



# Mount Owen Complex Bushfire Management Plan

Prepared for  
Xstrata Mt Owen Pty Ltd

01 December 2011





# Bushfire Management Plan

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**Mt Owen Complex**

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**PREPARED FOR**      **Xstrata Mt Owen Pty Ltd**

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**PROJECT NO**        **09SUTBUS-0053**

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**DATE**                **December 2011**

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## ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd in consultation with mine site stakeholders, RFS representatives, Mt Owen Complex Community Consultative Committee and Interagency Flora and Fauna Advisory Group Committee members, neighbouring residents and a State Forests representative.

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# Contents

|   |      |
|---|------|
| Contents .....  | v    |
| List of Figures .....   | viii |
| List of Tables .....  | viii |
| Abbreviations .....   | x    |
| <b>1</b> Introduction .....   | 1    |
| 1.1 Purpose and Scope .....   | 1    |
| 1.2 Objectives .....  | 2    |
| 1.3 Format of Documents .....   | 2    |
| 1.3.1 Bushfire Management Plan Poster .....                             | 2    |
| 1.4 Community Consultation .....  | 3    |
| 1.5 Site Description.....   | 3    |
| 1.5.1 Location of the Mt Owen Complex .....                             | 3    |
| 1.5.2 Existing and Proposed Infrastructure .....                        | 4    |
| 1.5.3 Management of the Mt Owen Complex.....                            | 4    |
| 1.5.4 Activities within the Mt Owen Complex .....                       | 4    |
| 1.5.5 Land use within the Mt Owen Complex.....                          | 4    |
| 1.5.6 Conservation Areas.....   | 5    |
| 1.5.7 Surrounding Land uses .....                                       | 5    |
| <b>2</b> Statutory Requirements .....                                   | 6    |
| 2.1 Environment Protection and Biodiversity Conservation Act 1999 ..... | 6    |
| 2.2 Environmental Planning and Assessment Act 1979.....                 | 6    |
| 2.3 Rural Fires Act 1997 .....  | 6    |
| 2.4 National Parks and Wildlife Act 1974 .....                          | 6    |
| 2.5 Threatened Species Conservation Act 1995 .....                      | 7    |
| 2.6 Native Vegetation Act 2003 .....                                    | 7    |
| 2.7 Forestry Act 1916 .....   | 7    |
| 2.8 water management act 2000 .....                                     | 7    |
| <b>3</b> Bushfire Hazard Assessment .....                               | 8    |

|          |  |           |
|----------|--|-----------|
| 3.1      | Vegetation and Fuel Accumulation .....                   | 8         |
| 3.1.1    | Current Fuel Loads .....                                 | 9         |
| 3.2      | Topography.....  | 9         |
| 3.3      | Bushfire Hazard .....                                    | 9         |
| <b>4</b> | <b>Bushfire Risk Assessment .....</b>                    | <b>10</b> |
| 4.1      | Factors which affect the chance of a fire igniting ..... | 10        |
| 4.1.1    | Sources of Ignition.....                                 | 10        |
| 4.1.2    | Climate .....  | 11        |
| 4.1.3    | The Fire Season.....                                     | 11        |
| 4.2      | Factors Affecting the Spread of Fire.....                | 12        |
| 4.2.1    | Rainfall.....  | 12        |
| 4.2.2    | Access .....   | 12        |
| 4.2.3    | Construction/upgrade of Fire trails .....                | 13        |
| 4.2.4    | Fire History .....                                       | 13        |
| 4.3      | Assets that are at risk of fire .....                    | 14        |
| 4.3.1    | Residential Dwellings .....                              | 14        |
| 4.3.2    | Other Buildings .....                                    | 14        |
| 4.3.3    | Cattleyards .....  | 14        |
| 4.3.4    | Fences.....  | 14        |
| 4.3.5    | Transport Infrastructure.....                            | 15        |
| 4.3.6    | Service Infrastructure - Water supply.....               | 15        |
| 4.3.7    | Service Infrastructure - Powerlines .....                | 15        |
| 4.3.8    | Mine Infrastructure .....                                | 15        |
| 4.3.9    | Mine Infrastructure - Conveyor Belts.....                | 15        |
| 4.3.10   | Mine Infrastructure - monitoring sites.....              | 16        |
| 4.3.11   | Mine Infrastructure - other.....                         | 16        |
| 4.3.12   | Aboriginal Heritage.....                                 | 16        |
| 4.3.13   | European Heritage .....                                  | 16        |
| 4.3.14   | Biodiversity .....                                       | 17        |
| 4.3.15   | Vegetation Communities .....                             | 17        |
| 4.3.16   | Threatened Flora .....                                   | 18        |
| 4.3.17   | Threatened Fauna.....                                    | 18        |
| 4.3.18   | Weed management .....                                    | 18        |
| <b>5</b> | <b>Fire prevention.....</b>                              | <b>19</b> |
| 5.1      | Prevention of Ignition .....                             | 19        |
| 5.1.1    | Monitoring, Inspection and Maintenance Program .....     | 20        |
| 5.1.2    | Fuel Reduction .....                                     | 21        |

|          |   |    |
|----------|---|----|
| <b>6</b> | Management Zones.....   | 22 |
| 6.1      | Asset Protection Zones (APZ) .....                            | 22 |
| 6.2      | Strategic Fire Advantage Zones (SFAZ) .....                   | 23 |
| 6.3      | Land Management Zones (LMZ).....                              | 24 |
| 6.4      | Prescribed burning .....                                      | 25 |
| 6.4.1    | Application to MOC .....                                      | 25 |
| <b>7</b> | Emergency Response .....                                      | 25 |
| 7.1      | Site Management and Emergency Response.....                   | 25 |
| 7.2      | Off Site Emergency Fire Response .....                        | 25 |
| 7.3      | The Emergency Responses Procedure .....                       | 27 |
| 7.4      | Responsibility for Fire Management and chain of command ..... | 28 |
| 7.5      | Communication of this Plan .....                              | 29 |
| 7.6      | Emergency Contacts .....                                      | 29 |
| 7.6.1    | Internal Mt Owen Complex Communication.....                   | 29 |
| 7.6.2    | Contact Details for Neighbours .....                          | 29 |
| 7.6.3    | Emergency Mt Owen Complex contact details .....               | 29 |
| 7.7      | Meeting and Access Points .....                               | 30 |
| 7.8      | Smoke management .....  | 30 |
| 7.9      | Training.....   | 30 |
| 7.10     | Post Emergency Response to Fire.....                          | 31 |
| 7.11     | Review and Reporting of Fire Incidents .....                  | 31 |
| 7.12     | Monitoring and Review .....                                   | 31 |
| <b>8</b> | Summary of Recommendations .....                              | 32 |
|          | References .....  | 34 |
|          | Appendix 1. On-Site Emergency Response Resources .....        | 36 |
|          | Appendix 2: Aboriginal Heritage Considerations.....           | 37 |
|          | Appendix 3: Prescribed Burning.....                           | 40 |
|          | Appendix 4: Preparing a prescription burning plan .....       | 52 |

# List of Figures

|   |    |
|---|----|
| Figure 1: Format of Bushfire Management Plan Poster .....   | 2  |
| Figure 2. Location of the Mt Owen Complex.....  | 3  |
| Figure 3. Average monthly temperatures and rainfall at the Bureau of Meteorology Singleton Water Board site ..... | 11 |

# List of Tables

|   |    |
|---|----|
| Table 1: Potential Ignition Sources.....  | 10 |
| Table 2: Distance of APZ from the wall of a residential dwelling to the hazard (NSW Rural Fire Service, 2006) ..... | 14 |
| Table 3: Actions to minimise ignition of fires .....  | 19 |
| Table 4: Monitoring and inspection program for fire prevention and minimisation .....                               | 20 |
| Table 5: Asset Protection Zone .....  | 22 |
| Table 6 Strategic Fire Advantage Zones.....   | 24 |
| Table 7: Land Management Zones .....  | 24 |
| Table 8: Emergency Response .....   | 27 |
| Table 9: Recommendations .....  | 32 |
| Table 10: Recommended APZ Distances .....   | 32 |
| Table 11: Vegetation Communities within MOC and their fire thresholds.....  | 42 |
| Table 12: Fire management safeguards for threatened fauna.....  | 42 |
| Table 13: Threatened Fauna Fire Ecology.....  | 44 |

|  |    |
|--|----|
| Table 14: Threatened Flora Fire Ecology.....                           | 48 |
| Table 15: Safeguards in sites containing problematic weed species..... | 49 |
| Table 16: PB contact details.....                                      | 52 |
| Table 17: PB fuels to be burned.....                                   | 52 |
| Table 18: PB special planning considerations .....                     | 53 |
| Table 19: Boundary preparation.....                                    | 53 |
| Table 20: Other pre-burn preparation .....                             | 53 |
| Table 21: Weather prescriptions .....                                  | 54 |
| Table 22: Lighting and patrol strategy.....                            | 54 |
| Table 23: Lighting plan .....  | 54 |
| Table 24: Resources .....  | 54 |
| Table 25: Notification checklist.....                                  | 55 |
| Table 26: Pre-burn monitoring.....                                     | 55 |
| Table 27: Weather forecast for day of burn.....                        | 55 |
| Table 28: Pre-burn briefing check-list .....                           | 56 |
| Table 29: Test fire recording .....                                    | 56 |
| Table 30: Weather and fire behaviour observations .....                | 57 |

# Abbreviations

| ABBREVIATION | DESCRIPTION   |
|--------------|---|
| 4WD          | Four Wheel Drive  |
| APZ          | Asset Protection Zone   |
| BEAC         | Bushfire Environmental Assessment Code                        |
| BMP          | Bushfire Management Plan                                      |
| CMA          | Catchment Management Authorities                              |
| ELA          | Eco Logical Australia   |
| EP&A Act     | Environment Planning & Assessment Act 1979                    |
| EPBC Act     | Environment Protection and Biodiversity Conservation Act 1999 |
| FFAC         | Flora & Fauna Advisory Committee                              |
| HV           | Hunter Valley   |
| LMZ          | Land Management Zone  |
| MOC          | Mt Owen Complex   |
| NPW Act      | National Parks & Wildlife Act 1974                            |
| NSWFB        | NSW Fire Brigades   |
| NV Act       | Native Vegetation Act 2003                                    |
| OCE          | Open Cut Examiner   |
| RF Act       | Rural Fires Act 1997  |
| RFI Act      | Rivers & Foreshore Improvement Act 1948                       |
| RFS          | Rural Fire Service (NSW)                                      |
| RSF          | Ravensworth State Forest                                      |
| SFAZ         | Strategic Fire Advantage Zone                                 |
| TSC Act      | Threatened Species Conservation Act 1995                      |
| WM Act       | Water Management Act 2002                                     |
| XMO          | Xstrata Mt Owen   |

# 1 Introduction

Eco Logical Australia (ELA) was engaged to prepare a Bushfire Management Plan (BMP) for the Mt Owen Complex. Mt Owen Complex (MOC) consists of Mt Owen, Ravensworth East, and Glendell open cut coal mines, and associated mining buffer lands and offset areas. Xstrata Mt Owen manages these areas on behalf of Xstrata Coal Australia (Xstrata). Mt Owen's mining operation is operated by Thiess Pty Ltd under a partnering agreement with Xstrata Mt Owen P/L.

The BMP was originally prepared in March 2007, reviewed in 2009 and this version is an update on the original document (ELA Project No. 122-001).

For the purpose of this Plan, Xstrata Mt Owen and Thiess are jointly responsible for fire management within the Mt Owen Complex. Outside of the Mining Area, Xstrata Mt Owen and the Xstrata owned Pastoral Company Colinta Holdings are jointly responsible for fire management activities.

## 1.1 PURPOSE AND SCOPE

Mt Owen Complex has a regulatory obligation to maintain an effective fire response capability and to control fires on the landholding. All landholders have an obligation to prevent damage to neighbouring properties. In addition to this duty of care, the Mine Development Consents require the preparation and implementation of a "conservation sensitive" Bush Fire Management Plan. The consents state:

*The Applicant shall:*

- (a) ensure that the development is suitably equipped to respond to any fires on site
- (b) assist the Rural Fire Service and emergency services as much as possible if there is a fire on site during the development
- (c) prepare a conservation sensitive Bushfire Management Plan for the site in consultation with the HCFFAC, to the satisfaction of Council and the Rural Fire Service

In preparing this plan, consideration has been given to the current and future landscape of the site. Historically the site, like many current mining operations in the Upper Hunter Valley, has undergone a change of land use from mainly pastoral (i.e. grazing and farmland) to mining operations.

As a result of progressive land rehabilitation works required under Development Approval conditions, significant areas of native bushland and open woodland with improved pasture understorey are being established on mined land across the Mt Owen Complex. With this in mind, this BMP will attempt to plan for these changes from the perspective of asset protection, environmental protection, land management and strategic fire advantage. By anticipating the future structure of the landscape this plan aims to put in place mechanisms for fire management that will save time, expense and potential environmental damage in the future.

## 1.2 OBJECTIVES

The aim of this plan is to assess fire risks and assets across and adjacent to the MOC, and to identify practical management strategies to reduce the risk of fire to life and property. Operationally, the objectives of fire management on the site are to:

- Reduce fire ignition potential
- Prevent the spread of fire within and beyond the site

From a conservation perspective, the objectives of the Mt Owen BMP are to:

- Protect the flora and fauna within the Mt Owen Complex from unplanned fire events
- Utilise fire as a management tool to maintain and enhance native ecosystems, where applicable.

## 1.3 FORMAT OF DOCUMENTS

This BMP will replace Mt Owen Mine's existing BMP (prepared by Eco Logical Australia and dated December 2009) and will cover the Mt Owen Complex, which includes the Mt Owen, Ravensworth East and Glendell mining areas and buffer lands.

The BMP consists of two documents;

1. A0 BMP Poster
2. Supporting Documentation (this document)

### 1.3.1 Bushfire Management Plan Poster

The main component of the BMP is the A0 BMP Poster. This Poster has been developed in conjunction with Mt Owen Complex staff, neighbouring landholders and the RFS. There are three main parts to the Poster, as shown in Figure 1;

1. The Emergency Response Pane of the poster details all information relating to what to do when there is a fire
2. The Land Management Pane of the poster outlines details regarding fire regimes for threatened flora, fauna and vegetation communities as well as actions required for overall fire management of the site
3. The main mapping pane relates primarily to emergency response and identifies key assets, roads and trails and meeting points

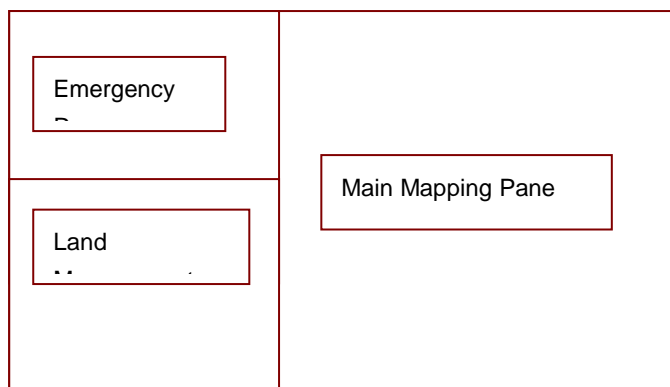


Figure 1: Format of Bushfire Management Plan Poster

## 1.4 COMMUNITY CONSULTATION

Consultation was an important part of the preparation of the BMP Poster and supporting documentation. Meetings were initially held with members of the local community, MOC staff, the Mt Owen FFAC and the Singleton Community Safety Officer. Their comments and information provided were invaluable and have been incorporated into this plan. The 2011 review again involved members of the community, FFAC, RFS, contractors responsible for implementing controls and representatives from the MOC Environment and Community, Safety and First Response teams.

## 1.5 SITE DESCRIPTION

### 1.5.1 Location of the Mt Owen Complex

The Mt Owen Complex is located in the Upper Hunter Valley, midway between Singleton and Muswellbrook to the east of the New England Highway, off Hebden Road (see Table 2). It is located on the eastern extremity of the Hunter Coal Fields with part of the land holding encompassing the steep escarpments of the Hunter Thrust (Theiss and HV Coal Group, 2002). The topography of the area ranges from steep undulating country against the Thrust in the north, to flat to undulating in the south.

The MOC contains areas subject to Open-cut mining and 'buffer lands'. The Colliery holding areas define the area of statutory responsibility for operators of Mt Owen, Ravensworth East, and Glendell. The 'buffer lands' refer to lands outside of this area. MOC buffer lands are jointly managed by Xstrata Mt Owen and Colinta Pastoral Company.

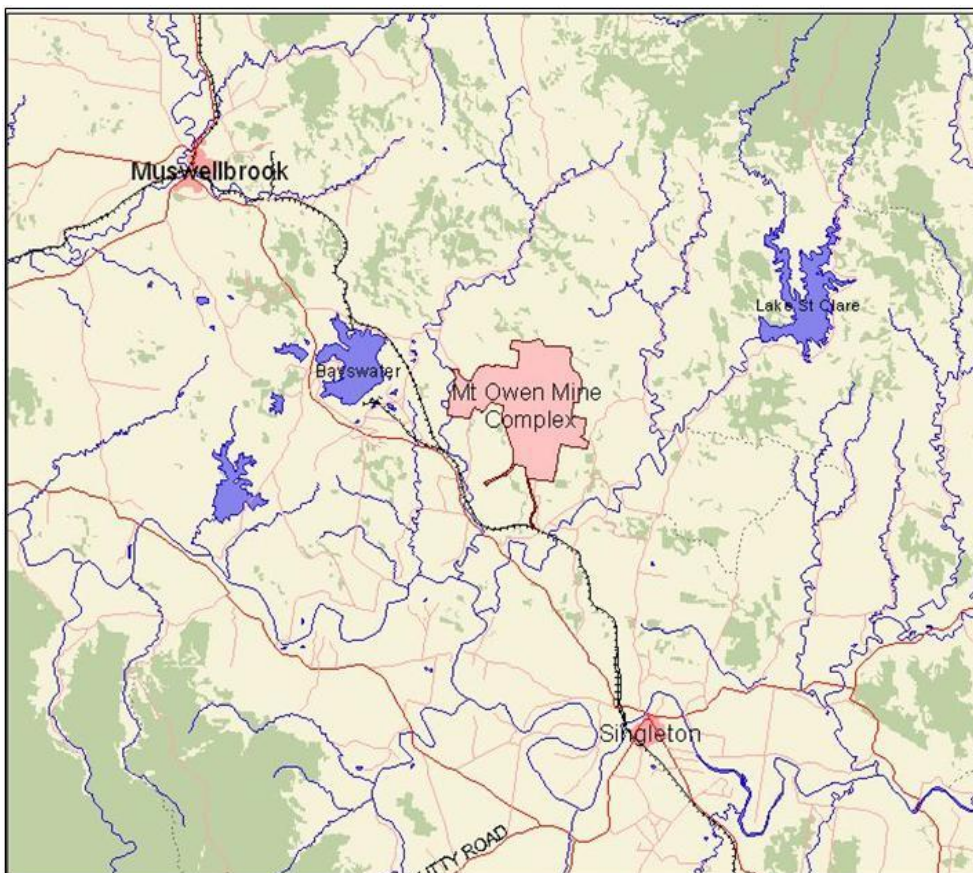


Figure 2. Location of the Mt Owen Complex

### 1.5.2 Existing and Proposed Infrastructure

The Mt Owen Complex consists of three adjacent open-cut coal mines, namely the Mt. Owen Mine, the Ravensworth East Mine and the Glendell Mine. Major infrastructure is listed below and is also shown on the BMP Poster.

- Buildings
- Conveyors
- Rail loop/refuelling facility
- Powerlines
- Pumps and Pipelines
- Gates
- Blast Monitoring Station
- Continuous Noise Monitor
- Continuous PM10 Dust Monitor
- Explosives Magazine
- Helipad
- Ravensworth Homestead
- Ventilation Shaft
- Water Fill Points
- Weather Station
- Buildings
- Roads and trails
- Fence lines

### 1.5.3 Management of the Mt Owen Complex

The total land holding associated with the Mt Owen Complex and managed by Xstrata Mt Owen is approximately 7651.3 ha (December 2011). Mt Owen, Ravensworth East and Glendell mines are operated by Xstrata Mt Owen Pty. Ltd. with the Mt Owen mining operation (excluding the CHPP) operated by Thiess Pty. Ltd. under a partnering agreement with Xstrata Mt Owen. The areas outside the Mining Area are managed jointly by Colinta Pastoral Company and Xstrata Mt. Owen. Colinta Pty Ltd is a wholly owned Xstrata Company and leases areas outside the Mining Area for cattle grazing.

### 1.5.4 Activities within the Mt Owen Complex

The Mt Owen Complex operates 365 days per year, 24 hours a day and is one of the deepest coal open pits in Australia. Raw coal is treated in a Coal Preparation Plant before being transported off site via the Mt Owen rail loop for export via the port of Newcastle. There is also domestic coal provision at the Ravensworth East facilities.

### 1.5.5 Land use within the Mt Owen Complex

The existing native vegetation around the mines is found predominantly to the north and the east of active mining areas and is largely associated with the Ravensworth State Forest (RSF) and surrounding biodiversity conservation areas.

Vegetated areas have been divided into five management zones for the purposes of the Mt Owen Flora and Fauna Management Plan (Mt Owen Complex, 2006). These zones are:

- Ravensworth State Forest
- Biodiversity offset areas
- Rehabilitation areas
- Southern wildlife corridor
- Ravensworth East Mine

Much of the Mt Owen Complex site is grassland, especially to the west and the south of active mining areas.

The Mount Owen Mine is mining through an area of the RSF. Two areas of the State Forest remain uncleared consisting of regionally and locally significant remnant sclerophyll forest and native threatened fauna species. Accordingly, Ravensworth State Forest is currently zoned 'Forest Management Zone 2 – Conservation' and is managed for conservation purposes.

#### **1.5.6 Conservation Areas**

Biodiversity Conservation areas at Mt Owen include:

- Northern Remnant of the RSF
- Southern Remnant of the RSF
- New Forest adjoining the RSF northern remnant
- Biodiversity offset areas adjoining the RSF
- Rehabilitation areas
- Southern wildlife corridor

Glendell Mine also has the Bettys Creek Habitat Management Area to the east of the mine. This is an area of approximately 190ha consisting of three main remnant vegetation communities: Central Hunter Bull Oak Forest Regeneration; Central Hunter Swamp Oak Forest; and Central Hunter Box-Ironbark Woodland,

These areas are shown on the accompanying poster.

Biodiversity Offset areas have been established to offset the impacts of clearing for mining purposes on regionally significant flora and fauna communities. Native vegetation communities are being actively planted/seeded in biodiversity offset and rehabilitation areas, with all areas being managed to promote natural regeneration. This includes the exclusion of grazing and other threatening processes.

The coverage of vegetation within the conservation areas will continue to increase over the coming years as conservation targets are achieved.

#### **1.5.7 Surrounding Land uses**

Neighbouring private property surrounding the Mt Owen Complex (predominantly to the north, east and south-east of the MOC) is used mainly for cattle grazing. The Hebden quarry is located to the north and the Rural Lands Protection Board's Hebden Reserve is located to the north-west of the MOC. Mining occurs to the north, west and south of the MOC. There are a further five mines in the immediate surrounding area.

## 2 Statutory Requirements

Fire management activities on the site are constrained by numerous Acts, plans and guidelines.

### 2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

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

### 2.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals (Part 4) and activities (Part 5).

### 2.3 RURAL FIRES ACT 1997

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

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

The RF Act also outlines the responsibilities of land owners to manage their land for bushfire protection and provides a mechanism for the approval of hazard reduction works, through the issue of a bushfire hazard reduction certificate.

The RF Act also provides for the formation of fire management committees and the preparation of fire management plans which includes

- (a) a plan of operations, and
- (b) a bush fire risk management plan.

### 2.4 NATIONAL PARKS AND WILDLIFE ACT 1974

Aboriginal and cultural heritage sites are protected under the *National Parks and Wildlife Act 1974* (NPW Act), as well as protected flora and fauna.

## 2.5 THREATENED SPECIES CONSERVATION ACT 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The *TSC Act* is integrated with the *EP&A Act* and requires consideration of whether a development or an activity (such as mechanical hazard reduction) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

## 2.6 NATIVE VEGETATION ACT 2003

The *Native Vegetation Act 2003* (NV Act) aims to end broad-scale clearing of native vegetation and repair damaged rivers and landscapes. Development consent by local Catchment Management Authorities (CMAs) for clearing vegetation will only be given if clearing vegetation will improve or maintain environmental outcomes. This is measured by the Property Vegetation Plan Developer (a decision support tool used by the CMAs). Some clearing (including burning) may require consent under the *NV Act*. Because the *Rural Fires Act* takes precedence over the *NV Act*, any vegetation clearing undertaken during the construction of Asset Protection Zones (APZs) is not restricted under *NV Act*.

## 2.7 FORESTRY ACT 1916

Forests NSW have the legislative responsibility of administering Ravensworth State forest under the Forestry Act 1916. Employees of Xstrata, and their contractors, require authorisation under the Forestry Act 1916 to undertake the day to day management activities within Ravensworth State forest (outside mine footprint area). This includes for fuel hazard reduction activities (including planned burns), road maintenance and other activities.

Authorisations relevant to bushfire management activities include:

1. Authorised officer status for all Xstrata employees engaged in management activities on RSF. (Forestry Act 1916(FA) Part 5 (38, 38a, 38b, & 47))
2. Special Purposes permits for all Research projects where the work/monitoring is undertaken on Ravensworth SF. (FA Sect 32F; Forestry Regulations 2009 Part 4: Division 7: Clause 52 (1) d,e,i,j.)

The E & C Manager is responsible for ensuring this is in place prior to bushfire control works or other activities in the area.

## 2.8 WATER MANAGEMENT ACT 2000

Works near riverbanks used to be regulated under the *RIF Act* however this has been repealed and incorporated into the provisions of the *Water Management Act 2000*. If a controlled activity is proposed on waterfront land (land within 40m of the bed of any river, lake or other estuary, including the bed itself), an activity approval is required for that work. Applications are made to the Minister for Water. Defences/exemptions apply if the person is a public authority.

## 3 Bushfire Hazard Assessment

Bushfire hazard assessment identifies the relative bushfire hazard across the site, based on the likely response of fire to fuel loads (using vegetation community as a surrogate in the absence of field assessment of fuel loads), slope and aspect.

### 3.1 VEGETATION AND FUEL ACCUMULATION

The MOC is dominated by native pasture understorey with associated high fire volatility when dry. Tree cover is light over most of the land but increases on the northern ridges and to the south of the mine. Due to consent requirements for Xstrata Mt Owen to develop additional native forest communities adjoining the RSF and existing remnant communities, the area of native forest/woodland is expected to significantly increase over the next 10 to 15 years and includes the Glendell Habitat Management Area.

There are several different vegetation communities found at the site. These are:

- Spotted Gum Forest / Grey Box / Ironbark Woodland
- Hunter Lowland Redgum Forest
- Grey Box Woodland
- Regenerating Woodland
- Central Hunter Riparian Forest
- Dry Rainforest
- Bull Oak Woodland
- Bull Oak Forest Regeneration
- Swamp Oak Forest
- Box-Ironbark Woodland
- Rehabilitated Area

Vegetation at the site has been divided into seven different management units for the purposes of flora and fauna management. These are:

1. Ravensworth State Forest: two areas of the State Forest remain as uncleared sclerophyll forest (a total of approximately 260 ha) which consists of highly regionally and locally significant remnant vegetation within the central of the land holding
2. New Forest: established between 1996-98 to offset disturbance of threatened fauna species and located north-east of the main land holding adjoining the RSF (415 hectares). Now forms part of the RSF
3. Mt Owen biodiversity offset areas: currently being established to offset disturbance of threatened fauna species and located north-east of the main land holding adjoining the RSF and New Forest. (415 hectares)
4. Rehabilitation area: areas that have been mined and are being rehabilitated to forest and woodland
5. Southern wildlife corridor: originally established to connect the southern and northern remnants of the Ravensworth State Forest. Remnant areas of the corridor remain and are now

formalised as part of the Glendell Conservation Area as the offset for the more recent Glendell Mine.

6. Ravensworth East and Glendell Mine: will be rehabilitated predominantly to grazing land with 30% rehabilitated with trees/habitat corridors.
7. Glendell Habitat Management Area: existing remnant currently being augmented to offset disturbance by Glendell Mine activities. This runs east of the mine and Bettys Creek (190ha).

### 3.1.1 Current Fuel Loads

Overall, fuel loads at the site are currently low (despite there being some denser areas of vegetation, grass layers in the forest areas are typically very low and sparse), however there are stands of *Acacia* sp. adjacent to the pit that have reached the end of their life cycle that will contribute to the fuel load (pers. comm. Mike Cole, University of Newcastle). There are also some more open pastures on steeper slopes in the biodiversity offset area at Mt Owen which responds well to rain in wetter years. Access needs to be maintained to these areas and controls implemented when required. There is a community fear that, as grazing no longer happens in the conservation areas, fuel loads will build, especially on the eastern side. It is noted also that woodchip is used in the soil used for rehabilitation and that this may also present a potential fire hazard (pers. comm. Mike Cole, University of Newcastle).

The low fuel loads at the site have historically been related to drought conditions, disturbance history (from grazing) within the RSF and the young age of rehabilitation works across the site. The predominant vegetation formation across the site falls into the category of 'Dry Sclerophyll Forest Grass Subformation' (NSWRFS 2006, from Keith 2004). This community has been assessed as having a maximum fuel load of 25 tonnes/hectare (NSWRFS 2006), however the fuel loads at the site would be much less than this figure.

It was noted that the revegetation areas on the site appear to be denser than the natural vegetation observed within the State Forest. This is likely to be a combination of the revegetation techniques employed and the different soil structure in these overburden areas. It is uncertain as to how vegetation structure and associated fuel loads in these areas will develop over time.

Areas at Glendell have a low fuel load also due to disturbance history, lower tree density and the flat to undulating topography. Buffer lands outside the offset and mining areas are grazed under Colinta Management.

## 3.2 TOPOGRAPHY

Topography over the site is varied. In the north the area consists of steep country, whilst in the south the land is flat to undulating. A ridgeline extends from the northern boundary of the site, along the eastern boundary of the site. The eastern portion of the MOC drains in a generally southerly direction to Glennie's Creek, whilst the central and western portions drain in a southerly direction to Bowmans Creek. Glennies and Bowmans Creeks are major tributaries of the Hunter River.

## 3.3 BUSHFIRE HAZARD

The BMP Poster provides a map of bushfire hazard. Based on Planning for Bushfire Protection Guidelines, Grassland and Dry Rainforest areas have been classified as low bushfire hazard. Other forest vegetation at the site has been assigned a hazard class of 'high' where slope is  $>10^\circ$ , and 'moderate' where slope is  $<10^\circ$ .

## 4 Bushfire Risk Assessment

A fire risk is defined as the chance of a fire igniting, spreading and causing damage to assets of value to the community.

### 4.1 FACTORS WHICH AFFECT THE CHANCE OF A FIRE IGNITING

#### 4.1.1 Sources of Ignition

Ignition sources were identified during the process of consultation with staff and community during the preparation of this plan. It is important that all staff at the MOC are made aware of these sources of ignition. Potential ignition sources and their most likely location were identified for the Mt Owen Complex and are listed in the following table. Section 5.1 presents actions to manage these potential sources of ignition.

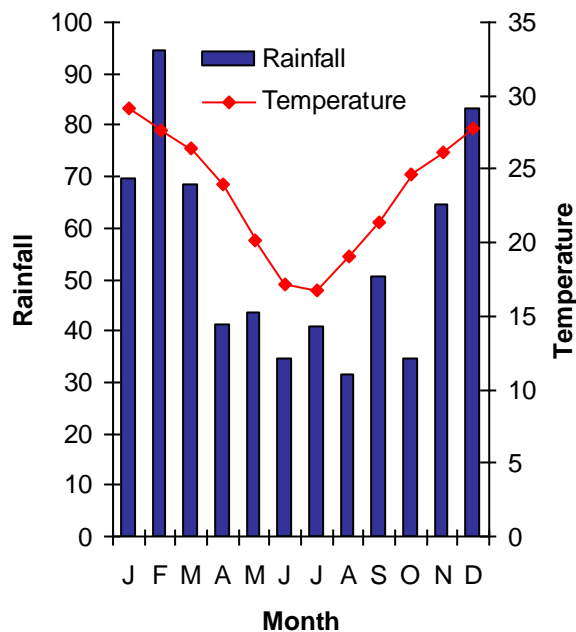
**Table 1: Potential Ignition Sources**

| Ignition Source                     | Likely Location   |
|-------------------------------------|---|
| Cigarettes thrown from cars         | Roads, especially public roads surrounding the boundary. These include Hebden Road (high risk), Picton Lane, New England Hwy, Glennies Creek Road, Falbrook Road., Falbrook Road., Forest Road, Shadlows Lane   |
| Higher fuel loads (Ignition hazard) | Rehabilitation areas, Ravensworth State Forest, Biodiversity Offset Areas   |
| Trespassers                         | Mainly due to remoteness of these locations the following are potential sites: Picton Lane north of Mt. Owen access Road., Hebden Road north of Mt. Owen Access Road, Falbrook Road east of Mt Owen Complex, Shadlows Lane east of Mt Owen Complex, Forest Road |
| Lightning strike                    | Ravensworth State Forest, biodiversity offset areas   |
| Neighbours                          | Neighbouring properties bordering XMO landholdings  |
| Railway line                        | Railway line (e.g. sparks from track works)   |
| Car accidents and car fires         | Roads, especially public roads surrounding the boundary   |
| Welding and maintenance             | In pit, exploration rigs outside of Colliery Holding on undisturbed land  |
| Fuel and exhaust fires              | In pit on fringes of mining area adjacent to undisturbed land, exploration rigs, contractors  |
| Overheated truck tyres              | In pit on fringes of mining area adjacent to undisturbed land   |
| Engines overheating                 | In pit  |
| Exploration drilling                | Falbrook area, Glendell, East of Mt Owen Complex on undisturbed land  |
| Contractors and consultants         | Various activities across all buffer lands  |

| Ignition Source           | Likely Location   |
|---------------------------|---|
| Clearing ignitions        | Clearing for mining purposes on fringes of the RSF and other undisturbed land |
| Hazard reduction burns    | Vegetated areas and neighbouring properties                                   |
| Fencing, stock management | Neighbouring land and internally grazed land                                  |

#### 4.1.2 Climate

The climate in the area is temperate and characteristically has warm summers and mild winters. Rainfall in the region is late summer dominated (see Figure 3). Electrical storms during summer are frequent (Muswellbrook, Scone and Singleton Bush Fire Management Committee, 2003).



**Figure 3. Average monthly temperatures and rainfall at the Bureau of Meteorology Singleton Water Board site**

The influence of the northern ridge and the local mine topography tends to create localised wind patterns and turbulence that can vary significantly from regional patterns (Theiss and HV Coal Group, 2002). This can create a problem for both personal safety and the creation of control lines.

#### 4.1.3 The Fire Season

In the Hunter Valley the fire season usually begins in early spring. The beginning of the season depends on the amount of rainfall that occurs during spring and the onset of strong southwest to northwest winds, which often prevail during October and November. The majority of serious bushfires occur from this period until the onset of summer rains, which normally start from December/January and continue through, to autumn. The fire season concludes in early to late March (Muswellbrook, Scone and Singleton Bush Fire Management Committee, 2003).

High fire danger periods typically have high temperatures associated with low humidity and moderate to strong west to northerly winds (Theiss and HV Coal Group, 2002). Dangerous bush fire seasons are most commonly associated with a combination of two or more of the following factors (Muswellbrook, Scone and Singleton Bush Fire Management Committee, 2003):

- Occurrence of an extended drought period
- Lower than average rainfall through winter
- Persistent SW to NW winds in early spring
- Prolific fuel occurrence from strong growing seasons the previous summer
- Spring/summer thunderstorm activity in dry years

There has been a growing trend throughout eastern Australia for the fire season to begin earlier and finish later. It has been common in recent years for the fire danger season to begin as early as September and continue through to April.

## **4.2 FACTORS AFFECTING THE SPREAD OF FIRE**

### **4.2.1 Rainfall**

Most rainfall at the Mt Owen Complex generally occurs in late summer after the peak fire season. This means that there is a risk of inadequate water supply during the time it is needed most for emergency response to fire.

### **4.2.2 Access**

Roads and trails within the Mt Owen Complex were classified as Primary, Secondary; or Dormant for the purposes of this management plan. These are shown on the accompanying poster

Primary roads are defined as all public roads fronting XMO landholdings or providing direct access to XMO landholdings, which are able to be traversed by normal road-going traffic (including RFS vehicles).

Primary roads include:

- Hebden Road
- New England Highway
- Picton Lane
- Glennies Creek Road
- Falbrook Road
- Middle Falbrook Road
- Shadlows Lane Road
- Forest Road
- Mt Owen Mine Access Road (off Hebden Road)
- Ravensworth East Mine Access Road (off Hebden Road)

Secondary roads are roads that provide major access through Xstrata Mt. Owen paddocks for four wheel drive vehicles (including RFS). Dormant roads are defined as the remainder on the site, e.g. an unused paddock trail or disused access road that has not been maintained.

Access to the site is varied. Access in the steeper, northern section of the site is limited. Fire control in these steeper areas would currently need to be aerial or on foot (Theiss and HV Coal Group, 2002). The southern, eastern and western parts of the Mt Owen Complex are more accessible; however, gullies and creeks do restrict access in some locations (Theiss and HV Coal Group, 2002).

Gates are located at many road intersections. It is noted that during a response to fire it should be assumed that all gates are locked. The standard response of the RFS is to cut a link in the chain of any locked gate through which access is required.

Restrictions to access at the site apply to the Ravensworth State Forest and the Biodiversity Offset Areas, including the New Forest Area. These areas are restricted to monitoring and research consultants, limited site personnel and access for land management related activities.

Trespass on the site correlates to the remoteness of locations. Areas where trespass is most likely include Picton Lane north of Mt. Owen access Road, Hebden Road, north of Mt. Owen Access Road, Falbrook Road east of Mt Owen Complex, Shadlows Lane east of Mt Owen Complex, and Forest Road.

#### **4.2.3 Construction/upgrade of Fire trails**

An annual inspection of MOC land is conducted to determine the requirement for construction of new roads or maintenance of existing roads/trails in strategic locations. As rehabilitation and offset areas continue to establish, consideration must be given to boundary and access trails in these locations. The BMP Poster will be reviewed following annual monitoring and updated as required to reflect new trails and roads that require construction or upgrade. Perimeter trails and trails to strategic locations are recommended. Perimeter trails, particularly in steeper areas or areas bordering private property, will assist in access for control and act as a fire break.

Consideration should be given to the construction of appropriate turning/passing bays to allow safe and efficient response to fire. Where possible, trails should have an alternative escape route to where the trail originated from, Where this is not possible, dead-end trails should be clearly identified on the BMP Poster.

An annual maintenance schedule for all roads and trails is to be incorporated into the normal works program. This should be undertaken before the fire season to ensure that condition is consistent with that mapped within this plan.

#### **4.2.4 Fire History**

Fire history at the site is limited. There were three fires which ignited on the New England Highway in 2005-2006, two fires starting as a result of lightning strikes. There were three fires recorded along Hebden Road in 2005 believed to be a result of arson, and one fire in the New Forest Area in January 2005 as a result of a lightning strike. A grass fire also occurred in 2010 adjacent to the rail line near the New England Highway at Ravensworth. This was ignited by track work on the rail line. There have been no fires recorded in the Ravensworth State Forest for at least 20 years (Pers. Comm. Geoff Marschke). All fires that were ignited were immediately suppressed. As a result they did not cover a sufficient area to require consideration in the landscape scale management of fire management zones in this BMP.

### 4.3 ASSETS THAT ARE AT RISK OF FIRE

#### 4.3.1 Residential Dwellings

There are a number of residential private and company owned dwellings located on and adjacent to the MOC, and these are marked on the BMP Poster with contact details provided. In the event of a fire these contact numbers should be used to alert residents as appropriate. As tenants and phone numbers may change, Xstrata MOC rental properties are managed through Max Bailey Real Estate in Singleton and they can get in contact with tenants in normal business hours. Ashton Coal and Integra Mine also own properties in close proximity to MOC.

Table 2 specifies the minimum distances for APZ around a residential dwelling (specified from the Bushfire Environmental Assessment Code, NSW Rural Fire Service, 2006).

The majority of the residential buildings are on slopes of less than 10 degrees, therefore the standard APZ distance that will be recommended in this plan is 20 metres. Two houses and one shed on the site have a slope between 10 and 15° and these have been marked on the Bush Fire Management Plan Poster as requiring an APZ of 30m.

All buildings should be assessed to determine if any upgrades for ember protection is deemed necessary.

**Table 2: Distance of APZ from the wall of a residential dwelling to the hazard (NSW Rural Fire Service, 2006)**

| Slope      | Up or Down Slope | Max. APZ distance (m) |
|------------|------------------|-----------------------|
| All slopes | upslope          | 20                    |
| < 10°      | downslope        | 20                    |
| 10°-15°    | downslope        | 30                    |
| > 15°      | downslope        | 40                    |

#### 4.3.2 Other Buildings

There are 38 other buildings located on the site. APZs protecting other buildings and infrastructure e.g. farm sheds, can be up to 20 metres although if a larger APZ already exists, it is recommended that they not be reduced to 20 m (pers. comm. Martin Siemsen, RFS).

#### 4.3.3 Cattleyards

There are 20 cattle yards at the site, 14 of which are constructed of timber and 6 of steel. The appropriate APZ around these structures is 20 m.

#### 4.3.4 Fences

A boundary fence surrounds the mining colliery holding area and the entire MOC landholdings. Internal fencing also traverses much of the pastoral areas and areas with regeneration of native vegetation.

Under Section 63 of the RF Act, the boundaries of the site will need to be maintained. Six metre buffers are recommended on either side of perimeter fences and should, where possible, accommodate the boundary trails recommended (see Section 4.2.3). Vegetation older than 10 years

must not be removed according to the Bushfire Environmental Assessment Code (BEAC) (RFS 2006). APZ's for internal fences will need to be maintained by Xstrata Mt Owen.

#### **4.3.5 Transport Infrastructure**

The transport infrastructure on the site includes a network of internal roads (principally of earthen construction) and a railway line.

Roads require 3.5m APZs (pers. Comm. Martin Siemsen, RFS). The recommended APZ adjacent to the railway line is 20 metres. This will reduce the potential for ignition from this source.

#### **4.3.6 Service Infrastructure - Water supply**

A buried poly pipeline runs along the Mt Owen rail spur from Glennies Creek to the south and carries water to a dam located adjacent to the Mt Owen CHPP. The route of the line is marked on the BMP Poster. Flow rate at the Glennies Creek pump is 78L per second. As the polyline is buried underground there is no requirement for protection against fire. There is a pipeline on the surface from Liddell Mine to MOC. This will require inspection and maintenance.

There are a total of 51 dams on the Mt Owen Complex. These dams are distributed predominantly around the boundary of the site in pastoral areas and areas within rehabilitating vegetation. There are three water cart fill points on the site (marked on the Bush Fire Management Plan Poster) that can be accessed by mine water carts. Other dams are not accessible to water carts. Although dams can be accessed by light vehicles, no reliance should be placed on these dams containing water for bush fire management and emergency purposes.

There is also a significant on-site supply of saline mine water held in on-site storages that supplies water fill points and the Mt Owen CHPP. This mine water limits the site's reliance on Glennies Creek water.

#### **4.3.7 Service Infrastructure - Powerlines**

Powerlines cross the site and are marked on the BMP Poster. The recommended APZ around these areas is 20m. The BEAC (RFS 2006) also states that at least seven days prior to a planned burn, Xstrata Mt. Owen must liaise with the local electricity provider to determine when conditions are likely to be most suitable to carry out the burn, determine any safety requirements, and subsequently comply with any requirements specified.

#### **4.3.8 Mine Infrastructure**

The majority of the fixed and mobile mine infrastructure (equipment) occurs within the mine pit area, which does not carry a risk of bushfire due to its location within a highly disturbed environment with no fuel source. The majority of mine infrastructure is therefore outside the scope of this bushfire management plan. However, some key infrastructure occurs outside of this pit area and has therefore been assigned APZs.

#### **4.3.9 Mine Infrastructure - Conveyor Belts**

Conveyor belts are important infrastructure that needs protection. Major conveyor belts run west from the Ravensworth East crushing plant to the Macquarie Generation Conveyor Line near the New England Highway and from the West Pit ROM Dump Station to the Mt. Owen coal handling and preparation plant conveyor line. A number of other coal handling conveyors are associated with the Mt Owen and Ravensworth East ROM coal delivery systems and CHPP's. These are marked on the bushfire management plan Poster. The recommended APZ around these areas is 20m unless

infrastructure occurs on steep slopes, in which case APZ should be widened according to the BEAC guidelines.

#### **4.3.10 Mine Infrastructure - monitoring sites**

Flora and fauna monitoring sites occur in the New Forest, Ravensworth State Forest and the biodiversity offsets areas. Dust, noise, blasting water and weather monitoring sites are also located within the Xstrata Mt. Owen land holdings. Of these, continuous noise and dust monitors, weather stations and blast monitoring stations are key fixed assets that need to be protected. Locations of these assets are shown on the BMP Poster. The recommended APZ around these areas is 20 m.

The flora and fauna monitoring site locations are also shown on the bushfire management plan. Currently these should be excluded from fire, future consultation with the Flora and Fauna Advisory Committee (FFAC) is warranted to determine if there is a requirement for a prescribed burn. There also may be a requirement for experimental burns to be conducted within the regeneration and monitoring areas. Any future control or experimental burns in designated conservation areas will only be undertaken following consultation with the Mt Owen FFAC. Any controlled burns in State Forest areas must be approved by State Forests in the form of a permit. This needs to be arranged in advance of burning and consultation with SF needs to take place closer to the time of the burn.

#### **4.3.11 Mine Infrastructure - other**

The recommended APZ around the explosives magazine is 30 metres as it is classed as 'other buildings'. The recommended APZ around the Glennies Creek Ventilation is 20m. Where these APZ's cannot be achieved, barriers to radiant heat flux can be installed to serve as further asset protection. Specifications for these barriers can be obtained from the RFS.

#### **4.3.12 Aboriginal Heritage**

Numerous archaeological sites are scattered across the MOC, principally on mining buffer land. Most sites within the Mining lease areas have been salvaged under permits issued by the Department of Environment and Conservation to allow for on-going mining operations. Evidence at these sites include:

- Artifact scatters
- Isolated artifacts
- Engraving sites
- Habilitation structures
- Natural resources
- Axe grinding grooves

Where Aboriginal heritage sites are indicated to be present, then hazard reduction works must be undertaken in accordance with the relevant conditions specified in the RFS/OEH document *Conditions for Hazard Reduction and Aboriginal Heritage* (a component of the Bushfire Environmental Assessment Code, 2006). An extract is provided in Appendix 2.

#### **4.3.13 European Heritage**

The Ravensworth Homestead is listed on the local heritage register. Actions related to hazard reduction must be consistent with the RFS/NSW Heritage Office document *Guidelines for Bush Fire Hazard Reduction Works Affecting Heritage Items* (a component of the Bushfire Environmental

Assessment Code, 2006). A historical dairy is located at 317921 E, 6414849 S. Another dairy is located at 324126 E, 6412637 S. These are not listed on any registers.

#### 4.3.14 Biodiversity

Fire is an important element of the Australian landscape and an integral part of the life cycle of many native species. Many species have adapted to a specific fire regime. Therefore, inappropriate fire regimes can have a negative impact on some species (Xstrata, 2006).

The NSW RFS and OEHL have produced the *Bushfire Environmental Assessment Code* (RFS 2006) which contains specifications for the management of threatened species and endangered ecological communities. This fire management plan refers to this code in order to recommend appropriate fire intervals for vegetation and measures to protect threatened species. Where vegetation and threatened species are not covered by the Code, general recommendations will be made. These have been presented in tabular format on the bushfire management plan Poster.

In addition, the *Mt Owen Complex Flora and Fauna Management Plan* (Xstrata, 2006) recommends management strategies for conservation areas that can be implemented in order to maintain and enhance the biodiversity of conservation areas. These include:

- Prevent the spread of wild fire into conservation areas
- Use of fire control measures within conservation areas, considering potential sensitivities of flora and fauna communities present within the conservation areas
- Use of fire management/fire regimes in conservation areas to assist in the conservation or to enhance biodiversity (considering the implications of fire frequency, fire extent, fire intensity and fire season)
- Specific management strategies for threatened fauna species
- Develop and implement a research strategy to investigate the importance of controlled burning for ecological enhancement to complement other management of biodiversity (Xstrata, 2006)

#### 4.3.15 Vegetation Communities

Vegetation classification and fire thresholds for the different vegetation communities across the MOC are based on the mapping provided by Xstrata Mt Owen Complex in the *Flora and Fauna Management Plan* (2006), and the BEAC (RFS 2006) and are presented on the BMP Poster. The six vegetation communities and their classification are:

- Forest and Woodland Communities
  - Spotted Gum Forest / Grey Box / Ironbark Woodland Hunter Lowland Redgum Forest
  - Grey Box Woodland
  - Regenerating Woodland
  - Central Hunter Riparian Forest
  - Bull Oak Woodland
  - Bull Oak Forest Regeneration
  - Swamp Oak Forest
  - Grey Box-Ironbark Woodland
- Rainforest Communities
  - Dry Rainforest

Regenerating and rehabilitated areas are also classed as Forest. The remainder of the site is pasture and is continually grazed.

Of these vegetation communities, the Hunter Lowland Redgum Forest and Central Hunter Grey Box-Ironbark Woodland are listed as an Endangered Ecological Community under the *Threatened Species Conservation Act, 1995* (as of December 2011).

#### **4.3.16 Threatened Flora**

Four threatened flora species have been located on site and consist of *Ozothamnus tessellates*, *Acacia pendula*, *Eucalyptus camaldulensis*, and *Goodenia macbarronii*. The location of threatened flora points are shown on the BMP Poster. Fire exclusion and no mechanical hazard reduction are the recommended management actions for this species (RFS, 2006).

A record for *E. glaucina* (Slaty Red Gum) has been identified within a 10km radius Wildlife Atlas search of the area, however the exact location of this species is unknown at this time.

#### **4.3.17 Threatened Fauna**

A total of 20 threatened fauna species have been recorded at the MOC, principally associated with the RSF and surrounding woodland areas. These are listed on the BMP Poster. Appropriate fire thresholds for the management of these species sourced from the Threatened Species Hazard Reduction List for the *Bush Fire Environmental Assessment Code* (RFS 2006) and are also shown on the BMP Poster.

#### **4.3.18 Weed management**

The BEAC (NSWRFS 2006) has standards related to the treatment of weeds. These are identified on the BMP Poster. Fire effect on weed establishment will need to be considered when planning hazard reduction activities. Weed growth is to be monitored and appropriate action undertaken to suppress weeds establishing after fire. This should be undertaken in consultation with the Mt Owen FFAC. Appropriate weed treatment after fire could be trialled in conjunction with experimental burning activities proposed by the Mt Owen FFAC.

## 5 Fire prevention

Prevention of fire outbreaks are the primary focus of fire control strategies. The key personnel responsible for reporting and monitoring fire hazards and for the prevention of fire are:

- **All employees** have a general duty of care to observe for and report fire hazards within the Mining Area and on mine access roads
- **The Xstrata MOC Environment and Community Coordinators**, in combination with Colinta staff, are responsible for monitoring for fire hazards on mine buffer lands outside of the Mining Area
- **The Xstrata MOC Environment and Community Coordinators** are responsible for overall monitoring of fire hazard within both colliery holding areas and surrounding buffer land (in consultation with key stakeholders as required).

### 5.1 PREVENTION OF IGNITION

The key to preventing the fire ignition is to increase the awareness of the risks of ignition. Table 3 documents the actions required to raise awareness amongst Mt Owen employees and contractors to prevent fire ignition. These strategies are especially important during the fire season when weather patterns are conducive to the spread of fire.

**Table 3: Actions to minimise ignition of fires**

| Ignition Source             | Action to Minimise Source  |
|-----------------------------|--|
| Cigarettes thrown from cars | <ul style="list-style-type: none"> <li>• Consider signs which alert road users to the risks and likely effects of disposing cigarettes from cars</li> <li>• On-going toolbox talks</li> </ul>  |
| Higher fuel loads           | <ul style="list-style-type: none"> <li>• Regularly review fuel accumulation</li> <li>• Annually maintain critical fire trails and access roads. Remove surface vegetation with dozer or grader blade</li> <li>• Ensure appropriate levels of grazing are maintained in paddocks, where permitted</li> <li>• Review need for mechanical hazard reduction prior to fire season and implement in conjunction with RFS Captain</li> <li>• Invite local Rural Fires Captain annually (preferably at start of fire season) to inspect fire controls, access etc</li> </ul> |
| Trespassers                 | <ul style="list-style-type: none"> <li>• Secure total landholding from trespass to maximum extent practicable (e.g. boundary fencing, minimise number of access points, locked gates, inspections)</li> </ul>  |
| Lightning strike            | <ul style="list-style-type: none"> <li>• Regularly review fire hazard situation annually maintain critical fire trails and access roads. Remove surface vegetation with dozer or grader blade</li> <li>• Review need for hazard reduction prior to fire season and implement in conjunction with RFS Captain</li> <li>• Invite local Rural Fires Captain annually (preferably at start of fire season) to inspect fire controls, access etc</li> </ul>   |
| Railway line                | <ul style="list-style-type: none"> <li>• Ensure adequately maintained APZ around this source</li> </ul>  |

| Ignition Source   | Action to Minimise Source  |
|---|--|
| Car accidents and car fires                                 | <ul style="list-style-type: none"> <li>• Ensure adequately maintained APZ boundary of site adjacent to public roads</li> </ul>   |
| Welding and maintenance                                     | <ul style="list-style-type: none"> <li>• Maintain high level of employee awareness (e.g. toolbox talks)</li> <li>• Ensure adequate buffer zone between activities and fuel source</li> </ul>   |
| Fuel and exhaust fires                                      | <ul style="list-style-type: none"> <li>• Maintain high level of employee awareness (e.g. toolbox talks)</li> <li>• Ensure adequate buffer zone between activities and fuel source</li> </ul>   |
| Overheated truck tires                                      | <ul style="list-style-type: none"> <li>• Maintain high level of employee awareness (e.g. toolbox talks)</li> <li>• Ensure adequate buffer zone between activities and fuel source</li> </ul>   |
| Engines overheating   | <ul style="list-style-type: none"> <li>• Maintain high level of employee awareness (e.g. toolbox talks)</li> <li>• Ensure adequate buffer zone between activities and fuel source</li> </ul>   |
| Exploration drilling  | <ul style="list-style-type: none"> <li>• Maintain high level of employee/contractor awareness (e.g. toolbox talks)</li> <li>• Consideration of fire in risk assessment prior to commencing drilling</li> </ul>   |
| Contractors and consultants                                 | <ul style="list-style-type: none"> <li>• Maintain high level of employee/contractor awareness (e.g. toolbox talks)</li> <li>• Restrict access by mine employees, contractors and outsiders to non-operational areas</li> <li>• Consideration of fire in risk assessment prior to commencing drilling</li> <li>• Availability of fire suppression equipment, where appropriate</li> </ul> |
| Clearing ignitions  | <ul style="list-style-type: none"> <li>• Maintain high level of employee awareness (e.g. toolbox talks)</li> <li>• Do not undertake mechanical clearing works on high fire danger days</li> <li>• Ensure 24hr fire contact information for the Mt Owen Complex is provided</li> </ul>  |
| Hazard reduction burns                                      | <ul style="list-style-type: none"> <li>• Monitor fuel accumulation in bushland areas</li> <li>• Correct timing of burns</li> <li>• Implement hazard reduction burning in conjunction with RFS Captain</li> </ul>   |
| Fencing, stock management, other land management activities | <ul style="list-style-type: none"> <li>• Maintain communications with community/neighbours, where appropriate</li> <li>• Ensure 24 hr fire contact information for the Mt Owen Complex is provided to neighbours and the local community</li> <li>• Consideration of fire in risk assessments</li> </ul>   |

### 5.1.1 Monitoring, Inspection and Maintenance Program

A monitoring and inspection program will be required to minimise fire hazard and risk on the site. An indicative monitoring schedule is provided in Table 4 below.

**Table 4: Monitoring and inspection program for fire prevention and minimisation**

| Task                          | Purpose   | Frequency              | Timing   | Responsibility                             |
|-------------------------------|---|------------------------|--|--|
| Roads                         | Condition of roads, confirm access is suitable to key areas   | Annually               | Prior to fire season (1 October to 31 March). Also following periods of heavy rain | XMO Environment and Community Coordinators |
| Fuel loads                    | Assess the need for Hazard Reduction Activities   | As per Management Zone | As per Management Zone   | XMO Environment and Community Coordinators |
| Water supply                  | Adequate water supply for fire fighting use   | Annually               | Prior to fire season (1 October to 31 March)                                       | XMO Environment and Community Coordinators |
| Audit fire fighting equipment | To ensure equipment is in proper working order and condition, and to identify any logistical changes that need to be made | Annually               | Prior to fire season (1 October to 31 March)                                       | XMO Environment and Community Coordinators |

### **5.1.2 Fuel Reduction**

The reduction of fuel loads by mechanical means, grazing and through the use of fire is also a primary means of prevention of uncontrollable wildfire. The primary means of fuel reduction at the site will be through the continuation of grazing in pasture lands, tied in with mechanical clearing and some hazard reduction burning. Further details are provided in the following chapter on Management Zones.

## 6 Management Zones

Management zones are based on the location of assets, topography, landuse and potential bushfire hazard. Management zones are separated into the following three categories:

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

Zones have been identified and mapped across the Mt Owen Complex to safeguard the community, company assets and biodiversity conservation areas. These zones are shown on the BMP Poster.

### 6.1 ASSET PROTECTION ZONES (APZ)

An Asset Protection Zone (APZ) is a buffer area between a bush fire hazard and an asset which minimises the impact of fire on that asset (NSW Rural Fire Service, 2005). The APZ should be maintained so that bushfire fuels are minimised.

Specific APZ requirements for the site are listed in the BMP Poster. APZs have been marked on the map in relation to the asset that they have been put in place to protect. Each asset is shown on the map with a corresponding symbol that identifies the required width for the APZ.

**Table 5: Asset Protection Zone**

|                       |   |
|-----------------------|---|
| <b>Aim</b>            | <ul style="list-style-type: none"> <li>• To provide a fuel free zone around the asset in question and all-weather access for emergency vehicles</li> </ul>  |
| <b>Specifications</b> | <ul style="list-style-type: none"> <li>• 20 or 30 metre wide fuel free zones. Width may be reduced where constrained by topography/land use, but can be supplemented by radiation barriers</li> <li>• Grass and pasture to be slashed to &lt;10cm height</li> <li>• Emergency access/egress points to road system should be maintained</li> </ul> |
| <b>Management</b>     | <ul style="list-style-type: none"> <li>• Grazing, where permitted and practicable</li> <li>• Mechanical, or manual hazard reduction</li> <li>• Slashing three times a year, before, during and after the bushfire danger period is recommended</li> </ul>   |
| <b>Monitoring</b>     | <ul style="list-style-type: none"> <li>• Weekly from September – February, monthly at other times of year</li> </ul>  |
| <b>Priority</b>       | <ul style="list-style-type: none"> <li>• Very high</li> </ul>   |

Following is a brief discussion and rationale for these requirements. Note that the creation of APZs around existing structures will require an environmental assessment to obtain a Bush Fire Hazard Reduction Certificate or other equivalent environmental approval, unless clearing has already been undertaken.

The fuel loads within the APZ should be maintained at low levels especially during the peak fire season. It is recommended that mechanical reduction of fuel be used preferentially (especially around assets). Manual fuel reduction may be more appropriate around areas of sensitivity – i.e. at flora or

fauna monitoring sites, or at archaeological sites. Where recommended APZ distances are less than current APZ's, the greater distance should be maintained.

Hazard reduction burning may be undertaken as a subsequent option (pers. Comm. Martin Siemsen, RFS). Soil erosion as a result of hazard reduction activities should be minimised (pers. Comm. Mark Nolan, DPI). The BEAC (RFS 2006) contains guidelines for soil erosion (see the BMP Poster).

A program to review the fuel loads in APZs is to occur regularly and especially before the commencement of the fire season. A slip-on unit should accompany any slashing during the bushfire danger period to minimise risk of ignition.

A permit to light a fire will be required from the RFS and SF in State Forest areas. A certificate may be issued for prescribed burning in an APZ regardless of fire interval, unless threatened species, populations or ecological communities are identified as per the list on the BMP Poster.

## **6.2 STRATEGIC FIRE ADVANTAGE ZONES (SFAZ)**

The Strategic Fire Advantage Zone (SFAZ) is intended to provide:

- strategically located fuel reduced areas to reduce the potential for large wildfires to develop
- areas where fire can more easily be suppressed
- strategically located fuel reduced areas to reduce vulnerability of assets which are susceptible to fire (RFS, 2006)

Specific SFAZ requirements for the site are listed in the BMP Poster. This zone has been mapped as transparent orange on the BMP Poster. This zone primarily relates to grazed pasture across the MOC. Table 6 outlines the management approach for this zone.

**Table 6 Strategic Fire Advantage Zones**

|                       |  |
|-----------------------|--|
| <b>Aim</b>            | <ul style="list-style-type: none"> <li>To provide a fuel reduced zone around the primary operational and biodiversity conservation areas to reduce the rate of spread and intensity of fires</li> </ul>  |
| <b>Specifications</b> | <ul style="list-style-type: none"> <li>Fuel managed area</li> <li>Access/egress points to road system should be maintained</li> </ul>  |
| <b>Management</b>     | <ul style="list-style-type: none"> <li>Grazing across site, where permitted and practicable</li> <li>Cool mosaic burns if required in forest/woodland areas outside LMZ. Burns to be planned and implemented in conjunction with the RFS.</li> </ul> |
| <b>Monitoring</b>     | <ul style="list-style-type: none"> <li>Weekly from September – February (dependent on rainfall/fuel loads), monthly at other times of year. This can be adjusted to suit weather conditions</li> </ul>   |
| <b>Priority</b>       | <ul style="list-style-type: none"> <li>Moderate, already undertaken as part of existing management regime</li> </ul>   |

Operational mining areas have been classified as SFAZs. Hence, they have reduced fuel loads which can be strategically used to reduce the spread of fire. Pasture land has also been classified as SFAZ because it is an area in which fire can more easily be suppressed.

### 6.3 LAND MANAGEMENT ZONES (LMZ)

LMZs are areas that will be managed to provide optimum fire frequency to maintain and improve biodiversity and provide a conservation sensitive approach. Any areas having established or rehabilitating vegetation communities have been classified as belonging to the LMZ.

The risk of fire is increased in these areas due to the exclusion of grazing and the establishment of large continuous areas of native forest and woodland, primarily to the north and east of Mt Owen Mine, and to the south adjacent the Glendell Mine. This zone has been mapped as transparent green on the main map in the BMP Poster.

Table 7 outlines the management approach for this zone.

**Table 7: Land Management Zones**

|                       |  |
|-----------------------|--|
| <b>Aim</b>            | <ul style="list-style-type: none"> <li>To manage land primarily for conservation</li> </ul>  |
| <b>Specifications</b> | <ul style="list-style-type: none"> <li>Area managed primarily for environmental purposes in accordance with the MOC Flora and Fauna Management Plan</li> <li>Recognition that revegetation works will result in increased fuels loads. Alternative fuel management works to grazing may therefore be required</li> </ul>   |
| <b>Management</b>     | <ul style="list-style-type: none"> <li>Maintain and establish stock fencing around these areas</li> <li>Establish and maintain fire trail network using existing trails to provide access and control lines</li> <li>Apply burns within ecological thresholds</li> <li>Appropriate ecological fire intervals and management requirements for vegetation communities and threatened flora and fauna</li> <li>Maintain a buffer of reduced fuel load around these lands</li> </ul> |
| <b>Monitoring</b>     | <ul style="list-style-type: none"> <li>Monitoring regime as part of existing Mt Owen flora and fauna monitoring program in consultation with the Mt Owen FFAC</li> </ul>   |
| <b>Priority</b>       | <ul style="list-style-type: none"> <li>High Priority, part of DA requirement</li> </ul>  |

## 6.4 PRESCRIBED BURNING

### 6.4.1 Application to MOC

The Mt Owen Complex continues to invest significant resources rehabilitating mined areas and establishing native forest and woodland communities in surrounding conservation areas. The risk of fire is increased in these areas due to the exclusion of grazing and the establishment of large continuous areas of native forest and woodland. Measures to protect conservation areas from inappropriate fire regimes, whether it is from prescribed burning and/or wildfire, is required along with providing protection to the surrounding community and internal assets. These measures can include a program of prescribed burning which is considered essential for ecological management, particularly in areas where fire has remained absent for many years.

For further information on aspects to consider when planning for prescribed burns, refer to Appendix 3. A suggested form for prescribed burns is included as Appendix 4.

# 7 Emergency Response

## 7.1 SITE MANAGEMENT AND EMERGENCY RESPONSE

Initial response to, and management of fire, within the MOC is the joint responsibility of Xstrata Mt Owen and, in the Mt Owen Mining operation area, Thiess P/L. Response to, and management of, fire on buffer lands outside the Colliery Holding Boundaries is the joint responsibility of Xstrata Mt Owen and Colinta Holdings.

Management of all lands, regardless of whether it is inside or outside of the Mining Area must be undertaken in accordance with license conditions and legislation. Under the *Rural Fires Act, 1997*, the RFS has the power to direct landholders, including Xstrata Mt Owen, to undertake hazard reduction activities on their property.

The NSW Fire Brigades (NSWFB) typically has the lead role in emergency response, due to the potential presence of gases and explosive material. However, given the extensive rural nature of the site and surrounding properties it is likely that a coordinated response between the NSWFB and the RFS (coordinated by the District Fire Management Officer and supported by the Local Brigade Captain) is likely to achieve the best results. Other than areas within the Mine Inspector region, mine plant deployed to the fire would come under the control of the RFS Incident Controller to allow effective management of the incident and ground crews.

## 7.2 OFF SITE EMERGENCY FIRE RESPONSE

The NSW Fire Brigade has fire stations in both Singleton and Muswellbrook. The response time from these sites is likely to be 20 and 30-45 minutes, respectively. Of these stations, only Muswellbrook has the resources to respond to a hazmat incident fire (pers. comm. Chris Kane, Muswellbrook Fire Station).

The MOC falls into RFS District 14 (Hunter Valley: Singleton, Muswellbrook) and the Rural Fire Service has Fire Control Centres in Darlington, Goorangoola and Glennies Creek. The response time from these sites is likely to be 20-25 to 30-35 min. However Hebden only have a Cat 9 (small 4WD) and due to work commitments they are very rarely the respondents. Darlington, Goorangoola and Glennies Creek are the primary responders for the area and backup appliances would come from Muswellbrook. If a major event occurred and local RFS appliances were not sufficient and there were no other major incidents on at the time, RFS coordinate with other responders in the region to backup the other brigades such as Edinglassie (response time approx 30min) (pers. comm. Martin Siemsen, RFS).

### 7.3 THE EMERGENCY RESPONSES PROCEDURE

The emergency response to fire is outlined in the BMP Poster and is reproduced here.

**Table 8: Emergency Response**

| Emergency Response |  |  |   |
|--------------------|--|--|---|
| Step               | Action   | Information Required   | Responsibility  |
| 1                  | If fire is in the Mt Owen Complex Colliery Holding area raise alarm on Channel 1 or via Emergency No. (818) or other appropriate means   | Type of fire<br>Location of fire<br>Assets or Property at Risk   | Person who has sighted signs of fire  |
| 2                  | <b>CONTACT 000</b>   | <b>Type of Fire</b><br><b>Location of Fire</b><br><b>Liaison officer name</b><br><b>Designated meeting point</b> | <b>Person who has sighted signs of fire</b><br><b>OCE or Thiess/MOC Environment &amp; Community Coordinator or Designated Authority</b>     |
| 3a                 | If fire is in Mt Owen Complex mining area advise Open Cut Examiner (OCE) via Control Room (65700 850) or Office (6570 0800)  | Type of fire<br>Location of fire<br>Assets or Property at risk   | The OCE assumes control until the RFS arrives   |
| 3b                 | If fire is on buffer lands outside of the mining area advise MOC Environment and Community Coordinator (telephone), contact office (6570 0800), and advise OCE   | Type of fire<br>Location of fire<br>Assets or Property at risk   | The appropriate MOC Environment and Community Coordinator assumes control until the RFS arrives   |
| 4                  | Dispatch liaison officer to designated meeting point   | Type of fire<br>Location of fire<br>Liaison officer name<br>Designated meeting point                             | OCE for fire within Colliery holding boundary<br>MOC Environment and Community Coordinator for fire on buffer lands outside the Mining Area |
| 5                  | Advise potentially affected neighbours   | Location of fire<br>Location of affected neighbours  | MOC Environment and Community Coordinator or Designated Authority   |
| 6                  | OCE dispatches first response crew to assess the situation and determine safe course of action until the RFS arrives. If it is a small, controllable fire then first response crew can attempt to contain it, giving the utmost importance to personal safety. RFS to 'mop-up' | Location of fire<br>Equipment Required   | OCE   |

| Emergency Response |  |  |   |
|--------------------|--|--|---|
| Step               | Action   | Information Required   | Responsibility  |
| 7                  | Arrange for water trucks, dozer/grader and additional crew to be put on standby awaiting assessment by the first response crew and RFS | Location of fire<br>Equipment Required                                     | OCE   |
| 8                  | Meet RFS at designated Meeting Point   | Best access to fire  | Designated Liaison Officer  |
| 9                  | Escort RFS to fire   | Best and safest access to fire   | Designated Liaison Officer  |
| 10                 | Escort RFS Incident Controller to incident control room  | Best access to fire  | Designated Liaison Officer  |
| 11                 | Mobilise trained mine crew and fire fighting assets in liaison with RFS Incident Controller  | Best access to fire, instructions on their role and lines of communication | RFS Incident Controller in consultation with Designated Liaison Officer |

#### 7.4 RESPONSIBILITY FOR FIRE MANAGEMENT AND CHAIN OF COMMAND

The Open Cut Examiner (OCE) and the Environment and Community Coordinator are responsible for coordinating all emergency response to fire at the site. The OCE will nominate a Designated Liaison Officer whose responsibility will be to meet the RFS upon their arrival at the site and liaise with them throughout the fire incident. The RFS will assume control of the fire upon their arrival at the site. Where appropriate, the Mt Owen Complex staff are to put all of its available on-site emergency response resources at the disposal of the RFS.

Responsibility for fire management at the site depends on the type of fire and its location. Fire management within the Mt Owen Colliery Holding area is the joint responsibility of the mine operator, Thiess and XMO. At Glendell and Ravensworth East Colliery Holdings, XMO holds the responsibility for fire management. Fire management within mine buffer areas outside of the Colliery Holding area is the responsibility of Xstrata Mt Owen and Colinta Pastoral Company.

First response is critical in an emergency situation. Emergency response authorities should be contacted immediately. Should the fire be small, controllable and of low hazard and suitably trained mine personnel be available to fight/contain the fire then these resources should be utilised immediately. Personal safety is the highest priority, if there is any doubt personnel should pull back and wait for the RFS to arrive.

Both the Rural Fire Service (RFS) and the NSW Fire Brigade are likely to play a role in emergency response to fire at the site. The RFS is the designated agency for the management of fires occurring in the Hunter Valley Team Rural Fire District, in which the Mt Owen Complex is located. The RFS is the most likely emergency response organisation to be involved with emergency fire response at the site.

The RFS also works closely with Forests NSW. Ravensworth State Forests is managed by Mt Owen but owned by Forests NSW. The legal responsibilities of managing fire and fire hazard on this land is not currently clear and should be verified. It is recommended that a formal process between Xstrata and Forests NSW is negotiated to resolve this issue.

## **7.5 COMMUNICATION OF THIS PLAN**

This BMP will be communicated and available to all persons having a responsibility under the Plan. A copy is to be retained in the OCE's offices and the Mt Owen CHPP Control Room and be referenced in the Emergency Response Manuals for the site. A copy of the Plan and supporting documentation will also be held by the MOC and Thiess Environment and Community personnel. This plan is to be used as a basis for annual training of staff so that they are aware of essential emergency bushfire responses and responsibilities.

It is also recommended that a current copy of the report and the BMP Poster be held by the local RFS.

## **7.6 EMERGENCY CONTACTS**

Emergency contact details for emergency services (police, ambulance, fire brigade), Rural Fire Service, State Forests, State Emergency Service (SES), regional hospitals, council, Road and Traffic Authority (RTA) and mines rescue are provided on the BMP Poster. This list is to be reviewed and updated annually by the Mt Owen Environment and Community Coordinator before each fire season in consultation with key stakeholders.

### **7.6.1 Internal Mt Owen Complex Communication**

The OCE is responsible for coordinating all emergency response to fire within the Mt Owen Complex Mining Area. The chain of command should be used to define the line of communication between all persons involved management of bushfire. Where there is a fire outside the colliery holdings, is the responsibility of the relevant MOC Environment and Community Coordinator, to coordinate all emergency response to fire via the site's emergency response process (contact will still need to be maintained with the OCE as the fire could pose risk to the site). Refer to the 'Communications' table in the BMP Poster for all relevant contact details.

During an emergency response to fire all Mt Owen staff and RFS crew are to maintain communication using UHF radio Channel 1.

### **7.6.2 Contact Details for Neighbours**

Neighbours that could be potentially affected by a fire should be contacted at the earliest possible time as specified in the Emergency Response Table. Contact details for surrounding properties and neighbouring mines are on the Bushfire Management Plan Poster. This list is to be maintained/reviewed annually by the Mt Owen Environment and Community Coordinator.

### **7.6.3 Emergency Mt Owen Complex contact details**

The 24 hour contact details for the Mt Owen Complex for emergency events, including fire is as follows:

Office Switch (24hrs): 02 6570 0800.

NB: This is also the number for fires on mine buffer land.

These contact detail will be made available to all adjoining neighbours and the local community.

## 7.7 MEETING AND ACCESS POINTS

There are seven designated meeting points where site employees will meet the RFS during a response to fire. These are shown and documented on the Bushfire Management Plan Poster.

The following basic safety principles should apply to all use of roads or tracks during a fire emergency:

- An escort familiar with the site and access roads/tracks shall accompany response personnel at all times
- Vehicle operator determines suitability to access area
- Experienced machinery operators only to be used
- No person or vehicle is to enter an area unless an escape route is available
- Unknown tracks are not be followed

## 7.8 SMOKE MANAGEMENT

If smoke from hazard reduction burns or wildfire is or is likely to obscure vision on the highway then the police and the RTA must be notified. The risk of problems from smoke resulting from any hazard reduction burn can be reduced by consulting a smoke dispersion forecast by the Bureau of Meteorology. Potentially affected adjoining landholders shall be directly contacted where appropriate. The general community should be notified about the possibility of smoke from any hazard reduction burns through the media and using signage on public roads and around the site. This is particularly important for wineries in the area. Appendix 4 contains smoke management guidelines.

## 7.9 TRAINING

Two elements of training are proposed;

1. Employee and Contractor Training
2. Annual incident training

Training of employees and contractors includes emergency management and aspects of Bushfire Management are covered. Training also includes hazard identification and risk assessment, permits (such as hot work permits) and assets at the MOC. Additional training/communications may include the following aspects:

- Bushfire risks on the site
- Assets on the site
- APZ locations and management regimes
- Fire fighting apparatus
- Emergency response guidelines
- Monitoring and maintenance requirements

It is recommended that an annual incident training program is undertaken prior to the start of the fire danger season. This will encompass testing equipment, scenario planning, application of the emergency response procedures and coordination with the local fire authorities.

The BMP Poster provides a register of staff with bushfire training and trained safety officers. This should be reviewed annually by the Mt Owen Environment and Community Coordinator and the BMP updated accordingly. Appendix 1 provides a list of resources at Xstrata Mt Owen Complex available for fire fighting purposes.

### **7.10 POST EMERGENCY RESPONSE TO FIRE**

There are a number of different stages that may have to be undertaken after an emergency response to fire. These are documented in the BMP Poster and include:

- Monitor the area until it is confirmed that the fire is extinguished
- Debriefing of all personnel involved in the emergency
- Full internal investigation, with assistance from MOC if needed
- Continued support of injured personnel and their families
- Restoration of facilities and equipment, and resumption of operations
- Participate in any external investigation
- Review the emergency response plan and upgrade as necessary

### **7.11 REVIEW AND REPORTING OF FIRE INCIDENTS**

It is recommended that an internal review be undertaken immediately after an emergency response incident has concluded to assess the effectiveness of the response. This review should review the emergency response plan and update it as necessary.

The findings of this review and any required changes to the response procedure should be made available to all relevant site personnel and external parties.

### **7.12 MONITORING AND REVIEW**

Individual monitoring requirements for fire management zones have been identified in section 6. Additional monitoring and review requirements are detailed below;

1. The fire management plan and poster is to be reviewed every 5 years
2. The regeneration areas are to be monitored annually for fuel loads
3. The effectiveness of grazing as a means of fuel reduction should be assessed annually
4. All fires occurring on the site are to be documented, including details of:
  - a. Date/time
  - b. Location
  - c. Weather conditions
  - d. Ignition source
  - e. Type of fire (bush fire, waste fire etc)
  - f. Emergency response
  - g. Mapping of the extent of the fire on GIS and any damage resulting from the fire
  - h. Effectiveness of management zones
  - i. Effectiveness of Emergency Response
  - j. Any Required Remedial Action

## 8 Summary of Recommendations

The following table summarises recommendations outlined in this plan and provides a cross reference to the relevant section.

**Table 9: Recommendations**

| Recommendation   | Report Section |
|--|----------------|
| Clarify legal responsibilities for fire with State Forest  | 7.4            |
| Annual review of requirement to construct or upgrade trails in areas with inadequate access  | 4.2.3          |
| Construct perimeter trail on the boundary of the site, along the ridgeline running from the north along the eastern boundary   | 4.2.3          |
| Incorporate an annual maintenance schedule for all roads and into the normal works program   | 4.2.3          |
| Implement prescribed burning within LMZ areas to promote ecological functioning (regeneration) whilst opportunistically reducing fuel loads spatially and temporally | 6.4            |
| It is also recommended that a current copy of the report and the BMP Poster be held by the local RFS   | 7.5            |
| Undertake an annual incident training program prior to the start of the fire danger season   | 7.9            |
| Undertake an internal review after an emergency response incident has concluded to assess the effectiveness of the response  | 7.11           |

The following table summarises recommended APZ distances outlined in this plan along with recommended maintenance action.

**Table 10: Recommended APZ Distances**

| Asset                   | APZ Distance | Action                    | Report Section      |
|-------------------------|--------------|---------------------------|---------------------|
| Buildings and Dwellings | 20/30 metres | Mechanical Fuel Reduction | 4.3.1, 4.3.2, 4.3.3 |
| Cattleyards             | 20 metres    | Mechanical Fuel Reduction | 4.3.4               |
| Fences                  | 20 metres    | Mechanical Fuel Reduction | 4.3.5               |
| Roads                   |              | Mechanical Fuel Reduction | 4.3.6               |

|                                  |            |   |               |
|----------------------------------|------------|---|---------------|
| Railway                          | 20 metres  | Mechanical Fuel Reduction   | 4.3.6         |
| Water Fill Points                | 20 metres  | Mechanical Fuel Reduction   | 4.3.7         |
| Powerlines                       | 20 metres  | Mechanical Fuel Reduction   | 4.3.8         |
| Conveyor Belts                   | 20 metres  | Mechanical Fuel Reduction   | 4.3.10        |
| Monitoring Sites Flora and Fauna | 20 metres  | Generally mechanical but Manual fuel reduction in sensitive locations | 4.3.11        |
| Monitoring sites other           | 20 metres  | Mechanical Fuel Reduction   | 4.3.11        |
| Glennies Creek Vent Shaft        | 20 metres  | Mechanical Fuel Reduction   | 4.3.11        |
| Explosives Magazine              | 20 metres  | Mechanical Fuel Reduction   | 4.3.11        |
| Archeological and Heritage sites | see detail | Generally mechanical but Manual fuel reduction in sensitive locations | 4.3.13-4.3.18 |

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# Appendix 1. On-Site Emergency Response Resources

The following resources are available at the site the management of fire.

## Vehicles

Dozers

Graders

Water Trucks (fill smaller trucks) x 3 with cannons

Utes                      **Staff**

Emergency response team

## Communications

Radios    All mine vehicles fitted with radios, plus handheld units available

Mobile phones                                      Supervisory staff all carry mobile phones.

## Suppression Equipment

Fire extinguishers                                      All vehicles and buildings fitted with fire extinguishers.

## Pumps    **Personal Safety Gear**

Gloves    Available

Goggles    Available

Boots    Available

## Miscellaneous

Water fill points

## Appendix 2: Aboriginal Heritage Considerations

There are records on the site including Artefacts, Art, Grinding Grooves, and Habitation structures. The BEAC provides recommended conditions for hazard reduction based on the type of site present. Where Aboriginal heritage sites are indicated to be present, then hazard reduction works must be undertaken in accordance with the relevant conditions specified in the RFS/OEH document *Conditions for Hazard Reduction and Aboriginal Heritage* or the most recent version of this legal advice (a component of the Bushfire Environmental Assessment Code, 2006). Following are relevant extracts from *Conditions for Hazard Reduction and Aboriginal Heritage* (a component of the Bushfire Environmental Assessment Code, 2006).

### General Site Protection Considerations

When hazard reduction proposals are assessed under the Bushfire Environmental Assessment Code, officers must ensure they act in accordance with the following:

- Ensure that hazard reduction activities are only approved if the method is rated as LOW or MEDIUM and use the preferred method unless there is valid reason (e.g. safety) to use another appropriate method
- Ensure that the person/s undertaking the works recognises that all aspects of all Aboriginal sites must be treated with respect, keeping in mind that things of significance are not always apparent when one is not familiar with different belief systems
- Partake in discussions with personnel undertaking the hazard reduction activities to ensure that they understand and respect cultural values, including respect for confidentiality of sites, and their role in being stewards for Aboriginal people and Australian history
- Recognise that the local Aboriginal community will have important ties to these features and that relationships with the Aboriginal community should be fostered (for example, the Local Aboriginal Land Council)
- Address all relevant conditions in cases where there are multiple (and different) site features within the area to be hazard reduced. In circumstances where there is conflict between conditions then RFS Head Office must be contacted
- Ensure conditions are addressed for at least 100 metres in all directions from the identified site location. In addition, it is to be made clear to the person/s carrying out the works that any other areas that contain features similar to the identified site features must also be hazard reduced in accordance with the relevant conditions

## General Conditions

The following conditions must be applied to the Bush Fire Hazard Reduction Certificate for all site feature groups and hazard reduction methods.

- No one must drive off established roads in the vicinity of the site
- Unnecessary walking within the site area must be avoided
- Hoses and other equipment must not be dragged across Aboriginal sites, and rubbish must not be left in the area
- All known sites are to be re-inspected after hazard reduction works are completed, and if any site disturbance has occurred then details must be provided to DEC
- If an unregistered site is discovered during works then site must be treated

## Site Group 1 - Artefacts

### Conditions

Do not break earth around known sites, especially where there is surface evidence of artefacts, shell, charcoal or ochre. Any surface impact adjacent to site must be immediately returned to previous state, a note made of site location, and details of site disturbance provided to DEC. Vehicles or heavy equipment must not be used on or within these sites unless a path exists that will not damage the site. Vegetation which is screening the site must not be damaged. There must be no slashing/trittering of vegetation, no tree removal, and no use of earthmoving equipment such as bulldozers. If using fire place the control lines well away from the site.

## Site Group 2 - Art, Grinding Grooves

### Conditions

If burning, loose leaf litter must be carefully removed from rock platforms and from under overhangs. Leaf litter is to be returned to the site after the fire as site may be covered for protection from vandalism. If using fire place the control lines well away from the site. Heavy equipment (including vehicles) must not be used on rock platforms, or within 10 metres of sites unless there is an existing road available for use. If burning, rake loose leaf litter away from vegetation in the vicinity of the site if smoke is likely to impact upon rock paintings. No use of chemicals or other retardants within 20 metres of art sites. If windy the distance is to be extended to 50 metres. Vegetation which is screening the site must not be damaged. There must be no slashing/trittering of vegetation, no tree removal, and no use of earthmoving equipment such as bulldozers.

## Site Group 3 - Habitation Structure

Loose leaf litter and low ground cover is to be manually cleared by raking for 10 metres around carved or scarred trees and wooden structures. Wooden structures and trees of concern are to be protected at time of burn. For example, dampen earth around structure and trees to be protected, and minimise risk of ember attack. If using fire place the control lines well away from the site. Trees of concern must be examined as soon as possible after the passage of the fire and

embers that might cause the tree to burn must be extinguished. Chemicals or other retardants that can impact upon plants and animals used by Aboriginal people or cause damage to water holes must not be used. There must be no slashing/trittering of vegetation, no tree removal, and no use of earthmoving equipment such as bulldozers. *If site is used by Aboriginal people for resource and gathering then liaise with the Aboriginal community to ensure that hazard reduction is timed to cause minimal damage to the resource, and is not disruptive to gathering practices. Do not proceed if damage cannot be avoided.*

# Appendix 3: Prescribed Burning

## 8.1.1 Application to MOC

The Mt Owen Complex continues to invest significant resources rehabilitating mined areas and establishing native forest and woodland communities in surrounding conservation areas. The risk of fire is increased in these areas due to the exclusion of grazing and the establishment of large continuous areas of native forest and woodland. Measures to protect conservation areas from inappropriate fire regimes, whether it is from prescribed burning and/or wildfire, is required along with providing protection to the surrounding community and internal assets. These measures can include a program of prescribed burning which is considered essential for ecological management, particularly in areas where fire has remained absent for many years.

For further information on aspects to consider when planning for prescribed burns, refer to Appendix 3. A suggested form for prescribed burns is included as Appendix 4.

## 8.1.2 Ecological principles

Contemporary ecological research in fire-prone ecosystems similar to that at the site has established some general principles about the fire regimes needed to avoid the extinction of native species and conserve biodiversity. Management of fire for both protection and conservation purposes should be guided by these general principles, which include:

- Groups of plant and animal species respond similarly to fire according to characteristics of their life history. It is therefore not necessary to individually specify fire regimes for the conservation of every species, rather, an overview is needed of the requirements for broad groups of species. Requirements for most plant species can be summarised on the basis of a small number of groups, however scientific understanding of the requirements for groups of animals (and particularly invertebrates) is less advanced;
- Plant and animal communities are inextricably linked. Plants form an important component of habitat for animals. Fire managers must consider this important interaction;
- A diversity of fire regimes may be needed to maintain native biodiversity. This means that over time, there is a place for fires of high, moderate and low intensity, frequency and size. Extinctions may be likely when fire regimes of relatively fixed intensity, frequency and extent prevail without variation;
- Bradstock et al (1995) contend that there is a threshold in fire regime variability that marks a critical change from high species diversity to low species diversity. For some groups of biota these thresholds separating desirable and undesirable fire regimes can be defined. Management should therefore be targeted toward desirable fire regimes using these thresholds as a guide. The advantage of using thresholds to determine fire regimes is that it is not directing an ecosystem to a single state, but maintaining it in a range of states above the threshold;
- Management strategies involve the manipulation of fire regimes. While scientific information supporting this strategy may be incomplete, fire management using this framework can progress as further knowledge is accumulated. Assessment of fire regimes through the mapping of individual fires (including the characteristics of the fire) will be ongoing so that strategies (manipulation of fire regimes) can be regularly reviewed, refined and adjusted.

### 8.1.3 Fire regime guidelines

Table 8 provides fire regime guidelines (thresholds) for the major groups of vegetation across the MOC and is based upon the above mentioned principles for biodiversity conservation. It is emphasised, however, that a variable fire regime within the thresholds identified in Table 8 is required to avoid the potential for species decline. This requires varying fire frequency and intensity, and the season and pattern of burn. In addition, the following points must be considered when implementing the fire interval guidelines:

- The fire regime for each vegetation community should be maintained within biodiversity thresholds, as far as is possible
- Variability in the fire regime parameters of fire interval, fire season, fire intensity and pattern of burn is to be included in a burn program as much as practicable
- In areas that have not experienced fire for a period that exceeds the biodiversity thresholds, use of fire will be considered. Any burn is to involve only a section of the vegetation community to ensure that a mosaic of different age groups is created. Mosaic burning is an approach that involves using patches of small, low-intensity fires to control fuel levels in the vegetation understorey, over varying intervals of time. This achieves a variety of life stages for flora and fauna habitat. The mosaic approach to burning also allows for fauna in the area to take refuge and escape fire. It is recognised that this may mean that some vegetation communities may extend beyond their biodiversity thresholds temporarily
- Where fire frequency becomes high in the future, and the biodiversity thresholds are likely to have been exceeded, fire is to be excluded
- Fires within areas of regenerating/rehabilitated vegetation should be excluded for at least 10-15 years (pers. comm. Mike Cole, University of Newcastle) as the seed bank is currently limited within the soil of these areas and therefore fires in these areas are likely to result in low recruitment and proliferation of weeds. Buffers or a boundary zone around these areas are recommended to prevent fire occurring within this timeframe.
- Variation in the ignition pattern will ensure that the burn regime does not create heavily 'altered' patches of similar fire regimes e.g. 'fire shadow' or 'high impact' areas. Whilst downhill burns are typically used in prescribed fire ignition, an occasional uphill burn may be useful, provided that the resultant fire intensity can be managed safely.
- A community should not be burnt repeatedly at the minimum interval, rather at a landscape level it is expected that the majority of the community falls somewhere within the domain between the minimum and maximum intervals.
- In some areas, especially within Strategic Fire Advantage Zones (SFAZs) and adjacent to built assets, fire intervals may be shorter than biodiversity guidelines, and for relatively small areas, may theoretically result in a localised loss of biodiversity;
- Some activities involved in the control of wildfire may have an adverse effect on biodiversity. Examples include use of heavy machinery to construct control lines, or use of fire retardant chemicals. This potential damage should be avoided wherever possible, using guidelines provided in the BEAC and provided on the BMP Poster
- In riparian areas, mechanical work must be excluded from all vegetation adjacent to a water body as defined in the BEAC, and presented in the BMP Poster
- Prescribed Burning is not permitted in vegetation adjacent to a water body (i.e. the riparian buffer zone) within 20 m, and should be excluded from dry rainforest.

**Table 11: Vegetation Communities within MOC and their fire thresholds**

| Vegetation Communities and Biodiversity Thresholds |                             |                     |                     |
|--|-----------------------------|---------------------|---------------------|
| Vegetation Type                                    | Keith (2004) Classification | Fire Freq Min (yrs) | Fire Freq Max (yrs) |
| Spotted Gum Forest / Grey Box / Ironbark Woodland  | Grassy Forest/Woodland      | 8                   | 30                  |
| Hunter Lowland Redgum Forest                       | Grassy Forest/Woodland      | 8**                 | 30**                |
| Grey Box Woodland                                  | Grassy Forest/Woodland      | 8                   | 30                  |
| Regenerating Woodland*                             | Grassy Forest/Woodland      | Exclude* then 8     | Exclude* then 30    |
| Central Hunter Riparian Forest                     | Grassy Forest/Woodland      | 8                   | 30                  |
| Dry Rainforest                                     | Rainforest                  | No Burning          | No Burning          |
| Bull Oak Woodland                                  | Grassy Forest/Woodland      | 8                   | 30                  |
| Rehabilitated Area                                 | Grassy Forest/Woodland      | 8                   | 30                  |

Fire Intervals from Appendix A Bush Fire Environmental Assessment Code. \*Fires within areas of regenerating/rehabilitated vegetation should be excluded for at least 10-15 years as a seedbank is currently limited within the soil of these areas. \*\* BEAC specifies no fire more than once every 25 years

#### 8.1.4 Prescribed burning safeguards for threatened fauna

The following Table 9 lists general safeguards for threatened fauna and could be applied to the protection of any fauna species whether threatened or not. Management measures for specific species are listed in Table 10 following Table 9.

**Table 12: Fire management safeguards for threatened fauna**

| Safeguard options | Where possible, in locations of known populations and/or core habitat :  |
|-------------------|--|
| Safeguard 1       | Avoid fire regimes beyond fire interval thresholds of the native vegetation communities making up the species habitat.   |
| Safeguard 2       | Avoid burning more than 30% of the local habitat of the species in any year  |
| Safeguard 3       | Avoid size of each burn patch being >50% of the smaller home range of the species  |
| Safeguard 4       | Avoid actual area burned being >75% of the total area within a burn perimeter  |
| Safeguard 5       | Avoid burning a small total area where post-fire herbivore overgrazing is a concern  |
| Safeguard 6       | Avoid lighting up more than 50% of the burn perimeter and allow fire to spread in a single direction. Avoid situations resulting in converging fire lines with no escape routes. |
| Safeguard 7       | Avoid burning in breeding season. If a number of species with different breeding seasons occur in the burn area, avoid the breeding season of the most fire sensitive species.   |

|              |  |
|--------------|--|
| Safeguard 8  | Avoid high intensity fire by minimising the size of wildfires, ignition times during mid-day, ignition during high fire danger periods and if possible suppressing wildfires prior to it affecting the population. Prescribed burning may be appropriate to reduce nearby fuel loads in the direction from which wildfire is expected. |
| Safeguard 9  | Avoid scorching the overstorey canopy during prescribed burning  |
| Safeguard 10 | Avoid placing infrastructure (e.g. temporary utilities, re-routing trails, etc.) within habitat or near nesting and roosting sites   |
| Safeguard 11 | Avoid felling hollow-bearing trees during mop-up and control line construction   |
| Safeguard 12 | Avoid burning known den trees and roost sites during prescribed burning  |
| Safeguard 13 | Avoid felling feed trees during mop-up and control line construction   |
| Safeguard 14 | Avoid predation by, or competition with, feral animals (in areas where they occur) by implementing appropriate feral animal control measures in conjunction with the prescribed burning  |

Table 13: Threatened Fauna Fire Ecology

| Threatened Fauna Fire Ecology |                              |                            |   |   |  |
|-------------------------------|------------------------------|----------------------------|---|---|--|
| Common Name                   | Scientific Name              | Breeding season            | BEAC Conditions re the use of Fire*               | BEAC Conditions re Mechanical Hazard Reduction* | Comment/ recommended action  |
| Green & Golden Bell Frog      | <i>Litoria aurea</i>         | Dec – Feb                  | None provided                                     | None provided                                   | Protect Potential Habitat from intense fire.   |
| Masked Owl                    | <i>Tyro novaehollandiae</i>  | Mar – Jul sometimes summer | None provided                                     | None Provided                                   | Protect large hollow bearing trees and known roost sites from intense fire   |
| Powerful Owl                  | <i>Ninox strenua</i>         | May - Aug                  | No burning around known nesting sites at any time | None Provided                                   | Protect large hollow bearing trees and known roost sites from intense fire   |
| Brown Treecreeper             | <i>Climacteris picumnus</i>  | May – Dec                  | Utilise mosaic burn                               | No slashing, trittering or tree removal         | OEH lists threats from lack of regeneration of eucalypt overstorey in woodland due to overgrazing and too-frequent fires, which remove ground logs that are a foraging resource. Recovery >20 – 50 years for replacement of logs from old trees                            |
| Speckled Warbler              | <i>Pyrrolaemus sagittata</i> | Aug – Jan                  | None provided                                     | None provided                                   | OEH lists threats from modification and destruction of ground habitat and too-frequent fire. Fire removes ground cover which provides nesting and foraging resources. Recovery <5 years depending on ground cover recruitment. Loss of ground logs also a long-term impact |
| Black-chinned                 | <i>Melithreptus gularis</i>  | Jun – Dec                  | None provided                                     | None provided                                   | -  |

| Threatened Fauna Fire Ecology |                                |                 |                                     |   |   |
|-------------------------------|--------------------------------|-----------------|-------------------------------------|---|---|
| Common Name                   | Scientific Name                | Breeding season | BEAC Conditions re the use of Fire* | BEAC Conditions re Mechanical Hazard Reduction* | Comment/<br>recommended action  |
| Honeyeater                    |                                |                 |                                     |   |   |
| Grey-crowned Babbler          | <i>Pomatostomus temporalis</i> | Jul – Feb       | Utilise mosaic burn                 | No slashing, trittering or tree removal         | Fire removes ground cover which provides nesting and foraging resources. Recovery <5 years depending on ground cover recruitment. Loss of ground logs also a long-term impact   |
| Hooded Robin                  | <i>Melanodryas cucullata</i>   | Jul – Nov       | None provided                       | None provided                                   | OEH lists threats from modification and destruction of ground habitat and too frequent fire. Fire removes ground cover and shrubs which provide foraging and nesting resources. Recovery <5 years depending on recruitment of shrubs and ground cover. Loss of ground logs also a long-term impact  |
| Diamond Firetail              | <i>Stagonopleurata guttata</i> | Aug - Jan       | None provided                       | None provided                                   | OEH lists threats from modification and destruction of ground- and shrub layers within habitat and too frequent fire. Fire removes ground cover which provides nesting and foraging resources. Recovery <5 years depending on ground cover recruitment. Loss of ground logs also a long-term impact |
| Swift Parrot                  | <i>Lathamus discolor</i>       | Sep – Feb       | None provided                       | None provided                                   | -   |

| Threatened Fauna Fire Ecology |                                 |  |                                     |   |  |
|-------------------------------|---------------------------------|--|-------------------------------------|---|--|
| Common Name                   | Scientific Name                 | Breeding season                        | BEAC Conditions re the use of Fire* | BEAC Conditions re Mechanical Hazard Reduction* | Comment/<br>recommended action   |
| Spotted-tail Quoll            | <i>Dasyurus maculatus</i>       | Apr – Jul                              | None provided                       | None provided                                   | OEH Priority recovery action: Recovery strategy: Habitat management: Fire - Negotiate to incorporate protection of rocky outcrops and riparian zones (and other features as required) into fire management prescriptions within areas of known habitat. Fire removes ground logs providing den sites and old habitat trees. Recovery >20 – 50 years for replacement of logs from old trees |
| Squirrel Glider               | <i>Petaurus norfolcensis</i>    | Jun – Aug                              | Utilise mosaic burn                 | No slashing, trittering or tree removal         | Protect large hollow bearing trees and known roost sites from intense fire   |
| Grey-headed Flying-fox        | <i>Pteropus poliocephalus</i>   | Mar – Feb, core Apr – Oct              | Avoid known roost sites             | Avoid known roost sites                         | -  |
| Eastern Freetail Bat          | <i>Mormopterus norfolkensis</i> | Unknown but presumed Spring and Summer | Utilise mosaic burn                 | No slashing, trittering or tree removal         | Protect hollow, hollow limb bearing and fissure trees and known roost sites from intense fire  |
| Large-eared Pied Bat          | <i>Chalinolobus dwyeri</i>      | Sept – Jan                             | No burning around known roost sites | None provided                                   | Protect hollow, hollow limb bearing and fissure trees and known roost sites from intense fire  |
| Large Bent-wing Bat           | <i>Miniopterus schreibersii</i> | Aug – Jan                              | None provided                       | None provided                                   | Protect hollow, hollow limb bearing and fissure trees and known roost sites from intense fire  |

| Threatened Fauna Fire Ecology |                              |                 |                                     |   |   |
|-------------------------------|------------------------------|-----------------|-------------------------------------|---|---|
| Common Name                   | Scientific Name              | Breeding season | BEAC Conditions re the use of Fire* | BEAC Conditions re Mechanical Hazard Reduction* | Comment/<br>recommended action  |
| Little Bent-wing Bat          | <i>Miniopterus australis</i> | Sep – Dec       | No fire around known roost sites    | Utilise buffer around known roosts              | Protect hollow, hollow limb bearing and fissure trees and known roost sites from intense fire |
| Large-Footed Myotis           | <i>Myotis adversus</i>       | Oct – Jan       | No fire around known roost sites    | No removal of trees                             | Protect hollow, hollow limb bearing and fissure trees and known roost sites from intense fire |
| Greater Broad-nosed Bat       | <i>Scoteanax rueppellii</i>  | Nov - Feb       | None provided                       | None provided                                   | Protect hollow, hollow limb bearing and fissure trees and known roost sites from intense fire |

### 8.1.5 Prescribed burning safeguards for threatened flora

Management measures for specific flora species are listed in Table 11 below. During any ecological burning, protection should also be afforded to the many nesting boxes that have been established within the RSF and surrounding conservation areas and are susceptible to fire. Appropriate preparation may include exclusion from fire, wetting down boxes and mechanical clearing around sites.

**Table 14: Threatened Flora Fire Ecology**

| Threatened Flora Fire Ecology   |  |  |
|---------------------------------|--|--|
| Scientific Name                 | Species Specific Conditions relating to the use of Fire* | Conditions relating to Mechanical Forms of Hazard Reduction* |
| <i>Ozothamnus tessellatus</i>   | No fire  | No slashing, no trittering or tree removal                   |
| <i>Acacia pendula</i>           | No known conditions. Exclude fire as precaution          | No slashing, no trittering or tree removal                   |
| <i>Eucalyptus camaldulensis</i> | No known conditions. Exclude fire as precaution          | No slashing, no trittering or tree removal                   |
| <i>Goodenia macbarronii</i>     | No known conditions. Exclude fire as precaution          | No slashing, no trittering or tree removal                   |

\*Threatened Species Hazard Reduction List for the Bush Fire Environmental Assessment Code

### 8.1.6 Fire season

Research and management experience has shown that there are advantages and disadvantages for burning in any season of the year. For example:

- Tolhurst et al (1992) states, “autumn burns appear to provide a longer period of reduced litter fuel loads” than spring burns; and
- Catling (1991) identified the importance of spring fires for maintaining habitat complexity and reducing fire effects on moist gullies; and
- Conroy (1993) suggests that widespread spring burning may have an adverse impact on the reproduction of fauna and the subsequent dispersal of young.

For ecological based burning, the relative abundance of key fire response species and their method of persistence determines the best season to burn a particular community or location. For instance, Keith *et al.* (2002) state that autumn burning is optimal for the regeneration of threatened species within Fabaceae and Proteaceae families. Thus, it is not a simple matter of just selecting appropriate weather conditions for burning. Objectives of each prescribed burn and the environmental constraints must be known before selecting the season and weather conditions under which burning is to occur. Other factors may play a role such as smoke affects on neighbouring areas (e.g. wineries and harvest) and the availability of resources.

### 8.1.7 Fire and weed management

Prescribed burning needs to take into account the effects on invasive weeds. Fire regimes and fire management can exacerbate the spread of weeds e.g. through earth moving equipment. Fire management activities and particularly prescribed burning can also assist with weed control.

The management of bushfire should be complimentary to current and future weed control operations and aim to avoid exacerbation of the problem, for example;

- post-wildfire weed control programs should commence within one month and completed within 12-18 months of a fire;
- when weed control resources for post-fire work are inadequate, prescribed burning should be strategically excluded from areas where problematic weeds have the potential to spread into clean areas or impact key areas e.g. threatened species habitat;
- where prescribed burns are unavoidably located in areas where the weed problem can be significantly exacerbated, spraying of infestations is recommended; a multi-stage, spray-burn-spray strategy may be an effective control.

Table 12 outlines additional weed safeguards to be followed where prescribed burning and other fire management activities are planned in areas affected by problematic weeds.

**Table 15: Safeguards in sites containing problematic weed species**

| Potential impact   | Options to mitigate the impact include:  |
|--|--|
| Exotic seeds introduced on machinery and boots during fire management activities                 | <ul style="list-style-type: none"> <li>▪ wash down all vehicles and machinery likely to disturb the soil during prescribed burning or trail maintenance activities. Whenever practicable, this should also be done for vehicles and machinery to be used in wildfire suppression;</li> <li>▪ carry out weed management following the fire management activities.</li> </ul>  |
| Weed distribution and abundance increased as a result of fire management activities              | <ul style="list-style-type: none"> <li>▪ carry out weed management following the fire management activities;</li> <li>▪ avoid movement through weed infested areas;</li> <li>▪ wash down all vehicles and machinery that are likely to disturb the soil during prescribed burning or trail maintenance activities. Whenever possible, this should also be done for vehicles and machinery to be used in wildfire suppression;</li> <li>▪ consider alternative activities;</li> <li>▪ no topsoil for post-fire rehabilitation works is to be used unless it has been sterilised.</li> </ul> |
| Environmental conditions that favour the expansion of exotic species are created by fire regimes | <ul style="list-style-type: none"> <li>▪ minimise size of burn areas by slashing or other (non-fire) fuel reduction</li> <li>▪ delay burning if burning at the proposed time will exceed fire interval threshold;</li> <li>▪ whenever possible, avoid scorching the overstorey canopy during prescribed burning;</li> <li>▪ consider alternatives to burning.</li> </ul>   |

### 8.1.8 Prescription burn plans

Prescription burning plans need to be prepared prior to a burn. Appendix 3 provides a number of forms to aid this process. All burn plans should, among other things, identify:

- Acceptable fire behaviour parameters and appropriate weather conditions;
- Lighting burn patterns;
- Command structure for management of the fire;
- Resource requirements and deployment;
- Appropriate notification of visitors, neighbours and fire authorities;

- Visitor and traffic control, signposting;
- Smoke management;
- Threatened species safeguards that are to apply;
- Weed mitigation strategies.

#### **8.1.9 Burn control lines**

On occasions obvious fire control lines such as a road cannot always be used as the boundary of a prescribed burn and other methods of securing the burn perimeter are required. Other methods may include the following:

- Burning under conditions where the fire is self-extinguishing overnight after burning out an area approximating the required size. Different fuel types (vegetation communities) often behave differently under cooler / moister conditions and this may allow fires to 'self-extinguish' near to a vegetation community boundary. Alternatively, downhill versus uphill and downwind versus upwind fire spread create further options to achieve the desired burn pattern;
- Burning a narrow strip along the selected boundary under conditions where the fire will only spread a few metres (e.g. under moister conditions or in winter). This burnt strip can then be used as a boundary for the remainder of the burn when appropriate weather conditions become available;
- Lays of 25 mm canvas hose to provide either a wet / foam line or extinguishment of a burn when it has reached the predetermined boundary;
- Burning in different seasons, time of day / night and weather conditions can be used to determine the spread and behaviour of a prescribed fire;
- Use of naturally occurring breaks in vegetation such as along animal tracks and watercourses/wetland areas or clearings and rock surfaces;
- Construction of small temporary tracks with handtools such as rakehoes and brushcutters, or a narrow slashed break; and
- A combination of the above listed options.

The lighting method and pattern for prescribed fires is important in providing escape routes for animals. Where ground ignition occurs, fires spreading from one end of a 'burning block' to the other, rather than creating a converging fire that causes 'hot-spots', are less likely to entrap fleeing wildlife.

#### **8.1.10 Conditions suitable for prescription burns**

Generally, the most favourable periods for prescribed burning occur when there are:

- dry surface fuels (moisture levels of 10 to 20 percent);
- a high level of moisture recovery in fine fuels at night; and
- a low probability of winds from the westerly sector.

#### **8.1.11 Monitoring the effects of prescription burns**

Monitoring of prescription burning operations is an important component of any fire management or fuel reduction burn program and is used to determine whether objectives have been met. It may also facilitate:

- adjustment of future fuel reduction burning activities;
- evaluation of the impact of the imposed fire regime on conservation;
- establishment and/or 'fine tuning' of fire regime requirements for conservation of threatened species and biodiversity;
- evaluation of the impact and value of fuel reduction burns.

Appendix 3 provides various forms for the monitoring of prescribed burning.

After a prescribed burn the following actions should be undertaken:

- Visually inspect the site as soon as practical afterwards and evaluate plant destruction (e.g. ground cover burned, canopy scorched, scorch height). A post burn analysis should be completed including a fuel hazard assessment and photographs; and
- Visually estimate the percentage of area within the burn perimeter that has burned versus unburned (if possible map and digitise the internal unburned areas).

All records should be entered on a suitable database and into the GIS database, or at least kept together with the original burn plan to facilitate reporting and analysis of impacts.

# Appendix 4: Preparing a prescription burning plan

**Table 16: PB contact details**

| <b>Contact Details</b>  |                                  |
|---|----------------------------------|
| Burn Planned Prepared By: .....   |                                  |
| Contact No.: .....  |                                  |
| <b>Location and Objectives</b>  |                                  |
| District: .....   | Location (grid reference): ..... |
| Tenure: .....   | Location (describe): .....       |
| Year/Month(s) of Burn: .....  | Gross Area (ha): .....           |
| Fire Permit No.: .....  |                                  |
| Objective: .....  |                                  |
| .....   |                                  |
| .....   |                                  |
| Origin of Burn (fire management plan, neighbour request, coordinated burn with local agencies and authorities)..... |                                  |
| .....   |                                  |
| .....   |                                  |
| .....   |                                  |

**Table 17: PB fuels to be burned**

| Vegetation Type | Location (e.g. N slopes) | Fuel Type (litter, shrub, etc.) | Area (ha) | Fuel Age (yrs) | Fuel Qty (t/ha) |
|-----------------|--------------------------|---------------------------------|-----------|----------------|-----------------|
|                 |                          |                                 |           |                |                 |
|                 |                          |                                 |           |                |                 |
|                 |                          |                                 |           |                |                 |
|                 |                          |                                 |           |                |                 |

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  |  |  |  |
|--|--|--|--|--|--|

**Table 18: PB special planning considerations**

|  |
|--|
| <p><b>Rare and Threatened Species Present:</b> .....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p><b>Other Planning Constraints</b> (e.g. nearby assets, hazards, fuel distribution, neighbours <i>etc...</i>)</p> <p>.....</p> <p>.....</p> <p>.....</p> |
|--|

**Table 19: Boundary preparation**

| Boundary Type | Length | Work Required | Date Completed |
|---------------|--------|---------------|----------------|
|               |        |               |                |
|               |        |               |                |
|               |        |               |                |
|               |        |               |                |
|               |        |               |                |

**Table 20: Other pre-burn preparation**

| Work Required<br>(e.g. waterholes, fence lines, line construction, edge burning) | Date Completed |
|--|----------------|
|  |                |
|  |                |
|  |                |
|  |                |

**Table 21: Weather prescriptions**

|  |                                  |
|--|----------------------------------|
| Max flame Height (m):.....                       | Max Rate of Spread (m/min):..... |
| Temperature (°C): .....to.....                   | SDI (mm): ..... to               |
| Humidity (%): .....to.....                       | Forest FDR: ..... to .....       |
| Wind (km/hr): .....to.....                       |                                  |
| Wind Direction: .....to.....                     |                                  |
| Other (e.g. sunshine, days since rain):<br>..... |                                  |
| Outlook: .....<br>.....                          |                                  |

**Table 22: Lighting and patrol strategy**

|  |
|--|
| Lighting Method (state): .....   |
| Lighting Strategy: .....<br>.....<br>.....   |
| Mop Up and Patrol Strategy (e.g., resources, timing, next high FDR day): .....<br>.....<br>..... |

**Table 23: Lighting plan**

|   |  |
|---|--|
| <b>Attach/Consult:</b> Topographic Map (name, scale, and North point) |  |
| <b>Indicate:</b>  | - Access                      - Assets                      - Potential Hazards              |
|   | - Boundary Types              - Test fire locations              - Water Stations/points     |
|   | - Fuel types, dist. & quantity      - Crew placement/assembly points      - Lighting pattern |

**Table 24: Resources**

|                 |         |                     |        |
|-----------------|---------|---------------------|--------|
| Fire Controller | (name): | Ignition Equip      | (No.): |
| .....           |         | .....               |        |
| Navigator       | (name): | Ignition            | Fuel   |
| .....           |         | (litres/caps):..... |        |
| Slipons         | (No.):  | Pumps               | (No.): |

.....

**Table 25: Notification checklist**

|                          | To Contact<br>(tick box) | Names | Phone No. | Done<br>(Date/Time) |
|--------------------------|--------------------------|-------|-----------|---------------------|
| <input type="checkbox"/> | Fire Warden              |       |           |                     |
| <input type="checkbox"/> | Local Brigade            |       |           |                     |
| <input type="checkbox"/> | Local Council            |       |           |                     |
| <input type="checkbox"/> | Local Police             |       |           |                     |
| <input type="checkbox"/> | Adjoining landowners     |       |           |                     |
| <input type="checkbox"/> | Neighbours               |       |           |                     |
| <input type="checkbox"/> |                          |       |           |                     |
| <input type="checkbox"/> |                          |       |           |                     |
| <input type="checkbox"/> | Other                    |       |           |                     |
| <input type="checkbox"/> |                          |       |           |                     |

**Table 26: Pre-burn monitoring**

| Date                                    |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|
| Rainfall (mm)                           |  |  |  |  |  |  |  |  |
| Peat/Soil<br>(wet, moist, dry)          |  |  |  |  |  |  |  |  |
| Leaf Litter Bottom<br>(wet, moist, dry) |  |  |  |  |  |  |  |  |
| Aerial Fuel<br>(wet, moist, dry)        |  |  |  |  |  |  |  |  |

**Table 27: Weather forecast for day of burn**

|                                    |                               |
|------------------------------------|-------------------------------|
| Obtain the latest information for: |                               |
| Rainfall to 9am (mm):              | Days Since Rain:              |
| SDI (mm):                          | Drought Factor:               |
| Max Temperature (°C):              | Haines Index (if applicable): |
| Relative Humidity (%):             | Dew Point (°C):               |
| Wind Speed (km/hr):                | Wind Direction:               |

Forest FDR:

**Table 28: Pre-burn briefing check-list**

A briefing is essential for all planned burns. Deliver briefing in sections, each covering one aspect of the burn plan. Involving the input of experts is essential here. Obtain feedback at the end of the briefing. Briefings should cover:

- Objectives;
- Chain of Command;
- Lighting & control strategy;
- Allocation of crews to tasks;
- Coordinating Instructions;
  - timing;
  - communication channels;
  - command signals;
  - reporting requirements;
- Logistics;
  - water and turning points;
- Safety;
  - safety equipment;
  - hazards;
  - escape routes;
- Recording requirements.

**Table 29: Test fire recording**

| Record fire behaviour for a 10 minute period after test fire has been alight for 10 minutes |       |       |       |
|---|-------|-------|-------|
|   | No. 1 | No. 2 | No. 3 |
| Time test fire lit:   | ..... | ..... | ..... |

|                              |   |       |       |       |       |
|------------------------------|---|-------|-------|-------|-------|
| Headfire ROS (m/min)         | .....                                   | ..... | ..... | ..... | ..... |
| Flankfire ROS (m/min)        | .....                                   | ..... | ..... | ..... | ..... |
| Backfire ROS (m/min)         | .....                                   | ..... | ..... | ..... | ..... |
| Headfire Flame Height (m)    | .....                                   | ..... | ..... | ..... | ..... |
| Hours to 1800 hrs EST        | .....                                   | ..... | ..... | ..... | ..... |
| Ignition Spacing (see below) | .....                                   | ..... | ..... | ..... | ..... |
| <b>Hours to 1800 Hrs EST</b> | <b>Flow Rate of Spread of Test Fire</b> |       |       |       |       |
|                              | 0.2                                     | 0.4   | 0.6   | 0.8   | 1.0   |
|                              | <b>Spacing of Spots (m)</b>             |       |       |       |       |
| 1                            | 10                                      | 20    | 30    | 40    | 50    |
| 2                            | 20                                      | 46    | 60    | 80    | 100   |
| 3                            | 30                                      | 60    | 100   | 130   | 160   |
| 4                            | 40                                      | 80    | 130   | 170   | 220   |
| 5                            | 50                                      | 100   | 160   | 220   | 270   |

**Table 30: Weather and fire behaviour observations**

|                             |  |  |  |  |  |  |  |  |  |  |
|-----------------------------|--|--|--|--|--|--|--|--|--|--|
| Time (24 hr clock)          |  |  |  |  |  |  |  |  |  |  |
| Temperature (dry bulb) (°C) |  |  |  |  |  |  |  |  |  |  |
| Temperature (wet bulb) (°C) |  |  |  |  |  |  |  |  |  |  |
| Relative Humidity (%)       |  |  |  |  |  |  |  |  |  |  |
| Tree top Wind Speed (km/h)  |  |  |  |  |  |  |  |  |  |  |
| 1.7 m Wind Speed (km/h):    |  |  |  |  |  |  |  |  |  |  |
| Wind Direction              |  |  |  |  |  |  |  |  |  |  |
| Cloud (%)                   |  |  |  |  |  |  |  |  |  |  |
| Forest FDR                  |  |  |  |  |  |  |  |  |  |  |
| Vegetation Type             |  |  |  |  |  |  |  |  |  |  |
| Location (e.g. N slopes)    |  |  |  |  |  |  |  |  |  |  |

|                        |  |  |  |  |  |  |  |  |  |  |
|------------------------|--|--|--|--|--|--|--|--|--|--|
| Fuel Type              |  |  |  |  |  |  |  |  |  |  |
| Rate of Spread (m/min) |  |  |  |  |  |  |  |  |  |  |
| Flame Height (m)       |  |  |  |  |  |  |  |  |  |  |

**What effect did the weather have on your burn?**

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**Post Burn Evaluation**

| Vegetation Type | Location<br>e.g. N slopes | Fuel Type | Area Burnt | Fuel Load Remaining<br>t/ha | Overstorey Scorched % |
|-----------------|---------------------------|-----------|------------|-----------------------------|-----------------------|
|                 |                           |           |            |                             |                       |
|                 |                           |           |            |                             |                       |
|                 |                           |           |            |                             |                       |
|                 |                           |           |            |                             |                       |
|                 |                           |           |            |                             |                       |

**Comments on Light Up (note modifications to burning plan or lightning pattern as a result of conditions on the day):**

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**Comments and recommendations:**

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**What procedures went well during the day?**

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**What procedures didn't go so well?**

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.....  
.....

**Date Burn Declared Out:**

.....

**Escapes**

**Did the burn escape?**      Yes/No

If the burn escapes, please file report



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