

APPENDIX 19

Boco Rock Wind Farm Bushfire Risk Assessment

Eco Logical Australia Pty Ltd



BOCO ROCK WIND FARM

BUSHFIRE RISK ASSESSMENT

PREPARED FOR	Wind Prospect CWP Pty Ltd
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Executive Summary

This Bushfire Risk Assessment describes the objectives, strategies and activities for the treatment of bushfire risk that may be presented during construction, operation and maintenance of the proposed Boco Rock Wind Farm. The development is to be located approximately six kilometres west of Nimmitabel on the NSW Monaro Plains and the proposal consists of the construction and operation of 125 wind turbines and associated infrastructure.

The purpose of this assessment is to provide an analysis and justified treatment of bushfire risk to address responsibilities under the *Rural Fires Act 1997* based on the risk management process as defined by AS/NZS 4360-2004 'Risk Management' (Standards Australia 2004) and recommended within the National Inquiry on Bushfire Mitigation and Management (COAG 2004).

The study area is amongst predominantly cleared plains for many kilometres. The nearest community is the township of Nimmitabel, and the built assets and human life in the area are those associated with farm houses scattered across the landscape. The site consists of cleared pasture with large areas of Natural Temperate Grassland, featuring Snow Gum Woodland in scattered remnants.

The site and surrounding area has an uneventful fire history and an analysis of bushfire hazard demonstrated a scattered pattern of 'medium' bushfire hazard on the steeper slopes supporting remnants of good condition Snow Gum Woodland. Most of the hazard is rated as 'low' due to the prevalence of grasslands within the area.

An assessment of the risk of fire spreading from the site and impacting on nearby assets was undertaken whereby a risk classification scheme developed through qualitative scales of likelihood and of consequence resulted generally in a 'minor' risk of damage at a variety of scales. An 'insignificant' risk of a widespread loss of property and loss of human life was also recorded. The highest risk rating scored was 'moderate' for the possible short-term damage to nearby stock and/or crops.

Bushfire risk treatment aimed at reducing both the likelihood and consequences of bushfires was recommended based on an understanding of the risk. In line with AS 4360-2004 (Standards Australia 2004) and the NSW Bushfire Coordinating Committee (BFCC) Guidelines (2008), six broad groups of risk treatment options were identified, each having one or more specific strategies (risk treatments):

1. Avoid the risk – Limit or prohibit ignition creation activities;
2. Reduce the hazard – Education and training;
3. Reduce consequence – Fuel reduced zone establishment and maintain access roads;
4. Accept risk – Suppression and response;
5. Transfer the risk – Insurance review;
6. Retain the risk – Bushfire Emergency and Evacuation Plan.

1 Introduction and context

1.1 INTRODUCTION, LOCATION AND BACKGROUND

This Bushfire Risk Assessment (the Assessment) was prepared for Wind Prospect CWP Pty Ltd. The plan describes the objectives, strategies and activities for addressing bushfire risk management for the construction, operation and maintenance of the Boco Rock Wind Farm on the NSW Monaro Plains, approximately six kilometres west of Nimmitabel. The study area spans two local government areas; Cooma-Monaro and Bombala. Figure 1 (Appendix 1) locates the proposed wind farm site.

The need for a Bushfire Risk Assessment was identified within the Director General's Requirements (DGRs) for the further assessment and subsequent approval for the construction and operation of the wind farm. The *Rural Fires Act 1997* imposes obligations on land managers to take all reasonable measures to prevent the occurrence and spread of wildfire to adjoining lands from lands under their care and management. This report contains risk treatment recommendations designed to address the land manager's risk management obligations.

This assessment is a technical report that is to be appended to, and read in conjunction with, the Boco Rock Environmental Assessment prepared by Wind Prospect CWP Pty Ltd with input from Eco Logical Australia Pty Ltd and other consultants. More detailed background information on the proposal and site characteristics can be found within the Environmental Assessment. Only those details necessary for the understanding of the Bushfire Risk Assessment are provided within this report.

1.2 WIND FARM PROPOSAL

The proposal consists of the construction and operation of some 125 wind turbines and associated infrastructure for the generation of electricity. The turbines are to be located along ridge lines above the Monaro Plains in four clusters as shown in Figure 1 (Appendix 1).

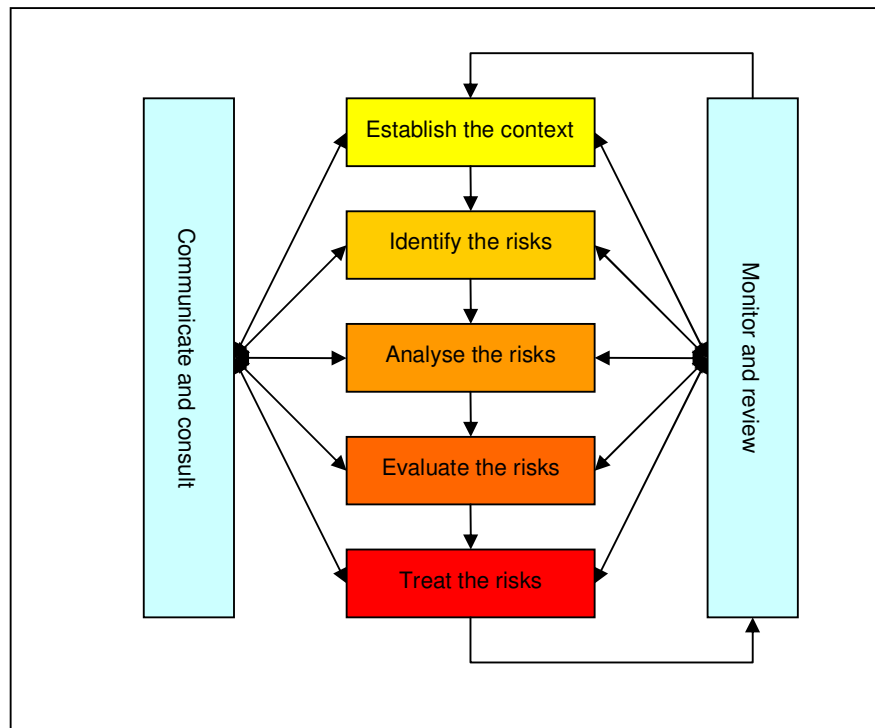
The built form will include the turbines and their footings, access and crane hardstands, a substation, facilities building, concrete batching plant, construction compound and storage, underground cabling and internal and external overhead transmission lines. The construction phase will involve the upgrading of existing roads and the creation of new ones used to access the turbine sites with some being retained to carry out future maintenance activities.

1.3 PURPOSE OF RISK ASSESSMENT

The purpose of this assessment is to provide the land manager with an analysis and justified treatment of bushfire risk to address responsibilities under the *Rural Fires Act 1997*.

Based on the risk management process as defined by AS/NZS 4360-2004 'Risk Management' (Standards Australia 2004) and recommended within the National Inquiry on Bushfire Mitigation and Management (COAG 2004), the assessment is to provide an analysis and evaluation of bushfire risk and acceptable risk treatments that will avoid the risk, reduce the likelihood, reduce the consequences, accept the risk, transfer the risk and retain the risk. A flowchart illustrating the process of emergency risk management is included as Figure 2 below.

Figure 2: Emergency risk management planning after AS/NZS 4360-2004 and COAG (2004)



1.4 AIMS AND OBJECTIVES

The aims of this assessment are to:

- Prevent the harm to, and loss of, human life due to bushfire arising from the construction, operation and maintenance of the wind farm and the associated infrastructure and activities; and
- Minimise the incidents of property damage to an acceptable level as a result by bushfire arising from the construction, operation and maintenance of the wind farm and the associated infrastructure and activities.

The objectives of this plan are:

- No human life is lost or person injured as a result of bushfire arising from the construction, operation and maintenance of the wind farm and the associated infrastructure and activities; and
- Infrastructure and property offsite is not significantly damaged from bushfire arising from the construction, operation and maintenance of the wind farm and the associated infrastructure and activities.

1.5 PLANNING FRAMEWORK

The relevant planning controls and how they have been considered within this assessment are summarised below:

1.5.1 NSW Rural Fires Act 1997

The RF Act imposes obligations on land managers to take all reasonable measures to prevent the occurrence and spread of wildfire to adjoining lands from lands under their care and management. The RF Act also places emphasis on cooperative fire management and wildfire suppression planning between the various organisations involved in fire management (through the Bushfire Management Committees and by the preparation and implementation of a Bushfire Risk Management Plan).

1.5.2 NSW Threatened Species Conservation Act 1995

The TSC Act aims to conserve biodiversity and to promote ecologically sustainable development by preventing the extinction of, and promoting the recovery of, all threatened plants, animals and ecological communities native to NSW, excluding fish and marine vegetation.

The TSC Act requires the consideration of threatened species and their habitats in the developmental planning process and a responsibility of the proponent to determine potential impacts on listed species and Endangered Ecological Communities (EEC).

'High frequency fire', 'clearing of native vegetation' and 'removal of dead wood and dead trees', are listed by the TSC Act as 'Key Threatening Process' and need to be carefully considered and managed when implementing fire management activities.

1.5.3 Commonwealth Environmental Protection & Biodiversity Act 1999

The EPBC Act provides for the protection of the environment, and the conservation of biodiversity, especially those aspects of the environment that are of National environmental significance.

Like that of the TSC Act, the EPBC Act requires the consideration of threatened species and their habitats in the developmental planning process and it is a responsibility of the proponent to determine potential impacts on species.

1.5.4 Snowy Monaro and Bombala Bushfire Risk Management Plans

The study area straddles the two local government areas of Monaro in the north and Bombala in the south. As a result, the site is also affected by two Bushfire Risk Management Plans, although this does not present any planning difficulties as the plans are consistent with each other across the local government boundary. This is ensued by both districts being under the one operational district for fire suppression and control.

Neither risk plan mentions the proposed study area or identifies it within any specific zoning or being affected by recommended actions. Both plans should consider the development within their next review/update as an asset of significant and economic importance.

2 Bushfire risk identification

2.1 LIFE AND PROPERTY DESCRIPTION

The study area is amongst predominantly cleared plains surrounded by grazing farms existing for many kilometres. The nearest community is the township of Nimmitabel six kilometres to the east, and the only other built assets and human life in the area are those associated with farm houses scattered across the landscape.

2.2 FIRE HISTORY

According to the respective Bushfire Risk Management Plans and consultation with the Monaro Team Rural Fire District, the study area has not been affected by a bushfire for more than 25 years. The last major fire within the locale surrounding the site was the Bobundra Grass Fire in 2005 further to the west of the site. The ignition and spread of grass fires is the main concern for fire authorities on the Monaro Plains as discussed further in Section 2.4.2.

The Cooma-Monaro and Bombala districts experience two 'major' fires per year on average, but the occurrence of these are not uniformly spread across the landscape, and have not occurred at or adjacent the site for many years. The ignition of such fires are similar to all rural environments of NSW, but the districts experience a relatively higher proportion of fires ignited from camp fires due to a high visitation of tourists camping and walking in the Snowy region. Accidental fires started from rural and farming activities are also common, as are fires started by lightning strikes.

2.3 FIRE WEATHER

An analysis of the fire weather experienced in the locale and the surrounding region provides insight into bushfire behaviour potential. Days with a higher Forest Danger Index (FDI) can be expected in spring and summer. Those months of higher FDI are attributed to the occurrence of the strong winds from the westerly sector accompanied by high daytime temperatures and low humidity. The weather and historical data plus local knowledge of fire weather patterns indicate that:

- adverse fire weather conditions are most common in spring and summer, although extreme fire weather days may occur at any time from September through to March;
- adverse fire weather conditions are likely to be associated with strong winds from the northwest and southwest; and
- southerly wind changes may adversely affect fire behaviour and hamper control efforts.

2.4 BUSHFIRE HAZARD

Bushfire hazard has been evaluated through analysis of a combination of slope and fuel (vegetation) as discussed in the following sections.

2.4.1 Slope

Steeper slopes can significantly increase the rate of spread of fires, and it has been shown that with each 10^0 increase or decrease in slope a corresponding doubling or halving, respectively, in the rate of spread can be expected (McArthur 1967). Thus, the relationship of the steepness of slope, and whether a fire moves upslope or downslope, is vital to understanding bushfire behaviour potential. Slope and wind are often the major factors determining the direction of fire spread.

The study area and the proposed four clusters are situated on the hill rises and ridgelines above the plains and therefore are adjacent downslopes leading away from the site in all cases. The gradient of these slopes range from gently undulating and rolling hills to steep gullies associated with the primary watercourses in the area.

2.4.2 Fuels (vegetation)

The district is characterised by cleared and grazed pasture, Natural Temperate Grassland in varying conditions and remnants of Snow Gum Woodland. The majority of the area, including the site, consists of cleared pasture with large areas of Natural Temperate Grassland, featuring the Snow Gum Woodland in small and scattered remnants such as within steep gullies and along watercourses. Figure 3 (Appendix 1) displays the distribution of these vegetation types. The proposed areas for the turbines and infrastructure such as the transmission lines are cleared and open so as to achieve wind harvesting objectives and limit the disturbance to native vegetation and tree cover.

'Planning for Bushfire Protection' (NSW Rural Fire Service 2006a) provides an assumed fuel load for 'Grassy Woodland' vegetation communities of 10 tonnes/ha surface fuel load and 15 tonnes/ha overall fuel load. For the purpose of comparison, the dry and wet sclerophyll forests further to the east along the Great Divide may have a fuel load around 25 - 30 tonnes/ha according to 'Planning for Bushfire Protection'. Native grasslands have a much lower fuel load than the woodlands as the only contributor to the accumulation of available fuels is the grass itself.

The availability of the grassland vegetation on the Monaro Plains depends on whether the grass is a native community or pasture, and whether the land is in drought. The lack of growth in pasture grasses during drought limits the spread of grass fires across pasture and farms as has been the case in the last decade in the area. However, this reduction in fire behaviour amongst pasture is accompanied by an increased curing time, and hence availability, of native grasses where they occur in the more natural parts of the landscape.

Generally speaking, vegetation communities can be categorised into four fuel groups based upon their estimated contribution to the potential behaviour of bushfire. The methodology for classifying these fuel groups is adapted from Dovey (1994).

The vegetation within the site is considered to be within the 'medium', 'lower' and 'minimal' fuel groups depending on the vegetation type (structure and available fuel loads) and condition (level of disturbance and regeneration), as discussed in Table 1.

Table 1: Description of the four fuel groups adapted from Dovey (1994)

Fuel group	Characteristics of each fuel group
High	Continuous fuels, higher quantity, available to burn during average seasons (<i>higher fire intensity expected</i>). Not present at, adjacent or near the site.
Medium	Less continuous fuels, medium level quantity, available to burn during average seasons but may be less often than high (<i>medium or high fire intensity expected</i>). Present at the site in the form of intact and good condition Snow Gum Woodland.
Lower	Possibly discontinuous fuels, low-medium fuel quantity, moister fuels unlikely to contribute to high intensity fires in average season, fuel structure facilitates easier control (<i>fire intensities may range from low-high and generally regarded as easier to control</i>). Present at the site in the form of poor condition Snow Gum Woodland and Native Grasslands.
Minimal	Unlikely to burn or always burn within controllable limits. Present at the site in the form of pasture grass.

2.4.3 Bushfire hazard class

Bushfire hazard classes can be generated across the landscape by applying relative weightings to the varying fuel groups (see Table 1) and combining them with available slope classes (i.e. 0-5, 5-10, 10-15, >15 degrees) within a Geographic Information Systems (GIS) model. The result is the mapping of relative hazard in classes of 'high', 'medium', 'low', and 'not applicable'. This analysis does not indicate how often an area will receive potentially damaging fires nor the actual intensity of a fire. It does, however, provide a useful comparative ranking indicating sites of higher and lower potential fire behaviour compared to others in an area.

The bushfire hazard map produced for the current vegetation pattern and condition (April 2009) is included as Figure 4 (Appendix 1). A pattern to note is the location of medium bushfire hazard on the steeper slopes supporting good condition Snow Gum Woodland, particularly adjacent the proposed infrastructure in the two northern clusters of turbines. Most of the hazard is rated as low due to the prevalence of grasslands within the area.

2.5 ANALYSIS OF LIKELY BUSHFIRE BEHAVIOUR

Based on the information provided in the fire weather and fire hazard analysis above, likely fire behaviour can be predicted. It is the combination of undesirable fire weather (i.e. hot and dry westerly winds during summer) and the potential for a grassfire to spread towards farm assets in the surrounding area. A grass fire under the influence of wind may travel fast, reaching assets before fire fighters can attend the scene.

2.6 EXISTING BUSHFIRE PROTECTION MEASURES AND ARRANGEMENTS

The existing level of bushfire protection for life and property in the surrounding area is relatively good and this is due to the existence of vast areas of cleared grazing lands combined with the compartmentalisation of the landscape by many roads. Grazing land and roads provide breaks and control lines for fast spreading grass fires.

The site and surrounding area can be well accessed by the immediate and surrounding road network providing acceptable response times for local volunteer NSW Rural Fire Service fire fighters.

The site is covered by the Snowy-Monaro and Bombala Bushfire Risk Management Plans which provide a platform to manage bushfire risk across the districts.

2.7 VULNERABILITY OF SURROUNDING ASSETS

The farming community surrounding the site and the township community of Nimmitabel are not considered overly vulnerable to the affects of a large bushfire emanating from the site or across the district. This is due to the large cleared areas dominant across the district.

3 Bushfire risk analysis

3.1 METHODOLOGY AND RESULTS

Based on the proceeding analysis, the following tables assess the risk of fire impacting on possible assets surrounding the site should a fire be ignited at the site and spread outwards. The methodology adopted is that given in AS/NZS 4360-2004 'Risk Management' (Standards Australia 2004) whereby a risk classification scheme is developed through qualitative scales of likelihood and of consequence. The terminology describing risk factors used in the assessment is consistent with bushfire risk management planning process adopted by the NSW Rural Fire Service for 'rural fire districts' of NSW.

The scale of likelihood is shown below and is based on AS/NZS 4360-2004 (Standards Australia 2004). Values have been allocated to the likelihood descriptors on a scale of 1 to 5 with 1 being extremely rare (extremely unlikely) and 5 being almost certain as listed in Table 2.

Table 2: Scale of likelihood for AS/NZS 4360-2004

Descriptor	Description
Almost certain (5)	The event is expected to occur in most circumstances over the life of the development.
Likely (4)	The event will probably occur in most circumstances over the life of the development.
Possibly (3)	The event might occur at some time over the life of the development
Unlikely (2)	The event could occur at some time over the life of the development.
Rare (1)	The event may occur only in exceptional circumstances.

Rating codes and the level of risk were then calculated by multiplying likelihood levels and consequence levels with the rating determined as per the scale outlined in Table 3 below.

Table 3: Rating codes and level of risk rating for AS/NZS 4360-2004

Level of risk	Risk rating
0 - 4	Insignificant
5 - 9	Minor
10 - 14	Moderate
15 - 19	Major
20 - 25	Extreme

Table 4 below provides an analysis of risk factors considered in the determination of the final risk assessment score for life and property in Tables 5 to 7 below.

Table 4: Rating codes and level of risk rating for AS/NZS 4360-2004

Risk Factor	Analysis of the risk factor
1. The likelihood of human and natural fire ignitions, as influenced by time, space and demographics	Natural ignitions are possible and historically common across the district. Human induced ignitions are known to occur across the district from accidental reasons such as camp fires and rural uses such as farming practices.
2. The potential spread and severity of a bushfire, as determined by fuel, topography and weather conditions.	The low availability of fuel across the landscape combined with predominantly cleared grazing land and many roads is such that it does not lend itself to severe, widespread fires. A widespread grassfire may occur in extremely windy and dry conditions such as a 'blow-up' day where resources are allocated elsewhere.
3. The proximity of assets vulnerable to bushfire and likely bushfire paths	There is a very low density of assets such as dwellings or communities proximate to the site, and these are at least 1-2 kms away.
3. The vulnerability of assets, or their capacity to cope with, and recover from bushfire	Stock and crops vulnerable to fire. Built assets are not considered vulnerable.

Tables 5, 6 and 7 on the following pages provide the bushfire risk assessment for life and property.

Table 5: Bushfire Risk Assessment – Life (human)

Vulnerability Criteria	Consequence (A)	Likelihood (B)	Level of risk (A x B)	Rating
Populated area where the combination of threat and vulnerability expose a community to a significant likelihood of fatalities and major injuries.	5	1	5	Minor
Less likely to be fatalities or major injuries due to the presence of attributes which afford some protection.	4	2	8	Minor
Loss of life or major injury highly unlikely. Medical/hospital treatment may be required.	3	3	9	Minor

Vulnerability Criteria	Consequence (A)	Likelihood (B)	Level of risk (A x B)	Rating
Minor injuries only - first aid treatment. No major injuries or fatalities likely.	2	4	8	Minor
No injuries or fatalities likely.	1	4	4	Insignificant

Table 6: Bushfire Risk Assessment - Property (built assets)

Vulnerability Criteria	Consequence (A)	Likelihood (B)	Level of risk (A x B)	Rating
Extensive and widespread loss of property. Major impact across a large part of the community and region. Long term external assistance required to recover	4	1	4	Insignificant
Localised damage to property. Short-term external assistance required to recover.	3	2	6	Minor
Short-term damage to individual assets. No external assistance required to recover.	2	3	6	Minor
Inconsequential or no damage to property. Little or no disruptions to the community.	1	4	4	Insignificant

Table 7: Bushfire Risk Assessment - Property (stock and crops)

Vulnerability Criteria	Consequence (A)	Likelihood (B)	Level of risk (A x B)	Rating
Extensive and widespread loss of property. Major impact across a large part of the community and region. Long term external assistance required to recover	4	2	8	Minor
Localised damage to property. Short-term external assistance required to recover.	3	4	12	Moderate

Vulnerability Criteria	Consequence (A)	Likelihood (B)	Level of risk (A x B)	Rating
Short-term damage to individual assets. No external assistance required to recover.	2	4	8	Minor
Inconsequential or no damage to property. Little or no disruptions to the community.	1	4	4	Insignificant

3.2 SUMMARY OF FINDINGS

A likelihood rating was assigned to the vulnerability criteria (consequence) in Tables 5, 6 and 7 to determine a risk rating for life and property (built assets and stock/crops). Generally speaking, there is a minor risk of fire spreading from the site to impact on the surrounding life and property in a variety of scales. There is an insignificant risk of a widespread loss of property and loss of human life. The highest risk rating scored was moderate for the possible short-term damage to stock and/or crops due to fast spreading grass fire and the high vulnerability of these farming assets.

4 Bushfire treatments

4.1 BUSHFIRE RISK TREATMENT OPTIONS

Bushfire risk treatment options should aim to reduce both the likelihood and consequences of bushfires, and allow provisions for addressing the risk that remains. There six broad groups of risk treatment options as described by AS 4360-2004 (Standards Australia 2004) and the NSW Bushfire Coordinating Committee (BFCC) Guidelines (2008). These options, definition and example treatments are summarised in Table 8. Implementation of these strategies provides an effective way of minimising the risk identified within this assessment.

Table 9 lists and describes those risk treatments recommended to be carried out at the study area for the construction, operation and maintenance of the wind farm and associated infrastructure.

Table 8: Six recognised bushfire risk treatment option groups (BFCC 2008)

Risk treatment option	BFCC (2008) / AS 4360 definition	Example treatment
Avoid the risk	By deciding not to proceed with the activity likely to generate the bushfire risk.	<ul style="list-style-type: none"> • Ceasing or removing activities from threat.
Reduce the likelihood	Programs to reduce the number of deliberate and accidental man-made ignitions (after BFCC 2008).	<ul style="list-style-type: none"> • Deterrence; • Community education; • Access restrictions; • Regulation.
Reduce the consequence	Programs to reduce the level of fuel available to burn in a bushfire (after BFCC 2008).	<ul style="list-style-type: none"> • Asset Protection Zones; • Strategic Fire Advantage Zones; • Land Management Zones; • Fire Exclusion Zones.
Accept the risk	After risks have been reduced, some residual risks may still exist, which may need to be managed with fire response strategies (after BFCC 2008).	<ul style="list-style-type: none"> • Detection and warning; • Response planning;

Risk treatment option	BFCC (2008) / AS 4360 definition	Example treatment
		<ul style="list-style-type: none"> • Suppression activities.
Transfer the risk	Involves another party sharing some part of the risk by providing capabilities or resources (after AS 4360).	<ul style="list-style-type: none"> • Insurance arrangements.
Retain the risk	After risk has been changed or shared, there may be residual risk without any specific immediate action being required (after AS 4360)	<ul style="list-style-type: none"> • Recovery planning; • Evacuation planning.

Table 9: Recommended risk treatments

Risk treatment options and strategies		
Avoid the risk		
Limit or prohibit ignition creation activities	<i>What/who</i>	Site manager to limit or prohibit welding and other construction and maintenance activities that can produce sparks and/or embers during days of extreme fire weather and days of Total Fire Ban.
	<i>Where</i>	Entire site.
	<i>How</i>	<p>Fire weather is to be monitored daily at the NSW Rural Fire Service website at http://www.bushfire.nsw.gov.au/dsp_content.cfm?CAT_ID=1109.</p> <p>Ignition creating activities outdoors such as welding should not occur on days of Total Fire Ban, and occur only on days of Extreme fire weather with the presence of a 4WD striker with slip-on water unit equipped with diesel pump and hoses and notification of the local Fire Control Centre (Monaro Team, Water Works Hill Cathcart Road, Bombala – 02 6458 3933).</p> <p>Ignition creating activities may occur on days of High fire danger and lower without these restrictions, and in combination of the measures listed under the remaining risk treatment options below.</p>
	<i>When</i>	During all phases of the development including future maintenance.
Reduce the likelihood		
Education	<i>What/who</i>	<p>Construction crew and maintenance staff should be educated on the topic of bushfire risk management and the risks that could be present at the site. This should also be included in the Construction and Operational Environmental Management Plans.</p> <p>An appreciation of the burning regulations obtained from the NSW Rural Fire Service website is essential http://www.bushfire.nsw.gov.au/dsp_content.cfm?cat_id=1108</p>
	<i>Where</i>	Facilities building or company office.

Risk treatment options and strategies		
Training	<i>How</i>	Brief education session ('tool-box' meeting) presenting this Bushfire Risk Assessment. Print outs from the NSW Rural Fire Service website on understanding fire weather and burning regulations.
	<i>When</i>	Prior to construction and during briefing of new contractors including maintenance contractors.
	<i>What/who</i>	Training construction crew and maintenance staff on basic first response fire fighting techniques including notification of fires and reporting. This training to include the use of 4WD striker unit to be available on site on certain days of higher fire weather, extinguishers, knap-sacks and hoes. Notification and reporting of fires to follow a procedure of notifying site manager and/or 000 immediately and provide a description of the fire location, size, proximity to assets and current access arrangements.
	<i>Where</i>	Facilities building or company office.
	<i>How</i>	Brief education session ('tool-box' meeting).
	<i>When</i>	Prior to construction and during briefing of new contractors including maintenance contractors.
Reduce the consequence		
Fuel reduced zone establishment for transmission lines	<i>What/who</i>	Establish a fuel reduced zone underneath transmission lines in accordance with relevant maintenance standards.
	<i>Where</i>	Underneath external transmission lines.
	<i>How</i>	Zone can be created using mechanical slasher or hand held tools such as a trimmer.
	<i>When</i>	During all phases of the development including future maintenance.
Fuel reduced zone establishment for	<i>What/who</i>	Establish a 10 m fuel reduced zone around construction activities that may result in ignition generation.

Risk treatment options and strategies		
construction activities	<i>Where</i>	Around construction activities that may result in ignition generation.
	<i>How</i>	Zone can be created using mechanical slasher or hand held tools such as a trimmer.
	<i>When</i>	During all phases of the development including future maintenance.
Maintain access roads as proposed	<i>What/who</i>	Maintain access roads to the proposed 6 m wide standard with grades and turning radii allowing the movement of large vehicles.
	<i>Where</i>	All access roads.
	<i>How</i>	Typical road maintenance activities such as grading surface and maintaining drainage controls.
	<i>When</i>	During all phases of the development including future maintenance as required.
Accept the risk		
Suppression and response	<i>What/who</i>	Provide and maintain fire fighting equipment capable of controlling and suppressing small initial outbreaks of fire. Equipment should include, but not necessarily be limited to, 4WD striker with slip-on water unit equipped with diesel pump and hoses, extinguishers, knap sacks, hand tools. Notify fire authorities when fire occurs that cannot be controlled by first response techniques described above.
	<i>Where</i>	Entire site.
	<i>How</i>	Initial response and suppression by construction crew followed by notification of fire authorities (000).
	<i>When</i>	During construction only for fire fighting capability, and all phases for notifying fire authorities.
Transfer the risk		
Insurance review	<i>What/who</i>	Conduct review of insurance policy to ensure relevancy based on the understanding of bushfire risk presented in

Risk treatment options and strategies		
		this assessment.
	<i>Where</i>	Office of land manager or insurance broker.
	<i>How</i>	Review insurance policy.
	<i>When</i>	Prior to construction and could be reviewed again at completion of construction prior to operation and maintenance phases.
Retain the risk		
<i>Evacuation plan and residual risk</i>	<i>What/who</i>	Understand the concept of residual risk described in Section 4.2 below. Execute the 'Bushfire Emergency and Evacuation Plan' prepared by Eco Logical Australia Pty Ltd (April 2009) and appended to the Boco Rock Environmental Assessment.
	<i>Where</i>	Facilities building
	<i>How</i>	Bushfire Emergency and Evacuation Plan to follow 'A Guide to Developing a Bushfire Evacuation Plan' (NSW Rural Fire Service 2004) and meet the requirements of Australian Standards AS 3745-2002 – <i>Emergency control organisation and procedures for buildings, structures and workplaces</i> (Standards Australia 2002).
	<i>When</i>	During all phases of the development including future maintenance.

4.2 RESIDUAL RISK

Residual risk is defined as the bushfire risk that remains after the implementation of bushfire risk treatments. It acknowledges that despite the treatments that are able to be put in place, some bushfire risk will remain and bushfires will continue to threaten assets, at least to some extent.

The concept of residual risk is inherent in most if not all risk plans. For example, there is also no guarantee of 100% life and property protection when applying the NSW standard for new development in bushfire prone areas 'Planning for Bushfire Protection' (NSW Rural Fire Service 2006a). Similarly, there is no guarantee of total 'safety' from the effects of bushfire using the NSW standard for existing developments, 'Bushfire Environmental Assessment Code' (NSW Rural Fire Service 2006b).

A diversity of opinion within the community is inevitable regarding what is an acceptable level of residual bushfire risk. It can be effectively argued that environmental impacts (including socio-economic impacts) will be excessive unless a higher level of residual bushfire risk is accepted, but it is clear that a higher level of residual risk includes a higher risk to life, as well as property.

Providing an acceptable level of protection and a tolerable residual risk, is to some extent a compromise between the level of threat, inconvenience, dangers, and costs (financial and environmental) involved in providing the protection.

Based on standards for existing residential development, this assessment notes residual risk will remain after the execution of the bushfire risk treatments recommended in Table 9.

5 Monitoring and review

All strategies and plans must define mechanisms to allow for recommended actions to occur and to show that progress is being made in dealing with the problem or it is successfully completing the prescribed actions. It is also necessary to determine the effectiveness of the plan and efficiency of individual actions.

Monitoring should occur at both the management level and at the field level. Monitoring and evaluation against the aims and objectives (Section 1.4) is an effective way to monitor the implementation of risk treatments. Recording of details pertaining to achievement of risk treatments, fire occurrence (including ignition source and point, spread and behaviour) and damage sustained to assets is important for continual review and update of objectives and strategies.

An evaluation, review and update of this assessment should occur annually (at the end of each bushfire season after March each year) through the process of updating fire history and other resource data, and adjusting works programs if required. Small changes to the strategies within this report may be made without significant consultation. Matters that require a more significant variation should be discussed amongst the stakeholders prior to implementation. The objectives of a review are to:

- Consider whether the aims and objectives have been achieved;
- Reassess the strategies in light of current research and management best practice;
- Reassess the strategies in light of recorded fire events within or nearby the site; and
- Reassess the strategies taking into account of legislative changes, financial constraints, social philosophies, improvements in bushfire protection and suppression, and changes in vegetation.

6 References

- BFCC (2008.) *NSW Bush Fire Coordinating Committee Bush Fire Risk Management Planning Guidelines.*
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- NSW Rural Fire Service (2006a). *Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities and Developers.* Australian Government Publishing Service, Canberra.
- NSW Rural Fire Service (2006b). *Bush Fire Environmental Assessment Code for New South Wales,* February 2006.
- Snowy Monaro Bushfire Management Committee (2009) *Draft Bushfire Risk Management Plan.*
- Standards Australia (2004) AS/NZS 4360-2004 *Risk Management.*

7 Appendix 1 – Figures 1, 3, and 4

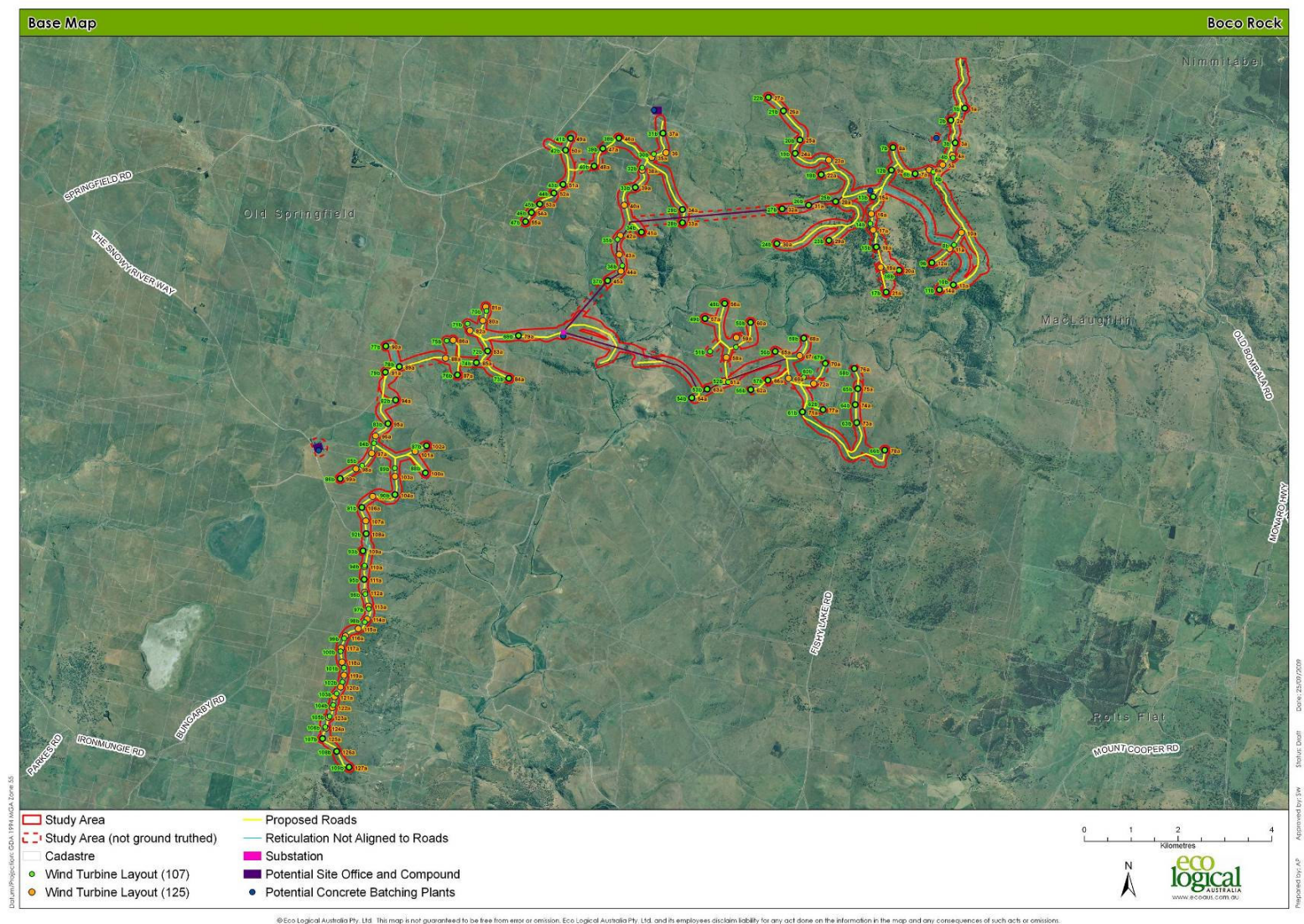


Figure 1: Study Area

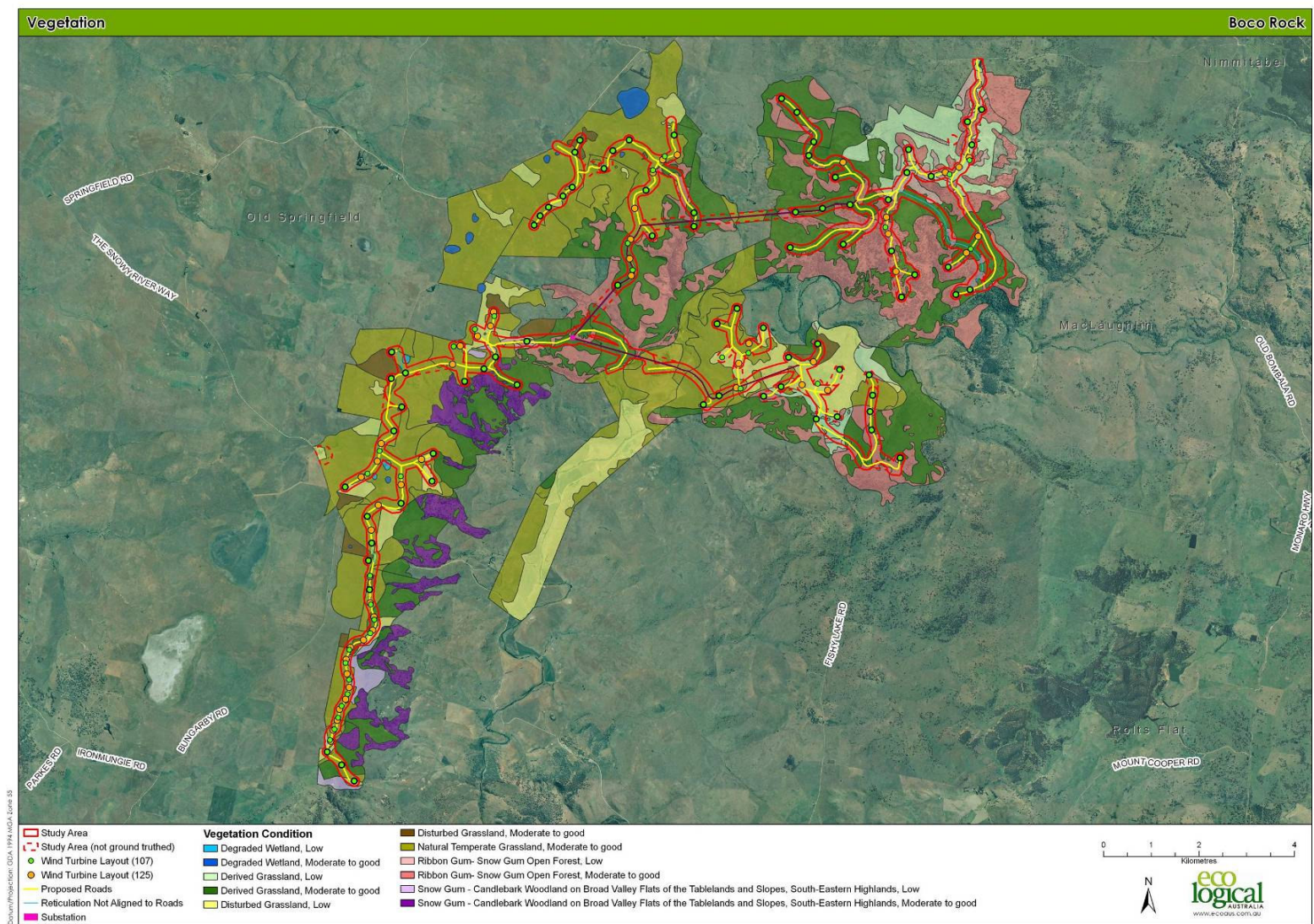


Figure 3: Vegetation

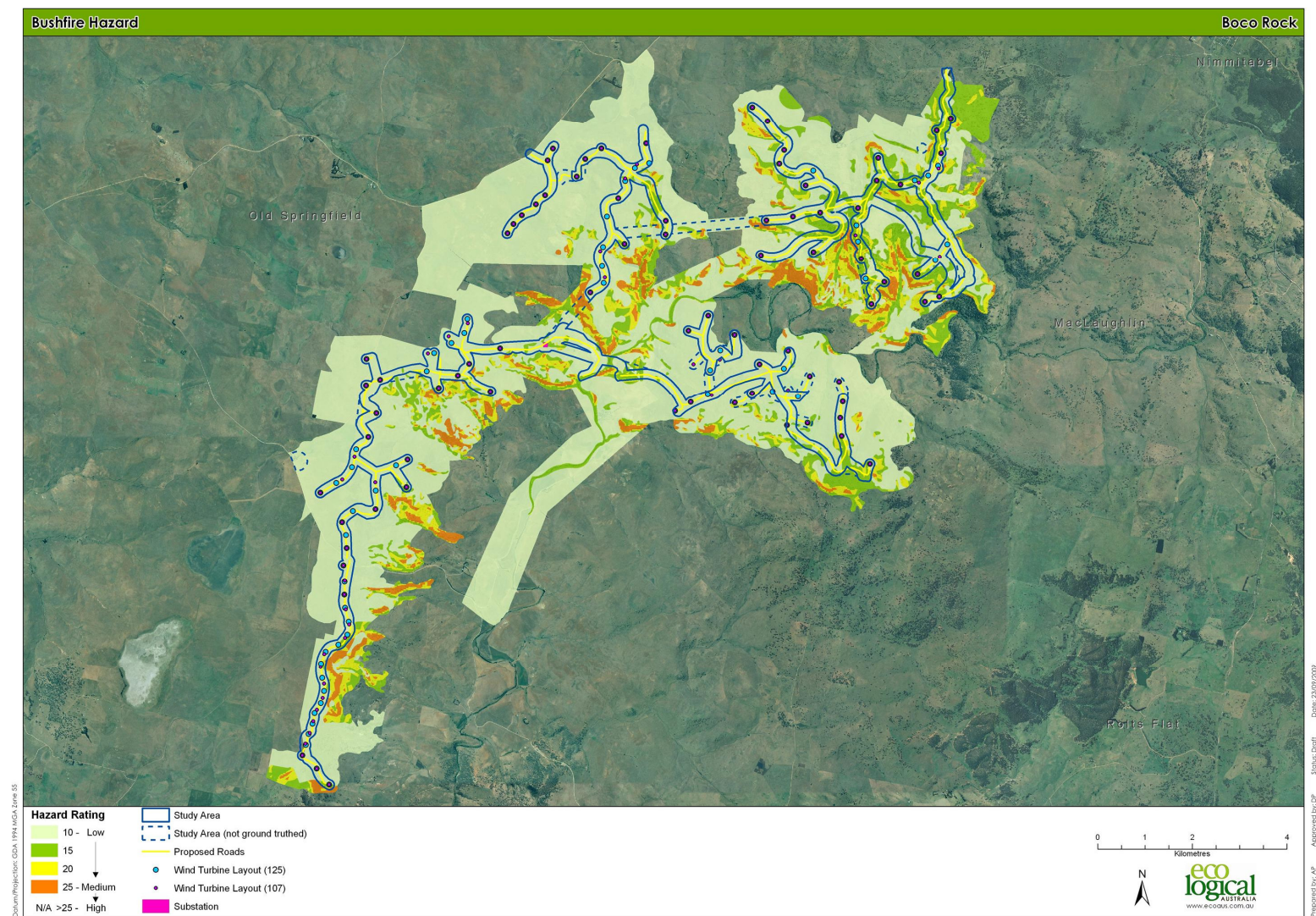


Figure 4: Bushfire Hazard