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Bushfire Development Report

for the development of a
Battery Energy Storage System at
151 Troys Road and 202 Troys Road
Waubra VIC 3352

Prepared for
Biosis Pty Ltd

October 2025

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Report prepared by Terramatrix for Biosis Pty Ltd

Cover photo – aerial image of the site.

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1 Executive summary

- This Bushfire Development Report (BDR), in support of the Waubra Battery Energy Storage System (hereafter referred to as 'Waubra BESS') planning permit application, demonstrates how it can respond to the applicable bushfire regulations.
- This report's structure and content responds to the *Design Guidelines and Model Requirements for Renewable Energy Facilities v4* (hereafter referred to as the 'Guidelines') and *Clause 13.02-1S Bushfire Planning* of the Pyrenees Planning Scheme.
- A bushfire hazard assessment was conducted at the site on 28/04/2025, and an assessment of landscape hazard was conducted by desktop analysis (see Section 5).
- The site and wider Waubra area are in a landscape of moderate bushfire hazard. The site is in a designated Bushfire Prone Area (BPA) but not covered by the Bushfire Management Overlay (BMO). The nearest BMO cover is 1 km to the north.
- The Waubra BESS is exposed to classified vegetation within 100 m of the site, comprising Grassland in surrounding paddocks outside the lease area (site).
- The applicable slope classes are 'Downslope >0°-5°' to the north and west and 'All upslopes and flat land' in other directions.
- The bushfire risk to the Waubra BESS can be mitigated to an acceptable level and the facility meets the objectives of the Guidelines by implementing the applicable 'model requirements' (see Sections 6-10).
- Distinct elements of the Guidelines are:
 - Risk Management Plan (see Section 6).
 - Fire Safety Study (not included in this BDR but referenced in Section 6.6).
 - Fire Management Plan (not included in this BDR but referenced in Section 9.1).
 - Emergency Management Plan (not included in this BDR, see Section 10).
 - A response to Clause 13.02-1S (see Section 4.1.2 and Section 11).
- The elements of Clause 13.02-1S addressed in this report are:
 - Bushfire hazard assessment at various scales (see Section 5).
 - Setbacks from classified vegetation for a radiant heat flux less than 12.5 kW/m².
- Design elements of the Waubra BESS relating to bushfire protection (see Section 7.2) are:
 - Minimum low threat or non-vegetated setback distances for BESS infrastructure to achieve a radiant heat flux less than 12.5 kW/m² are:
 - 22 m from Grassland to the north and west.
 - 19 m from Grassland to the south and east.
 - Two points of access/egress; to Troys Road and Gordons Road.
 - Perimeter roads encircling BESS infrastructure aligning with the fire break requirements (min. 4 m wide).
 - A 432 kL static water supply on site with a compliant tank and hydrant system.
 - Fire detection and suppression systems (see Section 7.2.7).
 - A 10 m wide fire break around BESS infrastructure and other buildings/infrastructure in the central facility area that is clear of any vegetation (including screening).

- A minimum BAL-12.5 construction standard for any buildings on the site to demonstrate Clause 13.02-1S compliance.

1.1 Acronyms and Abbreviations

AS 3959:2018 – Australian Standard for Construction of Buildings in Bushfire Prone Areas.

BAL – Bushfire Attack Level.

BDR – Bushfire Development Report (*a document intended to be submitted along with the planning application for a development that comprises and/or references all required elements for bushfire planning compliance. This report*).

BEMP – Bushfire Emergency Management Plan.

BESS – Battery Energy Storage System.

BMO – Bushfire Management Overlay.

BPA – Bushfire Prone Area (*areas subject to or likely to be subject to bushfire, as determined by the Minister for Planning*).

CFA – Country Fire Authority (*the fire authority for planning approval and control agency for emergency response to fire amongst other hazards*).

EVC – Ecological Vegetation Class (*a generalised description of vegetation communities*).

FMP – Fire Management Plan (*a description of the hazard and risk mitigation responses to fire at the facility including a range of strategies – see Section 9.1*).

Fire Safety Study – *A document describing the risks posed by/to BESS infrastructure when involved in fire and recommended measures to mitigate those risks.*

Guidelines (the) – *A document prepared by the CFA to guide applications for renewable energy facilities (including BESS') in the design and operation of the facility.*

FRV – Fire Rescue Victoria (*the fire authority for planning approval but not the response control agency in Waubra, N.B. often interchangeable with CFA in a planning context*).

LSIO – Land Subject to Inundation Overlay (*while not directly related to bushfire, this overlay can also impact design and layout*).

NCC – National Construction Code.

RHF – Radiant heat flux (*a measurement in kW/m² at the receiver of a fire hazard interface*)

RMP – Risk Management Plan (*a description of the facility and in particular, the systems put in place to mitigate the impact of fire and how these have informed the design of the facility*).

2 Introduction

This Bushfire Development Report has been prepared for ACCIONA Energia, to assess how the proposed development of a Battery Energy Storage System (BESS) at 151 Troys Road and 202 Troys Road, Waubra VIC 3352 can respond to the bushfire risk and the applicable Victorian planning and building controls that relate to bushfire, in particular the objective and applicable strategies of the Planning Policy Framework (PPF) at Clause 13.02-1S *Bushfire Planning* in the Victoria Planning Provisions (Clause 13.02-1S Pyrenees Planning Scheme).

The proposal meets the objectives of Clause 13.02-1S and responds to the Model and Additional Requirements outlined in the *Design Guidelines and Model Requirements: Renewable Energy Facilities v4* (CFA, 2023)¹. The Guidelines require the Waubra BESS to assess bushfire risk according to the Victoria Planning Provisions, through the bushfire hazard assessment strategies in Clause 13.02-1S. These assessments are shown in this report at Section 5.

The development site comprises a lease area ('the site') that extends over both 151 Troys Road and 202 Troys Road. The site is in a designated Bushfire Prone Area (BPA). BPAs are those areas subject to or likely to be subject to bushfires, as determined by the Minister for Planning. Higher hazard land within a BPA, that may be subject to extreme bushfire behaviour, is covered by the Bushfire Management Overlay (BMO). No part of the site is covered by the BMO and the development is therefore not required to respond to the BMO objectives.

The primary function of the Waubra BESS is to capture and store energy from the grid during off-peak energy use times and feed it back into the grid during times of peak energy use. The anticipated operational lifespan of the facility is 25 years.

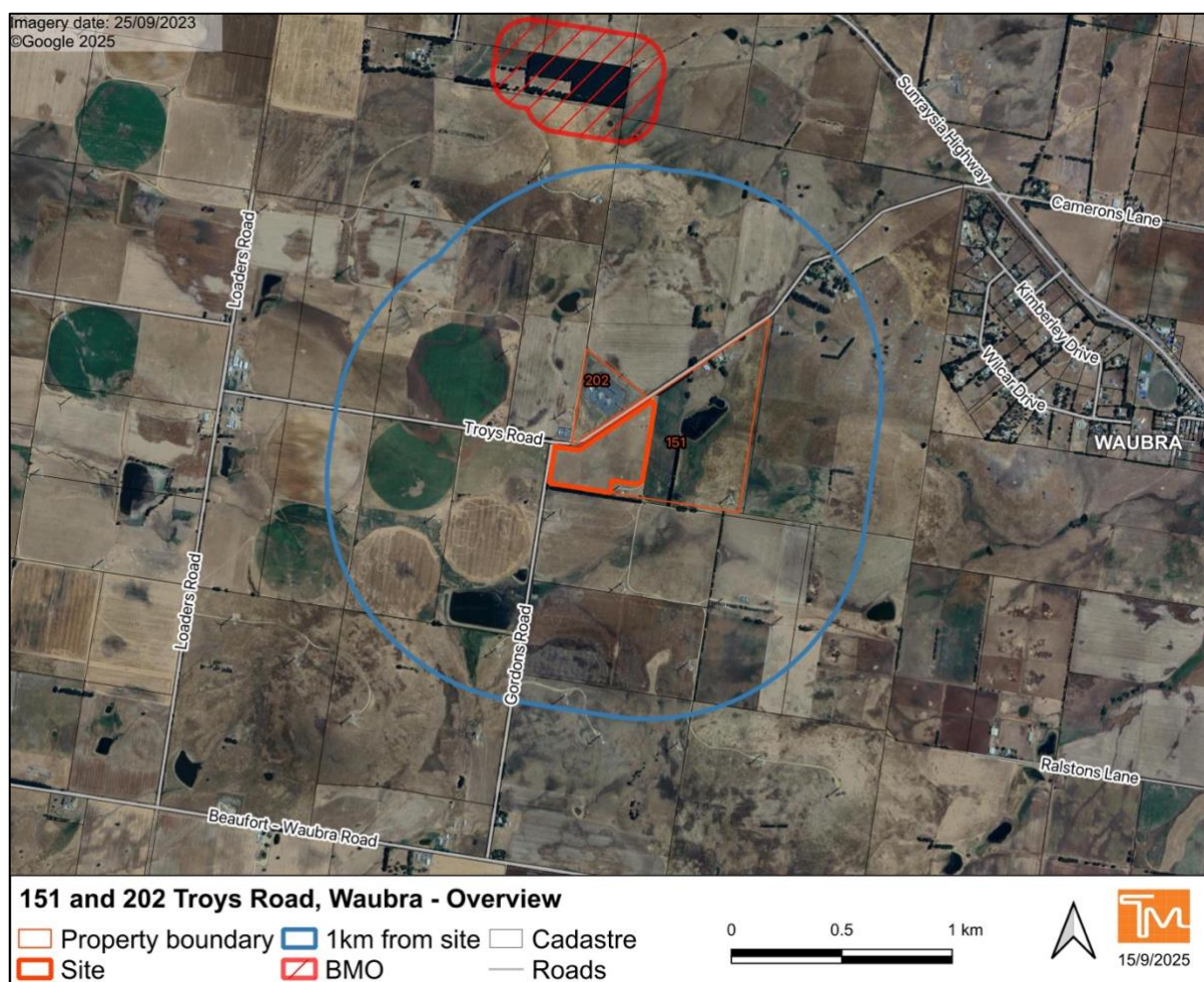
This report assesses the bushfire hazard and identifies how the proposed development of the BESS can appropriately mitigate the bushfire risk and comply with the applicable bushfire planning and building controls. It has been prepared in accordance with guidance for the assessment of, and response to, bushfire risk, provided in:

- Clause 13.02-1S *Bushfire Planning* (Clause 13.02-1S Pyrenees Planning Scheme).
- AS 3959:2018 *Construction of buildings in bushfire prone areas* (Standards Australia, 2020).
- *Bushfire State Planning Policy Amendment VC140*, Planning Advisory Note 68 (DELWP, 2018).
- *Design Guidelines and Model Requirements: Renewable Energy Facilities v4* (CFA, 2023).

¹ Version 4 of The Guidelines (2023) has had multiple minor amendments since being published, the most current is version 4.3, which was issued in January 2025, however the update has not changed the publishing date in the document.

3 Site and proposal overview

Addresses:	151 Troys Road, Waubra VIC 3352 202 Troys Road, Waubra VIC 3352
Combined property size:	93 ha (BESS lease area: 43 ha)
Local Government Area:	Pyrenees Shire Council
Zone/s	Farming Zone (FZ)
Overlay/s	Environmental Significance Overlay – Schedule 1 (ESO1) (<i>partial coverage, does not affect lease area</i>)
Directory reference	VicRoads 58 B7
Site assessment date	2025-04-28
Assessed by	Brittney Taylor & Angus Barbary



Map 1 – Overview of the site.

The BESS infrastructure will comprise 90 battery container modules, 60 medium voltage (MV) power station modules, and an on-site ancillary substation. Each power station will comprise a battery inverter and a 4400 kVA capacity MV transformer. The substation will comprise 1 x three-winding main power transformer of 250 MVA, which will connect to the BESS via 33 kV reticulated underground cabling. This composition of infrastructure for the project may be subject to change based on the outcomes of the detailed design process.

The 220kV Waubra BESS substation will connect the BESS into Ausnet's 220 kV transmission network at the Waubra Terminal Station via a 220 kV transmission line that will either be installed underground or overhead. Final configuration will be confirmed during detail design process. If the transmission line is constructed overhead (current design), it is anticipated four transmission towers will be required.

The site will also include an ancillary operations and management (O&M) facility/building, temporary laydown, temporary batch plant, temporary construction compound, fencing, roads, drainage, spill and fire water runoff containment and earthing.

The site will also be provided with a total static water supply of 432 kL with a fire fighting pump set and hydrants distributed around the site (see Figure 1).

The net weight of the lithium-ion-phosphate battery cells throughout the facility will be approximately 2.52 kilotons.

There will be up to 10 staff on-site during operations, with callouts to the site outside business hours as required. During the construction phase, there will typically be 40 workers on-site, with a maximum of 100 people during the peak of the construction stage.

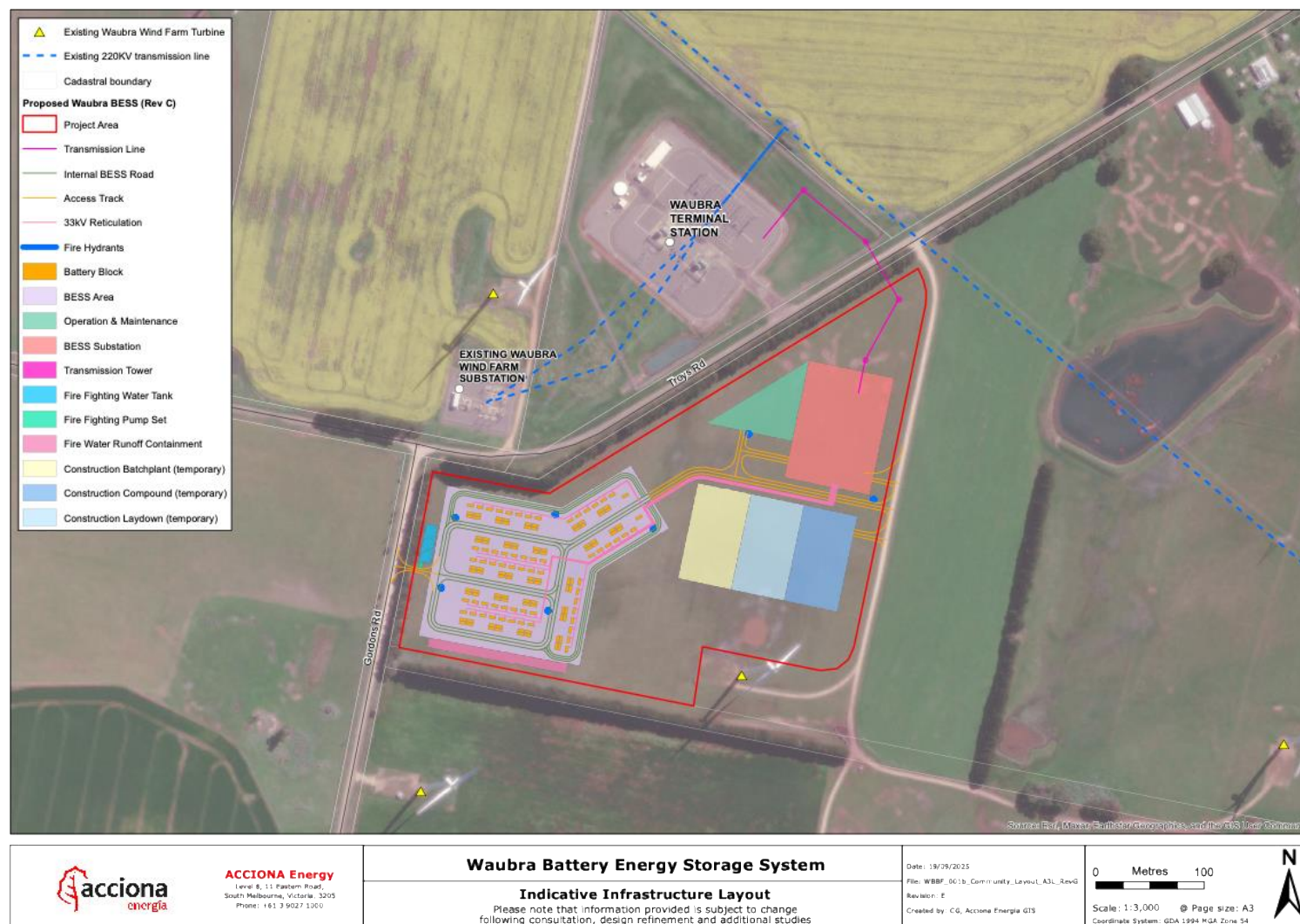


Figure 1 – Indicative site plan for the Waubra BESS (ACCIONA Energia, 2025b). *N.B.* the plan for the site is supported by Map 5 and Map 6.

4 Bushfire planning and building controls

This section identifies the applicable planning and building controls that relate to bushfire.

4.1 Clause 13 Environmental risks and amenity

This clause in the Planning Policy Framework (PPF) has two key provisions pertinent to bushfire.

4.1.1 Clause 13.01-1S Natural hazards and climate change

The objective of this Clause is to minimise the impacts of natural hazards and adapt to the impacts of climate change through risk-based planning. Specified strategies to achieve the objective are:

- *‘Consider the risks associated with climate change in planning and management decision making processes.*
- *Identify at risk areas using the best available data and climate change science.*
- *Integrate strategic land use planning with emergency management decision making.*
- *Direct population growth and development to low risk locations.*
- *Develop adaptation response strategies for existing settlements in risk areas to accommodate change over time.*
- *Ensure planning controls allow for risk mitigation or risk adaptation strategies to be implemented.*
- *Site and design development to minimise risk to life, property, the natural environment and community infrastructure from natural hazards’* (Clause 13.01-1S Pyrenees Planning Scheme).

Especially in southern and eastern Australia, since the 1950’s there has been an increase in the length of the fire weather season and an increase in extreme fire weather (CSIRO/BOM, 2024). The trend of a longer fire season and increased number of dangerous fire weather days is projected to continue. Climate change is contributing to these changes in fire weather including by affecting temperature, relative humidity and associated changes to the fuel moisture content (CSIRO/BOM, 2025) (see Section 0). The National Council for Fire and Emergency Services (formerly AFAC) identify that a failure of building codes and land use planning to adequately adapt to climate change is a significant risk (AFAC, 2018).

Climate change trends associated with the risk of bushfire, support the adoption of a precautionary and conservative approach in identifying and responding to the risk. Climate change in relation to fire weather is discussed further in the hazard assessment in Section 5.3 of this report.

4.1.2 Clause 13.02-1S Bushfire planning

Clause 13.02-1S has the objective *‘To strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life’* (Clause 13.02-1S

Pyrenees Planning Scheme). The policy must be applied to all planning and decision making under the Planning and Environment Act 1987, relating to land which is:

- Within a designated BPA;
- Subject to a BMO; or
- Proposed to be used or developed in a way that may create a bushfire hazard.

Development should not be approved where ‘...a landowner or proponent has not satisfactorily demonstrated that the relevant policies have been addressed, performance measures satisfied or bushfire protection measures can be adequately implemented’.

The CFA Guidelines require the Clause 13.02-1S bushfire hazard identification and assessment strategies to be applied (see Section 5).

The Waubra BESS can appropriately prioritise the protection of human life and meet the objectives of Clause 13.02-1S, by developing and implementing a Fire Management Plan, maintaining low threat vegetation within the site and other site management practices informed by the Guidelines, as detailed in this report.

Additionally, some classes of buildings are required under the National Construction Code (NCC) to be constructed to a Bushfire Attack Level (BAL) if they are in a designated BPA. By constructing all relevant buildings to a minimum BAL-12.5 standard, commensurate with the setbacks provided, it is considered that the objectives of Clause 13.02-1S will be met.

4.2 Clause 71.02-3 Integrated Decision Making

Clause 71.02-3 states that planning and responsible authorities should endeavour to integrate policies and balance conflicting objectives in favour of net community benefit and sustainable development. However, in bushfire affected areas, the protection of human life must be prioritised over all other policy considerations (Clause 71.02-3 Pyrenees Planning Scheme).

4.3 Bushfire Prone Area (BPA)

The entire site is within the BPA. BPAs are those areas subject to or likely to be subject to bushfire, as determined by the Minister for Planning.

In a BPA, the Building Act 1993 and associated Building Regulations 2018, through application of the NCC 2022, require specific design and construction standards for Class 1, 2 and 3² buildings, certain

² Class 1, 2 and 3 buildings are defined in the NCC and are generally those used for residential accommodation, including houses and other dwellings, apartments, hotels and other buildings with a similar function or use.

Class 9 and 4 buildings³, and Class 10A buildings⁴ or decks adjacent to, or connected with, these classes of buildings.

The specifications for construction at each BAL standard can be found in AS 3959:2018 (Standards Australia, 2020) or the ‘NASH Standard’ for steel-framed buildings (NASH, 2021).

The buildings proposed for the site are not likely to be in a class that requires construction to a BAL under the NCC, however, Terramatrix considers it advisable that a BAL-12.5 construction standard be applied to the buildings where possible, to reduce vulnerability to ember attack. This ties in with the Clause 13.02-1S requirement to provide setbacks from classified vegetation to reduce radiant heat flux to less than 12.5 kW/m², which under an applicable building class, corresponds to a BAL-12.5 construction standard.

ACCIONA Energia will use reasonable endeavours to ensure the following buildings are constructed to a BAL-12.5 standard and are provided with the commensurate low threat or non-vegetated setbacks:

- The control/switch room
- The O&M and any associated warehouses
- Any buildings associated with the substation.

4.4 Design guidelines renewable energy facilities

The *Design Guidelines and Model Requirements Renewable Energy Facilities* (CFA, 2023) call for consultation with CFA and provide guidance on designing, constructing, and operating new renewable energy facilities, including a BESS. The Guidelines include standard measures and processes in relation to fire safety, risk and emergency management. Measures include those to be applied in the development of all renewable energy installations, shown in this report as red tables:

<i>Model Requirements – all facilities</i>

and others specific to battery installations, shown in this report as orange tables:

<i>Model or Additional Requirements – BESS specific</i>
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Of relevance to the proposed Waubra BESS are:

- Consideration of applicable Australian standards.
- Meeting the requirements of the planning approvals process.
- Risk management planning.

³ Applicable Class 9 buildings are Class 9a health-care buildings, Class 9b early childhood centres, primary and secondary schools, Class 9c residential care buildings, and any Class 4 parts of a building associated with these Class 9 buildings.

⁴ Class 10a buildings are defined in the NCC as non-habitable buildings including sheds, carports, and private garages.

- Facility location and design.
- Construction, commissioning, and operational procedures.
- Emergency management planning.
- Incorporating CFA input re dangerous goods for battery storage facilities.
- Occupational Health and Safety requirements.
- Provision of information to, and consultation with CFA on the above-mentioned points.

This BDR forms part of the engagement process with CFA and is structured around the Guidelines. Relevant text from the Guidelines is provided at the start of each section under the appropriate headings.

5 Bushfire hazard assessment

The Guidelines require that the hazard identification and assessment strategies at Clause 13.02-1S be applied, using the best available science to identify the hazard posed by vegetation, topographic and climatic conditions. The hazard is to be assessed at the following scales:

- *‘Landscape conditions - meaning the conditions in the landscape within 20 kilometres and potentially up to 75 kilometres from a site;*
- *Local conditions - meaning conditions in the area within approximately 1 kilometre from a site;*
- *Neighbourhood conditions - meaning conditions in the area within 400 metres of a site; and,*
- *The site for the development’* (Clause 13.02-1S Pyrenees Planning Scheme).

The BPA coverage invokes Australian Standard (AS) 3959:2018, which requires a site assessment of the vegetation and topography up to 100 m around a building, for the purposes of determining the applicable BAL construction standard for that building (Standards Australia, 2020). Clause 13.02-1S also requires application of the AS 3959:2018 assessment method to ensure radiant heat flux will not exceed 12.5kW/m² for relevant buildings and, in this case, infrastructure.

This section includes an assessment of vegetation, topography and climate/weather considerations at:

- The wider landscape scale, for at least 20 km around the site (see Section 5.1 and Map 2).
- The local landscape scale extending up to 1 km from the site (see Section 5.1.2 and Map 3).
- The neighbourhood scale up to 400 m around the site boundary to identify any risk arising around the site beyond the BAL assessment zone (see Section 5.1.3 and Map 3).
- The site scale, for 100 m around proposed facility (see Section 5.2 and Map 4).

5.1 Landscape assessment

This section addresses bushfire risk from the broader landscape scale at 20 km to the local landscape at 1km and show these risks in Map 2 and Map 3. An overview of the landscape at a 1 km extent is also illustrated in Map 1 at the beginning of this report.

5.1.1 Broader landscape risk

The BESS is in the Pyrenees Shire Local Government Area (LGA) and located approximately 2.5 km south-west of central Waubra township and 31 km north-west of Ballarat.

Waubra is a small town on the Sunraysia Highway situated in a largely agricultural landscape that has been cleared of most native vegetation within 5 km. The landscape is dominated by paddocks and cropland with occasional plantations and townships.

The broader landscape can be described as follows:

- To the north of the site, agricultural land extends for 10 km, after which are areas of

bushland including Caralulup Nature Conservation Reserve.

- A similar pattern of agricultural land occurs to the west (except for scattered areas of bushland around Lexton) before giving way to Waterloo State Forest and other reserves.
- To the south and east, agricultural land extends for 20 km except for isolated patches of bushland, the largest of which occurs around Mount Bolton 5 km to the east.

The BMO covers the denser bushland in the region and the only BMO coverage within 5 km is that occurring around a small (approximately 8 ha) pine plantation 1.5 km to the north. The wider landscape has a history of large-scale bushfires, the largest of which occurred in the 1985 fire season more than 10 km to the north. Grassfires occurred within 5 km of the site in 1977 and 2018 to the south and in 1980 to the north. More recent large bushfires within the region occurred in 2016 at Mount Bolton, around 6 km to the east and in 2020 to the west of Lexton, around 15 km to the north-west (see Map 2).

The site could be approached by fire burning through the nearby farmland from any direction, however the north, west and south-west are the highest hazard directions (see Section 5.1.4).

Safer areas that would provide refuge in the event of a bushfire are available at the Waubra Neighbourhood Safer Place (NSP), which is the recreation reserve oval in the centre of the town, or alternatively in the urban areas of Ballarat 25 km to the south-east. Multiple routes via main roads are available to both destinations.

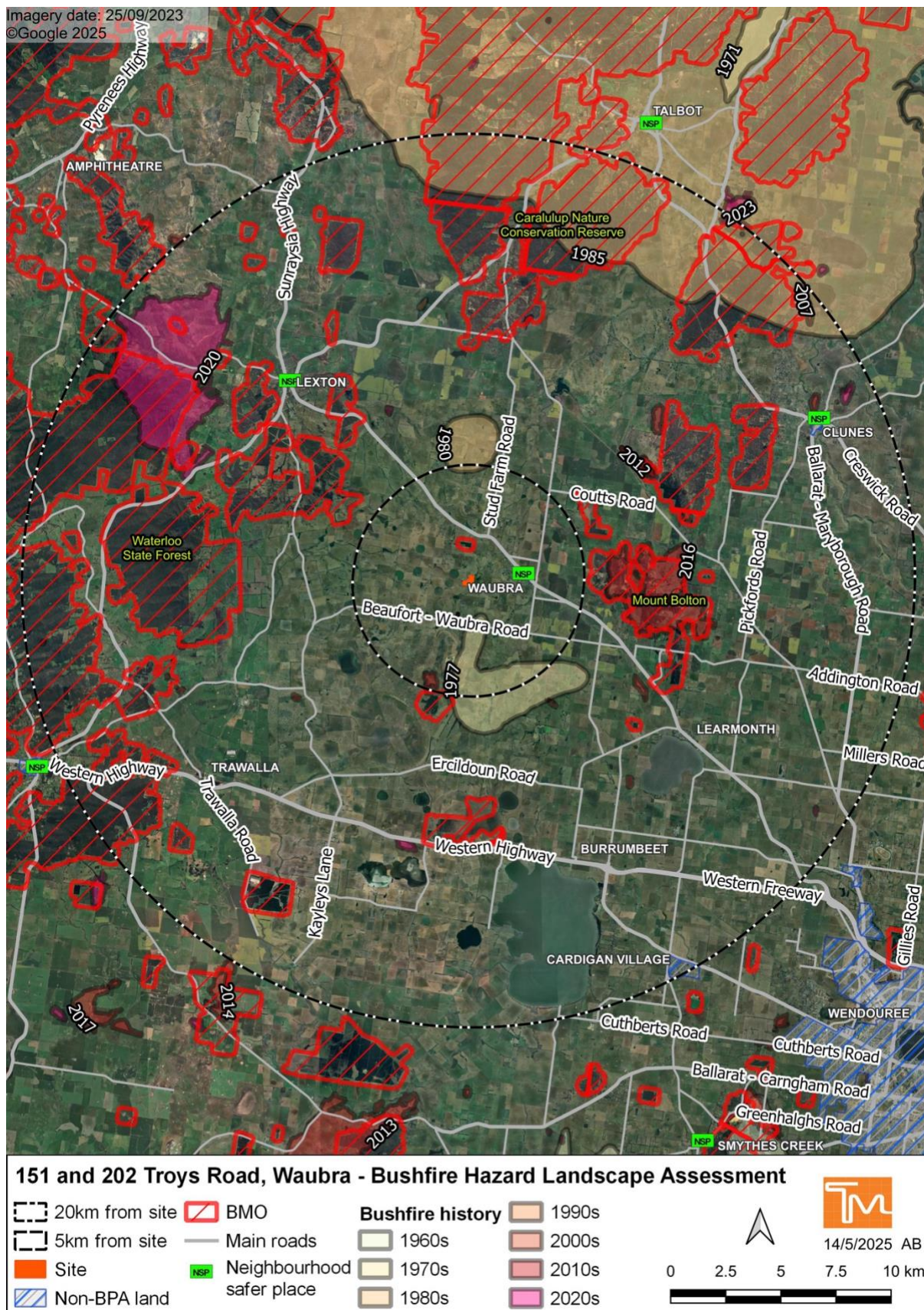
To assist in assessing landscape risk, four 'broader landscape types', representing different landscape risk levels, are described in the technical guide *Planning Applications Bushfire Management Overlay*. These are intended to streamline decision-making, and support more consistent decisions based on the landscape risk (DELWP, 2017).

The four types range from low-risk landscapes where there is little hazardous vegetation beyond 150 m of a site and extreme bushfire behaviour is not credible, to extreme risk landscapes with limited or no evacuation options and where fire behaviour could exceed BMO/AS 3959 assumptions (see Table 1).

The site is in a moderate risk landscape, potentially exposed to long runs of fire through grassland in all directions. The immediately surrounding landscape accords with Broader Landscape Type 2. Access to lower threat areas is available.

Table 1 - Landscape risk typologies (from DELWP, 2017).

Broader Landscape Type 1	Broader Landscape Type 2	Broader Landscape Type 3	Broader Landscape Type 4
• There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation). • Extreme bushfire behaviour is not possible. • The type and extent of vegetation is unlikely to result in neighbourhood-scale destruction of property. • Immediate access is available to a place that provides shelter from bushfire.	• The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site. • Bushfire can only approach from one aspect and the site is located in a suburban, township or urban area managed in a minimum fuel condition. • Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area.	• The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site. • Bushfire can approach from more than one aspect. • The site is located in an area that is not managed in a minimum fuel condition. • Access to an appropriate place that provides shelter from bushfire is not certain.	• The broader landscape presents an extreme risk. • Fires have hours or days to grow and develop before impacting. • Evacuation options are limited or not available.
			



Map 2 – Bushfire hazard landscape assessment.

5.1.2 Local landscape risk

Within the 1 km local assessment zone, the land predominantly comprises Grassland, which is also indicated by the modelled Ecological Vegetation Classes (EVCs) in the area, should the pasture/cropland be allowed to revegetate to its 'natural' state (see Map 3). *N.B.* no extant EVC vegetation communities were identified within the assessment zone, however, it remains a useful model for potential future revegetation in the bioregion.

The small pine plantation, which is 1.5 km to the north, does not pose a credible risk of increased ember attack, other than being part of a wider combustible landscape consisting mostly of Grassland.

A fire approaching the site through agricultural land to the north or north-west would be interrupted by the existing Waubra Terminal Station at 202 Troys Road and Waubra Wind Farm substation, which comprises managed and non-vegetated surfaces, and by the road itself. An approach from the west may be somewhat interrupted by the separation provided by Gordons Road, however the road is unlikely to reliably prevent fire from approaching the site from this direction. A grassfire may directly approach the site from the adjacent farmland on the balance of 151 Troys Road to the east and from neighbouring properties to the south.

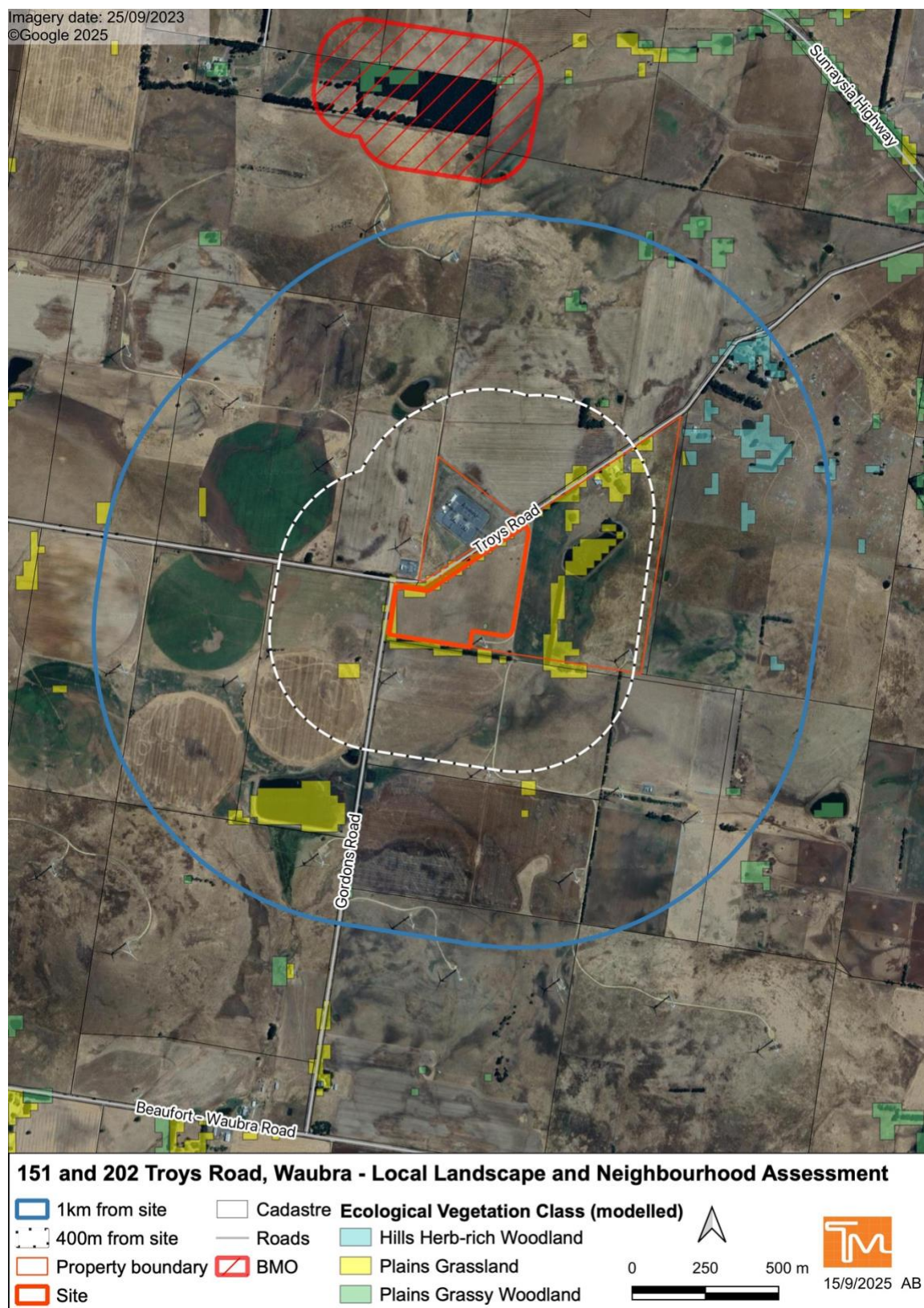
5.1.3 Neighbourhood risk

Within 400 m, the neighbourhood scale bushfire risk to the site is largely consistent with that for 1 km.

5.1.4 Credible bushfire scenarios

The most likely bushfire scenarios for a large landscape fire in Victoria are an approach from those directions typically associated with the direction of the wind on extreme fire danger days, i.e. from the north, north-west, west or south-west (Long, 2006). This principle forms a basis for identifying potential bushfire/grassfire runs that may occur in the landscape, which are therefore credible scenarios where a landscape-scale fire could interact with the site.

The site could be impacted by a fast-moving grassfire similar to the 1977 fire shown in Map 2, which characteristically appears to have occurred under the conditions of a strong northerly wind, followed by a south-westerly change. The most credible grassfire approaches are therefore from the north to south-west.



Map 3 - Local landscape and neighbourhood assessment. Note the distribution of EVC data models
Bioregional Conservation Status based on a 2005 extent and does not represent extant EVC cover.

5.2 Site assessment

The Guidelines require that an application assesses bushfire risk according to Clause 13.02-1S *Bushfire Planning*. Consequently, a bushfire hazard site assessment was conducted using the AS 3959:2018 methodology (Standards Australia, 2020) to determine the applicable vegetation classification/s and effective slope/s within 100 m of the BESS. This assessment informs the development of a Risk Management Plan.

5.2.1 Classified vegetation

Vegetation within a 100 m assessment zone around the BESS has been classified in accordance with the AS 3959:2018 methodology. Classified vegetation is vegetation that is deemed hazardous from a bushfire perspective and, unless excludable, is sorted into one of the vegetation classes at Section 2.2.3 of AS 3959:2018. The applicable class/es for this site are described below.

The classification system is not directly analogous to EVCs but uses a generalised description of vegetation based on the AUSLIG (Australian Natural Resources Atlas: No. 7 - Native Vegetation) classification system. The classification is largely based on the structural characteristics of the vegetation at maturity, but the key determinant should be the likely fire behaviour that it will generate.

The classification is based on the current and anticipated likely future long-term state of the vegetation.

5.2.2 Grassland

Vegetation on the nearby road reserves, in neighbouring paddocks/cropland to the north, west and south, and on the eastern portion of 151 Troys Road, matches the AS 3959:2018 classification of Grassland, which is defined as all forms of vegetation (except Tussock Moorlands) including situations with shrubs and trees, if overstorey foliage cover is less than 10%. Includes pasture and cropland (Standards Australia, 2020).

Grassland vegetation is considered hazardous and therefore classifiable when it is not managed in a minimal fuel condition. Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (e.g. short-cropped grass, to a nominal height of 100 mm) (Standards Australia, 2020). Grassland areas are assumed to be unmanaged and classifiable unless there is 'reasonable assurance' that they will be managed in perpetuity, in a low threat state, no more than 100 mm high.

There are single rows of pines (windbreaks) along the northern and western boundaries of 151 Troys Road, for which the underlying vegetation classification remains as Grassland.



Figure 2 – Grassland north of the site over Troys Road.



Figure 3 – Grassland on Troys Road reserve and a single row windbreak on the northern boundary of the site.



Figure 4 – Grassland on the road reserve and on a neighbouring property to the west.



Figure 5 – Looking into the site from the corner of Troys Road and Gordons Road, showing the single row windbreaks around the perimeter of the site.



Figure 6 – Pasture on a neighbouring property to the south, which is classified as Grassland.



Figure 7 – Pasture on a neighbouring property to the east, which is classified as Grassland.

5.2.3 Excluded vegetation and non-vegetated areas

Areas of low threat vegetation and non-vegetated areas can be excluded from classification in accordance with Section 2.2.3.2 of AS 3959:2018, if they meet one or more of the following criteria:

- (a) 'Vegetation of any type that is more than 100 m from the site.*
- (b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.*
- (c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other, or of other areas of vegetation being classified vegetation.*
- (d) Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.*
- (e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.*
- (f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks' (Standards Australia, 2020).*

All vegetation on the site will need to be managed in a low threat state (i.e. as non-classified vegetation), therefore Map 4 does not show classified vegetation within the BESS lease area.

The low-threat areas excluded from classification include the treed windbreak along the northern, western and southern boundaries of the site and managed grass on neighbouring properties associated with the existing terminal and substation to the north. Non-vegetated areas within the 100 m site assessment zone include roads, structures and parts of the Waubra Terminal Station and Waubra Wind Farm substation (see Map 4).



Figure 8 – Managed grass around the Waubra Terminal Station.



Figure 9 – Managed grass around and non-vegetated areas of the Waubra Wind Farm substation.

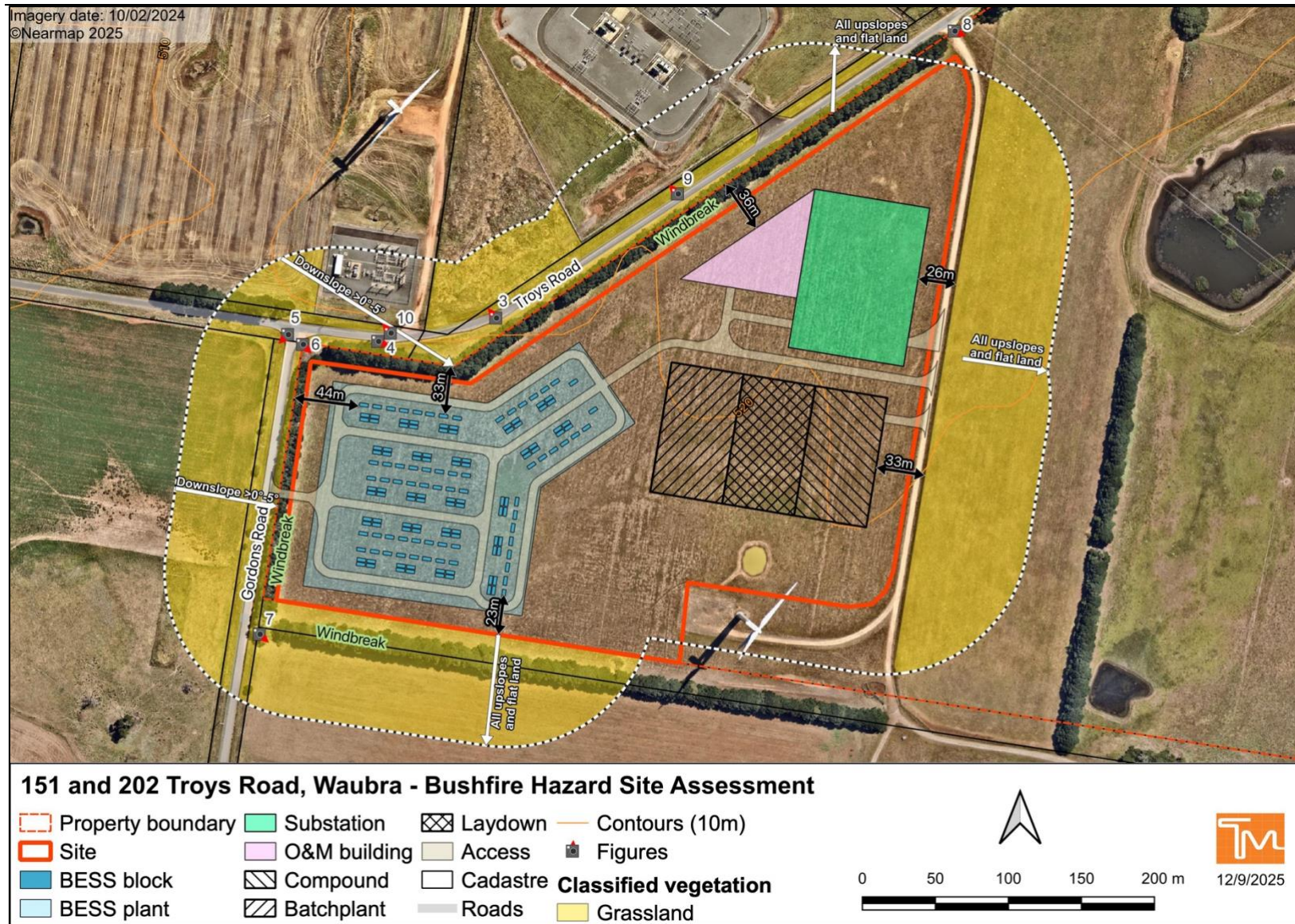
5.2.4 Topography

AS 3959 requires that the 'effective slope' be identified to determine the BAL and applicable vegetation setback distances. This is the slope of the land under the classified vegetation⁵ that will most significantly influence the bushfire attack on a building. Two broad types apply:

- Flat and/or Upslope - land that is flat or on which a bushfire will be burning downhill in relation to the development. Fires burning downhill (i.e. on an upslope) will generally be moving more slowly with a reduced intensity.
- Downslope - land under the classified vegetation on which a bushfire will be burning uphill in relation to the development. As the rate of spread of a bushfire burning on a downslope (i.e. burning uphill towards a development) is significantly influenced by increases in slope, downslopes are grouped into five classes in 5° increments from 0° up to 20°.

The land rises slightly toward the site from the north-west, creating an effective slope in the 'Downslope >0° to 5°' slope class to the north and west. In all other directions, the effective slope is in the 'All upslopes and flat land' category (see Map 4).

⁵ The slope of the land between the classified vegetation and the building is called the site slope, which in the Method 1 procedure of AS 3959 is assumed to be the same as the effective slope.



Map 4 – Bushfire hazard site assessment.

5.3 Fire weather

The Victorian planning and building systems use the Forest Fire Danger Index (FFDI) and the Grassland Fire Danger Index (GFDI) to represent the level of bushfire threat based on weather (and fuel) conditions. An FFDI 100/GFDI 130 (equivalent to a Catastrophic fire danger rating under the Australian Fire Danger Rating System) is applied in non-alpine areas of Victoria by the building system to establish building setback distances from classified vegetation in accordance with AS 3959:2018. The potential fire behaviour and impact under different Fire Danger Ratings (FDRs) is summarised in Table 2.

Table 2 - Fire Danger Ratings (Source: RFS, 2023).

Grassland Fire Behaviour Index	Fire Danger Rating (FDR)	Description of conditions	
		Indicative fire behaviour	Potential for impact
100+	Catastrophic	Extremely rapid fire growth and increasing likelihood of large final fire area/size. Possibility for fire behaviour to become erratic and plume driven. Strong convective column formation. Wind speed and direction likely to be erratic at times.	Extremely high likelihood of agricultural/pasture/crop/stock losses together with loss of rural assets such as homesteads, fencing machinery and buildings. Very limited visibility due to smoke and dust. Very high risk to the community related to inappropriate pre-considered plans, inadequate sheltering. Extremely strong winds are likely to impact infrastructure (e.g., power lines) and fall trees increasing the likelihood of obstructed roads and power outages.
50-99	Extreme	Extremely rapid fire growth and increasing likelihood of large final fire area/size. Possibility for fire behaviour to become erratic and plume driven. Strong convective column formation. Wind speed and direction likely to be erratic at times.	Increasingly high likelihood of agricultural/pasture/crop/stock losses together with loss of rural assets such as homesteads, fencing machinery and buildings. Limited visibility due to smoke and dust. High risk to the community related to inappropriate pre-considered plans, inadequate sheltering. Strong winds are likely to impact infrastructure (e.g., power lines) and fall trees increasing the likelihood of obstructed roads and power outages.
24-49	High	Wind driven, rapidly spreading fires with potential for development into large fire area/size and with the potential for short distance spotting and long flame lengths.	High likelihood of agricultural/pasture/crop/stock losses together with loss of rural assets such as homesteads, fencing machinery and buildings.
12-23	Moderate	Typically wind driven and rapidly spreading fires with the potential to gain size quickly.	Possible agricultural/pasture/crop/stock losses together with loss of rural assets such as homesteads, fencing machinery and buildings.
6-11	No rating	Fires easily sustained. Typically wind driven fires that can spread quickly.	Community losses are unlikely however unattended or poorly prepared houses and infrastructure may be at risk.
0-5		Fire difficult to ignite and sustain. Fires generally unlikely to spread and likely to self-extinguish.	Community losses are unlikely.

Note that the benchmark of an FFDI 100 represents a 'one size fits all' model of extreme fire weather conditions for the state, but which has been exceeded during some significant fire events, including in Victoria on 'Black Saturday' 2009. Therefore, it is important to note that this is not necessarily the *worst-case* conditions for any location, including the Waubra BESS site.

In southern Australia, since the 1950s there has been an increase in the length of the fire weather season and an increase in extreme fire weather. It is projected that there will be further increase in the number of dangerous fire weather days and a longer fire season for southern and eastern Australia (CSIRO/BOM, 2024). There is a 'high confidence' that climate change will result in a harsher fire weather climate for the Southern Slopes – Victoria West sub-cluster that the study area is in, with 'high' confidence that there will be increased potential evapotranspiration (curing) in all seasons as warming progresses (CSIRO/BMO, 2025).

Currently the CFA and DTP have no published policy on FFDI/GFDI recurrence intervals. There is, therefore, no compelling rationale for applying a different FFDI/GFDI from the 'default' FFDI 100/GFDI 130 threshold currently used throughout non-Alpine areas of Victoria in the planning and building system.

6 Risk Management Plan

The Guidelines require a Risk Management Plan to be developed for all renewable energy facilities, including BESSs, to address the threat of bushfire. The Risk Management Plan may also require a Fire Safety Study (see Section 6.6). Responses to each of the points in the Model Requirements of the Guidelines are summarised below, whilst also referring to more detailed descriptions elsewhere in this BDR.

Model Requirements – all facilities

A Risk Management Plan must be developed for facilities with battery energy storage systems, in conjunction with CFA, before development starts.

The Risk Management Plan must:

- a) *Describe the infrastructure (natural and built), landscape, nature of operations and occupancy of the facility.*
- b) *Describe the risks and hazards at the facility to and from the battery energy storage system and related infrastructure.*
- c) *Specify and justify, in accordance with Section 4.2 of this guideline:*
 - *The **location** of the battery energy storage system in the landscape and the proposed infrastructure on-site.*
 - ***Emergency vehicle access** to and within the facility that:*
 - *Includes site access points of a number suitable to the size and hazard of the facility (a minimum of two).*
 - *Provides access to battery energy storage systems, substations and fire service infrastructure.*
 - ***Firefighting water supply** for the facility.*
 - *A **fire break width** of 10m or greater, based on radiant heat flux (output) as an ignition source:*
 - *Around the perimeter of the facility.*
 - *Between any landscape buffer/vegetation screening and infrastructure.*
 - *The **separation distance**, based on radiant heat flux (output) as an ignition source, between:*
 - *Adjacent renewable energy infrastructure (e.g., between adjacent battery containers/enclosures).*
 - *Battery containers/enclosures and related battery infrastructure, buildings/structures, and vegetation.*
 - ***All other controls** for the management of on- and off-site hazards and risks at the facility (including all proposed battery energy storage system safety and protective systems).*
- d) *Provide an evidence-based determination of the effectiveness of the risk controls against the identified hazards, including justification for the omission of any battery safety and protective system/s.*
- e) *Form the basis for the design of the facility.*

6.1 Facility description

The Waubra BESS will comprise a battery array, substation and associated infrastructure. A detailed description of the facility, its operations and occupancy, and the landscape context in which it is set is provided in Sections 2 and 5.1 of this report respectively.

6.2 Identification of bushfire risk

Section 5 of this BDR identifies the bushfire risk arising from the proposed location of the BESS in the landscape and its siting in relation to the surrounding vegetation and land use. The key bushfire risks are:

- A landscape scale grassfire approaching from the north, west or south-west.
- Radiant heat/flame exposure from a fire in the Grassland within the 100 m site assessment zone.
- A malfunction of/damage to the BESS or related infrastructure within the site that results in a bushfire ignition.

6.3 Emergency vehicle access and water supply

Section 7.2 of this BDR describes the emergency vehicle access to/from the facility, the key points of which include:

- Two (2) access/egress points for emergency vehicles.
- Access roads within and around the facility with a minimum width of 4 m at the narrowest point, providing access to and around the BESS infrastructure, substation and fire fighting static water supply.
- A 432,000 L static water supply in 3 above ground, non-combustible tanks with appropriate fittings and signage, including an integrated hydrant system (see Map 6).

6.4 Fire breaks and separation distances

Section 7.2.5 of this BDR identifies the width and distribution of fire breaks within/around the facility, which are illustrated in Map 5 and Map 6. They include:

- Fire breaks around the perimeter of the facility for a minimum 10 m between BESS fire-hazardous infrastructure and any vegetation including landscape buffers containing screening vegetation.
- Setbacks from classified vegetation adjacent to the site (Grassland) by managing vegetation on the site as low-threat or non-vegetated areas to provide minimum separation distances for fire-hazardous infrastructure (from the property boundary) of:
 - 22 m to the north and west.
 - 19 m to the south and east.
- A separation distance based on potential for ignition by radiant heat flux, as determined by the Fire Safety Study (see Section 6.6), of:

- 3 m between all opening sides of battery containers/infrastructure. (*N.B.* BESS containers will be installed according to manufacturer specifications, which are tested to *UL9540* and *UL9540A* (Underwriters Laboratories developed standard, which is used in the USA and Canada)).
- 22 m between battery containers/fire hazardous-infrastructure and screening vegetation.

6.5 Other controls and design elements

Additional controls and design elements addressing bushfire are listed below:

- Fire suppression systems (see Section 7.2.3).
- BESS safe operating procedures (see Section 9).

6.6 Fire Safety Study

For BESSs, the Guidelines state that the CFA expects that a Fire Safety Study is conducted and recommends that it reflects the content and structure of NSW Planning's *Hazardous Industry Planning Advisory Paper 2: Fire Safety Study Guidelines* (NSW Government, 2011) to address risks from the proposed technologies.

Any Fire Safety Study of the Waubra BESS, if required, will be provided by others as a separate report.

To inform the required setback distance between battery units and screening vegetation, any Fire Safety Study must identify the radiant heat flux output of a BESS lithium-ion-phosphate unit when fully involved in fire and the distance at which that radiant heat decreases to 12.5 kW/m². Note if this distance is more than 10 m, the proposed fire break around the facility will also need to be widened.

7 Facility location and design

The Guidelines require that the location and design of the facility is considered in terms of both of the following bushfire risk scenarios:

- The bushfire risk posed by the facility to nearby communities, infrastructure, and assets.
- The bushfire risk posed by surrounding areas to the facility.

7.1 Facility location

‘Renewable energy facilities are to be located in low-risk environments wherever possible, to reduce the risk of external fire impacting the facility and its consequences’ (CFA, 2023).

Additional Requirement – BESS specific

Wherever possible, battery energy storage systems must be sited in low-risk environments, such as where the BMO and LSIO do not apply. The Risk Management Plan must inform the siting for battery energy storage systems.

Model Requirements – all facilities

Planning applications for all renewable energy facilities proposed in high-risk environments must address the following:

- a) An assessment against policy at **Clause 13.02-1S (Bushfire Planning)** where the facility is located in a Bushfire Prone Area (BPA):*
- b) The impact of any ignitions arising from the infrastructure (solar panels, wind turbines, battery energy storage systems, electrical infrastructure) on nearby communities, infrastructure and assets.*
- c) The impact of bushfire on the infrastructure (eg. ember attack, radiant heat impact, flame contact).*
- d) Assessment of whether the proposal will lead to an increase in risk to adjacent land and how the proposal will reduce risks at the site to an acceptable level.*

The hazard assessment in Section 5 has identified the landscape risk to be moderate and the BMO does not apply to the site. The site is in a designated BPA and as such has been assessed against Clause 13.02-1S.

7.1.1 Assessment against Clause 13.02-1S

The facility can comply with all the relevant objectives and requirements of Clause 13.02-1S, including setbacks from classified vegetation to reduce radiant heat flux to less than 12.5 kW/m². A full itemized response addressing the requirements of Clause 13.02-1S can be found in Section 11 of this BDR.

7.1.2 Impact on nearby communities, infrastructure, and assets

The likelihood of potential impacts that the Waubra BESS may have on nearby communities, infrastructure and assets will be determined and documented by the Fire Safety Study (see Section 6.6), which will outline the likelihood and consequence of ignitions within the site.

Nearby features of interest that should be considered include:

- Township of Waubra, 2 km to the north-east.
- Sunraysia Highway 2 km to the north and Western Highway 10 km to the south.
- Waubra Terminal Station on 202 Troys Road and Waubra Wind Farm Substation on the adjacent property to the west.

As the site is located in a moderate-risk landscape (see Section 5.1), in the event that the Waubra BESS causes a bushfire in the wider landscape, the resultant bushfire risk is also likely to be, at most, moderate.

7.1.3 Impact of bushfire on BESS infrastructure

The risk of bushfire impact on BESS infrastructure will be mitigated to an appropriate level via applying the design and operational requirements of the Guidelines (CFA, 2023). This is largely achieved by applying the following design features:

- Setbacks from classified vegetation for BESS infrastructure to reduce radiant heat flux to less than 12.5 kW/m².
- A minimum 10 m wide fire break that includes a perimeter road around the facility.
- Access road widths of 4 m or more.
- A static water supply of 432,000 L in 3 non-combustible, above-ground tanks with compliant fire authority outlet/s and couplings.
- Fire detection and suppression equipment.
- Management of vegetation on site in a low threat condition.
- Appropriate consideration of the bushfire risk during the construction, commissioning, and operational phases of the facility.
- An Emergency Management Plan (or equivalent) that includes bushfire, which will be composed prior to construction.

7.1.4 Risk to adjacent land

The risk to adjacent land will be determined and documented by the Fire Safety Study (see Section 6.6), however the risk is considered to be appropriately reduced through the mitigation measures integrated into the concept design and described in this BDR in adherence to the Guidelines.

The site is not covered by the BMO or LSIO, both of which concern land that is at risk of natural hazards, bushfire and flood respectively.

Section 5 identifies the level of bushfire risk at a range of scales and has determined that the broader landscape is a moderate risk landscape, with the risk closer to the site decreasing as the vegetation hazard at the local, neighbourhood and site-scales is restricted to Grassland.

Model Requirements – all facilities

- a) Construction of a four (4) metre perimeter road within the perimeter fire break.
- b) Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes (eg., no compacted earth).
- c) Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface. Ensure any fencing along access routes allows for width of fire vehicles.
- d) 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.
- e) Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.
- f) Roads must incorporate passing bays at least every 600 metres, which must be at least twenty (20) metres long and have a minimum trafficable width of six (6) metres. At least one passing bay must be incorporated where roads are less than 600 metres long.
- g) Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, and battery energy storage systems and related infrastructure, substations and grid connection areas.
- h) The provision of at least two (2) but preferably more access points to each part of the facility. The number of access points must be informed through a risk management process, in consultation with the CFA.

7.2 Facility design

‘Renewable energy facilities must be designed to eliminate or reduce the risk of fire occurring and if it does occur, its consequences’ (CFA, 2023).

7.2.1 Emergency vehicle access

The Guidelines require that access for emergency vehicles is provided at the Waubra BESS, that complies with the Model Requirements below.

Model Requirement – BESS specific

At least two access points are to be provided into each section where battery energy storage systems are located. The number and location of vehicle access points must be determined in consultation with CFA.

The proposed emergency vehicle access will meet (and in some cases exceed) the requirements of the Guidelines by providing a network of roads constructed of bitumen and/or crushed rock with a width of 4 m at the narrowest point (see Section Map 6). *N.B.* if sections of the proposed roads will be less than 4 m in width (and longer than 600 m access at any point), then passing bays of at least 4 m x 20 m are required.

Each of the access requirements listed above will be met, as illustrated in Figure 1 and Map 5. Further information and illustrative examples relating to the access requirements can be found in Appendix B.

The Waubra BESS will have two access points, as follows:

- Primary access – driveway of 300 m (± 50 m) connecting the facility to Troys Road near the north-eastern corner of the site.
- Secondary access – in the south-west (opposite) corner of the site, connecting the facility to Gordons Road.

The distance between the two access/egress points is 500 m (± 50 m) m (see Map 5).

7.2.2 Firefighting water supply

'In the event of a fire (structure fire, grassfire or bushfire), sufficient water must be available and safely accessible to emergency responders and trucks to ensure that fire suppression activities are safe, timely, effective and not hindered in any way. Firefighting infrastructure must be designed to allow effective response to the risks and hazards at the facility. Fire water must be provided to cover buildings, control rooms, substations and grid connections. The quantity of water supply must be established through a comprehensive risk management process that considers all relevant hazards, documented in the Risk Management Plan, in consultation with CFA' (CFA, 2023).

Model Requirements – all facilities

- a) Water access points must be clearly identifiable and unobstructed to ensure efficient access.
- b) Static water storage tank installations must comply with AS 2419.1-2021: Fire hydrant installations – System design, installation and commissioning.
- c) The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel.
- d) The static water storage tank(s) must be capable of being completely refilled automatically or manually within 24 hours.
- e) The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure (solar panels, wind turbines, battery energy storage systems, etc.).
- f) The hard-suction point must be provided, with a 150mm full bore isolation valve (**Image 1** in Appendix C) equipped with a Storz connection, sized to comply with the required suction hydraulic performance.
Adapters that may be required to match the connection are: 125mm, 100mm, 90mm, 75mm, 65mm Storz tree adapters (**Image 2** in Appendix C) with a matching blank end cap to be provided.
- g) The hard-suction point must be positioned within four (4) metres to a hardstand area and provide a clear access for emergency services personnel.
- h) An all-weather road access and hardstand must 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 or to the satisfaction of the CFA.
- i) The road access and hardstand must be kept clear at all times.
- j) The hard-suction point must be protected from mechanical damage (eg. bollards) where necessary.
- k) Where the access road has one entrance, a ten (10) metre radius turning circle must be provided at the tank.
- l) An external water level indicator must be provided to the tank and be visible from the hardstand area.
- m) Signage (**Image 3** in Appendix C) indicating 'FIRE WATER' and the tank capacity must be fixed to each tank.
- n) Signage (**Image 4** in Appendix C) must be provided at the front entrance to the facility, indicating the direction to the static water tank.

Additional Requirements – BESS specific

A fire protection system suitable for the risks and hazards at the facility must be provided.

For battery energy storage systems, the water supply quantity must:

- *Enable effective cooling of surrounding infrastructure.*
- *Account for reasonable duration of fire events based on the proposed battery chemistry.*
- *Account for local weather conditions and potential fire weather conditions.*
- *Provide for the safety of firefighters.*

The fire protection system must be designed in line with the requirements of AS 2419.1-2021: Fire hydrant installations, Clause 3.9: Open Yard Protection, in consultation with CFA.

For the purposes of determining system requirements, the 'yard area' referenced within AS 2419.1, Table 2.2.5(D) may be considered that of the battery installation, including the minimum 10m fire break around the battery infrastructure, rather than the entire area of the yard or site.

Emergency response experience from battery energy storage system incidents indicates that larger quantities of water may be required.

The objectives will be met for the Waubra BESS by addressing the Model and Additional Requirements.

The Waubra BESS will provide a 432,000 L static water supply in 3 tanks located in the western side of the project area (see Map 6). The tanks will be provided with appropriate construction, fittings, signage and distances from infrastructure in accordance with the above requirements. See Appendix C for further detail and illustrations on specific signage/layout examples.

The amount of cooling to be provided to infrastructure and the duration of fire in relation to battery chemistry will be determined in the Fire Safety Study (see Section 6.6). Appropriate design responses will be incorporated based on the findings of the Fire Safety Study.

Local fire weather conditions are considered in Section 5.1.4 and the design response to this is the application of the Model Requirements, including weather monitoring as part of the Emergency Management Plan (see Section 10).

The safety of firefighters will be provided by incorporating the Model Requirements for the facility design, operation, and emergency management planning.

Model Requirements – BESS specific

Where battery energy storage systems are ancillary to solar or wind energy facilities and proposed within a single centralised location, fire protection in accordance with the model requirements in this section must be provided.

1) For facilities with battery energy storage systems, the fire protection system must include at a minimum:

- a) Where reticulated water is available, a fire hydrant system that meets the requirements of AS 2419.1-2021: Fire hydrant installations, Section 3.9: Open Yard Protection, and Table 2.2.5(D): Number of Fire Hydrants Required to Flow Simultaneously for Protected - Open Yards. Except, that fire hydrants must be provided and located so that every part of the battery energy storage system is within reach of a 10m hose stream issuing from a nozzle at the end of a 60m length of hose connected to a fire hydrant outlet.
(see **Image 5** in Appendix C)

OR

- b) Where no reticulated water is available, a fire water supply in static storage tanks, where:
- i. The fire water supply must be of a quantity no less than 288,000L or as per the provisions for Open Yard Protection of AS 2419.1-2021: Fire Hydrant installations, Table 2.2.5(D) for open yards flowing for a period of no less than four hours at 20L/s, whichever is the greater.
 - ii. The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.1-2021: Fire hydrant installations, Table 2.2.5(D).
(E.g., For battery installations with an aggregate area of over 27,000m², 4 (four) hydrant outlets are required to operate at 10L/s for four hours, which equates to a minimum static water supply of 576kL.)
 - iii. Fire hydrants must be provided and located so that every part of the battery energy storage system is within reach of a 10m hose stream issuing from a nozzle at the end of a 60m length of hose connected to a fire hydrant outlet.
 - iv. The fire water supply must be located at vehicle entrances to the facility, at least 10m from any infrastructure (electrical substations, inverters, battery energy storage systems, buildings).
 - v. The fire water supply must be reasonably adjacent to the battery energy storage system and shall be accessible without undue danger in an emergency. (E.g., Fire water tanks are to be located closer to the site entrance than the battery energy storage system).
 - vi. The fire water supply must comply with AS 2419.1-2021: Fire hydrant installations, Section 5: Water storage tanks.
(see **Image 6** in Appendix C)

The Waubra BESS is a 'centralised' facility and will be provided with a 432,000 L static water supply and hydrant system that complies with all the Model Requirements under item b) above. This includes hydrants/millcocks, which will be located within 70 m of all BESS containers allowing for a 10 m water stream at the end of a 60 m length of hose. Further details of the water supply requirements can be found in Appendix C. The tanks will be located in the western side of the site near the Gordon Road entrance (see Map 5).

While it is not applicable to the Waubra BESS (as it falls under the ‘centralised’ stream), the Guidelines also state:

‘Where battery energy storage systems are decentralised, that is, proposed in multiple locations such as amongst solar panel arrays, fire water must be available for each container/enclosure/cabinet’ (CFA, 2023).

Model Requirements – BESS specific

1) For facilities with decentralised battery energy storage systems, the fire protection system must include at a minimum:

a) Where reticulated water is available, a fire protection system as per Model Requirement (1a) under ‘Centralised Battery Energy Storage Systems’.

OR

b) Where no reticulated water is available, a firewater supply in static storage tanks, where a minimum 45,000L static water tank is provided within 120m of each battery container. The aggregate quantity of fire water supply at the facility must be no less than 288,000L to the satisfaction of CFA.

(see **Image 7** in Appendix C)

7.2.3 Fire detection and suppression equipment

‘In addition to fire water supplies, suitable fire detection and suppression equipment must be provided at the facility. This includes first-aid equipment such as fire extinguishers and fire hose reels’ (CFA, 2023).

Model Requirements – All facilities

Suitable fire detection and suppression equipment must be provided:

- a) For on-site buildings and structures, according to the requirements of the National Construction Code.
- b) For storages of dangerous goods, according to the requirements of any Australian Standards for storing and handling of dangerous goods.
- c) For electrical installations, a minimum of two (2) suitable fire extinguishers must be provided within 3m-20m of each PCU.
- d) In all vehicles and heavy equipment, each vehicle must carry at least a nine (9)-litre water stored-pressure fire extinguisher with a minimum rating of 3A, or other firefighting equipment as a minimum when on-site during the Fire Danger Period.

The Waubra BESS will comply with all the above requirements.

7.2.4 Landscape screening and on-site vegetation

The Guidelines state that *‘any proposed or existing vegetation must be considered in the Risk Management Plan for its potential to intensify and propagate fire within and away from the site.’* (CFA, 2023).

This involves consideration of the type (species), density, height, location and overall width of the screening.

Facilities must be designed so that the radiant heat flux from vegetation does not create the potential for ignition of on-site infrastructure or other vegetation. Similarly, any screening vegetation must be far enough from BESS infrastructure so as not to be ignited by a nearby battery that is fully involved in fire.

The site is bounded by screening vegetation (pines), therefore no new additional screening vegetation is proposed within the project area. The existing screening complies with the requirements of the Guidelines.

All vegetation within the leased area will be managed in accordance with the Guidelines.

Further detail of the appropriate setback distance between will be provided in the Fire Safety Study (see Section 6.6), including the radiant heat output of a battery unit that is fully involved in fire to ensure it will not ignite screening vegetation.

The Guidelines provide specific direction for vegetation management around substations and electric lines. The entire substation will be surfaced to eliminate all vegetation including grasses. Substations and electric lines must also comply with the *Electricity Safety Regulations 2020* of the *Electricity Safety Act 1998*, based on an assigned fire hazard rating by CFA, which is available upon request.

7.2.5 Fire breaks

The Guidelines state that fire breaks are required, which are defined as *‘a gap in fuel (vegetation) that reduces the potential for fire to enter or leave an area. Firebreaks may also be used for emergency vehicle access’* (CFA, 2023).

Model Requirements – all facilities

A fire break must be established and maintained around:

- a) The perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary.*
- b) The perimeter of control rooms, electricity compounds, substations and all other buildings on-site.*

The width of fire breaks must be a minimum of 10 m, and at least the distance where radiant heat flux (output) from the vegetation does not create the potential for ignition of on-site infrastructure.

The Waubra BESS will provide fire breaks at least 10 m wide around the ‘facility’ elements (being BESS infrastructure and associated buildings) and areas of vegetation (including screening vegetation). The fire breaks will comprise 7-10m of non-combustible materials such as crush rock or concrete, some of which will overlap with the footprint of access tracks and drainage.

In addition to the fire breaks, there will be low threat vegetation setback areas within 22 m of BESS containers, comprising no more than managed grass that is kept mown to less than 100 mm in height. These low threat vegetation setbacks, in combination with the 10 m wide fire breaks,

effectively reduce the potential for ignition of infrastructure, by reducing radiant heat flux from a fire in the adjacent Grassland to less than 12.5 Kw/m².

The applied minimum width of the low threat setbacks is 22 m for all BESS modules, in which no additional re-vegetation is proposed other than low threat managed grass. The pines along the site boundaries are more than 22 m away, which will also be managed as low threat ongoingly (as a windbreak in accordance with Section 2.2.3.2 of AS 3959:2018).

Model Requirement – BESS specific

A fire break must be established and maintained around battery energy storage systems and related infrastructure.

This Model Requirement is met by the above conditions, however the Guidelines go on to state that *‘In addition to radiant heat flux (output) from vegetation, the width of fire breaks between vegetation and battery energy storage systems must be at least the distance where the radiant heat flux (output) from the battery energy storage system fully involved in fire does not create the potential for ignition of vegetation’* (CFA, 2023).

The findings of the Fire Safety Study (see Section 6.6) will determine whether the setback distance required from burning BESS infrastructure is achieved by the setbacks required from classified vegetation or whether the setback distance needs to be increased.

7.2.6 Design specific to facility type

The Guidelines specify that the current versions of *NFPA 855: Standard Installation of Stationary Energy Storage Systems*, *UL 9540: Energy Storage System Requirements* and *FM Global Property Loss Prevention Data Sheet 5-33 (2020) Electrical Energy Storage Systems*, should be used in the design and operation of BESSs, except where they are varied by the Guidelines.

Model Requirements – BESS specific

1) The design of the facility must incorporate:

- a) A separation distance that prevents fire spread between battery containers/enclosures and:
 - i. Other battery containers/enclosures.
 - ii. On-site buildings.
 - iii. Substations.
 - iv. The site boundary.
 - v. Any other site buildings.
 - vi. Vegetation.

Separation must be at least the distance where the radiant heat flux (output) from a battery energy storage system container/enclosure fully involved in fire does not create the potential for ignition of these site elements.

- b) A fire break around the battery energy storage system and related infrastructure, of a width of no less than 10 m, or greater where determined in the Risk Management Plan. Fire breaks must be non-combustible, constructed of concrete, mineral earth, or non-combustible mulch such as crushed rock. The width must be calculated based on the ignition source being radiant heat of surrounding

vegetation, including landscaping.

c) A layout of site infrastructure that:

- i. Considers the safety of emergency responders.*
- ii. Minimises the potential for grassfire and/or bushfire to impact the battery energy storage system.*
- iii. Minimises the potential for fires in battery containers/enclosures to impact on-site and off-site infrastructure.*

2) Battery energy storage systems must be:

- a) Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).*
- b) Located so that the site entrance and any fire water tanks are not aligned to the prevailing wind direction (therefore least likely to be impacted by smoke in the event of fire at the battery energy storage system.)*
- c) Provided with in-built fire and gas detection systems. Where these systems are not provided, measures to effectively detect fires within containers must be detailed within the Risk Management Plan.*
- d) Provided with explosion prevention via sensing and venting, or explosion mitigation through deflagration panels.*
- e) Provided with suitable ember protection to prevent embers from penetrating battery containers/enclosures.*
- f) Provided with suitable access roads for emergency services vehicles, to and within the site, including to battery energy storage system(s) and fire service infrastructure.*
- g) Installed on a non-combustible surface such as concrete.*
- h) Provided with adequate ventilation.*
- i) Provided with impact protection to at least the equivalent of a W guardrail-type barrier, to prevent mechanical damage to battery containers/enclosures.*
- j) Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection.*
- k) Provided with spill containment that includes provision for management of fire water runoff.*

The Model Requirements above are met by the proposed facility design, which among other design safety features, includes:

- The Gordons Road crossover is proximal to (less than 50 m from) the BESS area.
- The static water supply is west of the BESS area, minimising the likelihood of being compromised by smoke (particularly under a higher risk north-westerly wind scenario).
- Batteries (and BESS container units) have been tested in accordance with UL9540 and therefore designed to contain fire (thermal run away) and prevent spread.
- Battery containers contain in-built fire and gas detection systems.
- Battery containers contain explosion sensing, venting and mitigation features (deflagration panels).
- While a BAL rating is not applicable to BESS structures, they will be constructed of non-combustible materials with an inherent ember protection (metal exterior with minimal external plastic).
- BESS units, substation and O&M facility will be installed on non-organic surface pads (concrete or crushed rock).

- All cables within the BESS yard are insulated and protected from mechanical damage in compliance with AS3000.
- A 130 m x 9 m spill and fire water runoff containment retention basin 0.4 m depth along the southern edge of the BESS area.
- Full weatherproofing to prevent water ingress.

Notwithstanding, many of the requirements are principally concerned with the radiant heat setbacks and/or fire breaks (see Sections 7.2.5 and Map 5) or access (see Section 7.2.1 and Appendix B), which have been discussed.

7.2.7 Safety and protective systems

Additional Requirements – BESS specific

Battery Energy Storage System Safety and Protective Systems

Safety and protective systems will vary in battery energy storage systems based on battery technologies, chemistries, and the preferences of manufacturers. These systems may add a layer of protection during high-consequence emergency scenarios.

CFA recommends that battery energy storage systems are equipped with the following elements:

Battery management/monitoring systems for monitoring the state of battery systems to ensure safe operation.

Systems for detecting smoke, heat (thermal), fire and toxic gas (off-gassing) within battery containers. Detection systems for off-gassing must be single-trigger and provide for both lighter and heavier than air gasses.

Systems to prevent heat/fire spread within battery containers (such as thermal barriers, shut-down separators, isolation systems, cooling systems).

Systems to prevent explosion within battery containers (such as ventilation, pressure relief and exhaust systems).

Systems to prevent water ingress to battery containers and appropriate ingress protection (IP) ratings for containers/cabinets and/or battery modules.

Warning and alarm systems within the battery containers, and/or the facility, to enable early warning for faults, operation of the battery energy storage system above 'normal'/safe parameters, smoke, off-gassing, and fire.

The Waubra BESS facility will incorporate a number of protective systems, appropriate to the abovementioned recommendations, comprising:

- Battery Management Systems that continuously and automatically monitor battery performance and health, including the voltage and temperature of each individual battery cell;
- Functionality for the Battery Management Systems to automatically and instantaneously shut down and isolate a cell or the entire battery pack if it detects a voltage discrepancy or an abnormal temperature reading;
- Built in fire suppression agents that can be automatically released within the battery container if smoke or carbon monoxide is detected;

- Built in sprinklers that can activate automatically and flood the battery container with water to reduce its temperature;
- Thermal insulation to minimise the chance of fire escaping the container;
- Design of the BESS facility to ensure adequate spacing between battery units;
- Inclusion and maintenance of an appropriate fire break between the battery and the facility perimeter;
- BESS units designed to UL9540 with thermal barriers designed to contain fire (thermal run away) and prevent spread;
- Ventilation/exhaust units and deflagration panels;
- Full weatherproofing to prevent water ingress;
- Alarm systems compliant with AS/NZS 5139:2019.

The final safety and protective systems within the Waubra BESS are yet to be determined and will be updated in a subsequent version of this report once further information, including that from the Risk Management Plan, is incorporated into the final design.

Imagery date: 10/02/2024
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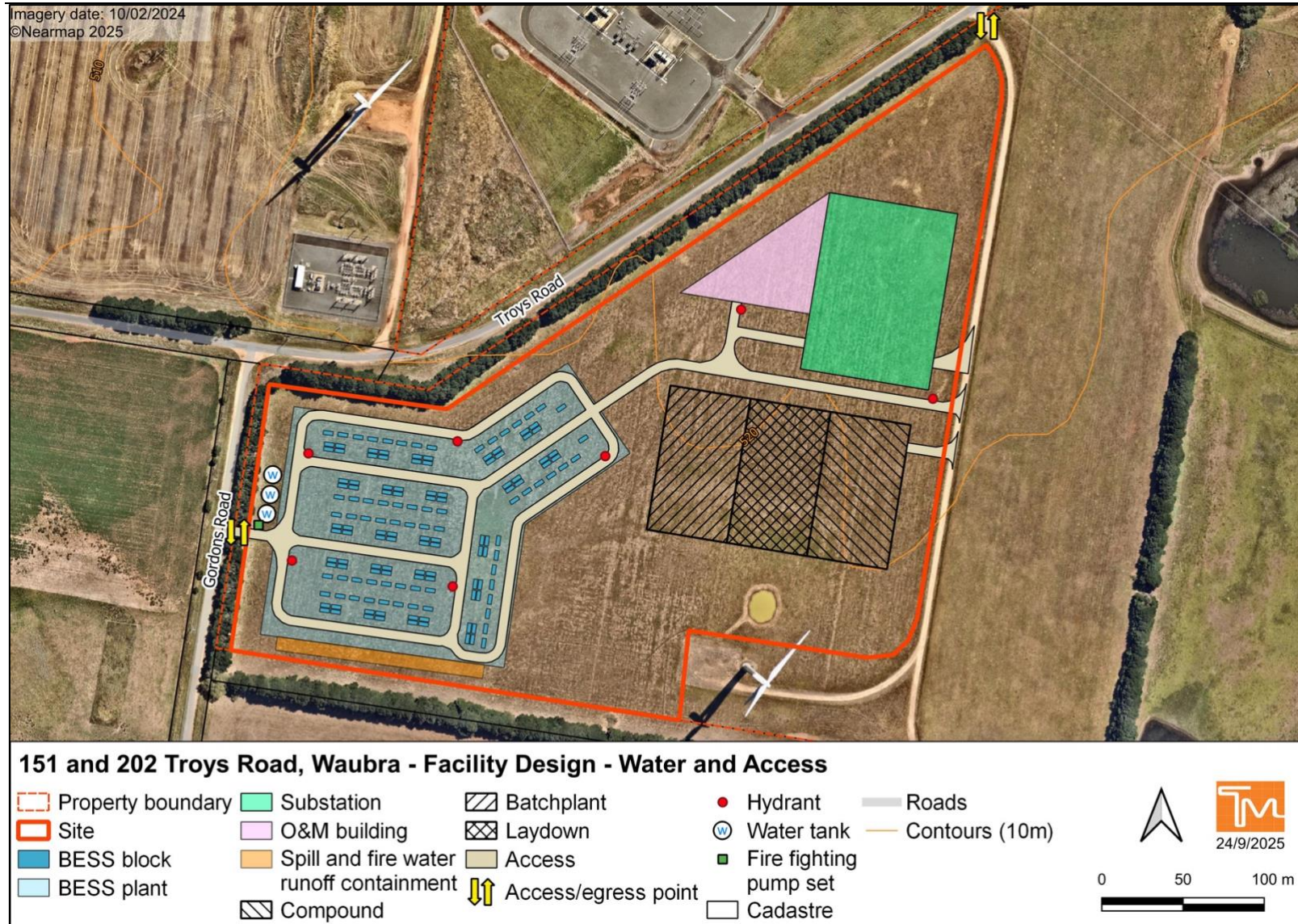


151 and 202 Troys Road, Waubra - Facility Design - Low threat Setbacks

- | | | | | |
|-------------------|--------------|------------|--|----------------|
| Property boundary | BESS plant | Compound | Access | Cadastre |
| Site | Substation | Batchplant | 22 m low threat setbacks (including 10 m fire break) | Roads |
| BESS block | O&M building | Laydown | | Contours (10m) |



Map 5 – Facility design including setbacks and fire break for the Waubra BESS. Note: If adjacent access road is included in setback, then entire substation area has the required 22 m setback.



Map 6 – Access and water at the Waubra BESS.

8 Facility construction and commissioning

‘Fire risks must be identified and effectively managed during the construction and commissioning of renewable energy facilities’ (CFA, 2023).

A response to this objective will be provided by incorporating the Recommended Risk Controls below, which are applicable to all renewable energy facilities, however, the exact timing of implementing these items is yet to be determined. A response to the requirements below is not within the scope of this BDR.

8.1 Construction

8.1.1 Fire detection and suppression systems

- a) *‘Install and commission fire detection and suppression systems for the facility at the earliest possible stage of construction.*
- b) *Provide first-aid firefighting equipment, such as fire extinguishers, appropriate to the identified emergency scenarios, at all construction portables/buildings on-site, in the vicinity of all construction activities, and in site-based vehicles.*
- c) *Provide the required fire protection equipment for any storages of dangerous goods as per the relevant Australian Standards’ (CFA, 2023).*

8.2 Commissioning

8.2.1 Fire Risk Management

- a) *‘Obtain appropriate permits for work during the Fire Danger Period and ensure that any conditions on permits are adhered to.*
- b) *Adhere to restrictions on Total Fire Ban or days of elevated fire danger according to CFA’s website.*
- c) *During the Fire Danger Period, ensure vehicle operators are instructed to remain on tracks and are not permitted to drive through paddocks.*
- d) *Restrict smoking to prescribed areas and provide suitable ash and butt disposal facilities.*
- e) *Provide remotely-accessible site/system security monitoring at the facility’ (CFA, 2023).*

8.2.2 Personnel Training

- a) *‘Provide training for personnel in the use of on-site first-aid firefighting equipment, and responsibilities during emergencies.*
- b) *Ensure all on-site personnel complete CFA’s online training module ‘Bushfire Safety for Workers’ (CFA, 2023).*

8.2.3 Emergency Management

Model Requirement – all facilities

An Emergency Management Plan must be developed for the construction and commissioning phase before development starts.

The requirement to provide an Emergency Management Plan (including bushfire) is detailed in Section 10 of this BDR.

- a) *‘The Emergency Plan must address the requirements of Section 7 of this guideline.*
- b) *An emergency communication system must be provided that is reliable and will operate in the event of power failure.*
- c) *CFA must be notified at least seven (7) days prior to the commissioning of any high-risk infrastructure at the facility (e.g., battery energy storage systems)’ (CFA, 2023).*

8.2.4 Occupational Health and Safety

‘CFA recommends the development of safe work procedures for the facility, encompassing but not limited to:

- a) *Electricity and chemical management.*
- b) *Vegetation management.*
- c) *Site security.*
- d) *Ignition source control, including hot works.*
- e) *Infrastructure, equipment, and vehicle maintenance.*
- f) *Emergency management’ (CFA, 2023).*

9 Facility operation

‘Fire risks must be effectively managed for the duration of the operational life of renewable energy facilities’ (CFA, 2023).

This objective will be met by implementing a Fire Management Plan and vegetation/fuel management as per the Model and Additional Requirements below.

9.1 Fire Management Plan

Model Requirement – all facilities

A Fire Management Plan must be developed for the facility, in consultation with CFA, before development starts.

Model Requirement – all facilities

If your facility is at-risk of bushfire, prevention and preparedness activities must be detailed in the Fire Management Plan.

The Fire Management Plan for the Waubra BESS is being prepared ongoingly in consultation with the fire authority on behalf of ACCIONA Energia, which details all the necessary on-site fire safety hazards and controls, as follows. The Fire Management Plan will either be incorporated in the facility’s Emergency Plan (see Section 10), remain as a subsection within this document, or be provided as a standalone document depending on the preference of the fire authority.

As the site is in a designated BPA, it is at-risk of bushfire, therefore the Fire Management Plan must incorporate prevention and preparedness activities specific to bushfire. This can be as a standalone Bushfire Emergency Management Plan if appropriate (see Section 10.1).

The Guidelines require that the Fire Management Plan incorporates the information in Table 3 below.

Table 3 - Fire Management Plan structure and content (CFA, 2023).

Requirement	Description
<i>A summary of fire hazards and risks to and from the site, specific to its location, infrastructure, activities and occupancy.</i>	<i>Based on sound hazard identification and risk management processes. This must include risks to firefighter safety during emergencies.</i>
<i>Description of control measures to prevent fire occurring and limit the consequences of fire at the facility.</i>	<i>Fire permits, ignition source controls, hot work permits, job hazard analyses, infrastructure/vehicle/equipment/road/fence/access maintenance, waste management, compliant dangerous goods storage and handling, vegetation/fuel reduction and management, peat management, Emergency Plan.</i>

<i>Description of control measures to prevent and reduce the consequences of external fire impacting the facility.</i>	<i>Bushfire monitoring, bushfire preparedness, reduced personnel presence/activities/travel on days of Severe and above Fire Danger Rating, creation and management of fire breaks at the site perimeter and around infrastructure, vegetation/fuel reduction and management, Emergency Plan.</i>
<i>Details of equipment and resources to manage fire at the facility.</i>	<i>Fire detection and suppression systems, fire water supplies, automatic shut-down and isolation systems, monitored alarms, communications equipment, occupant warning systems, designated evacuation assembly areas, Emergency Information Container(s), Emergency Plan.</i>
<i>Policies and procedures that ensure all control measures are appropriate and effective, and remain so.</i>	<i>Performance standards for risk controls, specific activities to verify controls (servicing/maintenance, housekeeping inspections, external audits), review processes for risk control effectiveness.</i>
<i>Procedures for review of the Fire Management Plan.</i>	<i>Review triggers and schedule, organisational accountability for the Plan, allocated responsibilities (to persons or roles) for the ongoing review and development of the Plan.</i>

9.1.1 Summary of fire hazards and risks

A summary of the hazard has been provided within this report at the landscape scale (see Section 5.1) and site scale (see Section 5.2).

As the site is located in a moderate-risk landscape (see Section 5.1), in the event that the Waubra BESS causes a bushfire in the wider landscape, the resultant bushfire risk to neighbouring communities, infrastructure, and assets is also likely to be, at most, moderate. Adequate prevention measures including design features and emergency procedures are in place to ensure any fire that originates from within the site can be contained (see Section 7.2).

Risks to/on the site are reliant on the outcome of the Fire Safety Study (see Section 6.6) and Bushfire Emergency Management Plan, including consideration of firefighter safety (see Section 10.1).

9.1.2 Fire prevention

During the construction phase and during the Waubra BESS operation, numerous control measures will be in place to prevent and mitigate the impacts of fire on the site including procedural permits/checks (paperwork), design/infrastructure, ongoing site management and emergency planning.

As a registered BESS facility operation will be subject to the relevant Australian Standards and other regulatory requirements (e.g. hot works permits, fire permits, etc.), which will be complied with to ensure safe construction and operation of the facility ongoingly.

Numerous aspects of the design and construction of infrastructure and buildings on the site is conducted for the purposes of fire prevention and mitigation including firebreaks, access and low threat setbacks (see Section 7.2).

Maintenance of the site including the storage/handling of dangerous goods, waste management and vegetation maintenance will be done in accordance with a regular schedule and designated to particular areas that are pertinent to the purpose of that maintenance. For example, the laydown area and O&M facilities are separated from the BESS containers and low threat vegetation maintenance will occur for the required distance (22 m) proximal to BESS containers.

Operation of the Waubra BESS facility will be supported by an Emergency Management Plan that includes bushfire (see Section 10.1).

9.1.3 Prevention and mitigation of external fire impacting the facility

Measures used to prevent and mitigate the consequences of bushfire impacting the Waubra BESS facility primarily focus on design, construction and site maintenance (see Section 7.2) and emergency management planning (see Section 10.1).

Low threat setbacks for 22 m in all directions for BESS containers ensure a radiant heat will not exceed 12.5 kW/m², establishment of firebreaks (see Section 7.2.5) and the provision of compliant static water supply and access all contribute to the ‘constructed’ elements of the design that prevent/mitigate the impacts of bushfire at the Waubra BESS. Furthermore, the BESS units themselves are designed with fire detection/suppression systems, which would also be deployable in the event of an external bushfire threatening the site.

The Bushfire Emergency Management Plan will identify (among other items) the procedural emergency responses to fire danger rating (FDR) triggers, total fire ban (TFB), conditional trigger points for bushfire approaching the site, site occupancy and evacuation/shelter-in-place. These responses all aim at mitigating the consequences of an external bushfire approaching the site.

9.1.4 Equipment and resources

A summary of the equipment and resources utilised to manage fire at the facility is itemised in Section 7.2.7. In addition, all BESS systems will be installed according to UL9540, UL9540A and all relevant Australian Standards associated with emergency service access and water (*e.g. AS 2419.1-2021: Fire hydrant installations*).

9.1.5 Procedural management and review

The management, review/monitoring and accountability of active systems and the relevant documentation will be contained within the respective plans to ensure that no process that requires ongoing review is overlooked.

Many systems installed at the Waubra BESS will require regular review, monitoring and maintenance, such as fire suppression systems, BESS infrastructure system functionality, waste management, and many more. An example of procedural management may include items such as a vegetation

management plan checklist (part of the landscaping plan) detailing the frequency and amount of maintenance required to ensure the low threat setbacks are provided ongoingly (see Section 9.2.1). The responsible party should also be identified in the document for effectiveness, accountability and assurance of regular monitoring.

Similar processes that have been established in accordance with manufacturer specifications and/or Australian Standards will be in place for all systems requiring ongoing review/monitoring.

9.2 Fire hazards and risk controls

9.2.1 Vegetation and fuel management

The requirements below provide a framework for the management of vegetation and other fuels (such as debris) on the site during its operational life. The Waubra BESS will meet all the requirements for landscaping design (see Section 7.2.4) and maintenance via procedures that actively manage vegetation and clear debris that would be a hazard in the event of a bushfire. This applies to all vegetation on the site, including all grass within the lease area, screening vegetation and any other landscaping elements (see Map 5).

Model Requirements – all facilities

Facility operators must undertake the following measures during the Fire Danger Period:

- a) *Grass must be maintained at or below 100mm in height during the declared Fire Danger Period.*
- b) *Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation.*
- c) *Restrictions and guidance must be adhered to during the Fire Danger Period, days of **High** (and above) fire danger and Total Fire Ban days (refer to www.cfa.vic.gov.au).*
- d) *All vehicles and heavy equipment must carry at least a nine (9)-litre water stored-pressure fire extinguisher with a minimum rating of 3A, or firefighting equipment as a minimum when on-site during the Fire Danger Period.*

Additional Requirements – BESS specific

Containers/enclosures and infrastructure for battery energy storage systems must be maintained to be clear of vegetation, including grass, for at least ten (10) metres on all sides, or greater as informed by the Risk Management Plan.

The proposed minimum fire break around all infrastructure and buildings at the Waubra BESS will be 10 m wide (see Map 5), which meets the minimum requirement for separation distance and aligns with the Risk Management Plan in Section 6. Note that this setback distance may need to be informed by the findings of a Fire Safety Study (see Section 6.6). The fire break will comprise non-combustible materials such as crushed rock or concrete, some of which will overlap with the footprint of access tracks and drainage (see Section 7.2.5). Additional low threat setbacks will be provided around the BESS containers to a minimum distance of 22 m.

Additional requirements – all facilities**Managing Vegetation On-Site**

- Gutters, roof surfaces and valleys, kerbs, traps, sumps, bunds, drains, roofs or any other accumulation points for leaf litter, dry vegetation, or any other combustible materials must be cleared, and the debris removed from site.
- Vegetation management activities must be conducted across the entire facility (e.g., grass slashing or mowing, removal of dead/fallen vegetation).
- Extraneous materials or vegetation in firebreaks at the site perimeter, at external building walls, and at other any site plant/assets must be cleared and removed from site.
- Extraneous or unnecessary materials (fuel loads) must be removed from site, e.g., mulch piles; dilapidated/stored vehicles, plant or equipment; excess fuel/chemicals; any combustible waste materials. Vehicles must not be parked on unmanaged vegetation.

In addition to the above Model and Additional Requirements, any proposed vegetation, such as the screening vegetation, must not create a hazard to BESS infrastructure. This can be achieved by managing all vegetation on site so that it is ‘low threat’ and eligible for one or more of the vegetation exclusion criteria in AS 3959:2018 (see Section 5.2.3).

The Guidelines also state that for substations and electric lines ‘*Vegetation management within any electric line easement is to be such that falling trees would not impact the transmission lines, towers, and associated infrastructure.*’ (CFA, 2023).

Additional guidance on vegetation management can be taken from defensible space maintenance standards that apply to BMO affected areas. The site is not covered by the BMO, so the following standards from Clause 53.02-5 of the Pyrenees Planning Scheme are not mandatory, however they are a generally accepted standard for maintaining vegetation in a ‘low threat’ state:

- ‘Grass must be short cropped and maintained during the declared fire danger period.
- All leaves and vegetation debris must be removed at regular intervals during the declared fire danger period.
- Within 10 metres of a building, flammable objects must not be located close to the vulnerable parts of the building.
- Plants greater than 10 centimetres in height must not be placed within 3 metres of a window or glass feature of the building.
- Shrubs must not be located under the canopy of trees.
- Individual and clumps of shrubs must not exceed 5 square metres in area and must be separated by at least 5 metres.
- Trees must not overhang or touch any elements of the building.
- The canopy of trees must be separated by at least 5 metres.
- There must be a clearance of at least 2 metres between the lowest tree branches and ground level’ (Clause 53.02-5 Pyrenees Planning Scheme).

N.B. 5 m canopy separation will not be required for the existing boundary windbreak (pines).

9.2.2 Arc flash hazard management

‘Electrical equipment must be designed to reduce risks associated with arc flash hazards. Where an arc flash hazard exists it must be identified and managed.

There must be clear demarcation of arc boundaries to at least 10 m from arc flash outlet flaps (blow-out panels) on PCUs, where there is a hazard to personnel’ (CFA, 2023).

The above is not within the scope of this BDR. Further guidance can be found at:

<https://www.esv.vic.gov.au/industry-guidance/electrical/electrical-technical-information/arc-flash-hazard-management>.

9.2.3 Facility and system monitoring and maintenance

Model Requirement – all facilities

Appropriate monitoring for facility infrastructure must be provided, to ensure that any shorts, faults or equipment failures with the potential to ignite or propagate fire are rapidly identified and controlled. Any fire must be notified to 000 immediately.

Additional Requirements – BESS specific

For battery energy storage systems, appropriate monitoring and intervention measures must be provided to ensure that the following are rapidly identified and notified to 000 immediately:

- *Any shorts, faults, temperature increases above normal parameters (e.g., precursor to thermal events/runaway).*
- *Equipment failures with the potential to ignite or propagate fire.*
- *Off-gassing, smoke or fire.*

The provision for direct alarm monitoring to the fire brigade for battery energy storage system automatic detection systems must be considered.

The abovementioned monitoring procedures will be adhered to during the operational life of the Waubra BESS.

Model Requirements – all facilities

Inspection, maintenance, and any required repair activities must be conducted for all infrastructure, equipment and vehicles at the facility. Maintenance must be in line with any relevant Australian Standards and the manufacturer's requirements.

Additional Requirements – BESS specific

Battery energy storage systems, including the battery management system and any associated safety systems, must be regularly serviced to the manufacturer's specifications.

A procedure, including a schedule and relevant personnel accountabilities, must be developed in relation to the inspection of battery energy storage systems.

Battery energy storage systems are to be regularly inspected for the following:

- *Any signs of mechanical damage to the external containers/enclosures.*
- *Any accumulation of combustible materials (including leaf litter) in or within ten (10) metres of any battery energy storage systems and related infrastructure.*

Any identified issues must be immediately rectified.

The above Model and Additional Requirements require regular maintenance checks on all parts of the facility. The Waubra BESS will comply with these requirements by having a plan that specifies the maintenance schedule for each aspect of the facility during operation.

The following monitoring/maintenance requirements also apply to BESS facilities and will be complied with:

Additional Requirements – BESS specific

A Fire Management Plan for a facility that incorporates a battery energy storage system must also include:

- a) A schedule, list of activities and accountabilities for the inspecting, testing, monitoring and servicing of the battery and its monitoring, safety and protective systems.*
- b) Monthly inspections of battery enclosures/containers and related infrastructure for physical damage. Any damage must be immediately assessed and rectified by a suitably qualified person.*
- c) Seismic activity as a trigger for inspecting, testing and servicing of the battery energy storage system and its related infrastructure. Any damages or changes in operating parameters must be immediately assessed and rectified by a suitably qualified person.*
- d) Regular inspection and removal of all combustible materials near the battery enclosures/containers and related infrastructure.*

9.2.4 Dangerous goods storage and handling

The Guidelines states that aspects of the facility such as signage, cleaning materials, training, documentation must be compliant with the *Dangerous Goods (Storage and Handling) Regulations 2022*.

This has implications for bushfire risk on the site and to nearby areas (see Section 7.1.2).

9.2.5 Housekeeping

The Guidelines state that regular housekeeping is required that addresses the following:

- a) 'Hazard identification - ensuring that infrastructure, plant, equipment, vehicles and safety/warning signs show no signs of damage or dilapidation.*
- b) Facility access - ensuring all vehicle site access points, including emergency access points, are clear and accessible.*
- c) Fire protection systems and equipment – ensuring that all equipment is unobstructed, clearly identifiable, in-service and performing optimally.*
- d) Vegetation management - ensuring that any accumulation of combustible materials is cleared from infrastructure, buildings and fire breaks, and removed from the site.*
- e) Security measures - ensuring that fences, gates, and security cameras are inspected for damage, and that any damage is immediately actioned (e.g., repaired or replaced)' (CFA, 2023).*

Housekeeping inspections must be conducted regularly at least every three months and again one month prior to the Fire Danger Period. Further information can be found at the following link:

<https://www.cfa.vic.gov.au/plan-prepare/building-planning-regulations/renewable-energy-fire-safety>.

9.2.6 Fire risk review

The Guidelines state that *‘fire risk must be effectively managed at operating facilities to meet obligations for providing a safe workplace under the OHS Act’* (CFA, 2023).

This can be achieved by reviewing and updating the Fire Management Plan, Risk Management Plan and Emergency Management Plan (all prepared by others) if there is a near miss or incident at the facility.

10 Emergency Planning

‘Emergencies at renewable energy facilities must be planned for and effectively managed’ (CFA, 2023).

Emergency planning documentation for bushfire can be incorporated in an ‘all hazards’ Emergency Management Plan (EMP) or it can be a standalone Bushfire Emergency Management Plan (BEMP). Terramatrix has not been engaged to develop a BEMP, therefore this report does not contain a formal response to the Guidelines’ Model Requirements, but the relevant requirements are listed below.

10.1 Emergency plans

Model Requirement – all facilities

An Emergency Management Plan must be developed specific to the facility, in conjunction with CFA, before development starts.

Additional Requirements – BESS specific

Emergency Plans for facilities with battery energy storage systems must additionally include:

- a) *Contact information for 24/7/365 specialist technical support for the battery energy storage system.*
- b) *Emergency response procedures based on identified risks and hazards of the battery energy storage system and related infrastructure, including but not limited to:*
 - i. *Electrical infrastructure faults and fire.*
 - ii. *Battery energy storage system damage or faults, including battery monitoring faults, temperature increases above normal operating parameters, electrical faults, chemical spills or reactions, off-gassing, thermal events/runaway, smoke and fire.*
 - iii. *Bushfire and grassfire.*
 - iv. *The management of fire water runoff.*
- c) *Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available (e.g., at the BESS containers, in an on-site control room, off-site monitoring facilities).*
- d) *A plan for partial and full decommissioning of the battery energy storage system in the event of an emergency incident that renders the facility inoperable or unsafe, before its anticipated end-of-life.*
- e) *Any information that supports the considerations in Appendix B: Emergency Response Considerations for Large-Scale Battery Energy Storage Systems*

This information must also be provided within the facility's Emergency Information Book.

Additional information is required on the following aspects of emergency planning that are not within the scope of this BDR:

- Projected occupant capacity during construction and operation.
- Site closure and emergency response procedures/triggers.
- Evacuation and shelter-in-place.
- Personnel training.
- Emergency exercises.
- Reviewing emergency plans.

10.2 Provision of Emergency Information

Model Requirements – all facilities

An Emergency Information Book must be developed and available to emergency responders. Emergency Information Books must be located in Emergency Information Containers, provided at each vehicle entrance to the facility.

Additional Requirements – BESS specific

Operators of facilities with battery energy storage systems must inform emergency responders of hazards. This information must be provided within the site's Emergency Information Book, and must include:

- a) Specifications for safe operating conditions for temperature.*
- b) Schematics and technical data for battery energy storage system containers/enclosures, the number of containers/enclosures on-site, and the number of battery racks or modules within each container/enclosure.*
- c) Details of the hazards for the battery energy storage system, including thermal events/runaway, electrical safety hazards, explosion hazards, dangerous goods hazards (including off-gassing and associated vapour clouds), and the effects of fire on the battery energy storage system (e.g., explosion, release of toxic gases).*
- d) Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available (e.g., at the BESS containers, in an on-site control room, off-site monitoring facilities).*
- e) Details of all provided battery safety and protective systems, including a description, the activation process/automatic trigger, and associated hazards.*
- f) The shut down and/or isolation procedures if the batteries are involved in fire, and appropriate personnel contact details for verifying that the battery enclosure/container system has been isolated/shut-down and de-energised during emergencies.*

Emergency information will be provided to emergency services and be readily accessible in the event of an emergency. Further guidance on the provision of an Emergency Information Booklet can be found in published CFA documents online (CFA, 2019).

11 Clause 13.02-1S Bushfire Planning response

The strategies stipulated in Clause 13.02-1S, are detailed in the following sub-sections, and a summary response to the relevant strategies is provided about how the proposed Waubra BESS development responds to the strategies.

11.1 Protection of human life strategies

Priority must be given to the protection of human life.

Prioritising the protection of human life over all other policy considerations

The facility is in a moderate bushfire risk location. The protection of human life can be prioritised by application of the Model and Additional Requirements in the Guidelines, applying relevant building regulations for construction in a BPA, and ensuring the BESS infrastructure and other buildings are located where radiant heat can be expected to be below 12.5 kW/m².

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.

As identified in Section 5.1, the site is in a moderate risk landscape and is not covered by the BMO. Therefore, if future buildings and infrastructure are setback sufficiently from any hazardous vegetation such that radiant heat can be expected to be below 12.5 kW/m², the risk can be deemed to be acceptable.

The nearest *lowest* risk locations are considered to be the neighbourhood safer place (NSP) located at Waubra Recreation Reserve and the urban-residential areas of Wendouree / Ballarat 25 km to the south-east, that are not in the BPA (see Map 2).

Reducing the vulnerability of communities to bushfire through consideration of bushfire risk in decision-making at all stages of the planning process

This report provides the basis for incorporating bushfire risk into decision making associated with planning development in the facility.

The proposal responds to the Guidelines prepared by CFA and can meet the Model and Additional Requirements for BESS facilities. This includes consideration of the bushfire risk during the planning, construction, and operational phases of the facility.

It is considered that development of the facility can appropriately implement the strategies in the Guidelines and Clause 13.02-1S that aim to prioritise protection of human life.

11.2 Bushfire hazard identification and assessment strategies

The bushfire hazard must be identified and an appropriate risk assessment be undertaken.

Applying the best available science to identify vegetation, topographic and climatic conditions that create a bushfire hazard.

This report identifies the hazard in accordance with the commonly accepted methodologies of AS 3959:2018 and, as appropriate, additional guidance provided in and *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DEWLP, 2018).

The type and extent of (hazardous) vegetation within 100 m of the facility has been identified and classified into AS 3959:2018 vegetation groups. Classification was based on the anticipated long-term state of the vegetation, EVC mapping, aerial imagery, site assessment, published guidance on vegetation assessment for bushfire purposes and experience with the fuel hazard posed by the vegetation types that occur within the region.

GIS analysis of publicly available 10 m contour data for the area was undertaken and ground-truthed during the bushfire hazard site assessment (see Map 4).

In relation to climatic conditions and fire weather, the AS 3959:2018 default FFDI 100/GFDI 130 benchmark used in the Victorian planning and building system, has been applied as discussed in Section 5.3.

Considering the best available information about bushfire hazard including the map of designated bushfire prone areas prepared under the Building Act 1993 or regulations made under that Act.

The extent of BPA coverage has been considered (see Section 4.3) and is shown in Map 2 (rather the inverse; non-BPA land is shown). This is based on the most recent BPA mapping for the area.

Applying the Bushfire Management Overlay in planning schemes to areas where the extent of vegetation can create an extreme bushfire hazard.

As identified in Section 1, no part of the site is covered by the BMO (see Map 3). This is considered appropriate and reflects recent statewide BMO mapping and the Pyrenees Planning Scheme.

Considering and assessing the bushfire hazard on the basis of:

- ***Landscape conditions - meaning the conditions in the landscape within 20 kilometres and potentially up to 75 kilometres from a site;***
- ***Local conditions - meaning conditions in the area within approximately 1 kilometre from a site;***
- ***Neighbourhood conditions - meaning conditions in the area within 400 metres of a site; and***
- ***The site for the development.***

The hazard has been assessed and described at the required scales (see Section 5).

At the local scale, the assessment follows the AS 3959:2018 methodology applied in a BPA, of classifying vegetation and topography within 100 m of the facility (see Map 4).

At the landscape scale a 20 km, 5 km and 1 km radius of the site has been applied (see Map 2 and Map 3) in accordance with guidance about assessing risk for planning scheme amendments in the Planning Advisory Note 68 (DEWLP, 2018).

Consulting with emergency management agencies and the relevant fire authority early in the process to receive their recommendations and implement appropriate bushfire protection measures.

Terramatrix understands there has been initial correspondence between Biosis/ACCIONA Energia and the fire authority (CFA/FRV) and that meetings are being arranged to discuss the Waubra BESS proposal. Outcomes from those meeting will inform future updates of this BDR and the overall facility design.

Ensuring that strategic planning documents, planning scheme amendments, planning permit applications and development plan approvals properly assess bushfire risk and include appropriate bushfire protection measures.

The Guidelines, Clause 13.02-1S, and the building regulations invoked by the BPA coverage, including the bushfire hazard landscape assessment, specify the general requirements and standards for assessing the risk. These have been used in this BDR as appropriate and bushfire protection measures have been identified commensurate with the risk.

Not approving development where a landowner or proponent has not satisfactorily demonstrated that the relevant policies have been addressed, performance measures satisfied or bushfire protection measures can be adequately implemented.

If the Model and applicable Additional Requirements of the Guidelines, the objectives and strategies of Clause 13.02-1S, and the building regulations for construction in a BPA, are complied with, as outlined in this report, then the risk can be deemed to be acceptably mitigated such that development can proceed.

11.3 Settlement planning strategies

Settlement planning must strengthen the resilience of settlements and communities and prioritise protection of human life. As development of the Waubra BESS is not settlement planning, these strategies are not applicable and no response is required. The settlement planning strategies are, however, listed below.

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 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).

Ensuring the availability of, and safe access to, areas assessed as a BAL-LOW rating under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009) where human life can be better protected from the effects of bushfire.

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.

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 reduce bushfire risk overall.

Assessing and addressing the bushfire hazard posed to the settlement and the likely bushfire behaviour it will produce at a landscape, settlement, local, neighbourhood and site scale, including the potential for neighbourhood-scale destruction.

Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.

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 3959-2009'.

11.4 Areas of high biodiversity conservation value

Ensure settlement growth and development approvals can implement bushfire protection measures without unacceptable biodiversity impacts by discouraging settlement growth and development in bushfire affected areas that are of high biodiversity conservation value

There are no apparent additional biodiversity impacts associated with the findings of this bushfire assessment.

11.5 Use and development control in a Bushfire Prone Area

Clause 13.02-1S requires that *'In a bushfire prone area designated in accordance with regulations made under the Building Act 1993, bushfire risk should be considered when assessing planning applications for the following uses and development:*

- *Subdivisions of more than 10 lots.*
- *Accommodation.*
- *Child care centre.*
- *Education centre.*
- *Emergency services facility.*
- *Hospital.*
- *Indoor recreation facility.*
- *Major sports and recreation facility.*
- *Place of assembly.*
- *Any application for development that will result in people congregating in large numbers'*
(Clause 13.02-1S, Pyrenees Planning Scheme)

It further states that:

'When assessing a planning permit application for the above uses and development:

- *Consider the risk of bushfire to people, property and community infrastructure.*
- *Require the implementation of appropriate bushfire protection measures to address the identified bushfire risk.*
- *Ensure new development can implement bushfire protection measures without unacceptable biodiversity impacts'* (Clause 13.02-1S, Pyrenees Planning Scheme).

Development of a BESS does not comprise a listed use under this strategy. This report does however demonstrate that the bushfire risk to people, property and community infrastructure has been appropriately considered.

12 Conclusion

Terramatrix was engaged by Biosis Pty Ltd on behalf of ACCIONA Energia to prepare a report for the proposed Waubra BESS concept design, that responds to the planning and building controls that address bushfire.

The site is in a designated BPA but no part of the lease area or any land within 1 km is covered by the BMO.

This report details how the bushfire hazard to the proposed Waubra BESS has been assessed at various scales, in accordance with Clause 13.02-1S in the Pyrenees Planning Scheme, the AS 3959:2018 methodology as invoked by the Victorian building regulations, and additional guidance provided in *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DEWLP, 2018). The report also responds to the Model and Additional Requirements in the *CFA Design Guidelines and Model Requirements: Renewable Energy Facilities*. At this stage of the design process for the Waubra BESS, some elements of the Guidelines are yet to be addressed and will be incorporated in subsequent stages of planning.

The landscape has been determined as being of a moderate bushfire risk. Bushfire behaviour can reasonably be expected to be within AS 3959:2018 presumptions and design parameters. The type and extent of classified (hazardous) vegetation within 100 m of the facility has been identified and classified into AS 3959:2018 vegetation groups, based on the extant modelled EVC mapping, aerial imagery and site assessment. The classification is based on the current and likely future state of the vegetation and identifies that the hazard is Grassland on the adjacent road reserves and in the paddocks of adjoining properties.

Overall, the topography on and around the site, within the 100 m assessment zone comprises minor downslopes to the north and west. For the purposes of determining setbacks from classified vegetation to reduce radiant heat flux to less than 12.5 kW/m², the applicable slope classes are 'Downslope >0° 5°' under Grassland to the north and west and 'All slopes and flat land' under the Grassland in all other directions.

The development can appropriately prioritise the protection of human life and meet the objectives of Clause 13.02-1S, largely by:

- Ensuring future buildings and infrastructure will not be exposed to a radiant heat flux above 12.5 kW/m², which is commensurate with a BAL-12.5 construction standard.
- Implementing the applicable Model and Additional Requirements of the Guidelines.

To reduce radiant heat flux to less than 12.5kW/m², low threat or non-vegetated setbacks from classified vegetation would be required for a minimum distance of:

- 22 m from Grassland to the north and west.
- 19 m from Grassland to the south and east.

Elements of the Guidelines including the Model and Additional Requirements which have been addressed (or will be, where recommended in this report) are:

- A Risk Management Plan, which includes a Fire Safety Study.
- Consideration of the facility location and design.
- Consideration of the construction, commissioning and operational phases.
- Emergency management planning.

The key design elements incorporated into the Waubra BESS concept design, which have been taken from the Model and Additional Requirements of the Guidelines are:

- Two points of emergency vehicle access/egress to the facility and through access that is at least 4 m wide.
- A 432,000 L static water supply on site with a compliant tank and hydrant system with fire fighting pump.
- Fire detection and suppression systems.
- A 10 m wide fire break around all BESS infrastructure and buildings in the central facility area that is clear of any vegetation (existing or proposed) and incorporates a perimeter road around BESS infrastructure that is at least 4 m wide.
- Minimum 22 m low threat managed setbacks for all buildings and infrastructure from any classified vegetation.
- A minimum BAL-12.5 construction standard for any buildings on the site where practicable.

The Model and Additional Requirements have been incorporated in the development plans, demonstrating that the Waubra BESS concept design will be able to comply with Clause 13.02-1S *Bushfire Planning* and the Guidelines, therefore ensuring that the bushfire risk to the site can be mitigated to an acceptable level in order to allow development to proceed.

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14 Appendices

14.1 Appendix A - BALs explained

Bushfire Attack Level (BAL)	Risk Level	Construction elements are expected to be exposed to...	Comment
BAL-Low	VERY LOW: There is insufficient risk to warrant any specific construction requirements but there is still some risk.	No specification.	At 4 kW/m ² pain to humans after 10 to 20 seconds exposure. Critical conditions at 10 kW/m ² and pain to humans after 3 seconds. Considered to be life threatening within 1 minute exposure in protective equipment.
BAL-12.5	LOW: There is risk of ember attack.	A radiant heat flux not greater than 12.5 kW/m ² .	At 12.5 kW/m ² standard float glass could fail and some timbers can ignite with prolonged exposure and piloted ignition.
BAL-19	MODERATE: There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat.	A radiant heat flux not greater than 19 kW/m ² .	At 19 kW/m ² screened float glass could fail.
BAL-29	HIGH: There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.	A radiant heat flux not greater than 29 kW/m ² .	At 29 kW/m ² ignition of most timbers without piloted ignition after 3 minutes exposure. Toughened glass could fail.
BAL-40	VERY HIGH: There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.	A radiant heat flux not greater than 40 kW/m ² .	At 42 kW/m ² ignition of cotton fabric after 5 seconds exposure (without piloted ignition).
BAL- FZ (i.e. Flame Zone)	EXTREME: There is an extremely high risk of ember attack and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.	A radiant heat flux greater than 40 kW/m ² .	At 45 kW/m ² ignition of timber in 20 seconds (without piloted ignition).

Source: derived from AS 3959:2018 (Standards Australia, 2020).

14.2 Appendix B – Access requirements

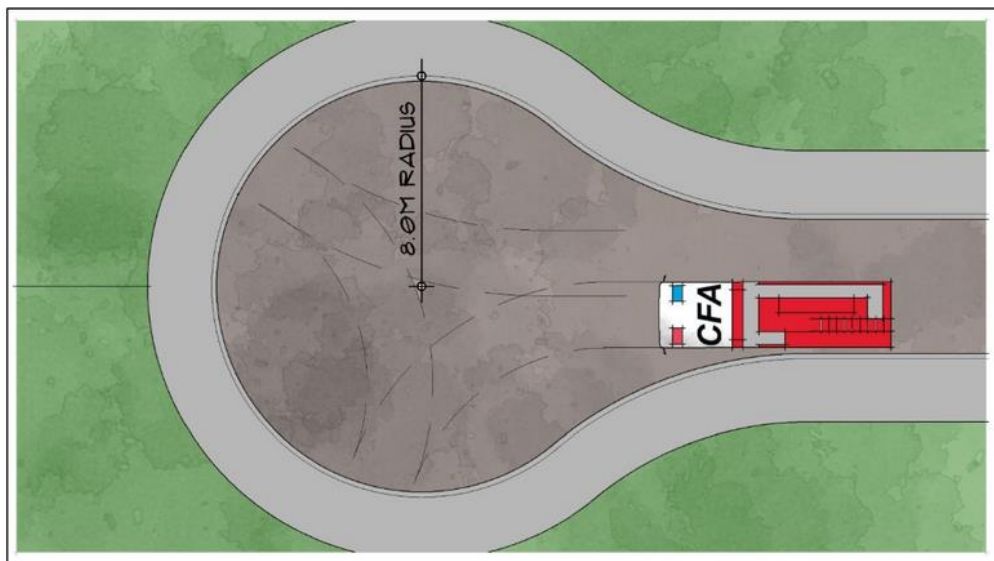


Image 1: Court-bowl style, minimum 8m radius (CFA, 2023).

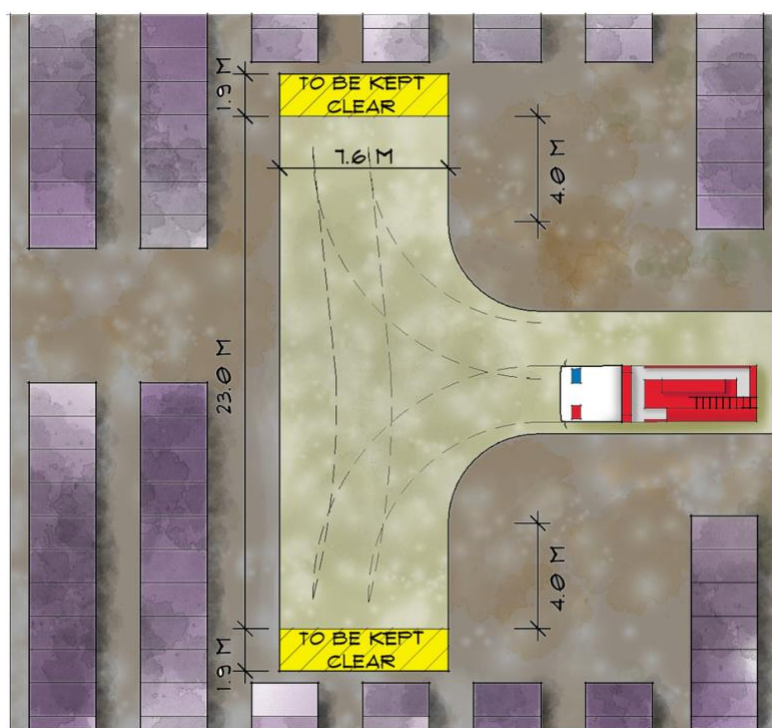


Image 2: 'T' head style (CFA, 2023).

14.3 Appendix C – Water requirements



Image 1: 150 mm Full bore isolation valve (CFA, 2023).

Image 2: 125 mm, 100 mm, 90 mm, 75 mm and 65 mm Storz tree adapters (CFA, 2023).



Image 3: Fire water signage to comply with AS 2419.1 Section 5.4.5 (CFA, 2023).

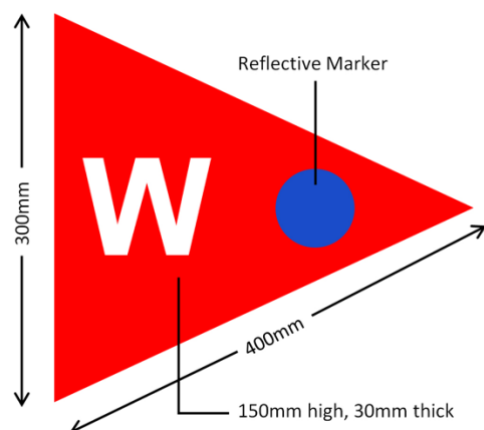


Image 4: Directional signage: fade resistant, fixed to rigid post in contrasting lettering, white sign writing on red background, with a circle reflective marker. 'W' in 150 mm upper case lettering (CFA, 2023).



Image 5: Best-practice arrangement of fire service infrastructure for facilities with battery energy storage systems with reticulated water supply meeting the performance requirements of AS 2419.1-2021: Fire hydrant installations (CFA, 2023).



Image 6: Best-practice arrangement of fire service infrastructure at facilities with battery energy storage systems without reticulated water supply, or a reticulated water supply that does not meet the performance requirements of AS 2419.1-2021: Fire hydrant installations (CFA, 2023).

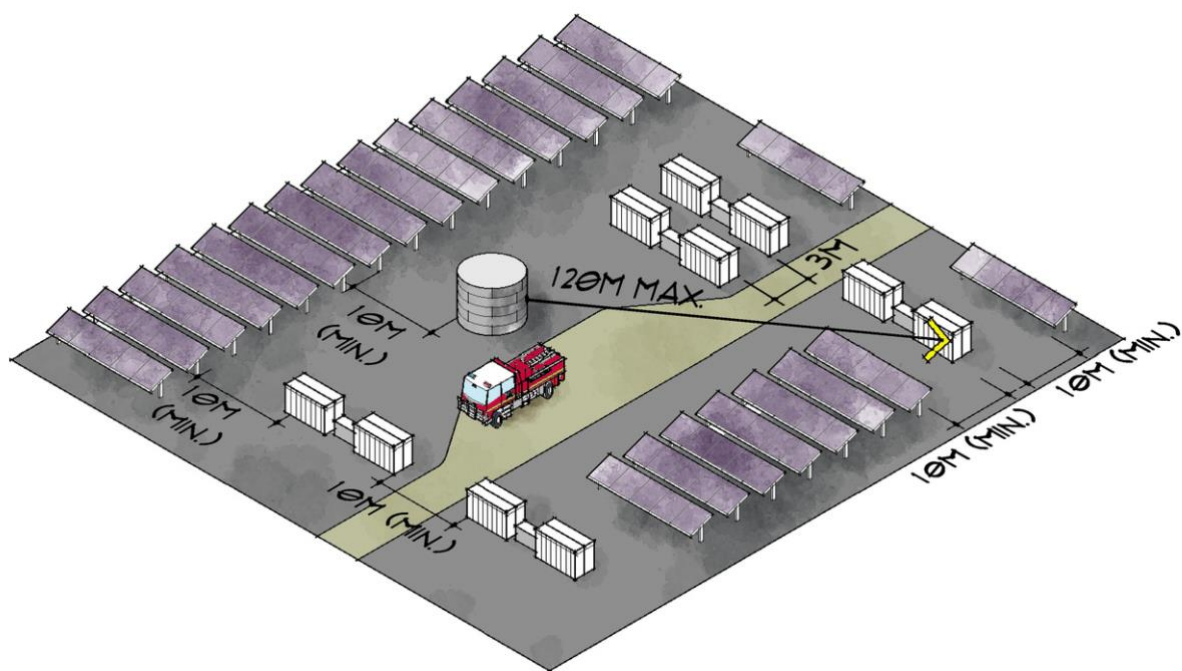


Image 7: Potential arrangement for fire water supply tank(s) for facilities with decentralised battery energy storage systems with no reticulated water supply to the site (CFA, 2023).