

## Appendix Q

# Fire Risk Assessment

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0437 393 455  
john@myem.com.au  
[www.myem.com.au](http://www.myem.com.au)

## FIRE RISK ASSESSMENT NORMANVILLE ENERGY PARK

28 January 2025

### 1. Introduction

This fire risk assessment (**FRA**) has been prepared by My Emergency Management Pty Ltd for the Normanville Energy Park (NMEP), (**the Project**) at the request of WestWind Energy.

### 2. Wind Farm Project Overview

The Project involves the establishment of a wind energy facility including wind turbines generators (**WTGs**) and associated electrical infrastructure approximately 15km Southwest of Kerang township in the North of Victoria. The Project site is located wholly within the Gannawarra Shire. Additionally, the Project will involve minor augmentation works at the existing Koorangie Terminal Station installation of transformer).

The Project will include up to 17 wind turbines and associated access tracks, an underground transmission line, a creator station and temporary construction areas. The total Project site covers approximately 1932.83 ha and is located on private land that is primarily used for cropping and livestock grazing.

Project site layout plan and vehicle access plan are attached as Appendices A and B respectively.

### 3. Relevant qualifications and experience

I, John Mealia am a suitably qualified person to provide this Assessment based on 27 years of professional firefighting, *risk* and fire engineering service with the Country Fire Authority, 3 years with Emergency Management Victoria and have been a sessional lecturer having met the pre-employment requirements for the College of Engineering & Science with Victoria University from 2017 to 2022.

I have experience in *risk*, fire and emergency management including prevention, preparedness, response and am regularly engaged as an expert for the purpose of providing expert advice and appearing as an expert witness in legal proceedings. I hold the following academic and professional qualifications:

- Master of Emergency Management (Charles Sturt University).
- Graduate Certificate of Risk Management (Monash University).
- Academic Member Grade with The Institution of Fire Engineers (IFE).
- Registered Engineering Technician with Engineering Council
- Diploma of Fire Technology.
- Advanced Diploma of Public Safety (Community Safety) (CFA).
- Advanced Diploma of Emergency Management (ASEM).
- Advanced Diploma of Firefighting Management (CFA).
- Diploma of Firefighting Management (University of Ballarat).
- Diploma of Front-Line Management (University of Melbourne).

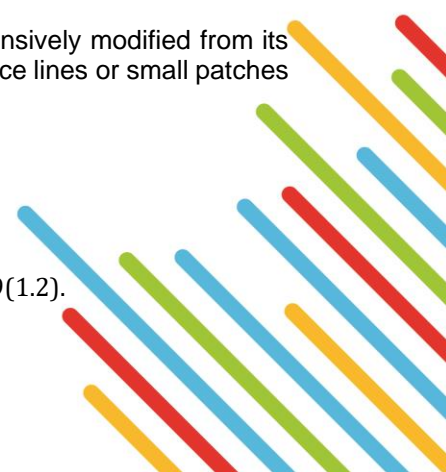
I consider I have the requisite expertise and experience required to form the opinions set out in this FRA. I have also set out all the facts, matters and assumptions upon which this FRA proceeds in the body of the Assessment.

### 4. Vegetation profile and topography

The vegetation within and immediately surrounding the Project site has been extensively modified from its original condition with most remanent vegetation confined to roadsides, internal fence lines or small patches on private land<sup>1</sup>.

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<sup>1</sup> NMEP Biodiversity Assessment, Page 2 dated December 2024 – Report No: 22271.09(1.2).



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The Project site is located on private land that is primarily used for cropping and livestock grazing and comprises extensively modified agricultural land of low quality for fauna. There is native vegetation along roadsides, isolated patches of native vegetation in paddocks and large trees<sup>2</sup>. Topography has little topographical relief and therefore the direct effect of slope and aspect on fire behavior would be negligible.

This type of vegetation type can typically be, if heavily grazed / cropped can have an average fuel load of < 2 tonnes per hectare and ungrazed / cropped of 5 tonnes per hectare.

For the purpose of this FRA, I have used a heat yield of between 13,700 and 13,900 kj/kg based on a moisture content of 10 with a fuel load of between 2 and 5 tonnes per hectare (t/ha) which is possible depending on the time of year and vegetation profiles.

## 5. Fire Brigade classifications and response times

The nearest fire brigade to the Project site is a CFA rural volunteer brigade and the second nearest is an urban volunteer brigade. The likely response time from CFA volunteer fire brigades range from 8min for urban brigade plus travel time and between 15 to 30 minutes for the rural brigade plus travel time. Both brigades are located with CFA District 20 and include:

- Wandella rural fire brigade located at 1131 Kerang-Quambatook Rd Wandella, and is located approximately 4km from the access point located on nearest northern boundary off Denyer Rd,
- Kerang urban fire brigade located at Fitzroy and Wyndham St, Kerang and is located approximately 16km from the access point located on nearest northern boundary off Denyer Rd.

## 6. Project siting and access

- The Project site is located within mainly open cropping area with small, isolated patches of native vegetation and large trees.
- There will be no scrub and trees in close proximity of wind turbines,
- Turbines will be separated at a minimum distance of 700m but typically 900m,
- The area surrounding the collector station, site office and operation and maintenance facilities will be clear of any scrub and trees for a distance of 6m. All transmission lines will be underground.
- There will be 3 x fire brigade access points along the northern boundary providing quick access to the two (2) initial responding fire brigades based on the direction they would be traveling from, see Appendix B,

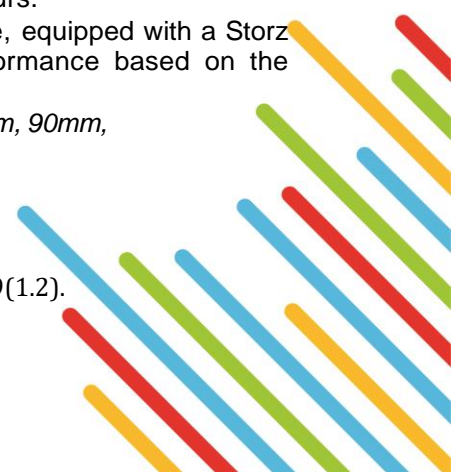
## 7. Site water supplies:

The following Project site water supplies are recommended prior to commencement of construction:

- 1 x static water storage tank with no less than 45,000 L effective capacity, be installed at each of the 3 x Project site entry points. Their exact locations be determined by the site project manager according to the following criteria:
  - 1 static water storage tank is located at least 10 metres from the O&M facility, site office, and/or collector station.
  - Are easily seen and accessible by responding fire brigades, and
  - Meets the wind energy facilities operational needs.
- The static water storage tanks installations comply with AS 2419.1-2021: Fire hydrant installations – System design, installation and commissioning, be above-ground constructed of concrete or steel and be capable of being completely refilled manually within 24 hours.
- Hard-suction points be provided, with a 150mm full bore isolation valve, equipped with a Storz connection, sized to comply with the required suction hydraulic performance based on the following:
  - *Adapters may be required to match the connection are: 125mm, 100mm, 90mm,*

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<sup>2</sup> NMEP Biodiversity Assessment, Page 5 dated December 2024 – Report No: 22271.09(1.2).



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- 75mm, 65mm Storz tree adapters with a matching blank end cap be provided.

(See Figure 4, page 19 of *CFA Design Guidelines and Model Requirements Renewable Energy Facilities for examples and more information*).

- The hard-suction point be positioned within four (4) metres to a hardstand area and provide a clear access for fire brigade personnel.
- All-weather road access and hardstand be provided to the hard-suction point. The hardstand must be maintained to a minimum of 15 tonne GVM, eight (8) metres long and six (6) metres wide.
- The road access and hardstand be kept clear at all times.
- The hard-suction point be protected from mechanical damage (eg., bollards) where necessary.
- An external water level indicator be provided to the tank and be visible from the hardstand area.
- Signage indicating 'FIRE WATER' and the tank capacity be fixed to each tank.
- Signage be provided at each vehicle entrance to the Project site, indicating the direction to the nearest static water storage tank if required.

(See Figure 6 page 19 of *CFA Design Guidelines and Model Requirements Renewable Energy Facilities for more information*).

## 8. Site track design and construction

- Each turbine has access tracks as per the network of tracks within the Project site, see Appendix B.
- As the landscape is predominantly flat, the average grade requirements will not be an issue, particularly as responding fire brigades will be rural tankers designed for off road firefighting.

To enhance the track design and construction above in relation to fire prevention and fire brigade response, the following additional design and construction standards are recommended:

- Roads / tracks are of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes (eg, no compacted earth).
- Constructed tracks be 5 metres in trafficable width with a four (4) metre vertical clearance for the width of the formed track surface. Ensure any fencing along access routes allows for width of fire vehicles.
- The 5m width is in excess of CFA requirements of 4m, however it is recommended to allow the tracks to also be used as fire breaks to achieve a 90% probability of stopping a grass / crop fire and assist fire brigades establishing controls lines, see Appendix C,
- The average grade should 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 fifty (50) metres.
- Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.
- Road / track network enable responding emergency services to access all turbines, O&M facility, site office and collector station.

## 9. Site infrastructure

I have been advised turbines have been designed using industry standards and will comply with international and Australian Standards. The system being installed at the Project site will have the following fire safety features:

- Internal Fire Detection and Suppression System
  - ❖ Turbine design in terms of the WTG and components have undergone rigours design validation and quality assessments through both internal and external agencies.
  - ❖ A control system comprising a Vestas Condition Monitoring Solution control system will be used to monitor and mitigate fire risk by continuously monitoring for smoke and rise in temperatures.
  - ❖ There will also be a smoke and heat detection system on switchgear and mechanical driven events and an Arc Detection System on high voltage zones.
  - ❖ The turbine internal fire suppression system will be a Vesta Fire Suppression System.
  - ❖ The turbine will have handheld fire extinguishers installed in the nacelle.
- Internal Monitoring and Shutdown System
  - ❖ Monitoring system will detect, and control turbine overheating and be remotely controlled to set a

- ❖ safe operating state in case of an emergency and will include:
  - Turbine automatic shutdown system and high temperature nacelle cut off system,
  - Temperature sensors will be located on the outside of the turbine nacelle.
  - Have individual components to monitor temperature sensors; including the converter IGBT (insulated-gate bipolar transistor), gearbox oil sump, turbine cooling system, generator, and transformer.
  - Electrical controls and hardware that will mitigate fire risk due to external electrical dynamics. For example, the WTG will have a switchgear that will electrically isolate the wind turbine in the event of high short circuit current events due to grid faults.
- Lightning Detection System:
  - ❖ The installed turbine will be certified to a Lightning Protection Class 1 in accordance with IEC61400-24.
- Underground Electrical and Communication Cables:
  - ❖ Installed turbines will be connected via an underground network of high voltage electrical cables.

## 10. Fire Risks During Construction and Operation

The highest risk identified at the Project site is a grass / crop (stubble) fire occurring during the installation and operation phases will be during the declared fire danger period, which can start as early as October in that part of Victoria and could last until May in a worst-case scenario. Potential hazards and ignition sources include:

- External grass or crop fire entering the Project site from a burn-off getting away, grinding, welding, or slashing, i.e. blade hits a rock,
- Lightning strikes to ground,
- Arson.
- Flammable and combustible fuels stored onsite igniting,
- Welding, cutting and grinding creating sparks,
- Sparks from faulty vehicle and machinery exhaust systems etc; and
- Discarded cigarettes and matches from construction workers.

To mitigate these risks, the following controls are recommended:

- Standard construction management measures and restrictions be applied on high fire risk activities (welding, cutting and grinding) during High or above fire danger ratings,
- All internal tracks / roads be a minimum of a 5m width fuel break to achieve a 90% probability of stopping a fire (according to CSIRO Grass fire research into the performance of fire breaks, see **Appendix D**).
- Grass within the Project site be kept well maintained and at a low height (100mm) through either slashing and/or grazing as appropriate.
- A minimum 6-metre mineral fire break (i.e. crushed rock or stones etc) be provided around each wind turbine. A minimum 6-metre mineral firebreak around the O&M facility, site office, and collector station. This is to prevent direct flame contact, minimise radiant heat impact.
- The area surrounding wind turbines, O&M facility, site office, and collector station are kept clear of scrub and trees to a minimum distance of 6m if planting is required as a planning permit condition. Currently there are small, isolated patches of shrubs and trees on the Project site and therefore there is little to no leaf litter contributing to the fire risk factor,
- There is no long grass in areas where plant and heavy equipment will be working.
- Smoking only be allowed in a designated area,
- If hot works are required, introduce a 'hot work' policy requiring a "Hot Work Permit" for open flame work such as welding, cutting and grinding. Such work cannot commence prior to obtaining a Hot Work Permit from the site manager or delegate. A "Hot Work Permit" be valid for 24 hours only. Introduce a work practice of no welding, cutting and grinding or undertaking other hot work that emits

a spark or flame during a day of total fire ban or during days when the fire danger rating is High or above.

- Have a minimum of two (2) 9 litre stored pressure water extinguishers or firefighting capabilities (i.e. water tanker) be available and ready to operate at any time when welding, cutting and/or grinding.
- All flammable and combustible liquids be stored and handled in accordance with Section 2 – Minor Storage of AS 1940 – 2017.
- Each vehicle and machinery working on the Project site:
  - be free from faults and mechanical defects which could cause an outbreak of fire, and
  - be fitted with a spark arrester; and
  - carry a minimum of one (1) 9 L pressurised water extinguisher.
  - All vehicles operating on non-gravel surfaces are fueled by diesel.(See Appendix E for CFA regulatory safety features of motor vehicles driven during fire danger period near vegetation).
- During construction, if required, a cleared vegetation easement along transmission line corridors be established and maintained during the declared fire danger period.
- Site construction manager and supervisors install the Vic Emergency App and program in a watch zone of the surrounding area out to 20km, to be notified of any potential threats in the area.

### 11. Awareness and Training for Fire Brigades

- At the appropriate time determined by the site manager, a familiarisation visit to the Project site should be offered to the local CFA fire brigades, and
- Training should be offered to CFA local fire brigades on how to safely respond to a fire involving the wind turbines and other infrastructure on the Project site during construction. This will assist the local CFA fire brigades to develop local and district response plans.

### 12. Fire and Emergency Management Plan (F&EMP)

Prior to construction commencing, a F&EMP be developed by a suitably qualified person that is consistent with AS3745-2010 and where appropriate with section 7.1 (page 38) of the *CFA Design Guidelines and Model Requirements Renewable Energy Facilities*.

It is recommended the F&EMP is based on the prevention, readiness and response continuum with response procedures based on contain, control and extinguishment for each of the potential fire and *emergencies* identified in this FRA.

### 13. Emergency information books

A red emergency information books should be developed and located at each of the access points / gates to the Project site. It should contain the following:

- A description of the Project site, its infrastructure and operations.
- Site plans include the layout of the entire site, including buildings, internal tracks, infrastructure, fire protection systems and equipment, dangerous goods storage areas, etc,
- A manifest of dangerous goods (if required) as per Schedule 3 of the *Dangerous Goods (Storage and Handling) Regulations 2022*.
- Up-to-date contact details for site management, relevant WestWind staff / management, and site neighbors.
- Safety Data Sheets (SDS) for dangerous goods stored on-site.

### 14. Project team training

Prior to construction at the Project site commencing and after the F&EMP has been developed, at a time determined by the site management, project staff training consistent with section 7.4 (page 41) where appropriate with *CFA Design Guidelines and Model Requirements Renewable Energy Facilities* be provided.

Training should include first response firefighting using all the fire protection systems available at the Project site based on the response procedures within the F&EMP. Training should also include all aspects of prevention and readiness detailed within the F&EMP.

### **15. Full fire risk assessment**

To ensure compliance with the planning permit in regard to fire and emergency management, it is recommended the Project undertake a full Fire Risk Assessment in accordance with the *CFA Design Guidelines and Model Requirements – Renewable Energy Facilities v4 dated August 2023* in relation to wind energy facilities.

### **16. Conclusion**

It is my professional opinion, if the recommendations within this fire risk assessment are implemented, the Project will meet all risk fire engineering requirements to achieve a level of acceptable risk within this type of risk environment and therefore has my full support and endorsement.

### **17. Limitations of this assessment**

The Assessment is based on a desk top assessment and a review of the documentation provided.

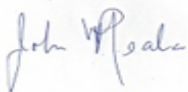
The Assessment does not include:

- an inspection of the Project site and surrounding area
- assessment of fire *risk* specific to plant and equipment to be used at the project site during construction,
- assessment of proposed staff training or exercising, and
- consideration of:
  - arson (other than a source of initial ignition)
  - multiple simultaneous ignition sources
  - acts of terrorism
  - business interruption or losses
  - personal or moral obligations of the owner / occupier.

These issues can be considered, but in this instance, have been specifically excluded from this Assessment. Further, it should not be treated as a full *risk* assessment or compliance audit with the CFA Act, Planning & Environmental Act, Building Act or Building Code of Australia, Environment Protection Act, or Occupational Health and Safety Act.

Please do not hesitate to contact me if you require further information.

Kind regards,

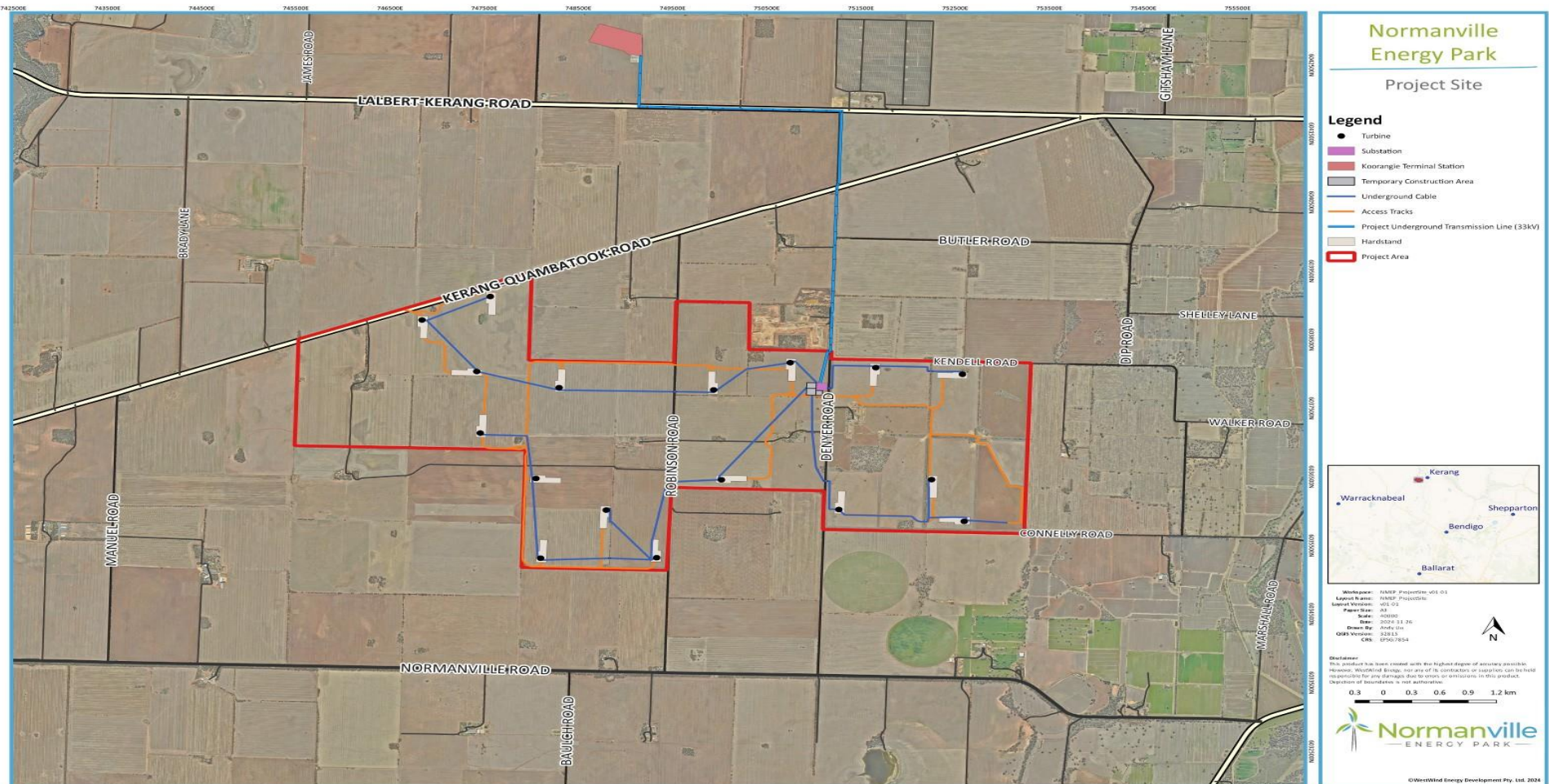


John Mealia  
Director  
**My Emergency Management Pty Ltd**

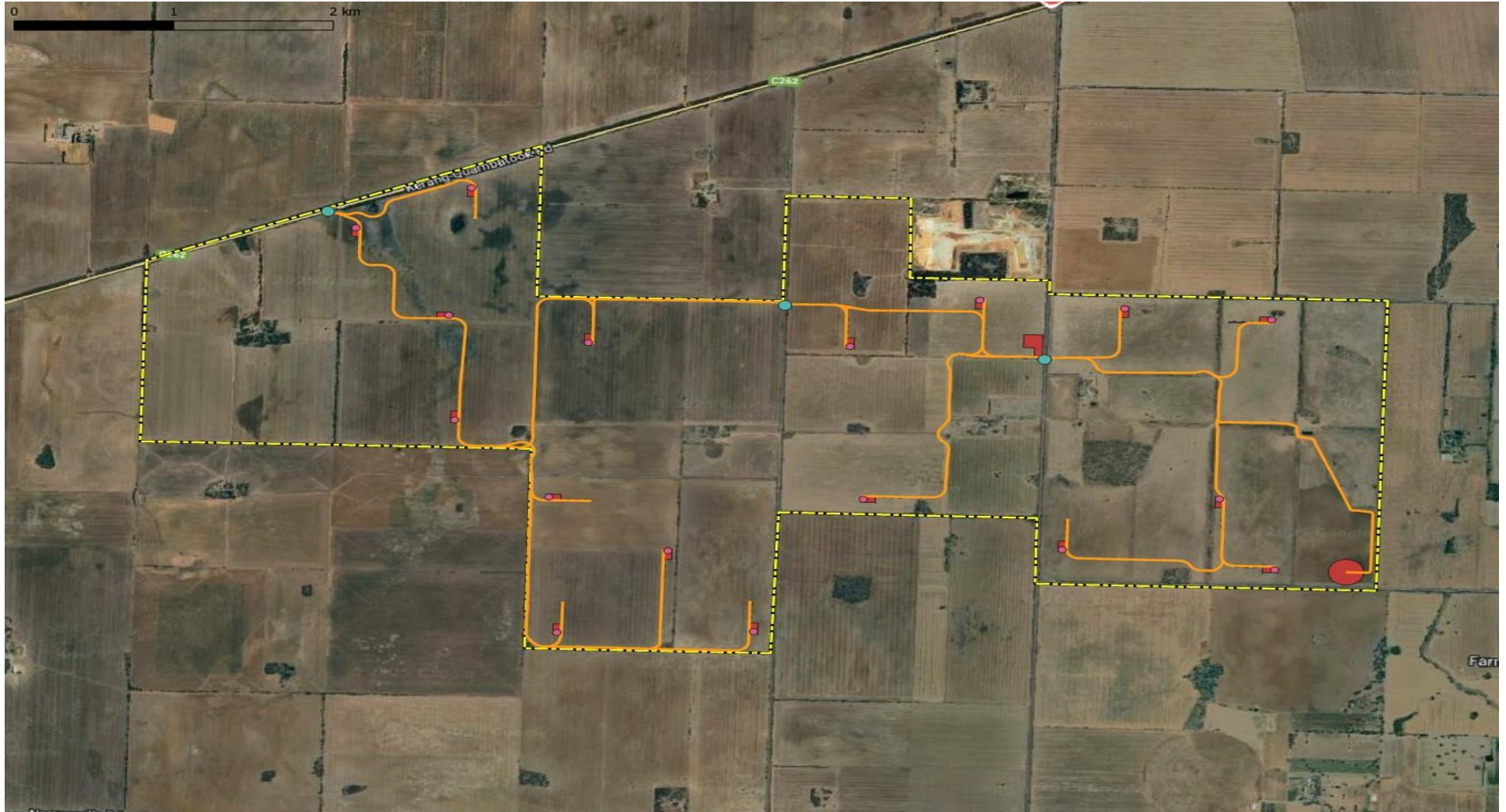
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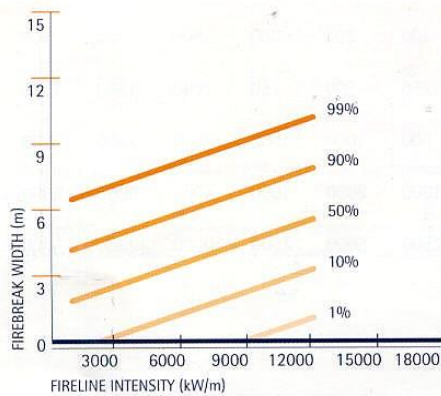
## Appendix C – Grass fire research onto performance of fire breaks

1. Relevant research to the site regarding fire break performance was conducted by scientists from the CSIRO National Bush Fire Research Unit in 1988 including an investigation into grass fire behavior.
2. The aim of the research was to develop a relation between the probability of fuel break failure and variables such as fuel break width and fire line intensity, (that is the quantity of heat released per metre of fire front).
3. The aim was achieved by lighting experimental fires over large uninhabited areas during periods of very high fire danger.
4. Fuel types involved mostly kerosene grass, kangaroo grass and sorghum, which are similar to many found in the open grasslands of southern Australia including Victoria. These grasses were almost fully cured and low eucalyptus and paperbarks and occurred sparsely on the test site, (average 10 trees per hectare).
5. Systematic measurements of fuel characteristics found most fuel fell between 2 and 5 tonnes per hectare and grass height was usually between 0.15 and 0.55 m.
6. During the experiment, wind speed varied from 3 to 30 km per hour, relative humidity from 13 to 55% and air temperature from 19 to 36 degrees Celsius. Using the Macarthur meter, this equates to Grassland Fire Danger Index of 'Extreme' using CSIRO – modified McArthur Mk 4 Grassland Fire Danger Meter.
7. The test site was divided into 170 blocks, (200 x 200m or 100 x 100m in size). Fuel breaks were constructed 5, 10, or 15m wide by grading or burning strips of grass so that no flammable material remained.
8. To test the effectiveness of fuel breaks, 113 fires, either at a single point or in a line 60 to 200m in length were lit. The head fires burned 20 to 200m before reaching a fuel break. Their speed ranged from 0.4 to 8.0 km per hour. No trees stood within 20m of the fuel break for 58% of fires lit, for the remainder, the number of trees present was generally less than four, and almost always less than eight.

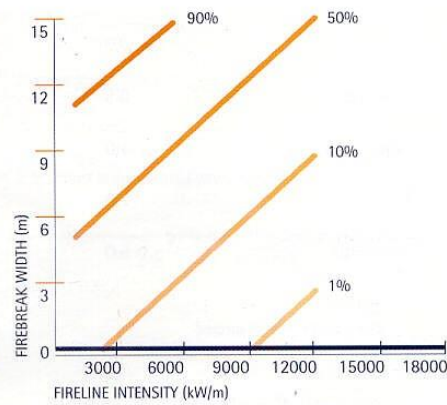
### Research results were:

- When trees were absent, none of the 4.5 to 15m wide fuel breaks were breached while 83% of those 1 to 3.5m wide were. Fuel breaks of 1 to 3.5m mainly failed because of direct flame contact, the fire actually 'reaching' across the barrier. All except the least-intense fires easily breached such breaks.
  - When trees were present within 20m of a fuel break, only 45% of the 4.5 to 15m wide fuel breaks managed to stop fires. These fires invariably jumped the fuel breaks directly opposite trees and firebrands (such as burning bark or leaves that are capable of starting spot fires) were the main cause.
  - Fuel breaks performance became less effective as fire line intensity increased. Of the 20 fires approaching breaks 1.0 to 3.5m wide with intensities less than 7,000 kW/m, 6 (30%) stopped; while of the 15 approaching breaks with an intensity of 7,000 kW/m or greater, none stopped.
12. To put these results to practical use, CSIRO researcher Andrew Wilson developed a statistical model that assists in calculating the probability of fuel break breach under given conditions.

13. This model involved taking into account fire line intensity, the presence or absence of trees within 20m, and fuel break width. Generally, the model predicts the fires breaks becomes less effective with increasing fire intensity, closer proximity of trees and / or decreasing fuel break width.
14. More specifically, the model as shown in Figures 1 and 2 predicts the following results:
- A 3m wide fuel break has only a 50% probability of stopping a grass fire (no trees within 20m) that approaches head-on with an intensity of 5,000 kW/m
  - A 5m fuel break has a 90% probability of stopping the same fire.
  - A 9m wide fuel break has only a 50% probability of stopping a grass fire with trees within 20m of the break that approaches head-on with an intensity of 5,000 kW/m.
  - A 15m wide fuel break has a 90% probability of stopping the same fire.
15. Finally, it is important to remember that Wilson's work does not include consideration of the effect of slope, but this does not detract from the value of his work because, in the absence of any other similar research data, it provides useful information to help us better understand potential fire behavior.



No Trees Present Within 20m of the Break



Trees Present Within 20m of the Break

Source: Cheney and Sullivan 1997, P70

**Fig 1** Probability of a head fire being controlled with no trees within 20m of the break

**Fig 2** Probability of a head fire being controlled with trees present within 20m of the break

16. Deductions from this research relevant to the Project site:
- The fuel type and conditions under which CSIRO research was undertaken were:
    - Kerosene grass, kangaroo grass and sorghum which has a Heat yield of between 16,900 and 18,600 kj/kg based on a moisture content (% Oven-dry weight) of 10 and a fuel load of 5 tonnes per hectare.
  - Using a conservative approach, it has been assumed the grassland around the Project site is grazed pastures (i.e. Phalaris) which has a heat yield of between 13,700 and 13,900 kj/kg based on a moisture content of 10 with a fuel load of 5 tonnes per hectare.
  - **The assessed grass fuel loads within paddocks around the project site and along road reserves could vary between 5 and 2 tonnes per hectare depending on the time of year.**



## Country Fire Authority Act 1958 – Section 50

### Appendix D – CFA Required safety features of motor vehicles driven during FDP near crops

(1) In the country area of Victoria, a person shall not drive or operate a vehicle propelled by internal combustion (other than a vehicle referred to in subsection (2)) so that the vehicle is in contact with any crop, grass, stubble, weeds, undergrowth or other vegetation unless the vehicle is fitted with an efficient silencing device so constructed that all the exhaust from the engine of the vehicle passes through the silencing device.

Penalty: 10 penalty units.

**(2) In the country area of Victoria, a person must not drive or operate a tractor or a self-propelled farm machine or a traction engine or an earth-moving, excavating or road-making machine propelled by or incorporating a heat engine within nine metres of or in contact with any crop, grass, stubble, weeds, undergrowth or vegetation unless the tractor, traction engine or machine—**

**(a) is free from faults and mechanical defects which would tend to cause an outbreak of fire, and**

**(b) is fitted with a spark arrester, and**

**(c) carries the prescribed fire suppression equipment during a fire danger period.**

**Penalty: 10 penalty units.**

(3) A person operating a tractor, traction engine or machine referred to in subsection (2) must maintain the spark arrester in proper working order so as to prevent the discharge of exhaust particles which may tend to cause an outbreak of fire.

Penalty: 10 penalty units.

(4) A person must not fit a spark arrester to a tractor, traction engine or machine referred to in subsection (2) unless the spark arrester complies with the standard prescribed under subsection (5).

Penalty: 10 penalty units.

(5) A person must not sell a tractor, traction engine or machine unless it is fitted with a spark arrester which complies with the relevant Standards Association of Australia standard prescribed for the purposes of this subsection.

Penalty: 10 penalty units.

(6) The Chief Officer may exempt a person from compliance with subsection (2)(c) where in the opinion of the Chief Officer the circumstances surrounding the operation of the tractor, traction engine or machine warrant it.

(7) Nothing in this section requires a tractor, engine or machine referred to in subsection (2) which is fitted with a turbocharger or an exhaust aspirated air-cleaner to be fitted with a spark arrester.

### **COUNTRY FIRE AUTHORITY REGULATIONS 2014 - REG 113**

#### **Vehicular heat engines**

(1) For the purposes of section 50(2)(c) of the Act, the prescribed fire suppression equipment is—

(a) at least one water spray pump of the knapsack pattern that—

(i) is in proper working order, and

(ii) is fully charged with water, and

(iii) has a tank capacity of not less than 9 litres, and

(iv) complies with AS 1687, or

(b) at least one water (stored pressure) fire extinguisher that—

(i) is in proper working order, and

(ii) is fully charged with water and maintained at the correct pressure, and

(iii) has a tank capacity of not less than 9 litres, and

(iv) complies with AS/NZS 1841.1.

(2) For the purposes of section 50(5) of the Act, a spark arrester must comply with AS 1019.

