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Bushfire Management Plan

Hard Rock Quarry, Karuah, NSW

Report Number HQP00-003

December 2014

Hunter Quarries Pty Ltd

PO Box 51

Thornton NSW 2322

Bushfire Management Plan

Hard Rock Quarry, Karuah, NSW

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Bushfire Management Plan – Hard Rock Quarry, Karuah, NSW

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1 INTRODUCTION

Hunter Quarries Pty Limited (Hunter Quarries) currently operates a hard rock quarry at Karuah, which was approved in November 1997. In October 2004, Hunter Quarries applied to the then Department of Infrastructure, Planning and Natural Resources (DIPNR) for approval to expand the quarry into adjoining land (i.e. the Stage 2 area) to allow the extraction of further hard rock resources.

Development Consent was granted by the Minister for the then Department of Infrastructure, Planning and Natural Resources on the 3 June 2005 (DA 265-10-2004), with the approved development including:

- Implementing the remainder of the approved Stage 1 quarry operation;
- Extending the quarry operations into the Stage 2 area;
- Upgrading and using existing infrastructure on site;
- Rehabilitating the site by re-contouring and revegetating exposed surfaces; and
- Producing up to 500,000 tonnes of product a year over the next 22 years.

The Development Consent contains requirements relating to bushfire management, including the requirement to prepare a Bushfire Management Plan (BMP).

SLR Consulting completed a review of the BMP in November 2014, following the Independent Environmental Audit. There were no specific recommendations relating to bushfire management from the 2014 Independent Environmental Audit, but all management plans were reviewed and resubmitted to the Department of Planning and Environment (DP&E).

2 SCOPE AND OBJECTIVES

The primary purpose of this BMP is to satisfy the conditions of Development Consent and the requirements of the *Rural Fires Act, 1997* (RF Act 1997).

*It is **not** intended that this document be part of the assessment process rather it is a Management Plan that provides the appropriate controls and tools for the management of bushfire on the site.*

The relevant conditions of Development Consent and the section(s) in this document where they are addressed are contained in **Table 1**.

Table 1 – Relevant Conditions of Development Consent (DA 265-10-2004)

Condition Number	Condition Requirement	Section
36 (a)	<i>The Applicant shall ensure that the development is suitably equipped to respond to any fires on-site</i>	Section 6.0
36 (b)	<i>The Applicant shall assist the Rural Fire Service and Emergency Services as much as possible if there is a fire on-site.; and within 6 months of the date of this consent, the Applicant shall prepare a conservation sensitive Bushfire Management Plan for the development, to the satisfaction of Council and the Rural Fire Service</i>	Whole BMP Section 6.0

In addition, Section 63 of the Rural Fire Act 1997 requires land owners to *'take all practical steps'* to prevent the occurrence of bushfires on their land, and to minimise the danger of the spread of bushfires on or from, their land.

To fulfil the purpose of the BMP, the following objectives have been established.

- Minimise the risk of unplanned outbreak of fire occurring;
- Have mitigations measures in place to contain any fire outbreak;
- Have appropriately trained personal and firefighting equipment available to suppress localised fires;
- Have arrangements in place to communicate and coordinate actions with the Rural Fire Service in the event of any fire outbreak;
- Investigate any occurrence of fire to identify the cause and to assess the effectiveness of BMP in preventing and controlling the fire; and
- Produce an annual report on fire management activities.

This document relates to the management of bushfire on the land subject to the approval to operate a hard rock quarry at Karuah (DA 265-10-2004). This land includes:

- Lot 21 DP 1024341;
- Lot 11 DP 1024564; and
- Part of Lot 12 DP 1024564.

Quarrying activities will be undertaken on Lot 21 and Lot 11, which are owned by Hunter Quarries, and a Conservation Offset Area is to be established on a southern portion of Lot 12. The land is shown in **Figure 1**.



Figure 1 – Site Locality

3 PERFORMANCE CRITERIA AND GUIDELINES

The key performance criteria of the legislation relating to bushfire management is under Section 63 of the Rural Fires Act 1997 which states that it is the duty of Hunter Quarries (as the land owner or occupier) to take steps ***“to prevent the occurrence of bush fires on, and to minimise the danger of the spread of bush fires on or from, that land”***, including any steps advised to be taken by the Bush Fire Co-ordinating Committee or required by a bush fire risk management plan applying to the land.

A list of the most relevant documents and legislation relating the bushfire management for the quarry is contained in **Section 9** (Relevant Documents & Legislation) of this BMP. Where appropriate these have been considered in the preparation of the Management Plan.

4 CONSULTATIONS

During the preparation of the BMP, the Great Lakes Council (GLC) and the Rural Fire Service (RFS) were contacted on several occasions to determine whether there were any additional requirements relating to subject land, as imposed by a Bushfire Risk Management Plan or otherwise. The GLC and RFS did not advise of any additional bushfire management requirements, and at the time of the requests made by GSSE (2006) were not able to provide a copy of Bushfire Risk Management Plan due to the difficulty in accessing the document.

A copy of the original Management Plan was sent to the GLC and the local Rural Fire Service for their comments and records.

5 POTENTIAL IMPACT & KEY ISSUES

Lightning is the predominant source of fires not resulting from human activity which is otherwise the most serious source of bush fires, with (on average) nearly twice the number of bush fires having arisen from careless, legal use of fire than illegal fires. These are important considerations for use of fire in management controls on the site.

Bushfires present potential impacts to life, property and the environment. The majority of the land is bushland, with the cleared area comprising of the previously mined area, active quarrying and production areas and various access tracks.

An uncontrolled bushfire outbreak within the bushland area has the potential to endanger the lives of quarry personnel, neighbouring residents and firefighters attending the fire. Similarly, uncontrolled bushfire has the potential to damage assets within the land (such as vehicles, machinery, crushers, fencing and buildings) and also assets on neighbouring properties (such as houses, fences, domestic constructions).

The approved Development includes the utilisation of the existing infrastructure, as approved in November 1997. The EIS (Asquith & deWitt, 2004) states that “*Bushfire was not identified as a major issue*” and that the “*development application for the existing site facilities will provide detail of any bushfire requirements for the site*”. The November 1997 approval does not contain any requirements for bushfire protection measures such as Asset Protection Zones, however, the nature of the development is such that there are substantially cleared areas around the infrastructure, water supply on site, and access paths around the site. There are no habitable buildings on site.

There are two nearby residences located to the east of the quarry on the same side as of the Highway (north), one adjacent to the offset area, and one to the east of northern end of Lot 11. It is important that bushfire management activities are coordinated such that these landholders are consulted and considered in the plan. The locations of the nearby residents are shown in **Figure 2**.

Bushfires also have the potential to impact on the environment. Inappropriate fire regimes can lead to loss of particular plant and animal species and communities. With respect to conservation aspects, bushfires can cause threatened fauna species to experience major habitat disruption. Terrestrial, aquatic and avian species can have their habitats burnt or transformed as a result of fires, including nesting/roost trees and terrestrial food sources. Aquatic habitats can also be heavily disturbed by increased sedimentation and water quality change to waterways. For this reason frequent fire has been listed as a ‘*key threatening process*’ by the NSW Scientific Committee under the Threatened Species Conservation Act. Fire also creates bare soil and increased soil erosion, particularly on steep sites.

Vegetation at the site is open eucalypt forest on steep elevated land. Generally more vegetation exists on the steep south facing slopes and some lower sections constitute closed forests which are well outside the proposal area. Dominant vegetation types are Blue Gum, Spotted Gum and Smooth-barked Apple. Generally the understorey comprises a number of rainforest species. The most previous bushfire passed through the site 2002.

The *Flora and Fauna Management Plan* (HWR, 2005) identifies distinct vegetation communities on site that require more conservation sensitive bushfire management activities. These areas are the areas of *Tetratheca juncea* habitat and the Tall Moist Forest within the offset area. In addition to the findings outlined in the *Flora and Fauna Management Plan*, Great Lakes Council (GLC) has identified that previous investigations for a proposed telecommunications tower on Lot 12 detected a threatened plant, *Asperula asthenes* (TSC Act – Vulnerable) within the Tall Moist Forest offset area (see GLC's memo note dated 04.08.2006). The locations of the more conservation sensitive areas are shown in **Figure 2**.

Figure 2

6 MITIGATION AND MANAGEMENT MEASURES

6.1 Annual Hazard Assessment

Annual inspections of the site will be undertaken to determine what actions are required to reduce fuel loads in the areas surrounding the quarry. This will be taken prior to the start of the bushfire season, with the bushfire season typically occurring from October to March.

This assessment should typically be made at the start of Autumn so that any necessary hazard reduction can be taken in Autumn in accordance with requirements of **Section 6.4**. The RFS need to be consulted annually to determine the most appropriate method of assessing the fuel load, and the level of fuel load that would warrant a hazard reduction burn. In general fuel loads exceeding **8-10 t/ha** are considered to pose a hazard. In additions to fuel loads other considerations will include assessment of climatic condition (e.g. rainfall) for the proceeding year, climate predictions, and the advice of RFS.

The RFS offer assessments for sites that have an increased bushfire risk. Where appropriate, Hunter Quarries will consult with the RFS to ensure that the fuel load assessments are completed and an appropriate hazard reduction strategy is employed on the site. Records of this consultation with the RFS will be maintained and stored on the site as part of the overall Environmental Management Strategy.

6.2 Asset Protection Zones (APZ)

An APZ is a fuel reduced area surrounding a built asset or structure, typically including residential buildings or major sheds for commercial, industrial or farming purposes. Whilst there are no habitable buildings on site, there are structures on site that would benefit from an APZ, these are the office, amenities and fuel storage. For these structures an APZ of 20 m has been established, with the fuel load within the APZ reduced by "*raking or manual removal of fine fuels*" and "*removal or pruning of trees, shrubs and understorey*" in accordance with the methods contained in the "Standards for Asset Protection Zones" (NSW RFS), which is included in **Appendix A**.

In addition to the APZ around the fuel storage, fuel will be stored in self contained bunded structure in accordance with Australian Standard AS 1940.

6.3 Perimeter Fire Trails & Fire Breaks

Perimeter fire trails will be established for the full perimeter of the lands owned by Hunter Quarries (Lot 21 and Lot 11) and for the offset area (within Lot 12). The fire trails are to have a trafficable width of 4 metres m with a fuel reduced zone of at least 1 m either side of the trail. In general, the fire trails will include a passing bay every 200 m, which will be about 20 m long by 3 m wide.

Existing tracks within the site will also be maintained in a trafficable condition to allow vehicle movement during fire fighting.

The Pacific Highway on the southern boundary of land acts as a substantial fire break to prevent fires coming from the south, and the perimeter fire trails will act as fire breaks for fires that could come from other directions.

6.4 Hazard Reduction & Fire Regime

There are three main methods of hazard reduction:

- **Hand clearing:** raking up leaves, clippings, clearing out gutters
- **Mechanical clearing:** mowing, slashing, ploughing, bulldozing, grading
- **Burning:** pile burning, or “controlled” or “prescribed” burning which use fire to reduce the amount of flammable fuel.

If necessary, hazard reduction management such as cool burning of the bushland to reduce the fuel load will undertaken. A hazard reduction burn would only be undertaken where there are heavy fuels loads that could support an uncontrolled bushfire. The RFS need to be consulted annually to determine the most appropriate method of assessing the fuel load, and the level of fuel load that would warrant a hazard reduction burn.

In accordance with the NSW Rural Fire Service, an environmental assessment would be undertaken prior to undertaking hazard reduction work. As part of the environmental approval for the hazard reduction a Bush Fire Hazard Reduction Certificate may be required.

The following points should be taken into consideration, prior to undertaking any hazard reduction burning:

- Clearing of vegetation using mechanical methods should not be undertaken. As per recommended by GLC, only sensitive hand clearing and controlled/prescribed burning within the appropriate ecological thresholds for particular vegetation communities should be used where necessary to reduce the fuel load within the Conservation Areas;
- Any burning should be undertaken in accordance with the NSW RFS *Standards for Low Intensity Bush Fire Hazard Reduction Burning (for private landholders)*, which is included in **Appendix C**;
- Strategic rotational burning (mosaic burning) of portions of the bushland area should be used so that burning of the whole BMP area in any burning event or three (3) year period is avoided;
- The burning regime should be managed such that overly frequent fires are avoided and in general, each portion of the BMP area should not be subject to fire more often than once every ten (10) years;
- The avoidance of burns in the Tall Moist Forest (potential *Asperula asthenes* habitat – GLC memo note dated 04.08.2006) should have an adopted 25 – 30-year minimum bushfire interval in accordance with the RFS Environmental Assessment Code and the Draft Great Lakes Vegetation Strategy;
- Burning during the flowering period should be avoided; and
- The *Flora and Fauna Management Plan* (HWR, 2005) recommends that:

“Bushfire management regimes should consider the ecological communities present on the subject site and the natural fire regime that this community is adapted to. There are some areas of the Blue Gum – Brushbox Forest that contains a highly mesic understorey comprising a number of rainforest species that are generally not adapted to fire. Therefore when implementing management activities such as hazard reduction burns the sensitivity of

these areas should be considered. Areas surrounding creeklines and gullies as a rule should not be included in bushfire hazard reduction activities, considering the ecological sensitivity of these areas."

Over the life of the quarry it is not appropriate to set a prescribed fire regime in place, and it is possible that prescribed burning may not be required within this time. Individual fuel reduction burns will be discussed in consultation with the RFS on a needs basis.

There are conservation sensitive areas on-site more prescriptive fire management methods are warranted. These areas are the areas of *Tetratheca juncea* habitat and the Tall Moist Forest, (potential habitat for *Asperula athenes*) within the offset area shown in **Figure 2**. The Flora and Fauna Management Plan contains the following recommendations for the management of these areas.

Tetratheca juncea (including Tj within the offset area)

The boundary of the potential *Tetratheca juncea* habitat is shown in red in **Figure 2**, and the recommendations of the *Flora and Fauna Management Plan* should be applied to this area, which are that any hazard reduction burns should have the following fire regime:

Fire Intensity: Cool fire, fast burning
Period between fires: 7 years
Season: After fruiting (i.e. Autumn)

An appropriate fire regime is required for the viability of the local *Tetratheca juncea* population to promote germination of *Tetratheca juncea* seeds, to maintain a diversity of flowering species which provide foraging for pollinators and to control competition with shrub species. In any areas where *Tetratheca juncea* populations are present hazard reduction burns should consider the following criteria:

- When was the last fire in this area? If 7 years or over hazard reduction required.
- Is *Tetratheca juncea* finished flowering and fruits are present? (i.e. after February)
- Have potential food sources for pollinators (see Section 4) finished flowering?
- Are the fuel loadings and conditions appropriate to have a cool/fast burning fire?

Offset Area

The boundary of the potential Offset Area is shown in green in **Figure 2**, and the recommendations of the Flora and Fauna Management Plan (HWR, 2005) should be applied to this area, which are that management of bush fire within the offset is needed to limit impacts of wildfires to mesic vegetation sensitive to fire present within areas of the Tall Moist Forest (shown in blue in **Figure 2**) and to control fuel loads below residential dwellings on the eastern side of the offset. Bush fire management will be implemented through a mosaic pattern of hazard reduction burns as detailed below.

Hazard reduction **burns should not be located within the Tall Moist Forest**. To limit impacts on foraging habitat for threatened fauna species the hazard reduction burns should only burn small patches at a time (i.e. no more than 3 ha). This allows adequate areas for fauna to find refuge in during fires and to forage in whilst burnt areas regenerate. Fire frequency, intensity, seasonality and location must also be considered. The following fire regime is considered adequate to maintain biodiversity, fuel loadings and threatened species:

Fire Intensity: Cool fire, fast burning

Period between fires: 7 years

Season: Autumn-Winter

It should be noted that whilst the Flora and Fauna Management Plan (HWR, 2005) recommended a bushfire interval of 7 years for the offset area, Tall Moist Forest (potential habitat for *Asperula athenes*) requires a minimum year bushfire interval of 25 – 30-years as specified in the RFS Environmental Assessment Code and Great Lakes Council's Draft Vegetation Strategy.

6.5 Electricity Transmission Lines

Electricity transmission lines on site will be regularly inspected to ensure that the transmission lines are in good condition and that the vegetation has not grown high enough that it may come in contact with the transmission lines. While this is routinely done by the electricity provider, a representative of Hunter Quarries will also undertake regular inspections and advise the electricity provider if any issues are encountered.

6.6 Plant & Equipment Operations

Vehicle movement will be restricted to designated vehicle routes and the quarry footprint to minimise the potential for spark ignition. The operation of any equipment that may emit sparks or hot particles (such as welding, grinding, soldering or gas cutting) will generally be restricted to the cleared areas within the quarry operations. Where the operation of such equipment is necessary within 20 metres of bushland it will be done in accordance with the NSW RFS Bushfire Safety Publication for "Equipment & Machinery use in Bushfire Prone Areas", which is included in **Appendix B**.

6.7 Fire Fighting Equipment & Water Supply

Hunter Quarries will maintain fire fighting plant and equipment on-site to contain any small fire outbreaks and to assist fire fighting crews in fighting fires where necessary.

The plant and equipment includes:

- Water storage dam (Sediment Dam 2) with a permanent fill point for tankers, and a 50,000 L clean water tank;
- Water tanker; Earth moving equipment (e.g. bulldozers, excavators);
- Fire extinguishers;
- Warning Alarm Siren; and
- Portable radios.

The firefighting equipment is to be maintained in accordance with Australian Standard AS1851.

Hunter Quarries will maintain access to the main water storage dam (Sediment Dam 2) will be maintained so water can be sourced by the RFS during any fires in the area.

6.8 Staff Training

The Hunter Quarries employee site induction manual includes specific reference to emergency response procedures and contact lists as well as locations of the on-site fire fighting plant and equipment. Evacuation from the site will be undertaken in accordance with the Hunter Quarries site safety plan. Emergency response procedures will include basic fire fighting training so that they are able to provide a first response capability.

6.9 Communication

The Quarry Manager will make regular contact with the Forster RFS to ensure that Hunter Quarries is aware of any issues that may affect bushfire management on-site, and that bushfire management activities are in accordance with RFS requirements.

Any outbreak of Fire on site is to be immediately reported to the Quarry Manager. The Quarry Manager is to make contact with emergency services where there is any risk that the outbreak cannot be contained with the land subject to the BMP. Hunter Quarries will also make contact with the neighbouring residences to ensure that any bushfire response is coordinated with neighbours.

Section 8.0 contains addition reporting to be done annually, and in response to a fire outbreak.

7 MONITORING & MEASUREMENT

As per GLC's requirements (see GLC's memo notes dated 04.08.2006) an ecological monitoring schedule will be designed and adopted to sample and test for any positive and negative affects of actual fire regimes on the ecological condition and function of the offset area and habitats of conservation significance, particularly *T. juncea* habitats and *Asperula asthenes* habitat. The monitoring schedule will be designed taking into account the fire management requirements (where applicable) to the offset area and habitats of conservation significance stated in *Flora and Fauna Management Plan*.

The Quarry Manager will regularly monitor the effectiveness of the mitigation and management measures, including:

- Level of training of staff, including the maintenance of a training register;
- Condition of firefighting equipment;
- Condition of water storage structures, the amount of water stored and the access for water supply;
- Condition of firebreaks, perimeter trails and internal fire trail;
- Condition of Asset Protection Zones around structures;
- Condition of electricity transmission lines; and
- The effectiveness of the monitoring schedule.

The Quarry Manager will also assess the bushfire hazard annually in accordance with **Section 6.1**. In accordance with GLC's requirements, any area identified to be affected by wildfire events and areas where controlled burns were conducted will be mapped digitally on GIS on an annual basis and will be

reported in the AEMR. Monitoring these areas will assist in determining the frequency of bushfires over specified land portions around the quarry. Through digital mapping, a detailed and graphic picture of the land portions of and around the quarry that are over-frequently burnt, under-frequently burnt or adequately managed for bushfire can be depicted. This monitoring approach will clearly allow the quarry manager and the relevant authorities to adapt to site conditions and implement bushfire management actions proactively and appropriately.

All monitoring conducted as part of the bushfire management activities will be properly documented and implemented as part of the AEMR.

8 REPORTING & REVIEWING

An annual statement on bushfire management activities will be included within the Annual Environmental Management Report (AEMR) to be submitted to DIPNR. Additionally, a report will be submitted to the RFS after any occurrence of bushfire which will include an assessment of the effectiveness of the BMP.

This BMP will be reviewed at a minimum of every five (5) years to assess its effectiveness. In addition, the plan will be reviewed after any occurrence of bushfire or if there is a significant variation to the quarry plan.

The BMP will be revised to increase its effectiveness where any changes are recommended as a result of the review. Any amendments to the BMP will be undertaken in consultation with the appropriate regulatory authorities, including DIPNR, Council and the RFS.

9 RESPONSIBILITIES

The Quarry Manager (or their nominated representative) is responsible for the implementation of the BMP. The Quarry Manager will allocate responsibility for specific tasks where necessary.

It is the responsibility of all staff to operate in accordance with this BMP. In the event of a fire outbreak, the Quarry Manager is responsible for directing any first response in accordance with the level of training and ability of Hunter Quarries related to the scale of the outbreak.

10 RELEVANT DOCUMENTS & LEGISLATION

The following section lists the relevant documentation and legislation applicable to the Bushfire Management Plan. The list of relevant legislation is not comprehensive, and there may be some peripheral aspects of bushfire management that are covered under other legislation.

- Rural Fires Act 1997;
- Rural Fires Regulation 2002;
- Planning for Bushfire Protection (NSW Rural Fire Service, December 2001 and Draft V9 October 2005);
- Standards for Low Intensity Bush Fire Hazard Reduction Burning (for private landholders) (NSW Rural Fire Service);

- Australian Standard 1851.1-1995, Maintenance of Fire Protection Equipment;
- Proposed Hard Rock Quarry Extension Environmental Impact Statement (Volume 1 of 3) (Asquith & de Witt, October 2004);
- Standards for Asset Protection Zones (NSW Rural Fire Service);
- Bushfire Safety Publication for Equipment & Machinery use in Bushfire Prone Areas (NSW Rural Fire Service, December 2004); and
- Karuah Quarry Flora and Fauna Management Plan.

Appendix A – Standard for Asset Protection Zones

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STANDARDS FOR ASSET PROTECTION ZONES

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INTRODUCTION

For thousands of years bush fires have been a natural part of the Australian landscape. They are inevitable and essential, as many Australian plants and animals have adapted to fire as part of their life cycle.

In recent years developments in bushland areas have increased the risk of bush fires harming people and their homes and property. But landowners can significantly reduce the impact of bush fires on their property by identifying and minimising bush fire hazards. There are a number of ways to reduce the level of hazard to your property, but one of the most important is the creation and maintenance of an Asset Protection Zone (APZ).

A well located and maintained APZ should be used in conjunction with other preparations such as good property maintenance, appropriate building materials and developing a family action plan.

WHAT IS AN ASSET PROTECTION ZONE?

An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, commercial or heritage buildings.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows suppression of fire;
- an area from which backburning may be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Potential bush fire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

WHAT WILL THE APZ DO?

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;
- damage to the built asset from intense radiant heat; and
- ember attack on the asset.

WHERE SHOULD I PUT AN APZ?

An APZ is located between an asset and a bush fire hazard.

The APZ should be located wholly within your land. You cannot undertake any clearing of vegetation on a neighbour's property, including National Park estate, Crown land or land under the management of your local council, unless you have written approval.

If you believe that the land adjacent to your property is a bush fire hazard and should be part of an APZ, you can have the matter investigated by contacting the NSW Rural Fire Service (RFS).

There are six steps to creating and maintaining an APZ. These are:

1. Determine if an APZ is required;
2. Determine what approvals are required for constructing your APZ;
3. Determine the APZ width required;
4. Determine what hazard reduction method is required to reduce bush fire fuel in your APZ;
5. Take measures to prevent soil erosion in your APZ; and
6. Landscape and regularly monitor in your APZ for fuel regrowth.

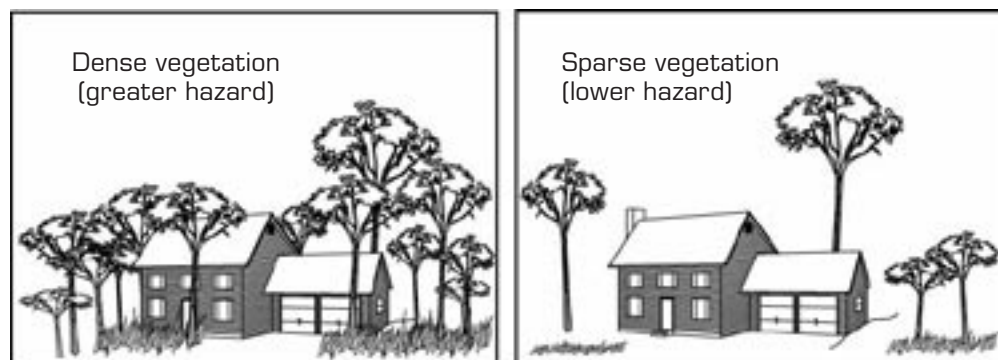
STEP 1. DETERMINE IF AN APZ IS REQUIRED

Recognising that a bush fire hazard exists is the first step in developing an APZ for your property.

If you have vegetation close to your asset and you live in a bush fire prone or high risk area, you should consider creating and maintaining an APZ.

Generally, the more flammable and dense the vegetation, the greater the hazard will be. However, the hazard potential is also influenced by factors such as slope.

- A large area of continuous vegetation on sloping land may increase the potential bush fire hazard.
- The amount of vegetation around a house will influence the intensity and severity of a bush fire.
- The higher the available fuel the more intense a fire will be.



Isolated areas of vegetation are generally not a bush fire hazard, as they are not large enough to produce fire of an intensity that will threaten dwellings.

This includes:

- bushland areas of less than one hectare that are isolated from large bushland areas; and
- narrow strips of vegetation along road and river corridors.

If you are not sure if there is a bush fire hazard in or around your property, contact your local NSW Rural Fire Service Fire Control Centre or your local council for advice.

STEP 2. DETERMINE WHAT APPROVALS ARE REQUIRED FOR CONSTRUCTING YOUR APZ

If you intend to undertake bush fire hazard reduction works to create or maintain an APZ you must gain the written consent of the landowner.

Subdivided land or construction of a new dwelling

If you are constructing an APZ for a new dwelling you will need to comply with the requirements in *Planning for Bushfire Protection*. Any approvals required will have to be obtained as part of the Development Application process.

Existing asset

If you wish to create or maintain an APZ for an existing structure you may need to obtain an environmental approval. The RFS offers a free environmental assessment and certificate issuing service for essential hazard reduction works. For more information see the RFS document *Application Instructions for a Bush Fire Hazard Reduction Certificate* or contact your local RFS Fire Control Centre to determine if you can use this approval process.

Bear in mind that all work undertaken must be consistent with any existing land management agreements (e.g. a conservation agreement, or property vegetation plan) entered into by the property owner.

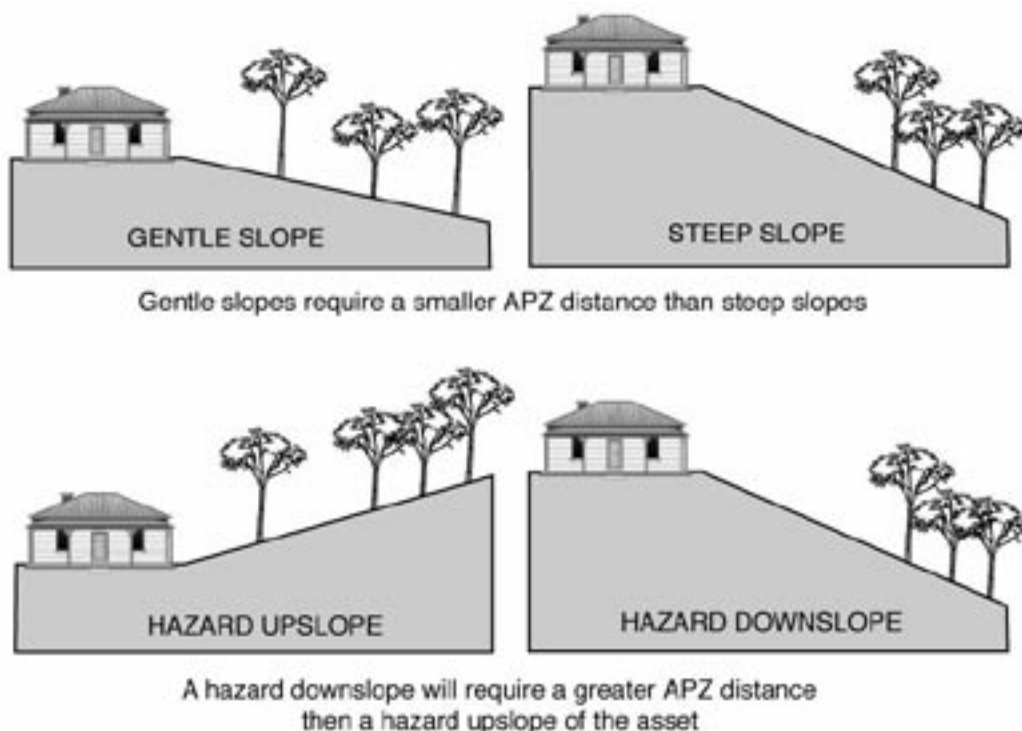
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

If you intend to burn off to reduce fuel levels on your property you may also need to obtain a Fire Permit through the RFS or NSW Fire Brigades. See the RFS document *Before You Light That Fire* for an explanation of when a permit is required.

STEP 3. DETERMINE THE APZ WIDTH

The size of the APZ required around your asset depends on the nature of the asset, the slope of the area, the type and structure of nearby vegetation and whether the vegetation is managed.

Fires burn faster uphill than downhill, so the APZ will need to be larger if the hazard is downslope of the asset.



Different types of vegetation (for example, forests, rainforests, woodlands, grasslands) behave differently during a bush fire. For example, a forest with shrubby understorey is likely to result in a higher intensity fire than a woodland with a grassy understorey and would therefore require a greater APZ width.

A key benefit of an APZ is that it reduces radiant heat and the potential for direct flame contact on homes and other buildings. Residential dwellings require a wider APZ than sheds or stockyards because the dwelling is more likely to be used as a refuge during bush fire.

Subdivided land or construction of a new dwelling

If you are constructing a new asset, the principles of *Planning for Bushfire Protection* should be applied. Your Development Application approval will detail the exact APZ distance required.

Existing asset

If you wish to create an APZ around an existing asset and you require environmental approval, the Bush Fire Environmental Assessment Code provides a streamlined assessment process. Your Bush Fire Hazard Reduction Certificate (or alternate environmental approval) will specify the maximum APZ width allowed.

For further information on APZ widths see *Planning for Bushfire Protection* or the *Bush Fire Environmental Assessment Code* (available on the RFS website), or contact your local RFS Fire Control Centre.

STEP 4. DETERMINE WHAT HAZARD REDUCTION METHOD IS REQUIRED TO REDUCE BUSH FIRE FUEL IN YOUR APZ

The intensity of bush fires can be greatly reduced where there is little to no available fuel for burning. In order to control bush fire fuels you can reduce, remove or change the state of the fuel through several means.

Reduction of fuel does not require removal of all vegetation, which would cause environmental damage. Also, trees and plants can provide you with some bush fire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns. Some ground cover is also needed to prevent soil erosion.

Fuels can be controlled by:

1. raking or manual removal of fine fuels

Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter) and bark should be removed on a regular basis. This is fuel that burns quickly and increases the intensity of a fire.

Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

2. mowing or grazing of grass

Grass needs to be kept short and, where possible, green.

3. removal or pruning of trees, shrubs and understorey

The control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation.

Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by two to five metres. A canopy should not overhang within two to five metres of a dwelling.

Native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

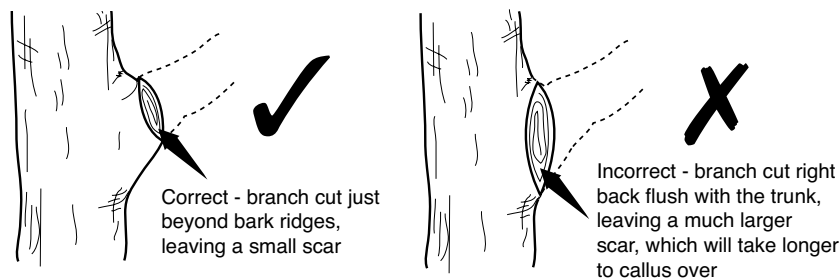
When choosing plants for removal, the following basic rules should be followed:

1. Remove noxious and environmental weeds first. Your local council can provide you with a list of environmental weeds or 'undesirable species'. Alternatively, a list of noxious weeds can be obtained at www.agric.nsw.gov.au/noxweed/;
2. Remove more flammable species such as those with rough, flaky or stringy bark; and
3. Remove or thin understory plants, trees and shrubs less than three metres in height

The removal of significant native species should be avoided.

Prune in accordance with the following standards:

- Use sharp tools. These will enable clean cuts and will minimise damage to the tree.
- Decide which branches are to be removed before commencing work. Ensure that you maintain a balanced, natural distribution of foliage and branches.
- Remove only what is necessary.
- Cut branches just beyond bark ridges, leaving a small scar.
- Remove smaller branches and deadwood first.



There are three primary methods of pruning trees in APZs:

1. Crown lifting (skirting)

Remove the lowest branches (up to two metres from the ground). Crown lifting may inhibit the transfer of fire between the ground fuel and the tree canopy.

2. Thinning

Remove smaller secondary branches whilst retaining the main structural branches of the tree. Thinning may minimise the intensity of a fire.

3. Selective pruning

Remove branches that are specifically identified as creating a bush fire hazard (such as those overhanging assets or those which create a continuous tree canopy). Selective pruning can be used to prevent direct flame contact between trees and assets.

Your Bush Fire Hazard Reduction Certificate or local council may restrict the amount or method of pruning allowed in your APZ.

See the *Australian Standard 4373 (Pruning of Amenity Trees)* for more information on tree pruning.

4. Slashing and trittering

Slashing and trittering are economical methods of fuel reduction for large APZs that have good access. However, these methods may leave large amounts of slashed fuels (grass clippings etc) which, when dry, may become a fire hazard. For slashing or trittering to be effective, the cut material must be removed or allowed to decompose well before summer starts.

If clippings are removed, dispose of them in a green waste bin if available or compost on site (dumping clippings in the bush is illegal and it increases the bush fire hazard on your or your neighbour's property).

Although slashing and trittering are effective in inhibiting the growth of weeds, it is preferable that weeds are completely removed.

Care must be taken not to leave sharp stakes and stumps that may be a safety hazard.

5. Ploughing and grading

Ploughing and grading can produce effective firebreaks. However, in areas where this method is applied, frequent maintenance may be required to minimise the potential for erosion. Loose soil from ploughed or graded ground may erode in steep areas, particularly where there is high rainfall and strong winds.

6. Burning (hazard reduction burning)

Hazard reduction burning is a method of removing ground litter and fine fuels by fire. Hazard reduction burning of vegetation is often used by land management agencies for broad area bush fire control, or to provide a fuel reduced buffer around urban areas.

Any hazard reduction burning, including pile burns, must be planned carefully and carried out with extreme caution under correct weather conditions. Otherwise there is a real danger that the fire will become out of control. More bush fires result from escaped burning off work than from any other single cause.

It is YOUR responsibility to contain any fire lit on your property. If the fire escapes your property boundaries you may be liable for the damage it causes.

Hazard reduction burns must therefore be carefully planned to ensure that they are safe, controlled, effective and environmentally sound. There are many factors that need to be considered in a burn plan. These include smoke control, scorch height, frequency of burning and cut off points (or control lines) for the fire. For further information see the RFS document *Standards for Low Intensity Bush Fire Hazard Reduction Burning*, or contact your local RFS for advice.

7. Burning (pile burning)

In some cases, where fuel removal is impractical due to the terrain, or where material cannot be disposed of by the normal garbage collection or composted on site, you may use pile burning to dispose of material that has been removed in creating or maintaining an APZ.

For further information on pile burning, see the RFS document *Standards for Pile Burning*.

In areas where smoke regulations control burning in the open, you will need to obtain a Bush Fire Hazard Reduction Certificate or written approval from Council for burning. During the bush fire danger period a Fire Permit will also be required. See the RFS document *Before You Light that Fire* for further details.

STEP 5. TAKE MEASURES TO PREVENT SOIL EROSION

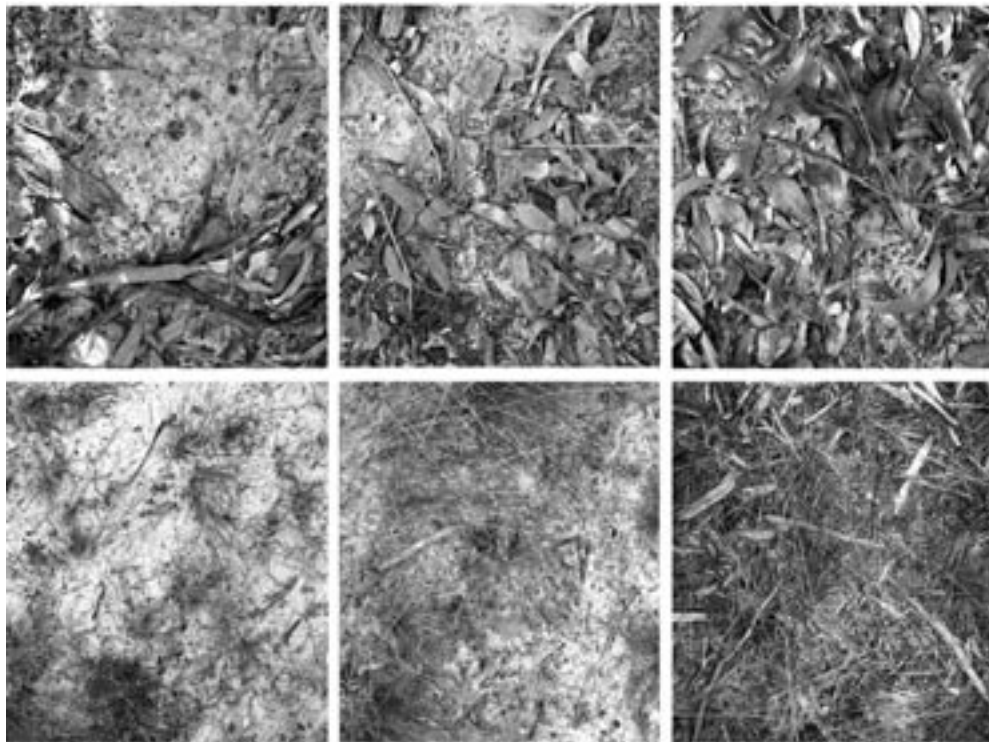
While the removal of fuel is necessary to reduce a bush fire hazard, you also need to consider soil stability, particularly on sloping areas.

Soil erosion can greatly reduce the quality of your land through:

- loss of top soil, nutrients, vegetation and seeds
- reduced soil structure, stability and quality
- blocking and polluting water courses and drainage lines

A small amount of ground cover can greatly improve soil stability and does not constitute a significant bush fire hazard. Ground cover includes any material which directly covers the soil surface such as vegetation, twigs, leaf litter, clippings or rocks. A permanent ground cover should be established (for example, short grass). This will provide an area that is easy to maintain and prevent soil erosion.

When using mechanical hazard reduction methods, you should retain a ground cover of at least 75% to prevent soil erosion. However, if your area is particularly susceptible to soil erosion, your Hazard Reduction Certificate may require that 90% ground cover be retained.



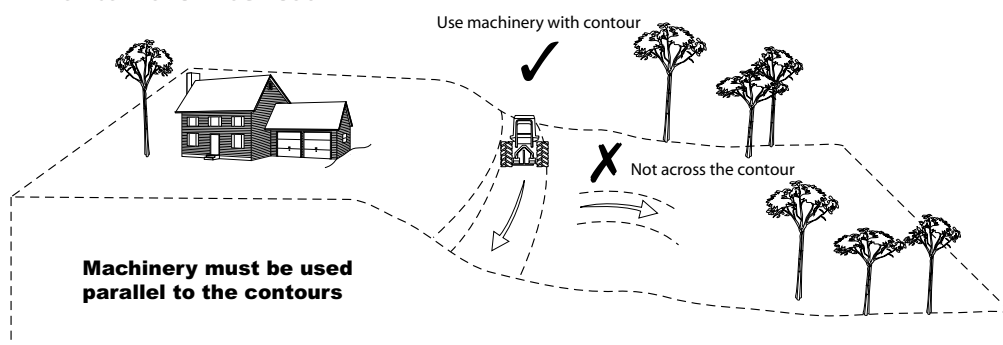
50%

75%

100%

Ground Cover

To reduce the incidence of soil erosion caused by the use of heavy machinery such as ploughs, dozers and graders, machinery must be used parallel to the contours. Vegetation should be allowed to regenerate, but be managed to maintain a low fuel load.



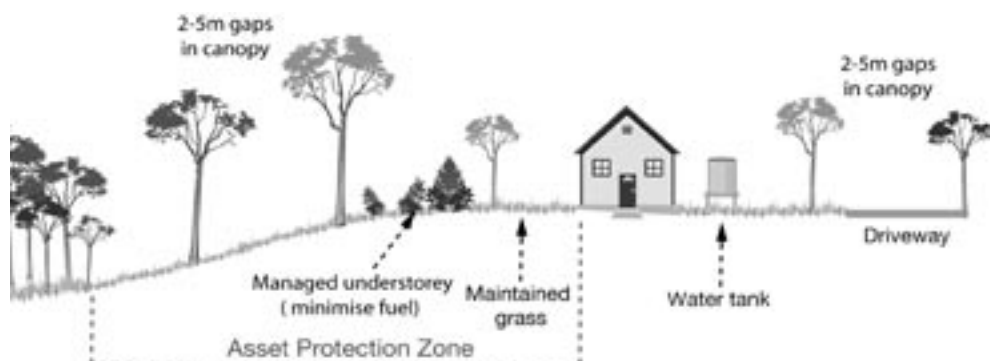
STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

Your home and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time. To provide an effective APZ, you need to plan the layout of your garden to include features such as fire resistant plants, radiant heat barriers and windbreaks.

Layout of gardens in an APZ

When creating and maintaining a garden that is part of an APZ you should:

- ensure that vegetation does not provide a continuous path to the house;
- remove all noxious and environmental weeds;
- plant or clear vegetation into clumps rather than continuous rows;
- prune low branches two metres from the ground to prevent a ground fire from spreading into trees;
- locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission;
- plant and maintain short green grass around the house as this will slow the fire and reduce fire intensity. Alternatively, provide non-flammable pathways directly around the dwelling;
- ensure that shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low-flammability plants and non flammable ground cover such as pebbles and crush tile; and
- avoid erecting brush type fencing and planting “pencil pine” type trees next to buildings, as these are highly flammable.



Removal of other materials

Woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. should be located away from the house. These items should preferably be located in a designated cleared location with no direct contact with bush fire hazard vegetation.

Other protective features

You can also take advantage of existing or proposed protective features such as fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts and vegetable gardens as part of the property's APZ.

PLANTS FOR BUSH FIRE PRONE GARDENS

When designing your garden it is important to consider the type of plant species and their flammability as well as their placement and arrangement.

Given the right conditions, all plants will burn. However, some plants are less flammable than others.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage the ground fire to spread up to, and then through, the crown of the trees.

Plants that are less flammable, have the following features:

- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without “ribbons” hanging from branches or trunks; and
- dense crown and elevated branches.

When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into your garden that can cause greater long-term environmental damage.

For further information on appropriate plant species for your locality, contact your local council, plant nurseries or plant society.

If you require information on how to care for fire damaged trees, refer to the Firewise brochure *Trees and Fire Resistance; Regeneration and care of fire damaged trees*.

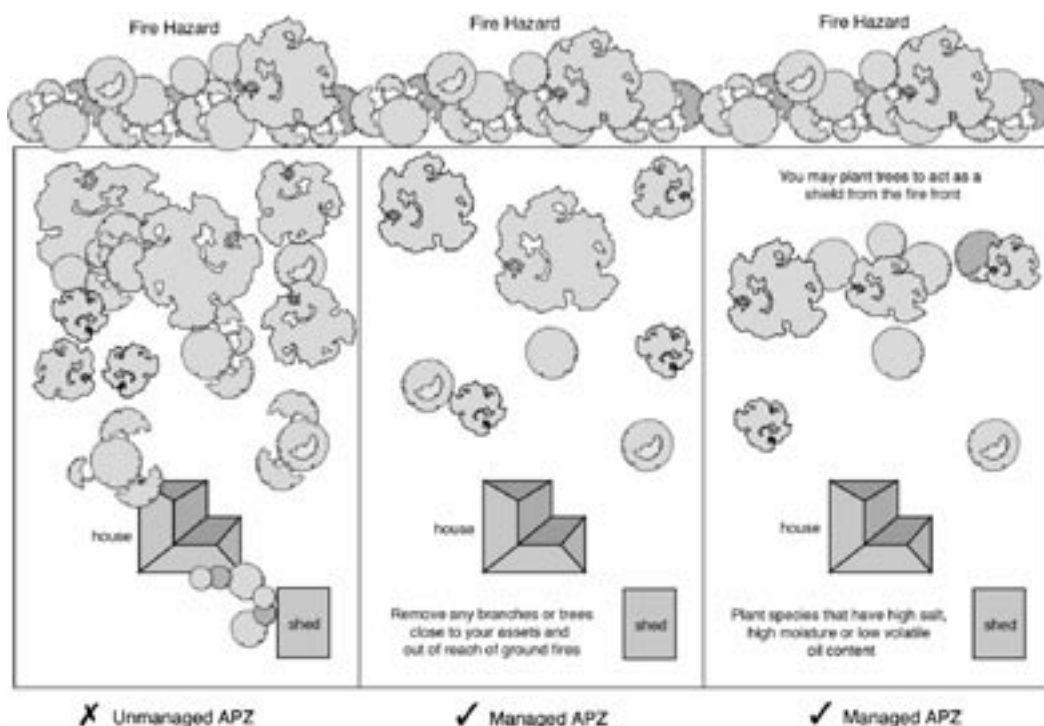
WIND BREAKS

Rows of trees can provide a wind break to trap embers and flying debris that could otherwise reach the house or asset.

You need to be aware of local wind conditions associated with bush fires and position the wind break accordingly. Your local RFS Fire Control Centre can provide you with further advice.

When choosing trees and shrubs, make sure you seek advice as to their maximum height. Their height may vary depending on location of planting and local conditions. As a general rule, plant trees at the same distance away from the asset as their maximum height.

When creating a wind break, remember that the object is to slow the wind and to catch embers rather than trying to block the wind. In trying to block the wind, turbulence is created on both sides of the wind break making fire behaviour erratic.



HOW CAN I FIND OUT MORE?

The following documents are available from your local Fire Control Centre and from the NSW RFS website at **www.rfs.nsw.gov.au**.

- Before You Light That Fire
- Standards for Low Intensity Bush Fire Hazard Reduction Burning
- Standards for Pile Burning
- Application Instructions for a Bush Fire Hazard Reduction Certificate

If you require any further information please contact:

- your local NSW Rural Fire Service Fire Control Centre.
Location details are available on the RFS website or
- call the NSW RFS Enquiry Line 1800 679 737
(Monday to Friday, 9am to 5pm), or
- the NSW RFS website at **www.rfs.nsw.gov.au**.

**Produced by the NSW Rural Fire Service, Locked Mail Bag 17,
GRANVILLE, NSW 2142. Ph. 1800 679 737**

www.rfs.nsw.gov.au

Appendix B – Equipment & Machinery use in Bushfire Prone Areas



EQUIPMENT & MACHINERY USE IN BUSHFIRE PRONE AREAS

If you use equipment and machinery, or if you supervise these operations for industry, you must observe fire regulations and safety precautions. As well, you must make yourself aware of the declaration of Total Fire Bans and stop work prohibited by Total Fire Bans as soon as they are announced.

On days of Total Fire Ban

Welding, grinding, soldering (with flame) and gas cutting in the open air are prohibited by the the Rural Fires Act in most cases. Certain exemptions may be granted for:

“fires lit, maintained or used by or under the authority of any person or body of persons corporate or unincorporate, for, or in connection with the repair or maintenance of services or equipment essential for continuance or restoration of the supply or provision of heat, light, power, water, sewage , transport or communication subject to observance of the special conditions that all reasonable steps are taken to prevent the escape of fire, sparks, or incandescent or burning material therefrom.”

The use of machinery such as tractors, slashers or even chainsaws should be postponed if possible, as the risk of starting fires is extremely high. If the work is essential, follow the general rules outlined for the Bush Fire Danger Season and use extreme care.

Bush Fire Danger Season Obligations

When carrying out welding, grinding, soldering or gas cutting in the open air you should:

- Place a shield or guard of fire resistant material in such a way as to prevent emission of sparks and hot pieces of metal from the area where you are working.
- Keep an area of 3 metres around the work completely cleared of flammable material or wet down sufficiently to prevent the spread of fire. This is particularly important where waste wood, sawdust, bark, or dry grass is in the vicinity.
- Have close at hand a reticulated water supply or an effective water spray pump, such as a knapsack, fully charged with 16 litres of water.
- Have a fire extinguisher (liquid type) of 9 litre minimum capacity.
- Have a fireproof receptacle for cut-offs and electrode stubs.

For more information on bushfire safety and general fire safety, visit the Rural Fire Service website at www.rfs.nsw.gov.au or call the RFS Education Line on 1 800 654 443 (Monday to Friday, 9am-5pm).



When using machinery such as tractors or slashers you must comply with certain requirements:

- The machinery must be fitted with an Australian Standards Association approved spark arrestor and be clean and free from mechanical defects which could start a fire.
- Spark arrestors must comply with Australian Standard AS: 1019 1985.
- Additionally, any “motorised machine” driven or used in any grass, crop or stubble must be fitted with safety guards so constructed as to prevent any heated areas from coming into contact with combustible matter.
- The machine must also carry a knapsack spray filled with water (minimum 16 litres) or a fire extinguisher maintained in a serviceable condition (liquid type) of 9 litre minimum capacity.

Use all necessary caution:

Read Regulation 21 & 22 of the *Rural Fires Regulation, 1997*.

Compliance with all regulations does not relieve a person of responsibility for damage caused by fire starting from the use of equipment and machinery. Therefore, it is essential to use all necessary caution to prevent fires.

- Avoid work when fire weather is hazardous, especially on days of high wind.
- If possible, it is far safer to bring the project into a safe, clean working area - on bare ground, concrete or within the confinement of an enclosed working area, rather than working in the field.
- If welding, grinding, soldering or gas cutting must be carried out in the field, there should be an observer on the job to guard against the accidental escape of fire.
- Ensure that any vehicles used in field work do not have exhaust leakage. Avoid driving vehicles into long dry grass.
- Take care when disposing of matches and cigarette butts.

Caution with equipment and machinery near combustible substances is a matter of observation. If a fire is likely to be caused, or if there is the slightest possibility of fire or explosion, take action.

For more information on bushfire safety and general fire safety, visit the Rural Fire Service website at www.rfs.nsw.gov.au or call the RFS Education Line on 1 800 654 443 (Monday to Friday, 9am-5pm).



Correct the position of the work; adjust shields and safeguards; ensure that no flammable vapours or fuels could be ignited; check that emergency water supplies are ready and that the area is cleared or wetted down.

Stop the project until you are satisfied that it is safe.

Remember: It is an offence for any person who permits a fire to escape from land so as to cause injury or damage to any person or property Produced in New South Wales by the NSW Rural Fire Service in co-operation with the Country Fire Authority, Victoria.

Appendix C – Standards for Low Intensity Bushfire Hazard Reduction Burning

standards

for low intensity bush fire hazard
reduction burning (for private landholders)

low intensity

Why Interactivity?

NSW RURAL FIRE SERVICE



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INTRODUCTION

This document explains the best way to carry out low intensity bush fire hazard reduction burning. While most of the information outlined here relates to dry open Eucalypt forest, it can also be applied to any bush fire hazard reduction burning once you have assessed the fuel load and weather conditions.

Before you start any hazard reduction burning, you need to ensure that you have the required environmental approvals. In many cases your local NSW Rural Fire Service (RFS) Fire Control Centre will be able to issue you with a Bush Fire Hazard Reduction Certificate (which provides most of the necessary approvals) or advise you on how to obtain other approvals.

You may also be required to obtain a Fire Permit before you conduct any burning. For details of the restrictions on lighting of fires, see the RFS document *Before You Light That Fire*.

Burning of vegetation can potentially be hazardous. **Ultimately you are responsible for any fire you light and if it escapes you may be liable for the damage it causes.** Before you start you should be confident that you can carry out the burn. In some cases it may be safer and more practical for you to rake up the material and conduct a pile burn. For information on pile burns see the RFS document *Standards for Pile Burning*.

BUSH FIRE HAZARD REDUCTION BURNING

The objective of a low intensity bush fire hazard reduction burn is to minimise the potential impacts of a bush fire on life, property and the environment. Following the conditions on your Hazard Reduction Certificate and the requirements in these Standards will provide the necessary consideration of environmental and cultural heritage values.

The characteristics of a low intensity burn include:

- **Low flame heights** - Flame heights should average about one metre, but may be higher in patches of heavy or elevated fuels.
- **Low scorch height** - Scorch height should be less than five metres. Scorch height is the height to which tree leaves are killed from the heat of the fire.
- **Slow rate of spread** - The fire should spread only at a slow walking pace.

OBJECTIVES FOR BUSH FIRE HAZARD REDUCTION BURNING

A successful low intensity hazard reduction burn will reduce the fuel load so that it creates a safe 'defensible space' around an asset. It should also minimise the impact from the burn on the environment.

In carrying out a burn, you need to consider:

1. the fuel load and structure
2. the effects on the environment and community
3. the specific zone objectives
4. if there are adequate fire breaks and control lines
5. the season and weather conditions
6. the topography and fire behaviour
7. what lighting patterns to use
8. conducting a test burn
9. what safety measures may be needed
10. mopping up afterwards
11. if you need to report the results.

In some cases (for example, if a bush fire hazard reduction burn is intended to cover many hectares) a detailed, written burn plan may be required. If in doubt, you should contact your local RFS Fire Control Centre to see if a burn plan is needed.

STEP 1. CONSIDER BUSH FIRE FUEL LOAD AND STRUCTURE

Bush fire fuel is vegetation that will burn. The most hazardous fuels are fine fuels that will burn during the intense initial passage of the fire front. Fine fuels include the dead or dry leaf litter, grass, twigs (less than 6 mm in diameter) and bark that gathers on the ground or is suspended in the shrub layer of a bushland area.

The rate of spread and behaviour of a fire is affected by both:

- **Fuel load** - the quantity (usually expressed in tonnes per hectare of fine fuel). More fuel will give a hotter fire.
- **Fuel structure** – the arrangement of shrubs and litter fuels. Fire will spread more easily through a continuous fuel layer. Shrubs, loose bark and vines provide a ladder for fire to climb into trees.

The objective of hazard reduction is to reduce, but not totally remove, the amount of fine fuel and to modify the fuel structure. With low fine fuel loads, a fire is difficult to light or sustain (like lighting a log fire without small kindling). With less suspended fine fuel, a fire is less likely to spread into the tree canopy.

Before conducting a hazard reduction burn, consider how the fuel load will affect the fire behaviour, and whether you are capable of controlling it. In areas of high fine fuel loads, a fire will be easy to light and you will need to be sure that you have the necessary people and equipment to control the fire and maintain a low intensity. As a rule of thumb, on flat ground, doubling the fuel load will double the forward rate of spread of the fire.

For more information about fuel assessment techniques, contact your local RFS Fire Control Centre.

STEP 2. CONSIDER THE EFFECTS ON THE ENVIRONMENT AND COMMUNITY

In some cases the area that you want to burn may have particular environmental values. To minimise possible environmental damage you need to comply with any conditions listed on your Hazard Reduction Certificate.

These conditions will take into account environmental factors such as:

- the presence of threatened species or endangered ecological communities;
- the risk of soil erosion or mass movement;
- fire history and minimum fire frequency intervals for specific vegetation types;
- the location of waterbodies and waterside vegetation; and
- the effect of smoke on the local community.

The conditions on your Certificate may include measures to protect biodiversity by limiting the frequency of burns, or excluding fire from specific areas. Failure to comply with the conditions will result in fines if damage is done to the environment.

4

Riverside or creek (riparian) vegetation is sensitive to fire and is important for maintaining water quality and aquatic habitat. Every effort should be made to keep fire out of these areas.

Ensuring that fires are of low intensity will protect tree canopies and any tree-dwelling animals such as koalas. Low intensity fires are often also patchy, which reduces the potential for soil erosion if significant rain falls after the burn.

The smoke produced from hazard reduction burning has the potential to impact upon other people. Weather conditions may limit smoke dispersal, causing it to linger in the area, so it is important to consider if smoke-sensitive areas such as schools, hospitals, neighbours with health concerns or nursing homes are nearby. Make sure you discuss your plans with any neighbours and occupiers of properties that may be affected by the burn.

A No Burn Notice, which may prevent hazard reduction burning, is issued on days of predicted high air pollution. Your local RFS will advise you of pollution concerns or lighting bans when you notify them 24 hours before your burn. Notification is a requirement of your approval, and ensures that people who may be affected by smoke or embers are aware of the activity and don't mistakenly report the activity as a wild fire.

To minimise the impact of smoke, burning should be restricted to daylight hours whenever possible.

Large fires near roads may produce smoke that could be a traffic hazard. There are some cases where smoke from fires has caused serious accidents. The local traffic authority (generally RTA or Council) should be contacted at least two weeks prior to a planned burn. They will determine the best way to manage the effects of smoke on traffic. Road safety measures such as signage or traffic flow controls may be required.

STEP 3. DETERMINE SPECIFIC ZONE OBJECTIVES

Local Bush Fire Risk Management Plans (prepared by local fire authorities and land management agencies) divide the landscape into four zones: Land Management Zones, Strategic Fire Advantage Zones, Asset Protection Zones and Fire Exclusion Zones. The specific objectives of your burn will depend on the zone in which the work is being conducted. The zone in which your burn is planned will be identified on your Bush Fire Hazard Reduction Certificate.

The following are examples of objectives for each zone:

ZONE	OBJECTIVES
Asset Protection Zone (APZ)	• reduce fine fuel load and structure to a level that provides a safe 'defensible space' around an asset; • reduce fine fuels within the zone to prevent a ground fire reaching the asset; and • reduce vertical structure of the fine fuels by reducing shrub fuels.
Strategic Fire Advantage Zone (SFAZ)	• reduce fine fuel load and structure to a level that provides firefighters with an area in which they have a high probability of success in containing bushfires burning within, or into, the area • reduce fine fuels by approximately 50-80% within area; and • reduce vertical structure of the fine fuels by reducing shrub fuels.
Land Management Zone (LMZ)	• provide a mosaic of areas with varying fuel load structures; • maintain or enhance biodiversity; and • provide fuel reduced areas in which firefighting suppression efforts are safer and have greater chance of success.
Fire Exclusion Zone (FEZ)	• protect fire sensitive areas such as rainforest, cultural sites, plantations and commercial crops.

STEP 4. ENSURE THAT THERE ARE ADEQUATE FIRE BREAKS AND CONTROL LINES

When planning your hazard reduction burn, it is important to think about the need for well-placed control lines and fire breaks. A control line is a planned, defined perimeter used to stop the fire escaping from the designated burn area. Control lines may be a combination of roads, earth breaks (hand or machine constructed), streams, areas that are already bare of fuels (rock shelves, green crop areas or recently burnt) or cleared land.

You should create a basic map of your plan, even if it is a sketch. This should include the location of assets, existing and proposed control lines and the proposed burn area. This will help you show your intentions to others who are helping with the burn (for guidance with burn plans, contact your local RFS Fire Control Centre).

You must establish if further work is required to make existing control lines suitable (i.e. they may require cutting back or grading). Alternately you may be required to create a control line. If doing so, be sure to take into consideration any environmental impacts that may result, particularly soil erosion.

Constructing a Control Line

To construct a control line, determine the best place for the line and clear all leaf litter and other fuel (down to mineral earth) to at least one metre wide. Control lines work best when as straight as possible, but need to be directed around trees. Try to place the control line where vegetation has already been disturbed.

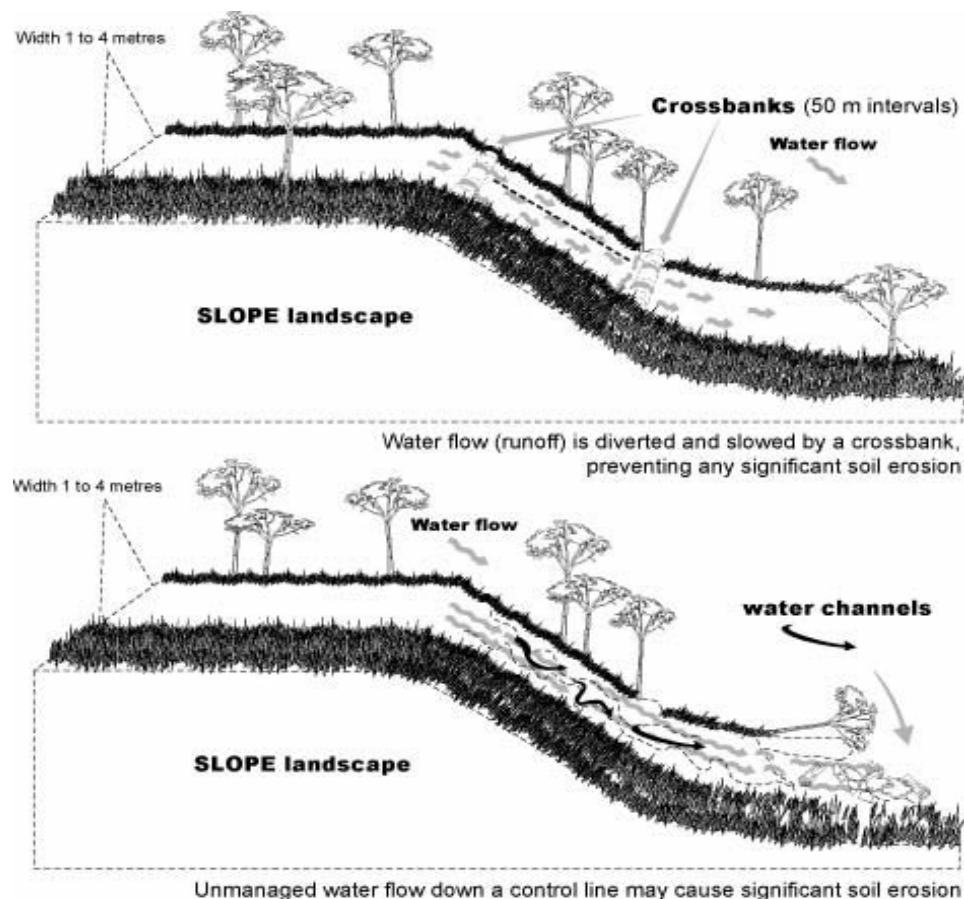
Rake the accumulated litter into the area on the side of the trail that will be burned, and spread the litter out over a wide area. Clear around the base of trees for approximately one metre and also around any large logs lying on the ground close to the control line. This will prevent the fire travelling up the trees (particularly trees with a rough bark surface or with hollows at the base). It is preferable to leave large logs unburned as they provide critical habitat for many native animals.

The width of a control line should be the minimum distance necessary to safely conduct the burn, however the width must not exceed four metres.

Control lines constructed down slopes (perpendicular to contours) with a width greater than one metre, require drainage structures to minimise water flow and subsequent soil erosion. There are many types of drainage structures, but the most simple to construct and possibly the most effective are crossbanks.

Crossbanks are mounds of earth that act like speed humps to slow down and divert the flow of water. Crossbanks should divert water away from the control line and onto a stable surface such as a vegetated or non-erosive surface. It is important that water flow is not diverted directly into a water course.

When drainage structures are required they should be placed at intervals of at least one every 50 metres.



Any control lines constructed for the purpose of a bush fire hazard reduction burn must be allowed to regenerate with natural vegetation following the burn.

The person responsible for bush fire hazard reduction work is responsible for its control. The law has severe penalties if a fire escapes its control lines onto your neighbour's property or into any environmentally sensitive location.

STEP 5. DETERMINE THE SEASON AND WEATHER CONDITIONS FOR A LOW INTENSITY BUSH FIRE HAZARD REDUCTION BURN

(a) Selecting the season

Selection of the right year and season to carry out hazard reduction burning is crucial to meet your fuel reduction and environmental goals, and minimise the potential for escape or re-ignition at a later date.

In southern NSW (generally from the Illawarra south) bush fire hazard reduction burning is typically conducted in autumn. Burning in late spring (after fuels have dried out sufficiently following winter rainfall) is usually avoided because there is potential for re-ignition in summer when rainfall is lowest and conditions are hot and dry. Spring burning in the south should only be carried out by, or with the assistance of, very experienced burning crews and should be avoided in years of below average rainfall.

In northern NSW (generally Sydney north, and more particularly north of the Hunter district) bush fire hazard reduction burning is generally conducted in early spring, when fuels have dried out during the usual dry winter. If fuels are sufficiently dry, a burn may also be conducted during autumn and winter. In most years, the onset of typical summer rainfall patterns reduces the potential for re-ignition during summer. Spring burning in years of below average rainfall should only be carried out by, or with the assistance of, very experienced burning crews.

(b) Selecting the appropriate day and time of the day

Fire behaviour is controlled by fuel and weather conditions. To minimise the risk of escape and to ensure calm fire behaviour, burning should be carried out when the weather conditions are suitable.

The four important weather elements for low intensity burning are:

(i) Temperature

Temperature affects the fire behaviour and moisture levels in the fuel. Ideally temperatures should be less than 25°C for low intensity burning. Temperatures are normally at a minimum early in the morning (3-4 am) and at a maximum early to mid-afternoon (2-3 pm).

(ii) Relative humidity

Relative humidity affects fire behaviour by altering fuel moisture levels. Relative humidity is usually highest overnight and lowest in the early afternoon. As a general rule, burning should only occur when the relative humidity is 50% and rising. Relative humidity forecasts and observations can be obtained from the Bureau of Meteorology website.

(iii) Wind speed and direction

Wind speed directly influences the rate of spread of the fire, thus increasing or decreasing the intensity of the burn. Wind speed usually strengthens mid-morning and reduces late evening. Low intensity burns are best carried out in wind conditions less than 15 km/h as measured in the open. The direction of the wind affects the direction in which the fire develops as well as how fast it progresses.

(iv) Atmospheric stability

To minimise the risk of escape, low intensity burning requires stable atmospheric conditions. Stable conditions are usually associated with a high-pressure system dominating the local weather pattern, with clear skies and light winds. Unfortunately a very stable atmosphere usually means that smoke will linger in the air. Rapid changes in atmospheric conditions such as unstable weather and high winds associated with the passage of a frontal system can affect the fire's behaviour.

In forest areas with deeply shaded fuels it may not be possible to burn successfully under the above weather conditions.

As an alternative, you may contact the local RFS Fire Control Centre to be given the Forest Fire Danger Index (FFDI) score and ways to measure your fuel load, to determine if the conditions are suitable to burn. An FFDI score is calculated based on all the weather elements and gives the best indication of potential fire behaviour. These scores are used for the fire danger signs. Low intensity burning should be performed when the FFDI is less than indicated in the table below.

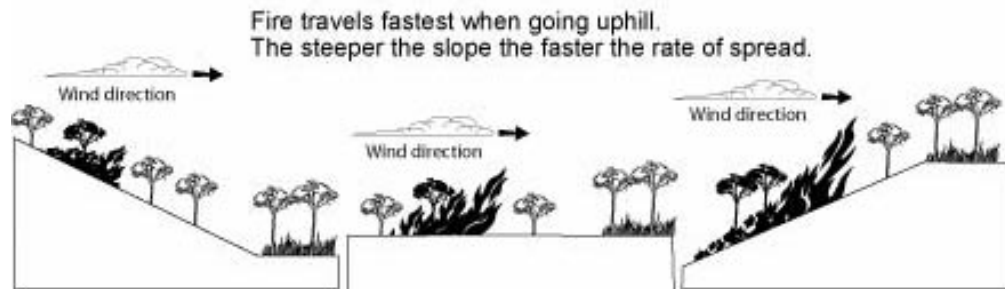
9

Table 1 Forest Fire Danger Index limits for low intensity bush fire hazard reduction burning.

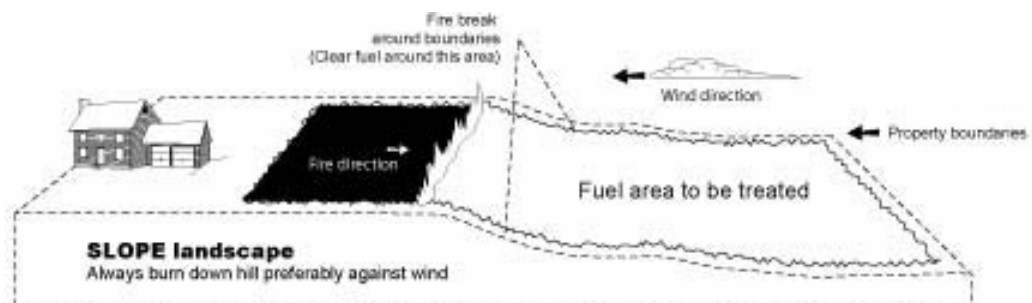
Fuel Load (t/ha)	Forest Fire Danger Index (FFDI)						
	2	4	6	8	10	15	>15
5	burn	burn	burn	burn	burn	burn	don't
10	burn	burn	burn	burn	burn	don't	don't
15	burn	burn	burn	burn	don't	don't	don't
20	burn	burn	don't	don't	don't	don't	don't
>25	burn	don't	don't	don't	don't	don't	don't

STEP 6. CONSIDER TOPOGRAPHY AND FIRE BEHAVIOUR

- Fires burning on level ground will have a different intensity and rate of spread from a similar fire (under the same weather conditions) travelling up a slope or down a slope.
- On an uphill slope an increase of 10 degrees will cause a fire to double the rate of spread and therefore the speed of the fire. If the angle is increased to 20 degrees then the spread of the fire will be increased fourfold.
- On a downhill slope, the figures will be reversed which means the fire will travel slower. Generally fires lit for reducing a hazard should be lit at the top of a slope to burn downwards.



- The aspect or direction the fuel faces is of importance, as the fuel may be more moist on some aspects or drier on others. Generally, fuels facing west, northwest or north are exposed to longer periods of sun during the day and will be drier than those on other aspects. The dry fuels will burn more readily, increasing the potential for erratic fire behaviour.



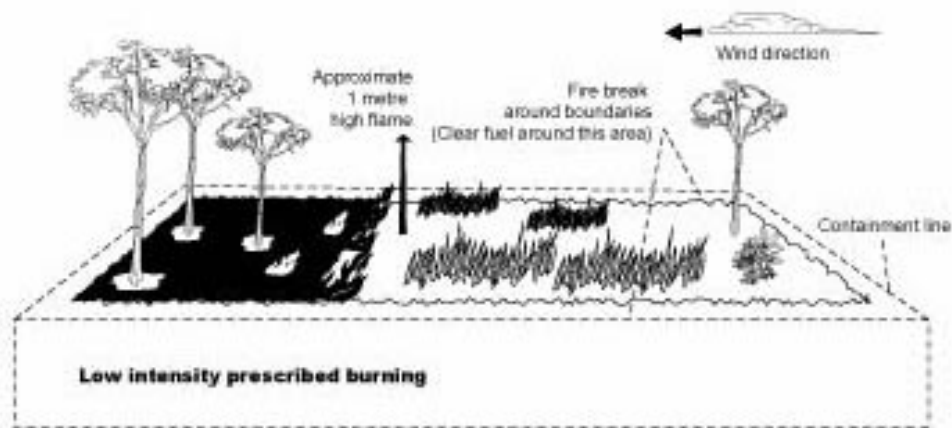
STEP 7. LIGHTING PATTERNS

Lighting patterns strongly influence the area that will burn and the flame height generated. Different lighting patterns can be used to achieve different burn coverage, intensity and environmental controls.

The pattern of lighting a fire can also help to keep fire out of environmentally sensitive areas such as riparian vegetation (vegetation found along rivers, streams, lakes and wetlands).

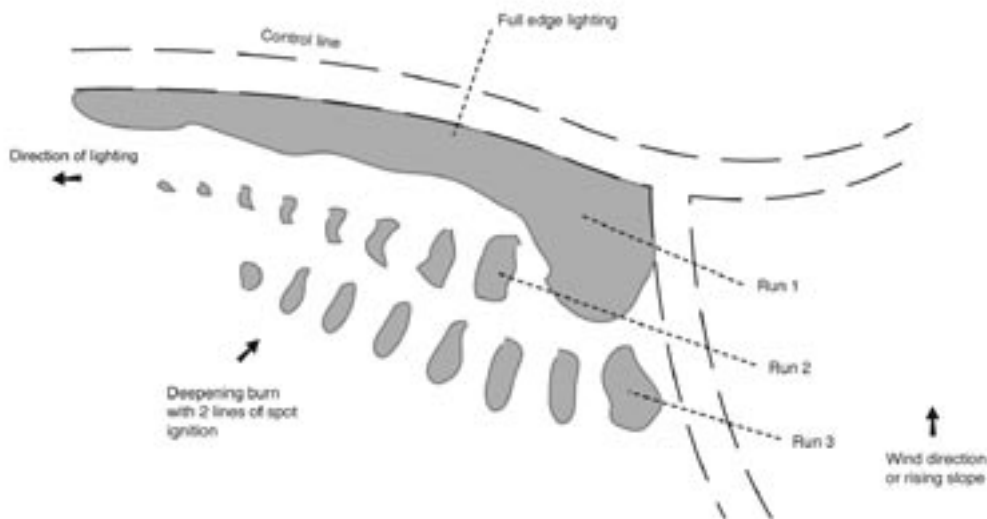
Lighting patterns to minimise environmental impacts:

- Burn when the higher parts of the topography (ridges) are drier, and the lower parts (valleys and gullies) are moist. To assess the likelihood of gully fuels burning, prior to the burning day collect gully fuel litter in the afternoon and, in a cleared area (such as the centre of a track), attempt to burn it. If fuels burn easily then burning should be delayed until rain has fallen.



- Use spot fires as they burn slower and with less intensity than a line of fire. The figure below clearly illustrates the spot lighting method.
- To minimise fire burning through stream areas, use a widely spaced spot lighting pattern (10 to 20 metres between spots) in areas adjacent to the streams, and do not light directly within any riparian vegetation or within 20 metres of the stream.

Implementing a spot ignition burning pattern for a low intensity burn:



- Make certain that your lighting pattern ensures that no fires are lit downslope of other personnel working in the burn area.
- Ensure that all personnel are familiar with the burn plan and lighting pattern.



STEP 8. CONDUCT A TEST BURN

It is important to test that conditions are suitable before lighting your low intensity burn. There are two steps to conducting a test burn:

(a) Use the burning leaf method to determine the fuel moisture.

A sample leaf (dead) should be taken from above and below the surface of the litter layer. Sheltered from any wind, light the end of each leaf. The aim is to discover the angle at which a small flame either goes out or flares up. The diagram below provides a guide.

There should be a difference between the two leaves. If the subsurface leaves are not moister than the surface leaves, the burn should not proceed.

	Leaf burns if held straight down or does not burn at all All fuels too wet if this leaf is in the area to be burnt. OK if only in wet area not to be burnt.
	Leaf burns if angled downwards Fine fuels from this leaf's position will only burn if on a slope or in the wind. OK if the leaf was from the bottom of the litter in the burn area, or from a wet area not to be burnt.
	Leaf burns if level Fine fuels from this leaf's position will burn, but very slowly unless helped by wind, slope and fuel continuity.
	Leaf can be angled upwards and still burns Fine fuels from this leaf position are dry enough to burn. OK if this leaf is from the top of the litter, risky if from the bottom.
	Leaf burns if held straight up All fine fuels are very dry and flammable. Fire will spot if windy. DON'T BURN

(b) Light a small test fire.

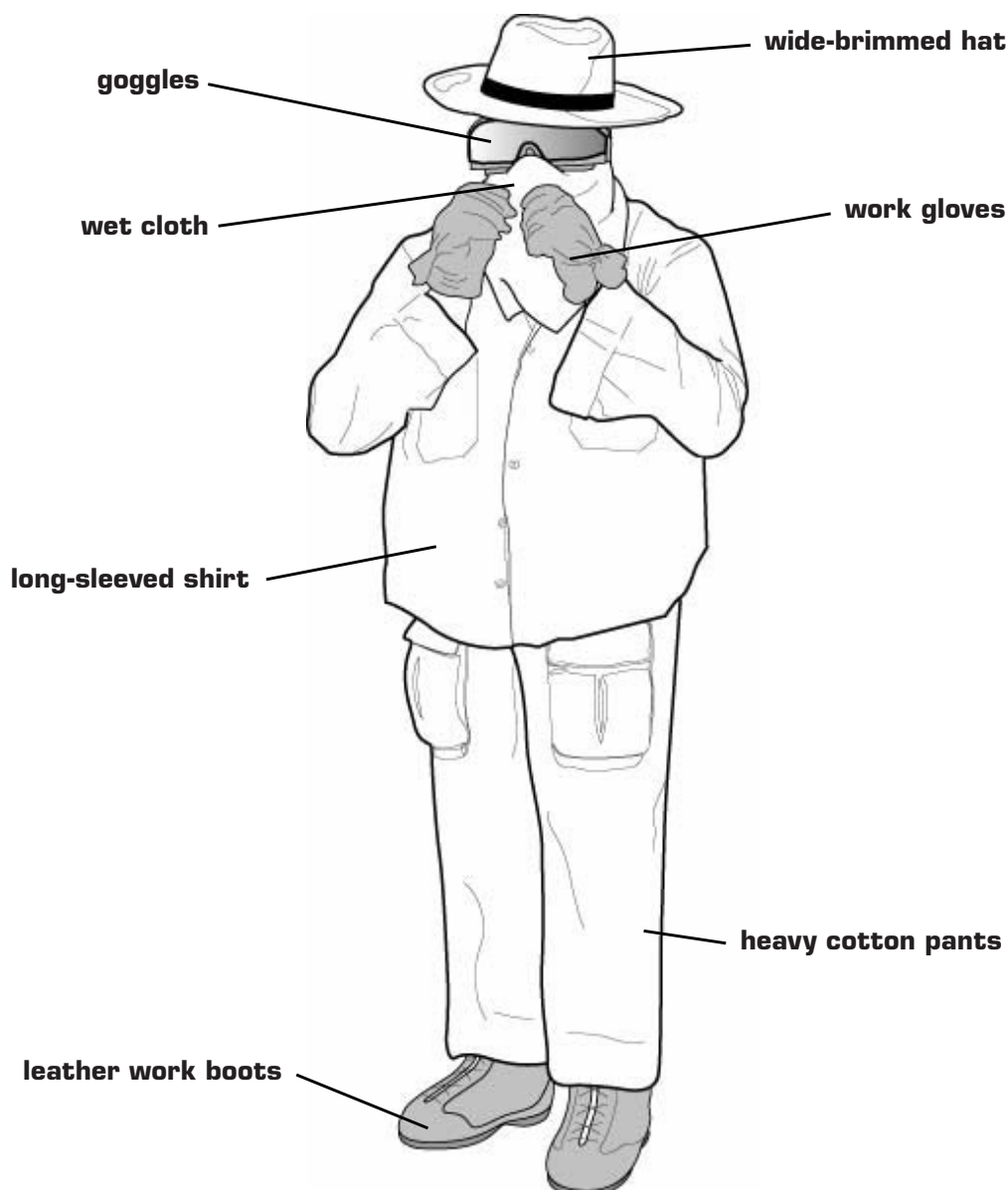
Having assessed that weather conditions are within a desirable range (Step 5), and with suppression equipment close at hand, light a test fire in a prepared area approximately five metres square on flat ground. Observe the test fire flame heights and rate of spread. If the height of flames burning in surface fuels consistently exceeds one metre, then the test fire should be immediately extinguished and your hazard reduction burn should be postponed.

STEP 9. ENSURE PERSONAL SAFETY CONSIDERATIONS ARE IMPLEMENTED

Your safety, and the safety of others assisting you during any hazard reduction burning is of utmost importance. You should discuss personal safety issues with your local RFS.

Before lighting the burn, everyone involved should consider:

- Wear natural fabrics (e.g. cotton, denim or wool). Synthetic fabrics can melt or burn.
- A long-sleeved shirt made from thick cotton or wool is ideal to prevent burns to the upper body and arms (e.g. flannelette or cotton drill work shirt).
- Sturdy leather work boots along with a pair of woollen socks prevent burns to the feet.
- A pair of heavy cotton pants will shield your legs from the radiant heat emitted from the fire (e.g. denim jeans or oil-free overalls).
- By wearing a wide-brimmed hat you can stop embers from dropping onto your head or down the back of your shirt.
- Work gloves will protect your hands.
- A good pair of goggles will safeguard your eyes against any embers and debris that may be in the air.
- Cover your nose and mouth with a wet handkerchief or piece of cloth to prevent inhalation of smoke and embers.



Prior to burning:

- Drink plenty of water throughout the day to avoid dehydration.
- Ensure the area to be treated is clear of personnel before burning begins.
- Ensure that adequate resources are available to conduct the burn in the prevailing and expected conditions, and contain the burn to the planned area.
- Use the attached checklist to ensure you are adequately prepared to conduct the burn.

During the burn:

- Ensure the burn is monitored at appropriate times until the risk of the fire escaping the planned area, and/or trees falling across roads and trails has passed.
- Working arrangements should ensure that personnel are not working alone or out of sight of others.
- Ensure that any safety hazards are immediately reported to the person supervising the fire.

The highest risk of fire trapping people conducting a burn is when they are working within the burn area perimeter. Additional safety precautions need to be planned and implemented in such circumstances and all personnel briefed about the precautions.

STEP 10. MOP UP AND PATROL

When you have completed the burn make sure that any logs or trees that are still burning are properly extinguished. In large bush fire hazard reductions the perimeter should be extinguished to a depth of at least 10 metres from all fire edges.

You should be regularly patrolling the perimeter to ensure that there is no ignition from burning embers of unburnt areas outside the perimeter of the area being treated. Under drier conditions, the area may need patrolling for several days following the bush fire hazard reduction work.

STEP 11. REPORTING

Ensure that you report on the completion of works by returning the completion form from the Bush Fire Hazard Reduction Certificate to the address indicated on the Certificate.

CHECKLIST FOR LOW INTENSITY HAZARD REDUCTION BURNING

PRIOR TO BURNING: MAKE SURE YOU HAVE:

- ☐ **Obtained a Bush Fire Hazard Reduction Certificate**
- ☐ **Obtained a Fire Permit (See "Before You Light That Fire")**
- ☐ **Either :**
 - ☐ Selected the appropriate season and weather conditions having considered:
 - Temperature
 - Relative humidity
 - Wind speed and direction
 - Atmospheric stability

OR

- ☐ Contacted the RFS for a Forest Fire Danger Index (FFDI), determined your fuel load, then cross checked with Table 1 to determine whether the chosen day is suitable.

☐ **Made a map of burn site taking into consideration:**

- ☐ Location of assets and control lines
- ☐ Direction of fire travel
- ☐ Areas of dry and moist fuel loads
- ☐ Most appropriate lighting patterns
- ☐ Placement of personnel during burn
 - Safe escape routes
 - Safety zones

☐ **Established control lines around the burn area including:**

- ☐ Drainage structures if necessary
- ☐ Cleared areas under trees and around logs

☐ **Conducted a test burn**

☐ **Notified all necessary parties:**

- ☐ RFS (24 hours prior to burning) or NSWFB
- ☐ Neighbours
- ☐ RTA (if traffic control is necessary)

☐ **Ensured that all personnel are familiar with details of the burn plan and adequately prepared:**

- ☐ Appropriate experience
- ☐ Protective clothing
- ☐ Food and water
- ☐ Awareness of safe burning procedures and first aid

☐ **Considered emergency procedures:**

- ☐ Efficient communication system
- ☐ First Aid Kit

AT COMPLETION OF BURN: HAVE YOU:

- ☐ **Extinguished all necessary burning material**
- ☐ **Returned the completion form from the Bush Fire Hazard Reduction Certificate**

HOW CAN I FIND OUT MORE?

The following documents are available from your local Fire Control Centre and from the NSW RFS website at **www.rfs.nsw.gov.au**.

- Before You Light That Fire
- Standards for Asset Protection Zones
- Standards for Pile Burning
- Application Instructions for a Bush Fire Hazard Reduction Certificate

If you require any further information please contact:

- your local NSW Rural Fire Service Fire Control Centre.
Location details are available on the RFS website or
- call the NSW RFS Enquiry Line 1800 679 737
(Monday to Friday, 9am to 5pm), or
- the NSW RFS website at **www.rfs.nsw.gov.au**.

**Produced by the NSW Rural Fire Service, Locked Mail Bag 17,
GRANVILLE, NSW 2142. Ph. 1800 679 737**

www.rfs.nsw.gov.au

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Appendix D – Comments provided by the NSW Rural Fire Service and the Great Lakes Council

20 JUL 2006

All communications to be addressed to:

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NSW Rural Fire Service
15 Carter Street
HOMEBUSH BAY NSW 2127

Telephone: (02) 8741 5430
e-mail: katie.collins@rfs.nsw.gov.au

Facsimile: (02) 8741 5550



Mr Anthony Alliston
Asquith & de Witt Pty Ltd
PO Box 179
CHARLESTOWN, NSW, 2290

Your Ref: AA:VJ:11683
Our Ref: DEV/0052(A06/1522)

18 July 2006

Dear Mr Alliston

**RE: KARUAH HARD ROCK QUARRY (DA 265-10-2004) BUSHFIRE
MANAGEMENT PLAN**

I refer to your letter dated 30 June 2006 regarding a final draft of the Bushfire Management Plan for the Karuah Hard Rock Quarry (DA 265-10-2004) prepared by GSS Environmental. The NSW Rural Fire Service has reviewed management plan and provides the following comments for your consideration:

- To provide a general context for bushfire management include a broad description of the vegetation and topography of the plan area and fire history (if known);
- p10 the sentence "A permit (Bush Fire Hazard Reduction Certificate) is required to light a fire will also be required for burning hazards" is not correct. A bush fire permit is required if you light a fire in the open during the bush fire danger period. To satisfy environmental legislation, an environmental assessment should be completed prior to undertaking any hazard reduction work. The environmental approval may be a Bush Fire Hazard Reduction Certificate.
- p13 Do the emergency response procedures include an evacuation plan?
- p15 the Rural Fires Regulation is 2002

Should you have any further queries regarding this matter, please contact Katie Collins (02) 8741 5430.

Simon Heemstra
A/Manager, Community Hazards Management
NSW Rural Fire Service

Chrissie Eckersley

From: Mathew Bell [Mathew.Bell@greatlakes.nsw.gov.au]
Sent: Friday, 4 August 2006 4:31 PM
To: Alan Bawden; anthony.a@asquithdewitt.com.au; Chrissie Eckersley
Subject: Review of Draft Bushfire Management Plan
Attachments: Memo_Bushfire MP Karuah Hard Rock.DOC

Alan, Anthony and Chrissie,

Here are the comments from Council's Natural Systems and Estuaries Branch to the Draft Bushfire Management Plan submitted for the Karuah Hard Rock Quarry.

Please contact the undersigned for clarification or extra details.

Regards

Mat Bell
Senior Environmental Officer/ Ecologist
Phone (02) 6591 7243
Mobile 0438 245 299

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Memo to: Alan Bawden (Senior Assessment Planner)

Memo from: Mat Bell (Senior Environmental Officer)

Ref: Review of Final Draft Bushfire Management Plan for the Hard Rock Quarry at Karuah

Date: 4th August 2006

The Minister for Infrastructure and Planning approval of DA265-10-2004, condition no. 36, required that the “*applicant shall prepare a conservation sensitive Bushfire Management Plan for the development, to the satisfaction of Council and the Rural Fire Service.*”

A Final Draft Bushfire Management Plan has been forwarded to Council and was prepared for Hunter Quarries by GSS Environmental and dated July 2006. The Plan has been referred to Council’s Natural Systems and Estuaries Branch for review and comment.

For the purpose of this review, we have inferred that the term “*conservation sensitive*” relates to the management of bushfire thresholds on the land that does not serve to harm, threaten or negatively affect biodiversity, including threatened species, nor the ecological function, evolutionary/ successional development of the natural and regenerating habitats present. To this we note, that both under-frequent and over-frequent fire constitutes a threat to ecological systems and their function. Ecological thresholds for natural vegetation communities have been discussed in the revised Environmental Assessment Code by the NSW Rural Fire Service. Further, bushfire suppression and bushfire risk management processes may also threaten or harm ecological systems.

Therefore, in this regard, our comments to the Draft Plan are provided below:

- It should be noted that during previous investigations for a proposed telecommunications tower on Lot 12, that the threatened plant, *Asperula asthenes* (TSC Act – Vulnerable) has been detected in a large and significant population within the area mapped as the conservation offset area - “*tall, moist forest.*” This species is probably very fire sensitive and needs to be protected from over-frequent fire regimes. Tall moist forest requires a minimum year bushfire interval of 25 – 30-years as specified in the Environmental Assessment Code and Great Lakes Council’s Draft Vegetation Strategy. This should be reported in the text of the Final Bushfire Management Plan.
- We provide support for sensitive methods only in the adoption of hazard reduction (unless in emergency situations) and thus do not favour mechanical clearing methods. We therefore endorse the statement on page 11 where clearing of vegetation using mechanical methods “*should not be undertaken*”. We support only sensitive hand clearing and controlled/ prescribed burning that is within the

appropriate ecological thresholds for the particular vegetation communities of the land.

- We support the information provided in the Plan for any controlled burning to follow the appropriate RFS standards and the adoption of strategic rotational burning (mosaic burning) as outlined in the Plan on page 11. The targeted aim of a 10-year general burning regime for the BMP area is generally supported. However, we do also support the avoidance of burns in the Tall Moist Forest (and *Asperula asthenes* habitat) and suggest that it be noted that such forest types should have an adopted 25 – 30-year minimum bushfire interval in accordance with the Environmental Assessment Code and the Draft Great Lakes Vegetation Strategy.
- We suggest that the area affected by wildfire events and controlled burns be mapped digitally on GIS on an annual basis and referred/ reported in the AEMR such that the frequency of bushfires over specified portions of the land can be mapped and presented to the relevant authorities. In this manner, a detailed and graphic picture of the parts of the land that are over-frequently burnt, under-frequently burnt or adequately managed for bushfire can be depicted. This approach would clearly allow the site manager and the authorities to adapt to site conditions and implement bushfire management actions proactively and appropriately.
- We suggest that more explicit reference is required to the NSW Rural Fire Service's Environmental Assessment Code within the Final Bushfire Management Plan.
- We also suggest that there be significant interaction between the Flora and Fauna Management Plan and the Bushfire Management Plan. Specifically, we suggest that reference to a monitoring schedule be designed and adopted to sample and test for any positive and negative affects of actual fire regimes on the ecological condition and function of the offset area and habitats of conservation significance (*T. juncea* habitats and *Asperula asthenes* habitat). The Draft Bushfire Management Plan should reference such ecological monitoring and a protocol for such monitoring should be devised, documented and subsequently implemented on the land as part of the AEMR.

We therefore generally support the Draft Bushfire Management Plan, provided that the above suggestions are duly incorporated into the Final Plan. We strongly urge that adaptive management and monitoring of bushfire activities/ events are very important and this needs to be reflected in the Final Plan.

Chrissie Eckersley

From: Mathew Bell [Mathew.Bell@greatlakes.nsw.gov.au]
Sent: Friday, 25 August 2006 10:24 AM
To: Alan Bawden; anthony.a@asquithdewitt.com.au; Chrissie Eckersley
Subject: RE: Karuah Hard Rock Quarry Bushfire Mgt Plan Draft_V6 06-0808 with RFS and GLC comments.pdf

Anthony,

We have reviewed the Final draft of the Bushfire Management Plan and specifically as it related to our memo dated 4th August 2006. In summary our memo indicated that the first draft plan was generally adequate but that a number of additional issues should be discussed, namely the presence and management requirements for *Asperula asthenes* on Lot 12, the need for GIS mapping of wildfire events for reporting on an annual basis, more explicit reference to the Environmental Assessment Code of the RFS and greater interaction between the BMP and Flora and Fauna Management Planning.

We note that these suggestions have been duly and appropriately incorporated in the Final Draft Plan. We therefore support and endorse the Final Draft Plan and have no objection to its finalisation. We believe it achieves its stated objectives and aims in an environmentally sympathetic manner.

Regards

Mat Bell

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