

Appendix J

Delburn Wind Farm

**Bushfire risk
assessment in support
of wind energy facility
planning application.**

September 2020



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Document Control

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Abbreviations, Acronyms and Definitions

The following abbreviations, acronyms and definitions are used throughout this report:

Abbreviation	Full title
APZ	Asset Protection Zone
Bushfire	A general term used to describe fire in vegetation, including grass fire.
Hazard (Bushfire)	The potential severity of a bushfire, which is determined by fuel load, fuel arrangement and topography under a given climatic condition.
Bushfire risk	The chance of a bushfire igniting, spreading and causing damage to the community or the assets they value.
CFA	Country Fire Authority (Victoria)
CFS	Country Fire Service (South Australia)
Consequence	An outcome or impact of a bushfire event.
DELWP	Department of Environment, Land, Water and Planning
DWF	Delburn Wind Farm
EMV	Emergency Management Victoria
FRC	Fire Risk Consultants Pty Ltd
FRV	Fire Rescue Victoria
FFMVic	Forest Fire Management Victoria
HVP	Hancock Victorian Plantations
Likelihood	The probability of a fire igniting and spreading, and how often this may occur.
MFMP	Municipal Fire Management Plan
MFMPC	Municipal Fire Management Planning Committee
Planning Scheme	The Victorian Planning Provisions
Preparedness	All activities undertaken in advance of the occurrence of an incident to decrease the impact, extent and severity of the incident and to ensure more effective response activities.
Prevention	The elimination or reduction of the incidence or severity of emergencies and the mitigation of their effects.

Abbreviation	Full title
Recovery	The co-ordinated process of supporting emergency affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical wellbeing.
Response	Actions taken in anticipation of, during, and immediately after an incident to ensure that its effects are minimised, and that people affected are given immediate relief and support.
Risk	The exposure to the possibility of such things as economic or financial loss or gain, physical damage, injury or delay, as a consequence of pursuing a particular course of action. The concept of risk has two elements, i.e. the likelihood of something happening and the consequences if it happens.
VFRR	Victorian Fire Risk Register that is managed by CFA and utilised to support the analysis of bushfire risk and treatments within the Municipal Fire Management Plan.

Executive summary

This report provides an assessment of the bushfire risk associated with the proposed Delburn Wind Farm in the context of the Victorian Planning Scheme. The reports aim is to clearly analyse the risk in accordance with the Planning Scheme requirements and to identify how this proposal will meet the various strategies to reduce bushfire risk.

The Planning Scheme requirements include Clauses 13.02-01S – Bushfire Planning, 14.03-01R – Resource Exploration and Extraction – Gippsland Coal Resource, 44.06 – Bushfire Management Overlay and 52.32 – Wind Energy Facility. These strategies also reference other publications that have been considered including CFA Guidelines and Municipal Fire Management Plans.

The proposed Delburn Wind Farm will be located within existing pine plantations. These plantations are at various stages of maturity. Along the gullies within the landscape there is native vegetation present. The area has been exposed to bushfires in the past with the most recent being in 2009 where the southern section of the proposed Wind Farm site was impacted. This bushfire also spread into private land and destroyed numerous houses.

In acknowledgment of the elevated bushfire risk, HVP and other agencies including VicRoads, DELWP and CFA have plans in place that are aimed at implementing treatments relating to prevention, preparedness and response. These plans are integrated through the Municipal Fire Management Plans for the three municipalities that cover this development.

With the introduction of the Wind Farm into the landscape, a range of initiatives have been proposed to reduce the bushfire risk from the development. These initiatives include increased fuel management surrounding the turbines, widened access roads, firefighting water supply located at strategic locations, emergency management planning, staff training and fire detection and suppression systems within the turbines.

Bushfire modelling using the Phoenix system has modelled the impact of the development when compared to the 2009 bushfires. The outcome of this modelling is that at lower fire danger indices, the presence of the Wind Farm development may reduce bushfire spread through the plantations. This is due to the enhanced fuel management and road network that will greatly reduce fire spread and assist in suppression response. At elevated fire danger conditions, very little change in the model is seen when the Wind Farm development is included. Consequently, at elevated fire danger conditions the presence of the wind farm will neither improve or worsen the fire risk.

Following the detailed analysis against the relevant Victorian Planning Scheme provisions, our analysis has indicated that the Delburn Wind Farm development does not increase the bushfire risk in the landscape if recommendations during the distinct phases of development, construction and operation are implemented.

1 Introduction

1.1 Site context

The site for the Delburn Wind Farm is within the existing Plantation operated by HVP. The Wind Farm will largely be located across the ridgeline of the Strzelecki Ranges leading from Mirboo North to the Latrobe Valley.

The area is considered a high to very high risk from bushfire. The area has experienced bushfires in the past with the most notable being in 2009 where a large part of the Plantation was destroyed. The area is also subject to criminal activity through vehicle dumping and arson attacks. This increased ignition risk has resulted in a strong initial response capability through a network of firefighting vehicles and firefighters with CFA, HVP, Parks Victoria and DELWP.

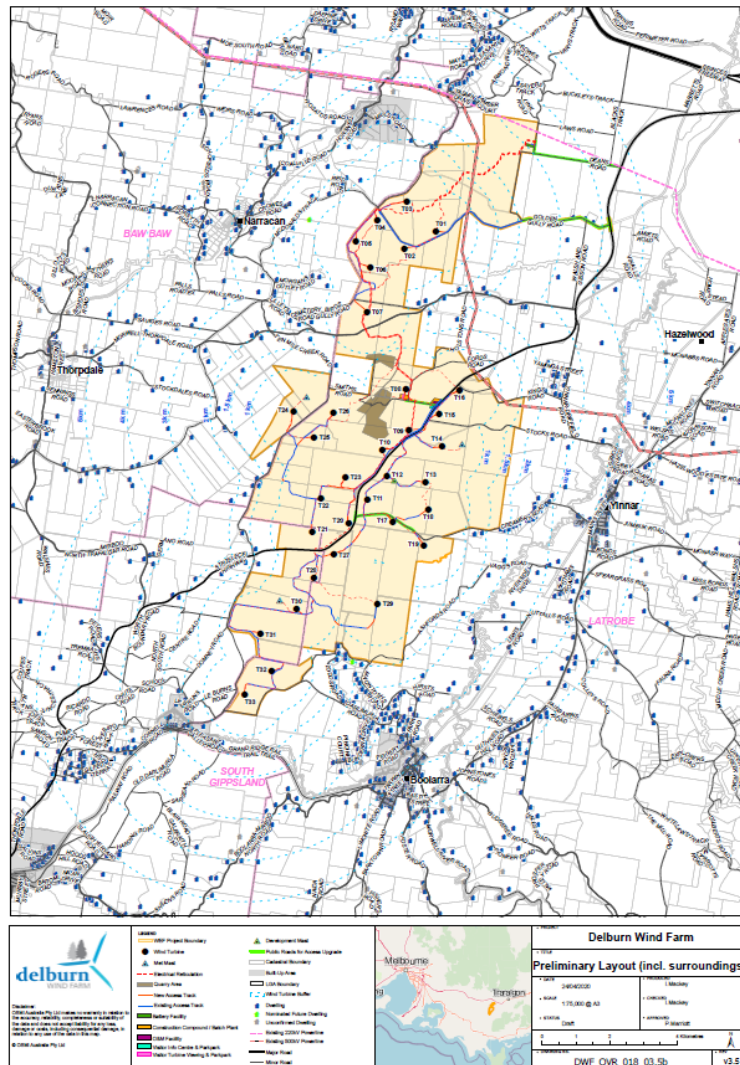


Figure 1 - Delburn Wind Farm preliminary layout

2 Victorian planning and building policy framework

The Planning Schemes across Latrobe, Baw Baw and South Gippsland municipalities recognise the risk from bushfire. In particular, Clause 13.02-1S is the key driver to strategically assess bushfire risk. Other sections of the Planning Scheme also require the consideration of bushfire risk.

2.1 Clause 13.02-1S – Bushfire Planning

The State Government has introduced into all Planning Schemes Clause 13.02 which is aimed at strengthening the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life.

The overarching strategies of Clause 13.02-1S are:

- Give priority to the protection of human life by:
 - Prioritising the protection of human life over all other policy considerations.
 - Directing population growth and development to low risk locations and ensuring the availability of, and safe access to, areas where human life can be better protected from the effects of bushfire.
 - Reducing the vulnerability of communities to bushfire through the consideration of bushfire risk in decision making at all stages of the planning process.

When considering bushfire matters in context of planning, it is Clause 13.02, sitting within the Victorian Planning Provisions, that directs municipalities to consider 'bushfire' irrespective as to whether the land is currently affected by a Bushfire Management Overlay. Further, it directs a considered approach to bushfire hazard identification and assessment.

To demonstrate that clause 13.02 has been considered, a bushfire hazard assessment has been undertaken and the 'Settlement Planning' objectives have been addressed in this report. It should be noted that the likely bushfire scenarios are also included in the sections relating to the Phoenix Rapidfire analysis.

2.1.1 Bushfire hazard assessment

The Bushfire Hazard Assessment is a key component of assessing risk as outlined within Clause 13.02 of the Latrobe Planning Scheme. The requirements outline the need to consider and assess the bushfire hazard on the basis of:

- Landscape conditions (20 kilometres)
- Local conditions (1 kilometre)
- Neighbourhood conditions (400 metres)
- The site for the development

As the development is in an existing pine plantation, the hazard assessment, following a detailed analysis has resulted in a similar outcome for the local conditions, neighbourhood conditions and the site for the development. Due to the nature of the landscape surrounding the proposed DWF and based

on past fire history, the likely scenarios include fires travelling through the plantations. The age of the plantation will influence the intensity of the bushfire.

Clause 13.02 of the Latrobe Planning Scheme identifies the objectives that are required to be achieved to strengthen the resilience of settlements and communities and prioritise protection of human life.

This policy must be applied to all planning and decision making under the Planning & Environment Act 1987 relating to land that is:

- Within a designated Bushfire Prone Area
- Subject to a Bushfire Management Overlay
- Proposed to be used or developed in a way that may create a bushfire hazard

The entire DWF development is within a Bushfire Prone Area and Bushfire Management Overlay and the proposal must be assessed against this planning clause. Whilst the DWF proposed development does not introduce new settlements into the landscape, it is important to consider whether the Wind Farm poses an additional bushfire risk, given settlements surround the site.

2.2 Integrated planning and building framework

Within the State of Victoria, the management of bushfire risk through the planning and building systems is integrated¹. Figure 2 outlines the integrated model. The entire Delburn Wind Farm is located within a Bushfire Management Overlay and Bushfire prone Area.

This model indicates for the Wind Farm development that due to the area being covered by a Bushfire Management Overlay and Bushfire Prone Area, those areas that are required to, must comply with these controls.

¹ https://www.planning.vic.gov.au/_data/assets/pdf_file/0027/5499/BPA-Mapping-Criteria.pdf

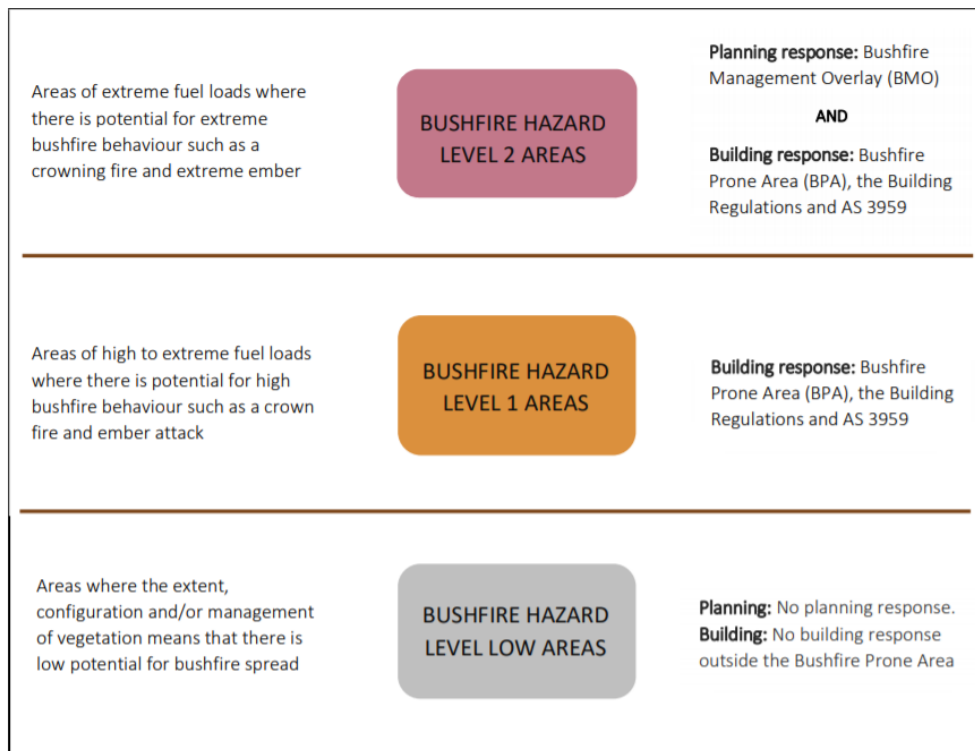


Figure 2 - Integrated planning and building framework

2.3 Clause 44.06 – Bushfire Management Overlay

The purpose of the Bushfire Management Overlay (BMO) is:

- To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To ensure that the development of land prioritises the protection of human life and strengthens community resilience to bushfire.
- To identify areas where the bushfire hazard warrants bushfire protection measures to be implemented.
- To ensure development is only permitted where the risk to life and property from bushfire can be reduced to an acceptable level.

As the BMO is largely aimed at protecting people and the Wind Farm will predominately not have anyone on site, it is debatable that the BMO needs to be addressed in a permit application for a Wind Farm. However, an operations and maintenance facility and visitor area are proposed and consequently will be assessed in accordance with the BMO.

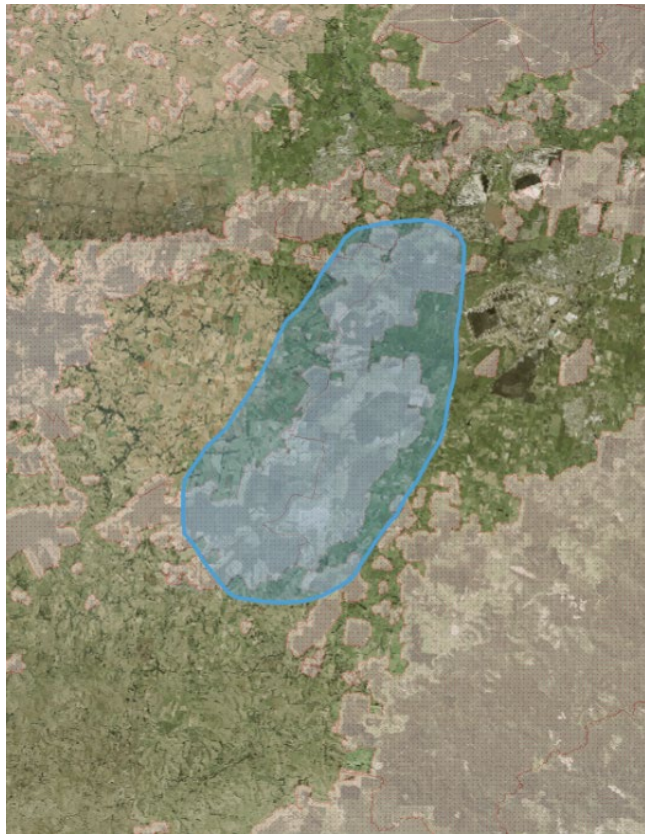


Figure 3 - BMO in pink shading with the DWF outlined in blue (approximate)

2.4 Bushfire Prone Area

Bushfire Prone Areas are areas that are subject to or likely to be subject to bushfires. The Minister for Planning has determined that specific areas are designated Bushfire Prone Areas for the purposes of the building control system.

The entire Delburn Wind Farm development is located within the Bushfire Prone Area.

2.5 Other development controls relating to bushfire risk

2.5.1 Clause 52.32 – Wind Energy Facility

Clause 52.32 is within the Latrobe, South Gippsland and Baw Baw Planning Schemes. The purpose of Clause 52.32 is to facilitate the establishment and expansion of wind energy facilities, in appropriate locations, with minimal impact on the amenity of the area.

The requirements of this clause in the context of bushfire risk is to analyse the site and to then consider if bushfire risk should be part of the analysis.

Due to the Delburn Wind Farm being located within a Bushfire Prone area, the assessment of bushfire risk is required by Clause 13.02-1S.

Clause 52.32-6 'Wind energy facility' decision guidelines also requires consideration of the impact of the facility on aircraft safety. In relation to aircraft associated with bushfire suppression activities and reconnaissance, this report outlines the low impact on the ability to undertake fire suppression activities around wind turbines. This is supported by a number of fire service guidelines and protocols.

2.5.2 Clause 21.04 – Environmental Risks (Latrobe Planning Scheme)

Clause 21.04 of the Latrobe Planning Scheme recognises the impact of climate change within the municipality and how this may affect the future. In relation to bushfires, the clause states that there is a likely increase in the frequency and severity of days of elevated fire danger.

Clause 21.04-12 states:

Like many local government areas in Victoria, large areas of the municipality are prone to bushfire. The highest risk areas, where bushfire behaviour may be extreme, including the possibility of crown fire, extreme ember attack and significant radiant heat, are subject to the Bushfire Management Overlay. High hazard areas include rural residential areas in the vicinity of the foothills of the Strzelecki Ranges and southern fall of the Alpine Ranges, where development could be exposed to long bushfire runs through high fuel hazard forest vegetation.

Grassland fires, and fires in bushland reserves and plantations, also pose a risk to development across the municipality.

Bushfire risk may be reduced through the planning and building system by ensuring statutory compliance in BMO areas, compliance with the building regulations in Bushfire Prone Areas (BPA) outside of the BMO, and, for strategic planning and larger or more vulnerable developments; requiring consideration of bushfire risk as at Clause 13.02 Bushfire.

Latrobe City Municipal Fire Management Plan 2017 – 2020 (MFMP) outlines the planned and coordinated implementation of measures undertaken by all agencies to minimise the occurrence and mitigate the effect of fire in Latrobe City. The MFMP will play an increasingly important role in land use planning, particularly where consideration of continued land management is necessary.

It is important that all development and use of land have regard to the level of bushfire risk and whether the risk can be reduced to an acceptable level via appropriate bushfire protection measures. Planning can assist to decrease the level of risk to life and property and biodiversity and to facilitate the efforts of emergency service in the event of fire.

The planning strategies within this clause are:

- Ensure the design, siting and layout of subdivision increases protection from fire.
- Require that use and development includes adequate fire protection measures.
- Ensure the application of, and compliance with, the Bushfire Management Overlay (BMO), in highest risk parts of the municipality.
- Outside of the BMO, in Bushfire Prone Areas (BPA) parts of the municipality:
 - Ensure new development and uses are appropriately located and designed in response to the bushfire hazard.

- Ensure that larger or more vulnerable developments and uses as identified at Clause 13.02, incorporate measures to acceptably mitigate any identified bushfire risk, including as appropriate:
 - Assessment of the landscape risk;
 - For subdivisions of more than 10 lots, a lot layout that responds to the risk and incorporates a perimeter road and two ways in and out of the development where possible;
 - A construction standard no higher than BAL-29 unless there are significant siting constraints, with commensurate vegetation management for defensible space;
 - A reliable water supply for property protection and firefighting;
 - Adequate access for emergency management vehicles; and
 - Development of a Bushfire Emergency Management Plan (BEMP) as appropriate, including triggers for closure or restricted operation on days of elevated fire danger.
- Ensure alignment of, and consistency between, planning policy and practices, and the Latrobe City Municipal Fire Management Plan.

2.5.3 Clause 14.03 – 1R – Resource Exploration and Extraction – Gippsland Coal Resource

Clause 14.03-1R outlines the importance of protecting coal resource areas and coal buffers. These areas are outlined within the Gippsland Coalfields Policy Area map which is included within the Policy.

In relation to fire, the Policy states within the coal resource policy guidelines section that amongst a range of guiding statements, the ‘protection of the coal resource area from fire’ is a consideration. This applies to parts of the Delburn Wind Farm development.

The assessment of this development against Clause 13.02 also addresses this policy guideline. This has been achieved through the assessment of fire risk both within the development and the surrounding communities.

2.6 Referenced documents

2.6.1 Policy and Planning Guidelines – Development of wind energy facilities in Victoria (DELWP)

These guidelines outline the planning process to introduce a Wind Farm within Victoria. The guidelines in relation to bushfires identify the need to consider the risk of bushfire. This is consistent with Clause 52.32 and 13.02-1S.

2.6.2 CFA Renewable Energy Guidelines

CFA has recently updated its publication Guidelines for Renewable Energy Installations (February 2019) to provide details about standard measures and processes in relation to fire safety, risk and emergency management that should be considered when designing, constructing and operating new renewable energy facilities, and upgrading existing facilities.

Renewable energy facilities that support the generation of electricity in Victoria include Wind Farms, solar farms, and battery storage facilities. The principles described may also apply to upcoming renewable technologies such as geothermal plants and landfill gas/biogas.

The Guidelines acknowledge that the majority of the Wind Farm developments to date have been located in agricultural areas containing grassland.

This document surpasses CFA's Emergency Management Guidelines for Wind Farms which, although containing relevant information regarding Wind Farms, was written in 2009 and is now outdated.

2.6.3 Latrobe Municipal Fire Management Plan

The Latrobe Municipal Fire Management Plan (MFMP) identifies the bushfire risk associated with the Plantations across the municipality as Very High. It states that there is a history of asset losses associated with fires in plantations as a result of arson and other ignition sources. It also identifies the potential impact on adjoining land.

The Victorian Fire Risk Register has been utilised to assess the risk from bushfire within the municipality along with identifying treatments. The outcome of this assessment for the Plantations is a residual risk of Very High.

2.6.4 South Gippsland Fire Management Plan

The South Gippsland MFMP identifies Plantations as a bushfire risk. The Plan has not assessed the residual risk for this category and identifies the raw risk rating as extreme. It does outline treatments including fuel hazard management, water supplies, fire access roads and ignition management.

2.6.5 Baw Baw Municipal Fire Management Plan

The Baw Baw Municipal Fire Management Plan identifies the bushfire risk associated with the Plantations across the municipality. The MFMP rates the plantations as having a residual risk of High. The treatments for this risk include water supply, fuel hazard management, ignition management and emergency management planning.

2.7 Other guiding documents

2.7.1 AFAC position

Australasian Fire and Emergency Services Authorities Council (AFAC) has produced a position paper for Wind Farms and Bushfire Operations (2014). The paper states the position of AFAC member agencies towards Wind Farms and their development. The scope of the paper is limited to the issues relating to planning for bushfire prevention, preparedness, response and to recovery operations in and around existing and planned Wind Farms.

The AFAC guidelines indicate:

- Wind Farms are not expected to adversely affect fire behaviour in their vicinity. Local wind speeds and direction are already highly variable across landscapes affected by turbulence from ridge lines, tall trees and buildings.

- Wind Farms can interfere with local and regional radio transmissions by physical obstruction and radio frequency electromagnetic radiation. Any interference can be minimised or eliminated through appropriate turbine siting at the planning stage and by moving away from the tower if experiencing local interference during operations.
- Wind Farms are an infrastructure development that must be considered in the preparation of Incident Action Plans for the suppression of bushfires in their vicinity. These considerations are routine and Wind Farms are not expected to present elevated risks to operations compared to other electrical infrastructure.

2.7.2 HVP fire management

HVP fire crews are part of the Country Fire Authority (CFA) being registered as a CFA Forest Industry Brigade (FIB). This registration is outlined within the Country Fire Authority Act 1958, section 23AA. As active members of the CFA, fire crews are trained in bushfire control and work alongside fire agencies during prevention, preparedness and suppression activities. HVP undertakes a range of prevention measures to protect its assets from fire including a network of firebreaks and fuel management programs.

HVP prepare, train and work together with the community, CFA and DELWP during fire season. Most fires HVP attends start outside the plantation boundary. HVP work closely with neighbouring land owners on fire breaks and fuel reduction activities around common boundaries.

HVP has developed fire protection guidelines for its operations which exceed those required under current CFA legislation. The guidelines aim to reduce the incidence and severity of fires. They include a series of stepped operational restrictions that take into consideration Forest Fire Danger Index and other local risk factors for any particular day at each specific plantation location.

2.7.3 AS 3745 – 2010 ‘Planning for emergencies in facilities’

The scope of the AS 3745 Standard is to outline the minimum requirements for the establishment, validation and implementation of an emergency plan for a facility to provide for the safety of occupants of that facility and its visitors.

The Standard provides a definition of a ‘facility’ as a building, structure or workplace that is, or may be occupied by people.

This Standard will be used to guide the development of the Bushfire Response Plan and other emergency related documents to ensure the safety of workers and visitors.

3 Existing bushfire conditions hazard assessment

3.1 Bushfire history

There are reports of fires in the area in 1898, in the 1920s and in 1944, but the most recent devastating fire in 2009 just prior to Black Saturday is still remembered by the local community. In January 2009 the Delburn fire burnt 6534 hectares and destroyed 44 houses primarily in and around Boolarra. Sixty percent of the area burnt was commercial plantations managed by HVP.

The fire impacted part of the proposed development area causing significant plantation loss. The fires burned mainly between 28th January and 3rd February, being at their most destructive on 30th of January. Of note is the fact that the peak FFDI was only 63 at 1630hrs on the 30th of January (Source: BOM records for Latrobe Valley) which was significantly less than experienced on Black Saturday. Worse fires are theoretically possible, and this is reflected in the Phoenix modelling.

Figures 4 and 5 show the February 2009 imagery, house and structure loss locations, the proposed tower locations, plantation area and public land.

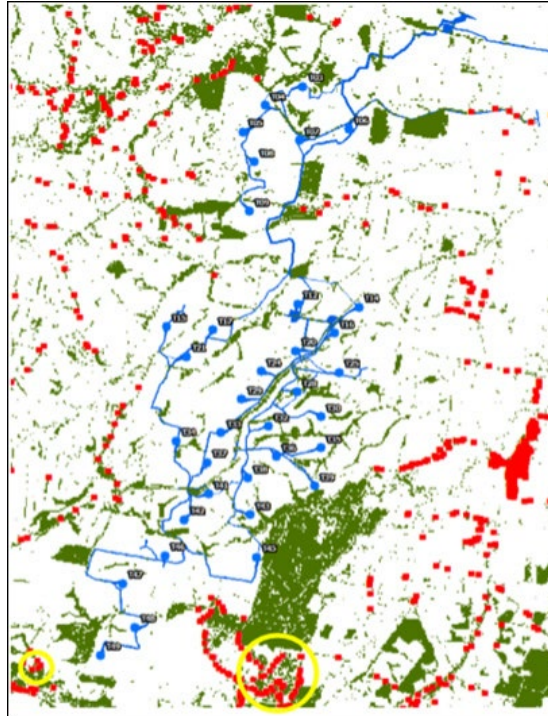


Figure 4 - Native forest fuels (green) are predominantly in private ownership and often contain many dwellings (red squares). The yellow circles highlight the areas where many houses were impacted in 2009.

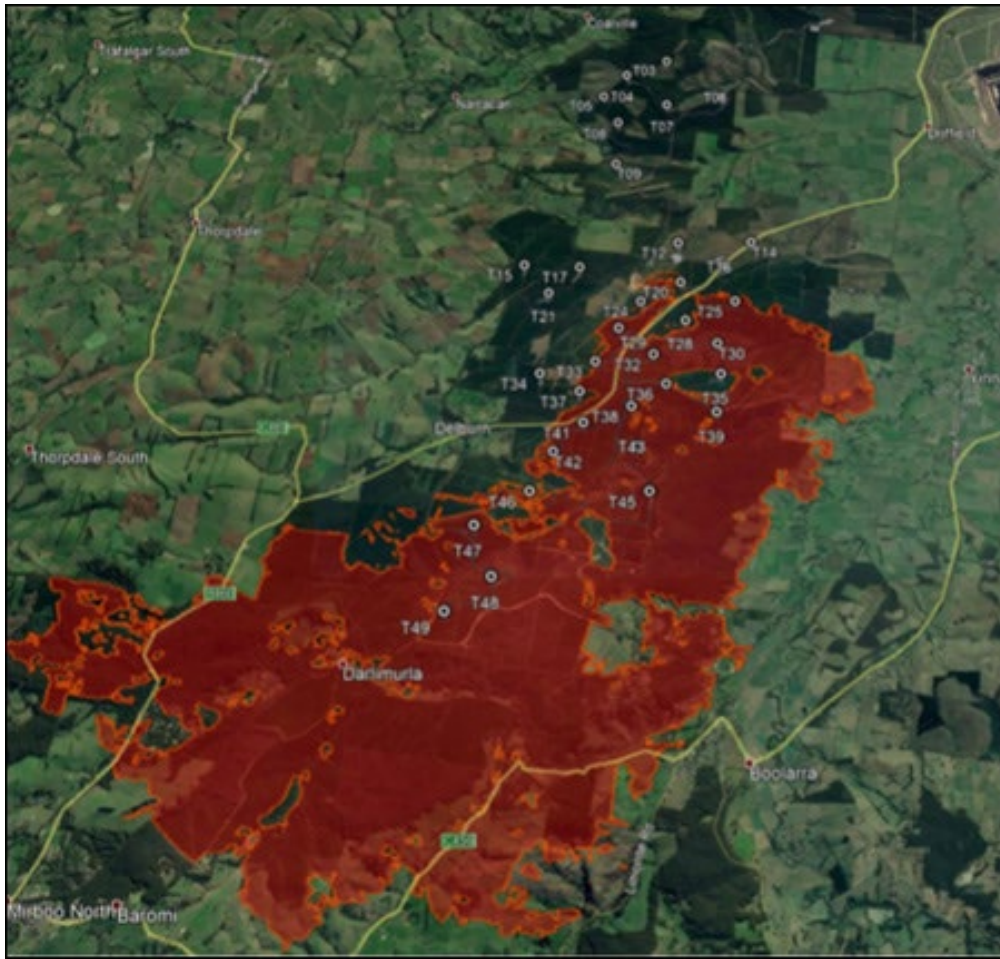


Figure 5 - Area burnt in 2009 Delburn fire and proposed DWF wind turbine locations

An examination has been made of the location of house and structure loss following the bushfire. This fire resulted from multiple arson ignitions and destroyed 44 houses.

Most house losses occurred when the fire moved to the east on the afternoon of the 30th of January. At Latrobe Valley Airport the temperature was 44c, RH 10% and the wind speed 20 gusting to 30km/h. There were many spot fires recorded ahead of the main fire which is expected within this type of landscape and vegetation.

3.2 Bushfire risk factors

Bushfire risk can be influenced by a range of risk factors. Each of these risk factors are outlined below. To determine the level of bushfire risk, it is an amalgamation of the risk factors that determine the overarching level of risk.

3.2.1 Access and egress

Infrastructure such as roads and tracks increase the speed of a fire response, allowing firefighters to suppress a fire safely and effectively before it reaches maximum intensity and flame height. A road and

track network can also act as boundaries for planned burns and to create a defensible space near assets, from which firefighters can work to protect these assets.

An effective road and track network can:

- Improve bushfire response times, which increases the likelihood of bushfires being suppressed in minimal time and to a minimal area
- Improve firefighter safety, by providing a safe area from which firefighters can prepare for and fight bushfires
- Provide greater protection for assets
- Improve the speed of evacuation of the area, if required.

An important factor in assessing locations, is the ability for the community/workers to leave an area safely but also for emergency service agencies to access a site safely.

Considerations for access and egress in relation to a location includes the following:

- Is more than one option available for access/egress from a location available?
- Are the access/egress corridors free from vegetation that may generate fire activity along these corridors?
- Are there large trees present along the roadsides that in the event of high winds or fire activity fall onto the roadway and impede access/egress?
- Is the road listed as a strategic firebreak within the MFMP in either the primary or secondary category?

The road network throughout the HVP Plantations is seen as effective and provides good access to most areas of the Plantations. In most locations, there is more than one option available. This aligned with the wider road network provides the ability to access all areas of the development.

A number of roads across the proposed development footprint have been identified as strategic fire breaks within HVP, local government and agency plans, and these have the ability to influence the effectiveness of access and egress across the development. Providing these are maintained in accordance with firebreak specifications, they can be considered as supporting access and egress from a location.

The Delburn Wind Farm proposal will increase the width of a number of roads in the area to initially support the movement of equipment into the plantation. At the completion of the construction works, these will be maintained by Delburn Wind Farm Pty Ltd.

3.2.2 Topography

The natural environment of the Latrobe City, South Gippsland and Baw Baw municipalities is diverse, containing varying topography ranging from steep, almost inaccessible hills of the Jeeralangs and Strzelecki Ranges to the flat plains of the Latrobe Valley, some of which is classified as flood plain.

The proposed Delburn Wind Farm development is located along the ridge line of the Strzelecki Ranges. The proposed turbine locations are all considered accessible and have been chosen with the aim of enabling trucks and other vehicles to access the sites for construction purposes. This equipment is larger

and requires more space than firefighting vehicles. Therefore, the road network can be considered suitable for firefighting appliances to access and egress from the Plantation.

3.2.3 Vegetation

AS 3959:2018 'Construction of buildings in bushfire prone areas' allows for all bushfire fuel present in Australia to be classified into one of seven fuel types. Bushfire fuel is classified based on the type, structure, height and the dominant species present.

These are:

- Type A Forest
- Type B Woodland
- Type C Shrubland
- Type D Scrub
- Type E Mallee / Mulga
- Type F Rainforest
- Type G Grassland

The area has extensive blue-gum and pine plantations with native vegetation dominating the gullies and other locations across the Plantation asset. Bushfire fuel present within the proposed development site can be classified as Type A Forest. The surrounding farmland can be classified as Type G Grassland.

HVP is transitioning away from hardwood to softwood plantation, and as such all new plantings are softwood (*Pinus radiata*). Older eucalypt plantations (blue gum) have a greater spotting potential (up to 30km on code red days) than pine plantations which have a maximum of around 1km. The transition of the plantations to pine will reduce this spotting potential. This is due to the nature of the bark as pine has heavy, rough and well attached bark, whereas many eucalypts have ribbony loosely attached bark which can lead to long, medium and short distance spotting. Figure 6 outlines the plantation age and type that existed across the plantation in June 2018.

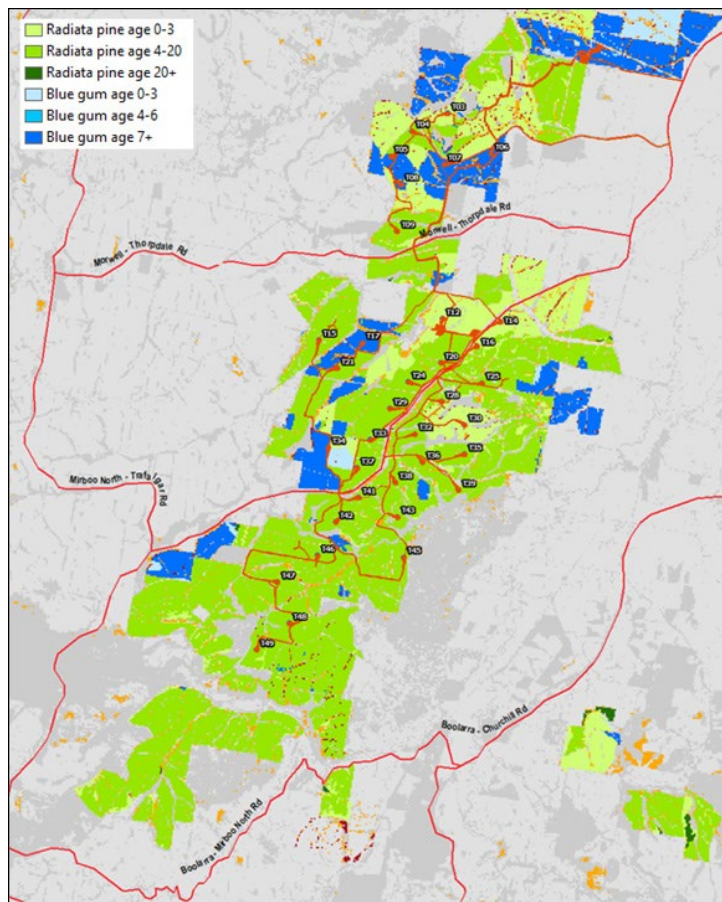


Figure 6 - Plantation age class as of June 2018, incorporating softwood and hardwood plantations

Native eucalypt forest is present within the plantations primarily along gullies. This fuel is often not treatable by planned burning but burns readily under extreme bushfire conditions. In lower bushfire conditions, riparian areas² do not tend to support bushfire behaviour due to the increased moisture content of the fuel and the protection from the wind that the landscape provides. Fires in native eucalypt forest can spread the fire into adjoining areas by embers starting spot fires.

In Plantations the Fire threat changes as the plantation type is altered, silvicultural operations occur (planting, thinning, harvesting), or as the forest grows and matures. Young eucalypt fuel loads vary depending on if there is a scrub or grassy understorey. Sites that were previously farmland tend to have less fuels, whereas areas that were native forest have much higher fuel loads. After about 6 years of age the eucalypt plantation develops high levels of ribbony bark which leads to greater spotting potential.

Pine is generally most flammable between the ages of 4 – 20 years with crown fires being common at Forest Fire Danger Indexes (FFDIs) greater than around 30. After this, with ages reaching around 20 the

² Country Fire Authority (2017) Riparian land and bushfire. Resource document. Version 2. Report prepared by obliqua pty ltd for the Country Fire Authority and Department of Environment, Land, Water and Planning. CFA, East Burwood, Victoria.

ladder (or connecting) fuels are not present and ground fires are more common at lower FFDI. Crown fires can occur above FFDI 50-60 and become increasingly likely as FFDIs increase. Young plantation or mechanically fuel modified plantation has generally lower fire intensities and is readily accessible by direct attack dozers constructing fire lines or aerial attack.

All forest fuels are capable of extraordinary fire behaviour when there are conducive weather conditions and fuel arrangement. Pine plantations are no exception. In 1983 in south eastern Australia flame heights of nearly 200m metres were observed (Sutton, 1984) in 15 year old pine plantation. These were calculated by the RAAF using the oblique photograph in Figure 7.



Figure 7 - Column of flame 200m high observed in the 1983 Ash Wednesday fire near Furner, South Australia.
Note that this was an intermittent burst of energy and not the norm of that fire.

Large tornado like fire storms have also occurred in plantations (Pierces Creek/Uriarra ACT in 2003 and at Mt Muirhead South Australia 1983). The coalescing of spot fires has resulted in large areas igniting simultaneously and generating tornado strength winds which snapped mature pine trees. Researchers in the ACT suggest that the tornado moved at 30km/h and was 0.5km wide.

Similar fire tornados have also been observed in native forest in the 2003 Pierces Creek/Uriarra fire. For our analysis plantation fuels are mapped as of June 2018. Much of the area is replanted pine following the 2009 fires and native forest is assumed to be at the levels pre 2009. This is slightly higher than current levels, but regrowth levels are approaching those of pre 2009. Much of the native forest fuels are located on private land.

Fires under catastrophic conditions burn freely but only occur rarely. These examples illustrate that although this type of fire behaviour is possible within plantations the occurrence is fortunately infrequent. A fire burning under catastrophic conditions would have a detrimental effect on the Wind Farm infrastructure and operation.

3.2.4 Fire prevention

The Municipal Fire Management Plans outline the responsibility for fire prevention within the municipalities. Each MFMP includes a works plan and acknowledges the range of fire management plans

that are in place. These plans relate to the management of bushfire risk through mitigation programs, community education activities and the bushfire response arrangements.

The Plantations managed by HVP have fire protection plans in place along with neighboring landowners including DEWLP, Parks Victoria, Municipalities, VicRoads all have plans in place to manage the risk from bushfire. Other agencies including CFA have an oversight responsibility and support the management of bushfire risk on private land.

3.2.5 Surrounding land use

The land proposed for the Delburn Wind Farm is used for both hardwood and softwood plantation. The majority of plantation resources in the area are managed as large-scale industrial plantations. It is surrounded in some areas of native forest and rolling farmland. Rural land is used mainly for dairy, beef, potatoes and general farming.

In many areas of Victoria, the highest fire risk is from the north-west, and south-west. Figure 8 highlights that the intensive irrigated agricultural area centered around Thorpdale remains largely non-flammable even in dry years. This provides a large buffer to the possible external fire threat. Ignitions likely to threaten the plantation and development are thus more likely to come from within the plantation or immediately adjacent (for example Mirboo North, Coalville, Hernes Oak and Darlimurla).



Figure 8 - Landsat false colour image from 22nd February 2014

3.2.6 Firefighting capability

CFA and FRV have a number of fire brigades located in the Latrobe Valley. Figure 9 shows the location of the fire stations in relation to the general outline of the DWF. In a number of these locations, there are multiple firefighting vehicles available. In every fire station there would be at least one appliance that has been designed to respond to bushfires.

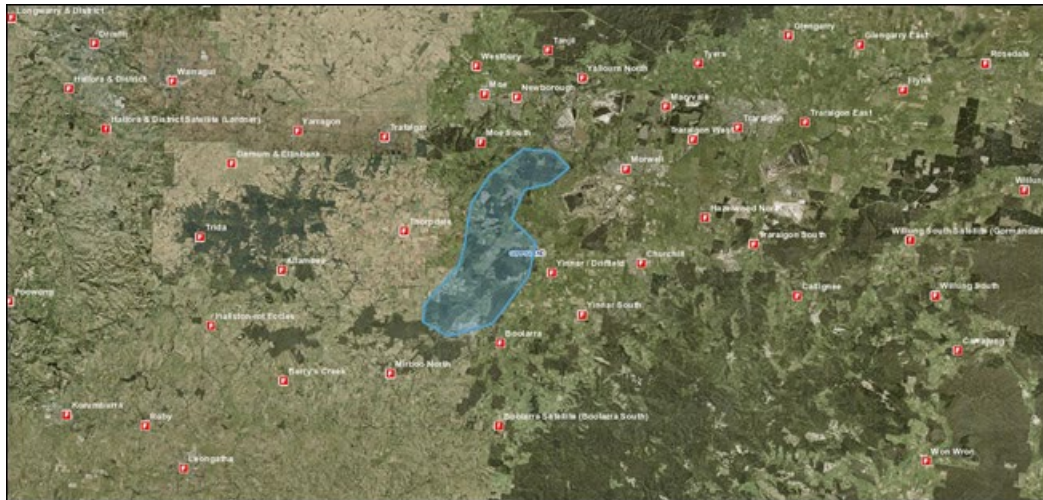


Figure 9 - CFA fire brigades within the general area of the DWF outlined in blue

HVP Plantations Gippsland Forest Industry Brigade comprises over 100 employees and contractors. The firefighting resources will enable quick response to reports of bushfires in the Latrobe Valley. The majority of bushfires that start on low fire hazard days are suppressed easily. On high risk days, if first attack is not possible by firefighting resources then it is likely for a bushfire to escalate to being uncontrollable in a short period of time.

The fire agencies also operate aircraft across Gippsland including the Latrobe Valley. The aircraft based at Latrobe Valley operate under a predetermined dispatch arrangement where they are automatically dispatched to reports of fires when certain protocols are met.

The AFAC guideline³ relating to Wind Farms notes the following precautions that need to be taken with firebombing:

- Wind monitoring towers associated with Wind Farm investigations and planning can be very much taller than the planned turbines and can be less visible. The location and height of monitoring towers should be noted during aerial firefighting operations.
- Aerial firefighting operations will treat the turbine towers similar to other tall obstacles. Pilots and Air Operations Managers will assess these risks as part of routine procedures. Risks due to wake turbulence and the moving blades should also be considered. Wind turbines are not expected to pose unacceptable risks.

The South Australian Country Fire Service (CFS) Guidelines for Wind Farms⁴ supports the use of fire bombing, subject to a risk assessment, and as part of an integrated plan to support ground resources.

³ Australasian Fire and Emergency Service Authorities Council 2018, Wind Farms and Bushfire Operations (AFAC Publication No. 2053), AFAC, Melbourne, Australia.

⁴ <https://www.nwfc.gov.au/sites/default/files/cfs-guidelines-wind-farms.pdf?v=1484179504>

Waterloo Wind Farm in South Australia’s Gilbert Valley region (January 2017) was approached by a grass fire that started about a half a kilometre west and burned to the top of the ridge where the wind turbines are. The turbines were paused by the Wind Farm operators and the water bombing aircraft flew wherever they were needed, sometimes between the turbines. This may have been the first bushfire in Australia at a Wind Farm where firebombing aircraft were used.

The Wind Farm operators made some learnings regarding fire preparedness, including:

- Practicing communications practices advising state air-desk (who control aerial firefighting assets)
- On site asset management/operations centre control procedures to pause, brake and ‘lock’ individual turbines
- Best practice approaches to support aerial and ground based responses
- Water storage point signage, access track markings and site mapping.

A more recent fire at the Waubra Wind Farm in Western Victoria on Friday 19th January 2018 is another example of how integrated aerial firebombing within the Wind Farm environment worked effectively with ground resources to halt the spread of fire. Twelve aircraft and 24 firefighting vehicles worked to control the 42 hectare fire over 2 hours.

3.3 Landscape assessment

Clause 13.02-1S of the Victorian Planning Scheme requires the identification of bushfire scenarios and the assessment of landscape conditions that may influence bushfire behaviour. As this development encompasses a large geographical area, the assessment of the bushfire hazards has been assessed at 20 and one kilometre.

Bushfire hazard type	Description	Likely scenario/s	Considerations
Landscape conditions	<p>The landscape hazard up to 20 kilometres from the DWF indicates significant areas of plantation.</p> <p>There are tracts of grassland that is primarily farmland. The farmland to the west of the development is irrigated.</p> <p>Refer to Figure 11 for further detail.</p>	<p>The likely scenario when assessing the hazard up to 20 kilometres from the DWF sites, is fires burning through grassland. There are some areas to the south of the development where the plantation vegetation connects to forest on private and public land. This could see a bushfire burning under a south westerly influence entering the plantation landscape.</p>	<ul style="list-style-type: none"> • Maintenance of perimeter fuel breaks. • Early identification of fire ignitions • Engagement with MFMPCs to ensure fuel management treatments on surrounding land including roadsides are implemented and maintained.

Local conditions	<p>The conditions within 1 kilometre of the site is primarily plantations.</p> <p>Refer to Figure 10 for further detail.</p>	<p>The likely scenario is a bushfire starting in the plantation estate and travelling towards the turbine towers.</p>	<ul style="list-style-type: none"> • Establish effective road access that also serve as fuel breaks. • Early identification of fire ignitions • Eliminate unnecessary activity on high risk days including hot work.
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3.4 Bushfire scenarios

The bushfire scenarios for the development site identifies the influence of the north westerly and subsequent south westerly wind change as the key risk factors. Whilst it is acknowledged through the assessment of bushfire history, that it is likely for a bushfire to start within the Plantations or immediately surrounding it. The assessment of bushfires impacting from outside the development area is an important consideration.

In both the one and 20 kilometre assessments, due to the connection between the development and the Strzelecki Ranges to the south west, there is the potential for a bushfire to travel long distances before it impacts on the development area.

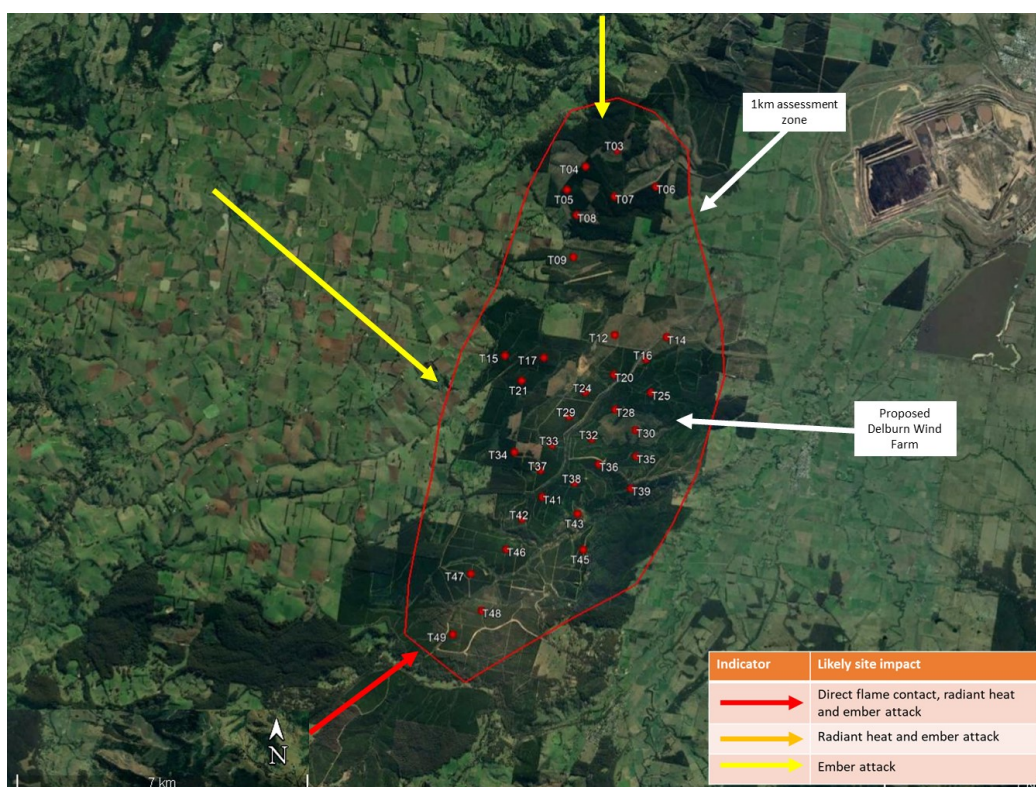


Figure 10 - 1 kilometre landscape assessment

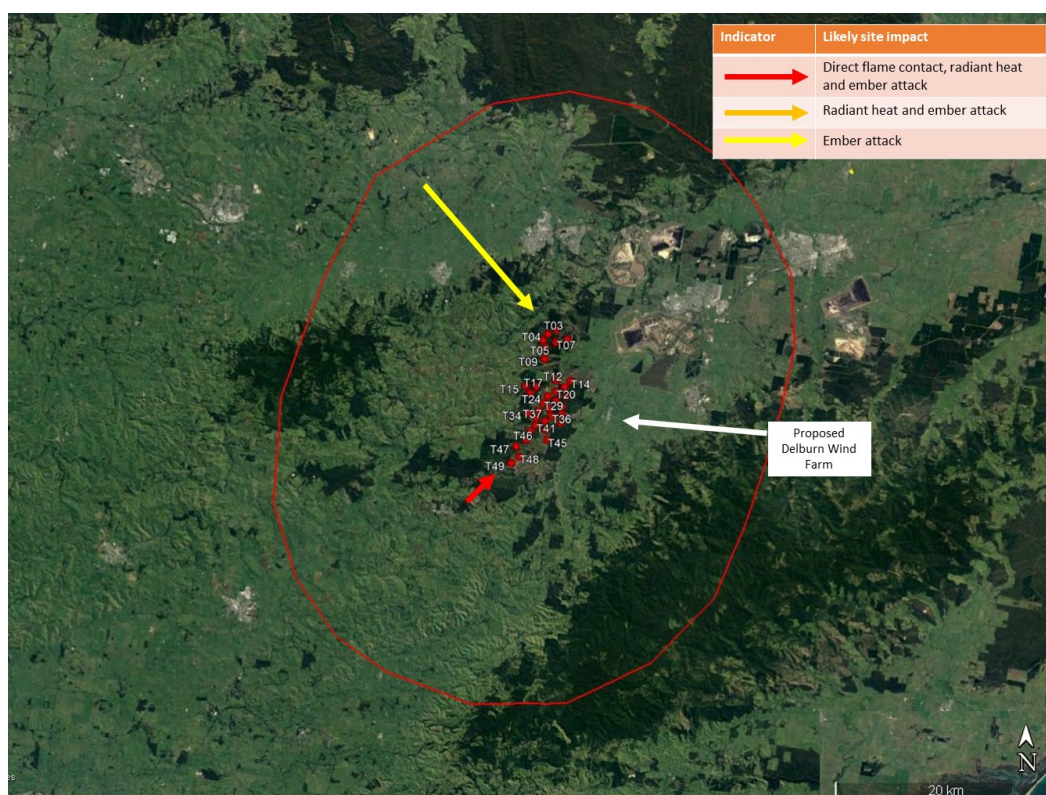


Figure 11 - 20 kilometre landscape assessment

A bushfire approaching from the south west will be through a bushfire front and emit high levels of radiant heat. Due to the type of vegetation to the north west, bushfire spread from outside the development area will likely be through embers starting small bushfires.

The Wind Farm development does not change the bushfire scenarios that are currently present and have been experienced in the past.

4 Management of bushfire risk

This section outlines how the DWF will manage the bushfire risk against the key requirements outlined previously in this report.

4.1 Clause 13.02-1S – Bushfire planning response

The analysis against Clause 13.02-1S is reliant on the information contained within the Bushfire Hazard Landscape Assessment and the bushfire scenarios. The following strategies from Clause 13.02-1S are aimed at ensuring a focus on the protection of life is achieved:

Strategy	Response
1	<p>Prioritising the protection of human life over all other policy considerations.</p> <p>The development is recognised as being within an existing extreme risk area. The design of the Wind Farm and associated infrastructure is considering the protection of human life at all times. The use of technology solutions to ensure that employees are not required in the area during elevated fire danger periods will be utilised.</p> <p>The primary technology will enable the Wind Farm to be managed remotely which will include the ability to turn off the Wind Farm and also move the turbines to a direction required by firefighting agencies.</p>
2	<p>Directing population growth and development to low risk locations and ensuring the availability of, and safe access to, areas where human life can be better protected from the effects of bushfire.</p> <p>It is acknowledged that the development is being placed in an existing extreme risk area and additional mitigation measures are required to ensure life safety is not compromised. These measures include:</p> <ul style="list-style-type: none"> • Development of a Bushfire Response Plan that ensures limited employees are within the development area during high fire danger periods and identifies safer areas for visitors and employees to egress to in the event of a bushfire. • Construction and maintenance of a road network that provides multiple options to exit the development area during a bushfire. • Asset Protection Zones constructed and maintained around buildings and turbines. • Monitoring of the local area during elevated fire danger conditions to detect bushfires early.
3	<p>Reducing the vulnerability of communities to bushfire through the consideration of bushfire</p> <p>The Wind Farm design has considered the risk to the community and will be implementing a range of solutions to manage this risk. The key focus is to reduce the potential for the development to increase the bushfire risk. The following initiatives will be implemented:</p>

risk in decision making at all stages of the planning process.	<ul style="list-style-type: none"> • Hot works management system to be in place. • Limiting smoking and other naked flame activities in the development area. • Installation of detection and suppression systems within the Nacelle to limit fire ignition and spread inside the turbine. • Maintaining the road network that is constructed as part of the construction phase.
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Within Clause 13.02-1S Settlement Planning objectives are outlined and how the development proposes to meet these is outlined in the following table.

Settlement Planning Objective	Project response	Achieved
Directing population growth and development to low risk locations, being those locations assessed as having a radiant heat flux of less than 12.5 kilowatts/square metre under AS 3959-2018 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009)	The wind turbines will be provided with defensible space that is more than the 48 metres required to achieve BAL 12.5 of AS 3959.	✓
Ensuring the availability of, and safe access to, areas assessed as a BAL-LOW rating under AS 3959-2018 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009) where human life can be better protected from the effects of bushfire.	The DWF development is providing increased access roads and defensible space surrounding the turbines. This will provide workers with the ability to travel safely to locations that would achieve a BAL LOW rating.	✓
Ensuring the bushfire risk to existing and future residents, property and community infrastructure will not increase as a result of future land use and development.	The DWF development will result in reduced plantation vegetation through the creation of cleared areas for the wind turbines along with additional access roads. The access roads will also be developed wider than what is currently there to facilitate construction, and these will be maintained.	✓
Achieving no net increase in risk to existing and future residents, property and community infrastructure, through the implementation of bushfire protection measures and where possible reducing bushfire risk overall.	<p>The DWF development will reduce bushfire risk within the Plantation. Bushfire protection measures will be implemented including:</p> <ul style="list-style-type: none"> • Vegetation clearance • Additional response capability • Vegetation thinning • Restricted operations during high fire danger periods 	✓
Assessing and addressing the bushfire hazard posed to the settlement and the likely bushfire behaviour it will produce at a landscape,	Based on the detailed assessment contained in this report and the additional information contained with the Phoenix	✓

settlement, local, neighbourhood and site scale, including the potential for neighbourhood-scale destruction.	analysis this development does not increase the hazard compared to the current situation. It has been concluded that the development reduces the amount of vegetation available for bushfire present in the landscape.	
Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.	As the development does not increase risk across the landscape, identification of alternative low risk areas has not required.	✓
Not approving any strategic planning document, local planning policy, or planning scheme amendment that will result in the introduction or intensification of development in an area that has, or will on completion have, more than a BAL-12.5 rating under AS 3959-2018 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).	The wind turbines are not required to comply with AS 3959 due to the development type. With the provision of defensible space, they will not be exposed to radiant heat in excess of BAL 12.5.	✓

4.2 Clause 21.04 – Environmental Risks response

The following strategies are outlined within Clause 21.04 and the project response is provided.

Clause 21.04 strategy	Project response	Achieved
Ensure the design, siting and layout of subdivision increases protection from fire.	<p>This development is not a subdivision however it does incorporate risk reduction strategies including:</p> <ul style="list-style-type: none"> • Fuel reduction around the turbines • Road widening • Turbines are located that enable firefighting vehicle access • Static water supply 	✓
Require that use and development includes adequate fire protection measures.	<p>The development includes fire protection measures including:</p> <ul style="list-style-type: none"> • Static water supply • Fuel clearance and management around the turbines • Detection and suppression systems within the Nacelle • Improved road access 	✓

Ensure the application of, and compliance with, the Bushfire Management Overlay (BMO), in highest risk parts of the municipality.	The entire site is covered by a BMO and the Operations and Maintenance Facility will meet BMO requirements.	✓
Outside of the BMO, in Bushfire Prone Areas (BPA) parts of the municipality:		
Ensure new development and uses are appropriately located and designed in response to the bushfire hazard.	The bushfire hazard has been assessed and as outlined previously, the bushfire design scenario includes treatments that recognise the risk.	✓
Ensure that larger or more vulnerable developments and uses as identified at Clause 13.02, incorporate measures to acceptably mitigate any identified bushfire risk, including as appropriate:	<p>With the increased road network and increased movement of people through the Plantations, it is expected that a reduction in criminal activity will occur.</p> <p>The existing firebreak network is considered sufficient providing it is regularly maintained during the fire danger period.</p>	✓
Assessment of the landscape risk;	The landscape risk has been assessed as part of the response to Clause 13.02-15.	✓
For subdivisions of more than 10 lots, a lot layout that responds to the risk and incorporates a perimeter road and two ways in and out of the development where possible;	Not applicable to this development.	N/A
A construction standard no higher than BAL-29 unless there are significant siting constraints, with commensurate vegetation management for defensible space;	<p>These buildings will be provided with defensible space that limits radiant heat to less than 12.5 kW/m².</p> <p>The buildings at the Operations and Maintenance Facility will be constructed to BAL 29 of AS 3959.</p>	✓
A reliable water supply for property protection and firefighting;	Static water supply is being provided across the development.	✓
Adequate access for emergency management vehicles; and	Access is being established for construction vehicles. Following construction, the network of roads will be maintained to that standard for the life of the Wind Farm.	✓
Development of a Bushfire Emergency Management Plan (BEMP) as appropriate, including triggers for closure or restricted operation on days of elevated fire danger.	A Bushfire Emergency Management Plan will be developed and will identify days that staff and visitors should not be in the Plantations.	✓
Ensure alignment of, and consistency between, planning policy and practices, and the Latrobe City Municipal Fire Management Plan.	Not applicable to this development.	N/A

4.3 CFA Renewable Energy Guidelines

The following summary table outlines how the Wind Farm project meets the requirements outlined within the CFA Guidelines for Renewable Energy Installations. For a detailed response against each section of the guidelines, refer to Appendix E.

Strategy	Project response	Achieved
Development of Installations	<p>CFA have been consulted in relation to the proposed Delburn Wind Farm. In the event that other legislation requires CFA consultation, this will occur at this time. This may include the Dangerous Goods (Storage and Handling) Regulations 2012 and the Building Act 1993.</p> <p>Community consultation has also occurred on a number of occasions with the provision of further information through the distribution of project updates and the development of 'Frequently Asked Questions'.</p>	✓
Emergency Management	<p>In the context of bushfire, risk has been assessed and has driven the development of treatments including the following:</p> <ul style="list-style-type: none"> • Emergency Management Plan including a Bushfire Response Plan • Layout design and provision of Asset Protection Zones • Static Water Supply • Limitations to be implemented during elevated fire danger conditions • Fuel management programs • Staff training • Fire Brigade familiarisation 	✓
Site Infrastructure	<p>The site will be provided with access for emergency vehicles that will meet most of the CFA requirements outlined within the Guidelines. The roads that are being widened to support the construction phase will be maintained ongoing.</p> <p>The CFA Guideline outlines the need to provide a perimeter road. This does suit not the layout of this Wind Farm due to it being spread over a large geographic area. Perimeter access requirements will be provided at the Operations and Maintenance Facility and Visitors Area. In addition, the Asset Protection Zones surrounding the turbines and other infrastructure will provide sufficient access for firefighting vehicles.</p> <p>Static water supply with CFA fittings will be strategically located across the development site. CFA will be consulted before finalising the amount of static water and locations.</p> <p>In the event that Dangerous Goods are stored on site, engagement with CFA will occur under the <i>Dangerous Goods (Storage and Handling) Regulations 2012</i>.</p>	✓
Site Operations	<p>The following initiatives will be implemented at the site during the construction phase and ongoing:</p>	✓

	<ul style="list-style-type: none"> • A Hot Work Permit system will be implemented and maintained on the site. • Asset Protection Zones will be established and maintained surrounding the Wind Turbines and other infrastructure. 	
Additional conditions for Wind Facilities	<p>The following conditions will be adhered to during operation of the Wind Farm:</p> <ul style="list-style-type: none"> • The wind facilities will be located more than 300 metres apart. • The wind facilities will be clearly marked as per the CFA guidelines. • The wind turbine parameters will be included in the site information contained within the Emergency Management Plan. 	✓
Additional conditions for Battery Installations	<p>In the event that Battery Installations are installed, they will comply with the relevant sections of the CFA Guidelines.</p>	✓

4.4 Bushfire Management Overlay

Clause 44.06 outlines the developments that are required to meet the Bushfire Management Overlay (BMO). Whilst it is unclear if the BMO applies to the development, it has been agreed for the Operations and Maintenance Facility to achieve the requirements of the BMO. This includes a minimum construction standard, water supply, access and defendable space. The Visitors Area does not need to comply with the requirements of the BMO. The management of bushfire risk will be achieved through policies that limit access to the Visitors Centre on days of Total Fire Ban.

Appendix B outlines the Bushfire Site Hazard Assessment for the Operations and Maintenance Facility and the Visitors Centre whilst Appendix C provides the Bushfire Management Plan for the Operations and Maintenance Facility.

4.4.1 Access provisions

The Wind Farm will comply with the access provisions contained within the CFA Guidelines for Renewable Energy Installations. The road network relating to the Wind Farm development will enable firefighting appliances to safely access and egress from the development area. These roads will comply with the following requirements:

1. The new or upgraded road network will be a minimum of six (6) metres wide and will be constructed within a minimum 20 metre wide fire break.
2. Access across the fire breaks will not be limited by the construction of the cable trenches.
3. Roads will be of all-weather construction and capable of accommodating a vehicle of 15 tonnes.
4. Constructed roads will be a minimum of six (6) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface.
5. The average grade will be no more than 1 in 7 (14.4% or 8.1°) with a maximum of no more than 1 in 5 (20% or 11.3°) for no more than 50 metres.

6. Dips in the road will have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.
7. Where roads are less than six (6) metres in width, passing bays will be incorporated at least every 600m which must be at least 20m long and have a minimum trafficable width of 6m. Where roads are less than 600m long, at least one passing bay is to be incorporated.
8. Road networks will enable responding emergency services to access all areas of the facility.
9. The provision of more than two (2) access points to the site, to ensure safe and efficient access to and egress from areas that may be impacted or involved in fire.

Figure 12 provides an overview of the road design and the associated clearances that will enable emergency vehicle access during an emergency.

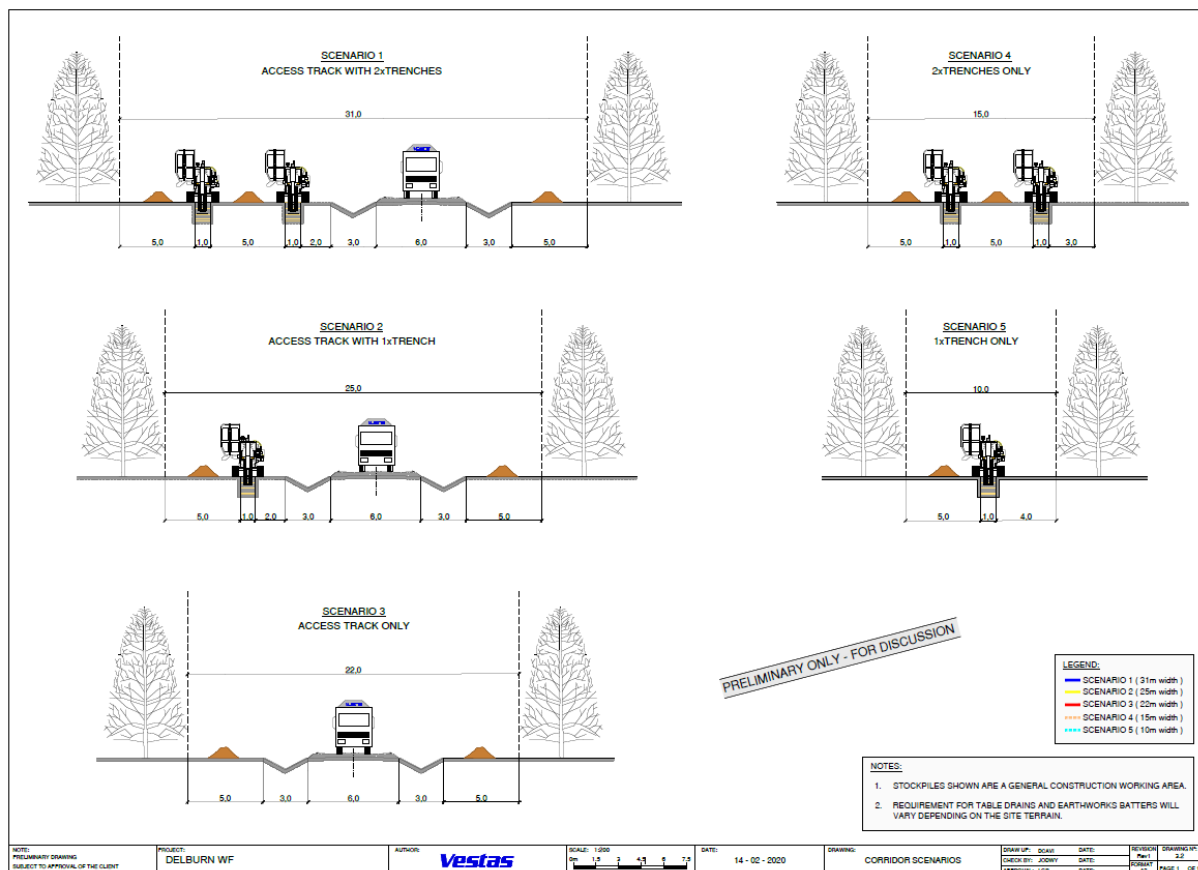


Figure 12 - Overview of corridor scenarios including road design

4.4.2 Defendable space

Defendable space for the Operations and Maintenance Facility will be provided through management of surrounding vegetation along with the installation of radiant heat barriers. All turbines and other infrastructure will be provided with defendable space that provides a level of protection to the infrastructure,

4.4.3 Water supply

In addition to an extensive network of static water supplies provided and managed by HVP across the landscape (Figure 13), static water will be provided at a minimum of five locations across the development area. Figure 14 shows the proposed location of the static water supplies that will each contain a minimum of 100,000 litres. These will be situated at:

- Varys Track (Terminal Station)
- Golden Gully Road
- Smiths Road (Operations and Maintenance Facility)
- Strzelecki Highway (LGA Boundary)
- Darlimurla Road

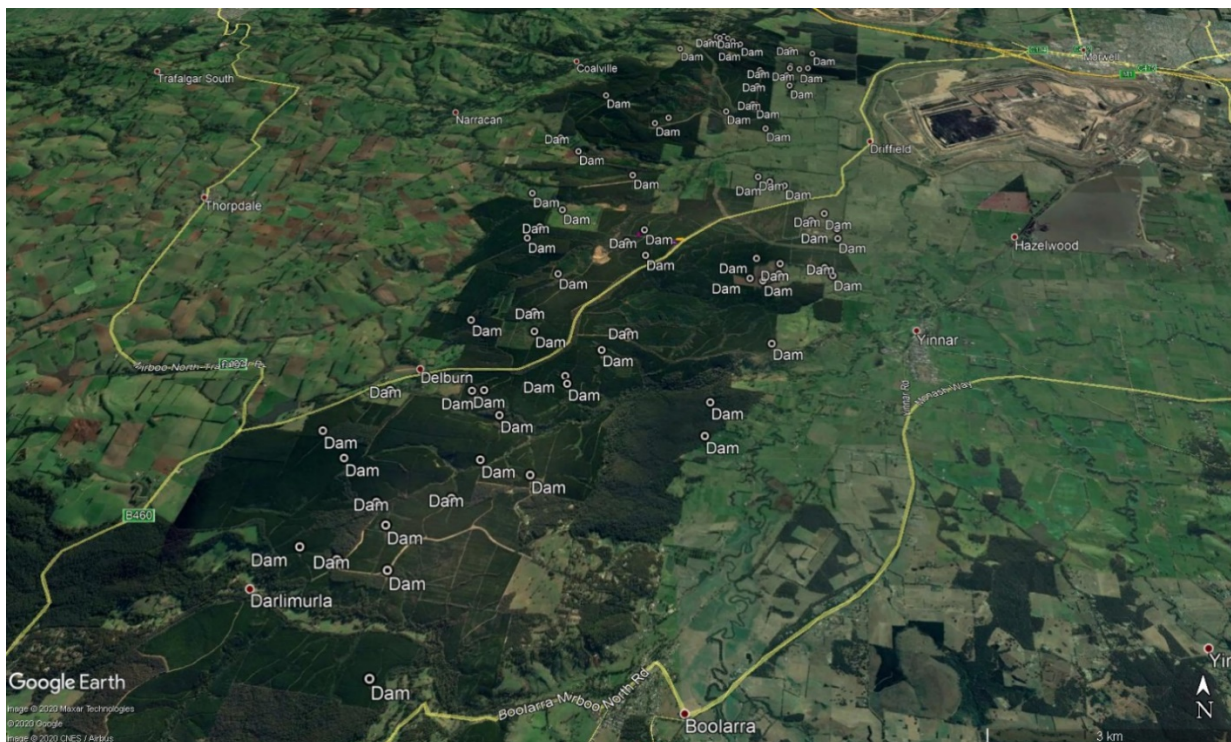


Figure 13 - HVP and private land water supply dams

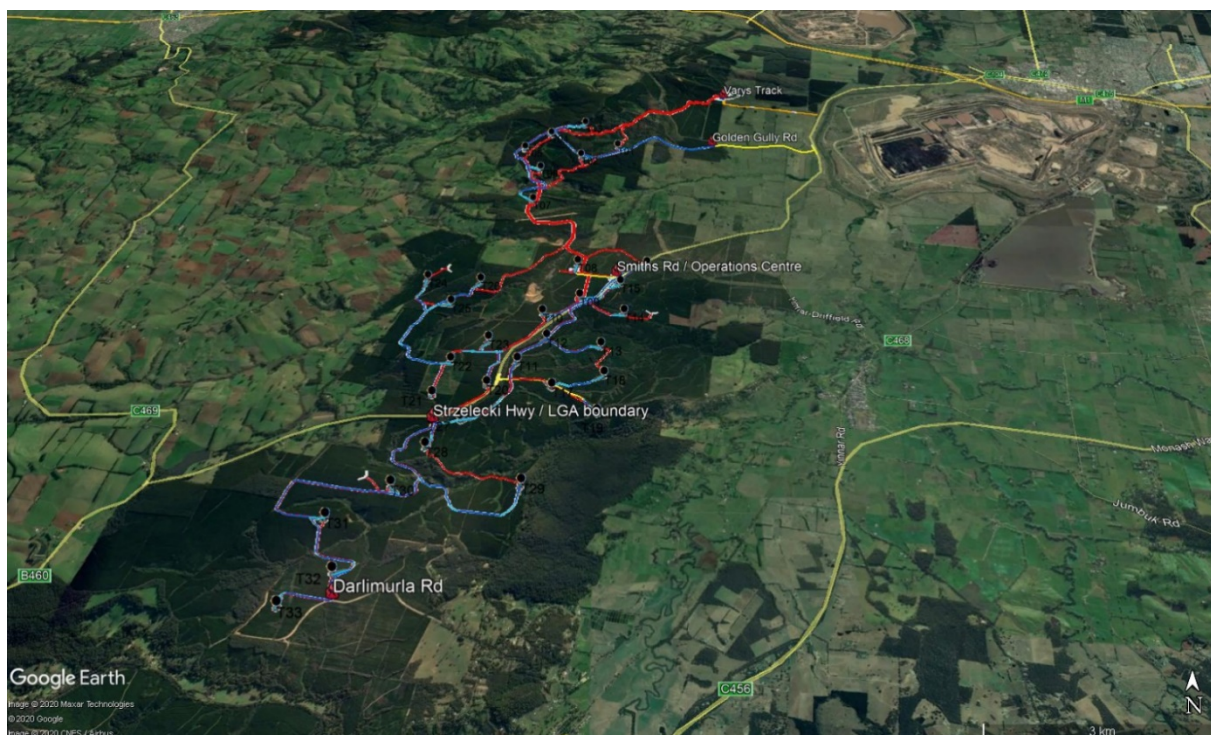


Figure 14 - Proposed additional 100,000 litre static water supplies with the turbine layout

The addition of the five static water supplies at strategic locations across the development in addition to the existing HVP managed water supplies, will provide increased capability when responding to bushfires within the plantation and surrounding areas.

4.4.4 Construction standards

In recognition of the landscape risk, whilst the Operations and Maintenance Facility will be provided with radiant heat barriers and defensible space to not be exposed to more than BAL 12.5, the Operations and Maintenance Facility will be built to a minimum of BAL 29.

4.5 Phoenix Rapidfire Modelling

The State of Victoria uses Phoenix RapidFire to model fire scenarios before and after fire risk reduction works, such as fuel management activities, to calculate residual risk. At maximum fuel levels, bushfire risk is at 100%. Through fuel management, the State aims to reduce fuel levels to 70% (the residual risk). This means, if a major bushfire were to occur, the impact of bushfires will be reduced by about a third.

However, Phoenix RapidFire simulations have limitations including the use of input data of varying quality. Phoenix RapidFire is one of several bushfire models currently available, each with its own strengths and weaknesses. Like all models, Phoenix RapidFire gives only an approximation of reality. Some of the factors that may limit the accuracy of Phoenix RapidFire results are:

- The quality of its inputs. Phoenix RapidFire uses a range of data inputs to model bushfire behaviour, including fuel types, ignition locations, weather variables, topography and previous fire history. These data sets vary in accuracy.

- All bushfires have been simulated using the same weather scenario, which has been designed to represent a typical 'worst case' fire day in Victoria.
- A full understanding of bushfire risk requires consideration of both the likelihood and consequence of bushfire impacts on human life, property and other values. Phoenix RapidFire mainly considers the consequence element of bushfire risk and the likelihood of particular ignitions is explicitly ignored.

The results of Phoenix RapidFire simulations need to be validated against the information collected from on-site data collection, as this provides a more accurate overview of the fire risk and residual risk from fire hazard mitigation works.

Two days of simulations were conducted using weather from Latrobe Valley Aerodrome on the 29th and 30th of January 2009. These days were both severe (tending extreme) fire danger ratings days and experienced different wind changes. These days were chosen as they are the conditions experienced during the Delburn fires in 2009 which occurred in the area proposed for the Wind Farm.

Three fires were ignited for the Phoenix analysis. The locations were:

1. Creamery Rd – 1300hrs
2. Ashfords Rd – 1300hrs
3. Lyrebird Walk – 1530hrs

This relates to the actual ignitions at Lyrebird Walk, Creamery Road and the escape from Ashfords Road during the 29th & 30th January 2009. To support the model, each fire is assigned resources comprising two (2) 4x4 slip on units, four (4) tankers and a medium helicopter. These are not aligned with the bushfire response that occurred in 2009 but rather an allocation to support the model to operate effectively.



Figure 15 -Point of origin map for fire ignition modelling

Two changes were made to the Phoenix data for post DWF modelling. The disruption layer was modified to change widths of roads, breaks and clearings. The fuel layer was also modified to show the footprint layer of the turbines as mineral earth/non-flammable. The operational protocols require an area of high pruning adjacent to the cleared areas at the base of each turbine tower. The Phoenix modelling is unable to measure this additional fuel modification treatment.

These changes mean that at low intensities and at low wind these and other barriers may stop the fire. Conversely at higher intensities and higher winds the fire and spotting will breach these non-fuel areas.



Figure 16 - Example of plantation fuel modification for proposed tower

In the 29th January post development scenario, the Creamery Road fire is halted by the clearings and suppression. With the pre development scenario, suppression fails, and the fire continues to spread. In the 30th January post development scenario, the Creamery Road fire is not halted by the clearings, but the suppression keeps it on one side of the Strzelecki Highway. In the 30th January pre-development scenario, the Creamery Road fire is much harder to suppress and crosses the Strzelecki Highway. In the 30th January post development scenario, the Ashfords Road fire is slowed (and occasionally stopped) by the clearings as night approaches and is assisted by topography (downhill fire run).

Our analysis has indicated fires of low intensity and low spotting potential can be stopped by the larger/wider development clearings. These may be flank fires parallel to the breaks, downhill fire runs, or fires in their early development phase.

4.6 Bushfire management strategies

The following bushfire management strategies will be implemented during the construction and operational phase.

4.6.1 Construction phase

- 1 Ensure all activities undertaken during the Fire Danger Period are appropriate under the Country Fire Authority Act 1958, including:
 - a. Compliance with Total Fire Ban Day restrictions.
 - b. Obtaining permits for any “hot work” activities.
- 2 Adhere to CFA’s Guideline for Renewable Energy Installations (February 2019) apart from the provision of perimeter access to the entire site.
- 3 Ensure all Staff, Contractors and site visitors are informed of fire response procedures that follow identified legislative requirements, policies and procedures.
- 4 Ensure that all works during the declared Fire Danger Period have appropriate permits from Local Government and CFA.
- 5 Ensure that all construction and operational works follow appropriate Work Health and Safety requirements.
- 6 Develop a ‘Bushfire Management Plan’ to consolidate recommendations.
- 7 Facilitate a high standard of communication with landowners, relevant stakeholders and the community regarding daily activities via a ‘steering committee’ or the like and an appropriate communication plan.
- 8 Establish a primary contact person for the community to contact with concerns, questions or issues.
- 9 Ensure all contractors:
 - a. Are appropriately briefed and understand their legal obligations in relation to managing bushfire risks.
 - b. Have appropriate procedures, safe work practices, contingency plans, MSDSs for operation of all equipment, chemicals, flammable materials that may contribute to bushfires.
 - c. Have appropriate ‘initial’ suppression equipment available on site.
- 10 Considers a policy of ‘no work’ on declared Code Red Fire danger days.
- 11 Provide appropriate bushfire training for contractors and staff.
- 12 Establish an APZ around each turbine and consider other zoning strategies to assist bushfire mitigation.
- 13 Ensure all building constructed at the Operations and Management Facility and Visitors Area confirms with AS 3959.
- 14 Ensure appropriate bunding in areas where there is potential for flammable fuels and oils to leak and create bushfires or other environmental risks.
- 15 Ensure all access roads and tracks are identified and meet CFA & FFMVic Guidelines for emergency vehicle access.
- 16 Consider appropriate signs to assist emergency response crews determine track names, location and turbines etc.
- 17 Establish emergency assembly areas.
- 18 Apart from the connection between the Terminal Station and the 220kV line, all power lines are to be underground.
- 19 Consider security fencing around turbines and substations to prevent public access.
- 20 DWF Pty Ltd provide fire suppression capability, in addition to HVP resources, to enhance response in the development area.

4.6.2 Operational phase

- 1 Install fire detection systems, in built fire protection and suppression systems, remote alarming and notification systems in turbines to report potential bushfire risks.
- 2 Provide cameras on the turbines to increase situational awareness across the landscape.
- 3 Adhere to CFA's Guideline for Renewable Energy Installations (February 2019) apart from the provision of perimeter access to the entire site.
- 4 Establish remote shut down procedures for turbine operations during bushfires or reported faults, or at the request of the emergency services.
- 5 Install lightning conductors to dissipate electricity to ground and reduce turbine damage and bushfire risk.
- 6 Undertake regular inspections and maintain records of all turbines, the substation, and power lines (including easements).
- 7 Develop bushfire preparedness audits to record all "annual" fire danger season preparedness activities and prevention works.
- 8 Develop a bushfire response plan, including a communications plan.
- 9 Ensure suitable firefighting equipment is available onsite or readily accessible (as per response plan).
- 10 Ensure staff and contractors are trained in the use of firefighting equipment and have appropriate personal protective clothing.
- 11 Ensure the maintenance of APZs around turbines and buildings.
- 12 Ensure all access roads and tracks are maintained to meet industry standards for emergency vehicle access.
- 13 Ensure DWF management vehicles carry firefighting water and basic fire equipment during the declared Fire Danger Period.
- 14 DWF to develop an induction package for CFA & HVP containing all relevant information on the Wind Farm operations, including specific bushfire response information.
- 15 Install static water supplies at strategic locations across the DWF proposed development in five locations with a minimum capacity of 100,000 litres each.

4.6.3 Other

- 1 Develop a response plan and suppression strategies to assist firefighters understand the risks associated with fires in turbines.
- 2 Liaise with the local CFA Brigades and Groups to assist with familiarising them with DWF operations and infrastructure.
- 3 Provide liaison person to support incident management during bushfires.
- 4 Respond to instructions and follow all advice from CFA, HVP and FFMVic during incidents.
- 5 Shut down turbines in vicinity of reported fire.

In addition, CFA, HVP and FFMVic to ensure all responding crews, including aircraft:

- Continue to encourage a safety first culture.
- Follow organisational policies and procedures.
- Regularly undertake dynamic risk assessments.

- Undertake pre-season familiarisation for local crews with new access roads and tracks, infrastructure sites, evacuation points and safe zones, low fuel areas and natural firebreaks.