating	
Co-ordinates	
Location	
Tenure – Point of Origin	
Detection	
Reported by	
Performance Assessment	
• **Detection**	
• **Response**	
• **Strategy**	
• **Equipment**	
• **Manpower**	
• **Organisational**	
• **Other Organisations**	
• **Damage**	
• **Weather/Environment**	
• **Map**	
• **Comments:**	

ANNEXURE 4

Management Zones

ANNEXURE 4 – MANAGEMENT ZONES

The following information is provided to inform about the management of the Asset, Strategic and Heritage Zones. This is generic information about the zones and not specific to a part of the development application.

Asset Protection Zones

Primary Fire Management Objectives:

To protect human life, including permanent residents, visitors and fire fighters from bush fires.
To protect identified high-risk assets which may include residential areas, utilities, camping areas, day use areas, urban interface, cultural heritage sites and other built assets.

Prevention & Mitigation Objectives:

To instigate, where appropriate, community education and community fireguard type programs.

Locations:

Areas adjacent to visitor congregation areas or built assets, as described above, which are exposed to a high level of bush fire risk.

Standards:

As far as possible, the width and fuel standards as specified in Planning for Bush Fire Protection (Planning NSW 2006) are applied to asset protection zones around new developments. The standards applying to asset protection zones around assets are specified in Reserve fire management strategies and vary from place to place. It must be recognised that factors such as topography and vegetation often make it impossible to meet the fuel and width standards as specified in Planning for Bush Fire Protection (Planning NSW 2006), particularly around existing assets.

Strategy:

1. Prescribed Burning.
2. Under scrubbing.
3. Herbicide application.
4. Watering.
5. Trail construction.
6. Radiation zone construction.

Fuel Management Tasks

- Estimate current fuel loads and determine level of fuel reduction
- Staged fuel reduction;
  - (1) Removal of waste timber,
  - (2) Slashing/brushcutting of grasses,
  - (3) Selective removal of shrubs within understorey,
  - (4) Selective removal of tree limbs overhanging occupied buildings,
  - (5) Selective tree removal to meet IPA or OPA standards.

Management Intensity:

Asset protection zones are the most intensively managed fire management zone with a large percentage of each zone treated per treatment cycle. Treatment cycles in asset protection zones are short.

Impacts:

Such intensive management may have significant negative impacts on a wide range of natural and cultural values. Strategies are modified to protect natural and cultural values only if it does not compromise the protection of life and property (which is the primary fire management objective in APZ's).

ANNEXURE 4 – MANAGEMENT ZONES

Heritage Management Zones

Primary Fire Management Objectives:	To prevent the extinction of all species which are known to occur naturally within the Rosedale property To protect aboriginal sites, historic heritage sites and other culturally significant features from fire.
Prevention & Mitigation Objectives:	Promotion and awareness of the values that may be threatened by bush fires or inappropriate fire regimes within the zone.
Locations:	Areas of retained vegetation not satisfying the criteria for inclusion in asset protection or strategic fire management zones.
Standards:	Fire regimes maintained within the specified biodiversity fire regime thresholds. The specified threatened species are conserved. The cultural heritage sites are conserved.
Fuel Management Tasks:	As appropriate to conserve biodiversity and cultural heritage (may involve suppressing bush fires, allowing bush fires to burn and ecological burns). 1. Selective timber waste and litter removal monitored by Project Ecologist 2. Protection of threatened species and habitats by establishing local protection zones and controlling the extent and timing of fire management activities 3. Ecological / or pile burning 4. Fire suppression
Management Intensity:	Low; determined prior to the implementation of fuel management activities in consideration of the vegetation community, threatened species and cultural heritage sites present within the zone.
Impacts:	The strategies implemented in this zone are designed to conserve natural and cultural heritage and will not have a negative impact on these values.

ANNEXURE 4 – MANAGEMENT ZONES

Strategic Fire Management Zones

Primary Fire Management Objectives:

To reduce fire intensity and spotting distance to assist in the strategic control and containment of bush fires.

To reduce the probability of bush fires being ignited in areas of high bush fire risk.

To compliment asset protection zones and to strengthen existing fire control advantages.

To restrict the movement of bush fires between fire management zones.

To restrict the movement of bush fires from other land onto the Seven Mile Beach property and from the Seven Mile Beach property onto neighbouring land.

To break up large continuous areas of high bush fire behaviour potential to reduce the probability of large 'landscape' scale bush fires.

Prevention & Mitigation Objectives:

Promotion of the Services' fire and fuel management activities.

Locations:

Within large continuous areas of high bush fire behaviour potential.

In areas with a proven history of bush fire ignitions.

In large areas of high bush fire behaviour potential that occur to the peripheries of the Seven Mile Beach property surrounding the proposed residential development.

Adjacent to existing fire control advantages or to link existing fire control advantages together.

Adjacent to asset protection zones.

Other strategic areas for controlling the spread of bush fires.

Standards:

Width is 100 to > 3000 meters.

Reserve fire management strategies specify the fuel standards that apply to each strategic fire management zone.

Tactics:

Prescribed Burning.

Underscrubbing.

Under scrubbing.

Trail construction.

Management Intensity:

Management intensity is moderate with a moderate percentage of each zone treated per treatment cycle.

Treatment cycles are typically intermediate between those in asset protection zones and heritage management zones.

Impacts:

The strategies implemented in strategic fire management zones are likely to have only a minor impact on most natural and cultural values but may have a significant negative impact on sensitive natural and cultural values. Strategies are modified to protect these values only if it does not compromise achieving the objectives of reducing the occurrence of human caused unplanned fires and preventing the spread of fire within, from and into the Seven Mile Beach property.

ANNEXURE 5

Definitions and Principles

ANNEXURE 5 – DEFINITIONS AND PRINCIPLES

Most definitions described below come from the *Australian Fire Authorities Council (AFAC) Glossary of Rural Fire Terminology (March 1996).*

Aerial Detection	The discovering, locating and reporting of fires from aircraft.
Aerial Fuels	The standing and supporting combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, bark and creepers.
Aspect	The direction towards which a slope faces, e.g. northeast. Slopes on a west to north-westerly aspect are the most hazardous during fire fighting operations.
Assets at Risk	The natural resources or improvements that may be jeopardised if a fire occurs. Examples include: threatened species habitat, rainforests, forestry coups, human built structures or infrastructures, information signs, transmission poles etc. and may also include scenic values. For the fire manager it may also include natural values that may be threatened by a fire (e.g. water catchment quality).
Backburning	A fire started intentionally along the inner edge of a fire line to consume the fuel in the path of a wildfire.
Buffer	A strip or block of land on which the fuels are reduced to provide protection to surrounding lands.
Burning Programme	All the prescribed burns scheduled for a designated area over a nominated period of time.
Bushfire Management Zone (BFMZ)	Management areas where a specified fire management operational objective, strategy and performance indicator has been developed to militate against the threat of a wildfire.
Coarse Fuels	Dead woody material, greater than 25mm in diameter, in contact with the soil surface (fallen trees and branches).
Crown Fire	A fire burning in the crowns of trees and usually supported by fire in ground fuels. It is a fast travelling fire that usually consumes all available fuels in its path.
Ecosystem	The interacting system of a biological community, both plant and animal, and its non living surroundings
Edge Burning	A term used to describe perimeter burning of an area in mild conditions prior to large scale prescribed burning. This practice is used to strengthen buffers and to reduce mop-up operations.
Fine Fuels	Generally all fuels less than 6mm in diameter, comprised of surface litter and aerial shrub layer.
Fire	The chemical reaction between fuel, oxygen and heat. Heat is necessary to start the reaction and once ignited, fire produces its own heat and becomes self-supporting. Removal of any one of the three elements of fuel, oxygen and heat will extinguish a fire.

ANNEXURE 5 – DEFINITIONS AND PRINCIPLES

Fire Behaviour	The manner in which a fire reacts to the variables of fuel, weather and topography. Changes in any of these variables with result in a change in the fires behaviour.
Firebreak	Any natural or constructed discontinuity in a fuel bed used to segregate, stop and control the spread of a wildfire, or to provide a fire line from which to suppress a fire.
Fire Extent	The area burnt by a wildfire, measured in hectares. Within that area there will be "islands" of unburnt vegetation (these islands are generally included in the total fire extent). *NB: it is preferable that fire affect only part of a vegetation community at any one time so that nearby areas of more mature plants may provide a seed source for recolonisation and animals will have suitable unburnt habitat in order to seek shelter and forage.*
Fire Front	The part of a fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind or upslope.
Fire Intensity	The rate of energy released per unit length of fire front. This is usually expressed as kilowatts per metre (kW/m).
Fire Management	All activities associated with the management of fire-prone land, including the use of fire to meet land management goals and objectives.
Fire Perimeter	The entire outer boundary of a fire area.
Fire Regime	The history of fire in a particular vegetation type or area including the frequency, intensity and season of burning (season in this context refers to the time of the year in which the fire occurred). It may also include proposals for the use of fire in a given area.
Fire Season	The period(s) of the year during which fires are likely to occur, spread and do sufficient damage to warrant organised fire control. In New South Wales the core fire season is from 1st October to the 31st March of the following year. *NB: At the regional scale, the season may be introduced or extended by one month dependent upon the prevailing weather conditions, drought indexes and number of wildfire's that may already be burning within that area.*
Fire Storm	Violent convection caused by a large continuous area of intense fire; often characterised by destructively violent surface indrafts, a towering convection column, long distance spotting, and sometimes by tornado-like whirlwinds.
Flame Height	The vertical distance between the tip of the flame and ground level, excluding higher flame flashes. Expressed in vertical metres.
Fuel	Any material such as grass, bark, leaf litter and living vegetation which can be ignited and sustains a fire. Fuel is usually measured in tonnes per hectare of dry weight.
Fuel Arrangement	A general term referring to the spacing and arrangement of fuel in a given area.

ANNEXURE 5 – DEFINITIONS AND PRINCIPLES

Fuel Load	The oven dry weight of fuel per unit area. Commonly expressed as tonnes per hectare.
Fuel Bed	The arrangement and vertical profile of all readily combustible materials lying on the ground.
Fuel Management	Modification of fuels by prescribed burning, manual removal, slashing, grazing, or other means. The objective is to reduce the fuel thereby reducing the risk posed by unplanned fires.
Fuel Type	An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause predictable rate of spread or difficulty of control under specified weather conditions.
Habitat	A physical portion of the environment that is inhabited by an organism or population of organisms. A habitat is characterised by a relative uniformity of the physical environment and fairly close interaction of all the biological species involved. *NB Organisms within a given habitat will express a level of co-dependency upon one-another. The loss of the physical characteristics of a given habitat can have severe and long term detrimental effects upon the organisms living in that habitat.*
Hazard Reduction	*see Fuel Management*
Island	An unburnt area within a fire perimeter. Islands are critical for species survival and recruitment after a wildfire event.
Keetch Byram Drought Index	A numerical value reflecting the dryness of soils, deep forest litter, logs and living vegetation, and expressed as a scale from 0 – 200 points. When 100 points has been reached in an area, that area is said to be in drought
NPWS	The National Parks and Wildlife Service of New South Wales.
NSWFB	The New South Wales Fire Brigades
Prescribed Burning	The controlled application of fire under specified environmental and weather conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives.
RFS	The New South Wales Rural Fire Service.
Rate of Spread	The forward progress per unit time of the head of the fire or another specified part of the fire perimeter.
SF	State Forests of New South Wales
Scorch Height	The height above ground level up to where foliage has been browned by a fire.
Slip-on Unit	A fire fighting unit that can be placed on to the back of a four wheel drive vehicle to convert it to a fire tanker. *Depending upon the unit's water carrying capacity, a four wheel drive tray top vehicle could be converted to Category 2, 7 or 9 fire tankers in a very short space of time.*
Spot Fire	Isolated fires started ahead of the main fire by sparks, embers or other ignited material, sometimes to a distance of several kilometres.

ANNEXURE 5 – DEFINITIONS AND PRINCIPLES

Striker	A small four wheel drive fire tanker capable of carrying from 400 to 600 litres of water for fire fighting purposes. Also known as a Category 9 Fire Tanker.
Structure Fire	A fire burning part, or all of any building, shelter, or other human made construction.
Tanker	A mobile fire fighting vehicle equipped with a water tank, pump, and the necessary equipment for spraying water and/or foam on unplanned fires. *NB Under NSW Dept. of Rural Fire Service guidelines, bushfire fighting tankers have been designated into nine 'Categories' delineating water carrying capacity and whether the unit is two or four wheel drive capable.*