
Bushfire management plan

Karara Battery Energy Storage System | Carbean Road | Karara | Queensland
Prepared for Saunders Havill Group Pty Ltd | 2 December 2024

Bushfire management plan

Final V3

Report 24052 | Saunders Havill Group Pty Ltd | 2 December 2024

Approved by Robert Janssen

Position Managing principal

Signature



Date 2 December 2024

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Table of contents

Contents

Table of contents	i
1 Introduction	1
1.1 Bushfire management plan review	1
1.2 Method	2
1.3 Suitably qualified person	2
2 Description of the Project area and the Project	3
2.1 The Project area	3
2.2 The Project	3
2.3 Bushfire prone area map	3
3 Bushfire hazard assessment	4
3.1 Severe fire weather	4
3.2 Fire history	4
3.3 Field inspection	4
3.4 Potential bushfire intensity calculations	6
3.5 Bushfire hazard areas	7
3.6 Radiant heat exposure assessment	7
4 Bushfire hazards associated with the Project area and the Project	8
4.1 Fire danger season	8
4.2 Fire history	8
4.3 Vegetation	8
4.4 Bushfire attack and the protection of above ground infrastructure	8
4.5 Workforce	8
4.6 Hazardous chemicals	8
4.7 Access roads	9
4.8 Rural Fire Brigade resources and capability	9
4.9 Fire-fighter water supply	9
4.10 Warning and evacuation requirements	9
4.11 Buildings and structures	9
5 Fire ignition risks	10
5.1 Land use	10
5.2 High voltage overhead transmission lines	10

5.3	Lightning strike	10
5.4	Electrical fire	10
5.5	Construction activities	10
5.6	Operational activities.....	10
6	Bushfire mitigation plan	11
6.1	Asset protection zone	11
6.2	Surface under infrastructure	11
6.3	Cleared vegetation.....	11
6.4	Fire-fighter access tracks	11
6.5	Fire-fighter water supply	12
6.6	Buildings.....	12
6.7	Construction phase.....	13
6.7.1	Staging of construction works.....	13
6.7.2	Fire extinguishers and protection equipment.....	13
6.7.3	Communications equipment and communications planning	13
6.7.4	Restrictions during the fire danger season	13
6.7.5	Hot works	13
6.7.6	Safety documentation.....	13
6.7.7	Training	14
6.7.8	Emergency management plan	14
6.8	Operational phase	14
6.8.1	Information transfer.....	14
6.8.2	Fire-fighter operations plan	14
6.8.3	Bushfire preparedness activities	14
6.8.4	Access rules	15
6.8.5	Safety documentation.....	15
6.8.6	High voltage overhead transmission line	15
6.8.7	Emergency management planning	15
6.8.8	Electrical safety	16
6.8.9	Hazardous materials.....	16
6.8.10	Lighting fires	16
7	Closing.....	18

Figures

Figure 3.1 Site locality and site assessment.....	5
Figure 6.1 Bushfire mitigation plan.....	17

Tables

Table 3.1 Site observations.....	6
Table 3.2 Potential bushfire intensity.....	6

Photographs

Photograph 3.1 VHC 13.2 within BAU 1.....	6
Photograph 3.2 VHC 40.4 within BAU 2.....	6

Appendix

Appendix 1 Infrastructure layout	
Appendix 2 Bushfire prone area map	
Appendix 3 Radiant heat exposure assessment	
Appendix 4 Bushfire overlay code assessment	

Disclaimer

Notwithstanding the precautions adopted in this report, it should always be remembered that bushfires burn under a range of conditions. An element of risk, no matter how small always remains, and although AS 3959-2018 is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any building will withstand bushfire attack on every occasion.

It should be noted that upon lodgement of a development proposal, State Government, council and/or the fire service may recommend additional construction requirements.

Although every care has been taken in the preparation of this report, Land and Environment Consultants Pty Ltd accept no responsibility resulting from the use of the information in this report.

1 Introduction

Land and Environment Consultants Pty Ltd (LEC) was engaged to prepare a bushfire management plan (BMP) for the proposed Karara Battery Energy Storage System (**the Project**) at Carbean Road, Karara (**the site**), properly described as lot 15/SP332758.

The part of lot 15/SP332758 which accommodates the Project is hereafter referred to as the **Project area**.

A development application, for a material change of use for undefined use (battery storage facility) will be made for the Project under the Goondiwindi Region Planning Scheme 2018.

The Goondiwindi Region Planning Scheme 2018 *Bushfire hazard overlay code* defers to the Queensland State Planning Policy (SPP) *Bushfire prone area map* (**Bushfire prone area map**) which identifies the site as a bushfire hazard area. Therefore, the development application for the Project is subject to compliance with the example bushfire overlay code (**Bushfire overlay code**) in the *Natural Hazards, Risk and Resilience – Bushfire, State Planning Policy State Interest guidance material* (DSDMIP 2019) (**SPP guidance material – bushfire**).

This BMP has been prepared in general accordance with *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest ‘Natural Hazards, Risk and Resilience - Bushfire’* (QFES 2019) (**BRC guide**) which was prepared by the former Queensland Fire and Emergency Services now Queensland Fire Department (QFD) to provide technical guidance for the implementation of the SPP guidance material – bushfire. It also considers guidelines for a Battery Energy Storage System (**BESS**) by the Australasian Fire and Emergency Services Authorities Council (AFAC 2020).

This BMP documents the bushfire hazard assessment for the Project area, identifies strategies that will mitigate the potential risk of bushfire hazards for the construction and operational phases of the Project and demonstrates how the development application for the Project will comply with the Bushfire overlay code. It includes:

- an introduction (this section) and description of methods and information resources used for the preparation of this BMP;
- description of the Project area and the Project;
- bushfire hazard assessment;
- identification of bushfire hazards associated with the Project area and the Project;
- radiant heat exposure assessment;
- a plan for mitigating the potential risk of bushfire hazards; and
- assessment of compliance with the Bushfire overlay code.

Please note, this BMP does not consider fire hazards associated with the BESS including (amongst other things) electrical hazards, chemical hazards, explosions, potential fire spread due to the proximity of battery enclosures or mechanical damage to battery enclosures. These are matters which will be dealt with via a separate fire safety study.

1.1 Bushfire management plan review

This BMP has been prepared for a development application. Upon approval of the Project, the appointed construction contractor and operational contractor may wish to prepare their own version of this BMP to distil the matters which are specific to their contract or to include corporate documentation or procedures. Notwithstanding, this does not permit the construction contractor or operational contractor to change or deviate from the mitigation measures specified in Chapter 6 or associated development approval conditions.

1.2 Method

To meet requirements of the SPP guidance material - bushfire and the BRC guide, the following tasks were undertaken:

- review of the Bushfire prone area map in the SPP interactive mapping system (DSDILGP 2024), fire history data in the Queensland Globe (DR 2024) and the Queensland regional ecosystem map, vegetation hazard class (**VHC**) map and severe fire weather map in the QFD online mapping system (QFD 2024) (**Catalyst**);
- field inspection of the Project area for vegetation characteristics, current land management practices, slope and evidence of previous fires;
- bushfire hazard assessment in general accordance with the method in the BRC guide;
- radiant heat exposure assessment using the Fire Protection Association of Australia *BAL calculator* V4.9 (**BAL calculator**) which models the 'method 2' bushfire attack level assessment procedure in the *Australian Standard* (AS 3959-2018) *Construction of buildings in bushfire prone areas*; and
- identification of mitigation measures required to reduce the potential risk of bushfire hazards to the construction and operational phases of the Project and to demonstrate compliance with the Bushfire overlay code.

Aerial imagery of the site was accessed online from Google Earth and Queensland Globe to assist in validating observations and measurements made during the field inspection.

1.3 Suitably qualified person

This BMP was prepared by Robert Janssen who is a suitably qualified and experienced bushfire management consultant.

Robert is the managing principal at LEC and has over 25 years of experience in bushfire planning and operations. He has prepared bushfire management plans for residential, commercial and industrial property developments, utilities, government facilities and conservation estates.

Robert's formal qualifications as an environmental scientist and consulting experience are coupled with 10 years of experience as a nationally accredited fire-fighter with the national parks and wildlife service in New South Wales and Queensland.

2 Description of the Project area and the Project

This chapter provides a description of the Project area and the Project.

2.1 The Project area

The location of the Project area is shown in Figure 3.1. It is approximately 45 kilometres west of Warwick and is adjacent to the Powerlink Queensland (**Powerlink**) MacIntyre Intermediate Switching Station (**MISS**) and the 923 megawatt (**MW**) MacIntyre Wind Farm.

Access to the Project area is via the Cunningham Highway, Carbean Road and an existing access road to the MISS.

The Project area is surrounded by a combination of bushland vegetation and grasslands on gently sloping plains to steep hills which are used for grazing livestock. The Project area has been cleared of bushland vegetation and consists of grasslands.

A Powerlink 330 kilovolt (**kV**) overhead transmission line (**OHTL**) runs along the northern perimeter of the Project area and connects into the MISS.

The Project area does not have access to a mains water connection.

2.2 The Project

The Project is shown in the infrastructure layout plan which is provided in Appendix 1.

The Project involves the construction of a grid connected BESS with estimated capacity of 400 MW (subject to detailed design) which will be connected to the electricity network via the MISS. It also includes an operations and maintenance compound, temporary laydown area, substation, internal access roads and 33 kV underground medium voltage cabling.

The Project involves uses defined in the SPP guidance material – bushfire as ‘community infrastructure for essential services’ and ‘hazardous materials in the context of bushfire hazard’.

2.3 Bushfire prone area map

The Bushfire prone area map for the site is provided in Appendix 2. It shows the Project area is affected by medium, high and very high potential bushfire intensity areas and potential impact buffer area.

3 Bushfire hazard assessment

This chapter provides details about the desktop review, field inspection and bushfire hazard assessment.

3.1 Severe fire weather

The severe fire weather map in Catalyst indicates the 5 % annual exceedance probability forest fire danger index (**FFDI**) for the Project area is 64. This FFDI value has been used for the potential bushfire intensity calculations in Section 3.4 and the radiant heat exposure assessment in Section 3.6.

For the assessment of grassfire attack, the FFDI value of 64 has been converted to a grass fire danger index (**GFDI**) value of 91, based on the GFDI values in Table B2 of AS 3959-2018.

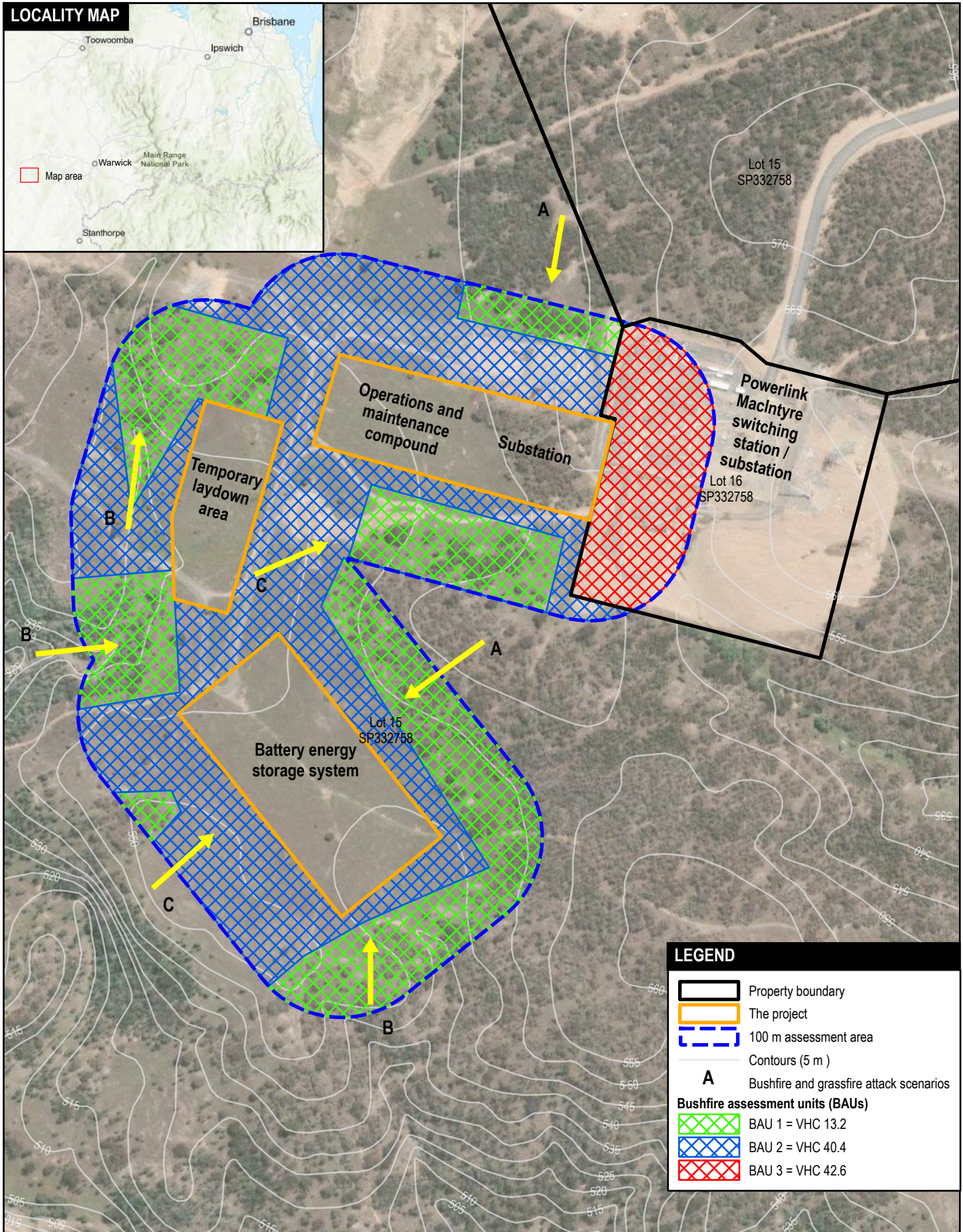
3.2 Fire history

Fire history data indicates the Project area and adjoining land has regular bushfires. The fire history data does not identify whether the bushfires were planned burns or unplanned bushfires.

3.3 Field inspection

LEC inspected the land within and adjoining the Project area on 31 May 2024. Observations were recorded about current land use and management, vegetation characteristics, slope and evidence of previous fires.

The locations of bushfire assessment units (**BAUs**) used for the bushfire hazard assessment are shown in Figure 3.1. Table 3.1 provides a summary of observations from the field inspection and notes about the bushfire hazard assessment of BAUs. Features of BAUs are shown in Photographs 3.1-3.2



 LEC Land and environment consultants	Client: Saunders Havill Group Pty Ltd Design: Land and Environment Consultants Date Saved: 22/11/2024 2:58 PM Created by: LW Scale: 1:5,000 Name: J24052_ArcGISProject_Karara_BEES_Figure_3-1	Bushfire management plan Karara BEES Carbean Road, Karara Title: Site locality and VHC assessment Figure 3.1	Aerial image: Maxar Scale: 1:5,000 0 50 100 150 200 m 
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Table 3.1 Site observations

BAU	Catalyst VHC	Ground truthed VHC	Notes
BAU 1	VHC 13.2 <i>Dry to moist eucalypt woodlands on undulating metamorphics and granite (VHC 13.2)</i> and VHC 40.4 <i>Continuous low grass or tree cover (VHC 40.4)</i>	VHC 13.2	Bushland vegetation located on rolling hills.
BAU 2	VHC 13.2 and VHC 40.4	VHC 40.4	Grasslands
BAU 3	VHC 13.2 and VHC 40.4	VHC 42.6 <i>Nil to very low vegetation cover (VHC 42.6)</i>	MISS

**Photograph 3.1 VHC 13.2 within BAU 1****Photograph 3.2 VHC 40.4 within BAU 2**

3.4 Potential bushfire intensity calculations

The potential bushfire intensity of BAUs was determined using the Queensland Public Safety Business Agency *Potential Bushfire Intensity Calculator* (version November 2014) which is an Excel spreadsheet calculator that models the bushfire hazard assessment method in Section 4.2.4 of the BRC guide.

Section 3.1 of the BRC guide defines bushfire hazard classes as follows:

- very high – potential bushfire intensity > 40,000 kilowatts/m (**kW/m**);
- high – potential bushfire intensity 20,000-40,000 kW/m;
- medium – potential bushfire intensity 4,000-20,000 kW/m; and
- non bushfire hazard - potential bushfire intensity <4,000 kW/m.

Results of the potential bushfire intensity calculations which determine the bushfire hazard class of BAUs shown in Figure 3.1 are presented in Table 3.2.

Table 3.2 Potential bushfire intensity

BAU	VHC	Potential fuel load (tonnes (t)/ha) ¹	Slope (°) ²	Potential bushfire intensity (kW/m)	Bushfire hazard class
BAU 1	VHC 13.2	14.4	7	13,337	Medium
BAU 2	VHC 40.4	5	5	1,401	Non-bushfire hazard class ³

Table 3.2 Potential bushfire intensity

BAU	VHC	Potential fuel load (tonnes (t)/ha) ¹	Slope (°) ²	Potential bushfire intensity (kW/m)	Bushfire hazard class
BAU 3	VHC 42.6	0	0	133	Non-bushfire hazard class

Notes

1. Potential fuel load taken from the BRC guide.
2. Slope defaults to 0° for VHC 42.6 which is defined in the BRC guide as a low hazard class with discontinuous bushfire fuel.
3. VHC 40.4 is defined in the BRC guide as a grassfire hazard with continuous grassfire fuel.

3.5 Bushfire hazard areas

Results of the potential bushfire intensity calculations in Table 3.2 generally align with the Bushfire prone area map and confirm that the Project is within a bushfire hazard area and the development application is subject to compliance with the Bushfire overlay code.

Note, the Bushfire prone area map does not identify grassfire hazard areas.

3.6 Radiant heat exposure assessment

The Bushfire overlay code requires community infrastructure for essential services and hazardous materials in the context of bushfire hazard, ie the BESS and substation, to be setback from hazardous vegetation by a distance which achieves a radiant heat flux level $\leq 10 \text{ kW/m}^2$ at the development footprint.

The operations and maintenance compound and temporary laydown area are not described as community infrastructure for essential services or hazardous materials in the context of bushfire hazard in the SPP guidance material – bushfire. Therefore, under the Bushfire overlay code they can be setback from hazardous vegetation by a distance which achieves a radiant heat flux $\leq 29 \text{ kW/m}^2$ at the development footprint.

The setback referred to above is hereafter referred to as an asset protection zone (**APZ**). The purpose of the APZ is to minimise the effects of grassfire or bushfire attack on above ground infrastructure and to provide access and a defensible space for fire-fighters to operate.

The radiant heat profile of grassfire and bushfire attack on the Project area was analysed using the BAL calculator. Inputs used in the BAL calculator and results are provided in Appendix 3.

Results of the radiant heat exposure assessment have been used to determine the width of the APZ specified in Section 6.1.

4 Bushfire hazards associated with the Project area and the Project

This chapter identifies bushfire hazards associated with the Project area and the Project.

4.1 Fire danger season

The fire danger season at the Project area starts in August, peaks in September and will begin to fall when consistent summer rainfall occurs. Typically, the worst fire weather conditions will be experienced during the fire danger season when the wind direction is from the north or west.

An FFDI of 64, ie the 5 % annual exceedance probability FFDI for the Project area, will be associated with hot, dry and windy conditions. If a bushfire starts and takes hold under these conditions, it will be difficult to control and fast moving in large areas of unmanaged vegetation.

Fire danger ratings (**FDRs**) provides advice about the level of bushfire threat on a day. There are four FDR levels which are summarised below:

- moderate – most fires can be controlled;
- high – fires can be dangerous;
- extreme – fires will spread quickly and be extremely dangerous; and
- catastrophic – if a fire starts to take hold, it could result in the loss of life.

The FDR will be monitored during both the construction and operational phases of the Project.

4.2 Fire history

As discussed in Section 3.2, fire history data indicates the Project area and adjoining land has regular bushfires. Therefore, it is considered almost certain that the Project will be exposed to bushfire attack in the future.

4.3 Vegetation

The development footprint of the Project will be cleared of vegetation in preparation for civil works. It will have a mineral earth surface that will be maintained free of weeds, woody regrowth and grass for the life of the Project.

4.4 Bushfire attack and the protection of above ground infrastructure

The protection of above ground infrastructure from grassfire and bushfire attack will be supported by the APZ and vehicle access tracks located around the perimeter of above ground infrastructure.

4.5 Workforce

Workers associated with the construction and operational phases of the Project will be accommodated in local housing.

4.6 Hazardous chemicals

Storage or handling of hazardous chemicals during the construction and operational phases of the Project will be in accordance with *Managing risks of hazardous chemicals in the workplace – Code of Practice* (SWA 2023), applicable safety data sheets, and otherwise in accordance with the *Queensland Work Health and Safety Act 2011* and its regulations.

4.7 Access roads

Access roads will be established within the Project area and will link the BESS, operations and maintenance compound and substation to the MISS access track and Carbean Road.

The access roads will be designed for emergency vehicles. Any requirement for them to be designed for urban fire trucks will be advised by the fire safety study. If there are gates across the access roads, they will be at least 4 m wide.

4.8 Rural Fire Brigade resources and capability

The local Rural Fire Brigades (**RFBs**) are voluntary primary producer brigades and have expertise and equipment to deal with vegetation fires. They will have little to no training or experience operating around electrical infrastructure, ie the BESS and substation, or responding to structural fires.

4.9 Fire-fighter water supply

There will be a dedicated fire-fighter water supply tank for the construction and operational phases of the Project.

There is a dam located within the site. However, the standard of vehicle access to this feature and the reliability of its water supply is unknown and should not be relied upon.

Please note, the fire-fighter water supply recommended in this BMP is separate to any requirement for hydrants and static fire water storage specified in the *National Construction Code–Building Code of Australia* (ABCB 2022) (**NCC-BCA**) and *Queensland Development Code* (QG 2021) (**QDC**).

4.10 Warning and evacuation requirements

Queensland emergency services use a range of methods to warn the community about bushfire, severe weather and other emergencies that require preparation and action at the property level. The construction workforce and operational workforce will be subject to advice and warnings by Queensland emergency services via radio, online media and local community safety announcements.

A safety and emergency management plan and an evacuation plan will be prepared for the construction phase and operational phase of the Project. These plans will provide details of actions to be undertaken in response to a bushfire emergency. They are separate plans to this BMP.

4.11 Buildings and structures

Offices and worker amenities that are required for the construction phase of the Project will be demountable buildings, ie temporary buildings, that will be in a cleared compound.

Buildings and structures associated with the Project will be designed to meet the fire resistance and safe access and egress requirements of the NCC-BCA and governing Queensland laws, codes and standards that apply to the building industry.

Fire detection and first attack fire-fighting equipment in buildings will comply with requirements in the NCC-BCA and any Queensland specific requirements.

5 Fire ignition risks

This chapter identifies fire ignition risks within the Project area.

5.1 Land use

The Project area adjoins farming land and a mining lease which have large continuous areas of bushland and grassland vegetation.

The operation of equipment and machinery or hot works could result in unplanned fires that impact on the Project area, particularly on days with an FDR of high or above. In addition, landowners may light fires to burn waste or for fuel hazard reduction. Therefore, the adjoining land use is considered a potential bushfire hazard to the Project.

5.2 High voltage overhead transmission lines

The Powerlink OHTL along the northern perimeter of the Project area is susceptible to ‘flashover’ which can cause a fire ignition in surrounding vegetation. Fires with a flame height greater than 1 m adjacent to or under high voltage OHTLs have the potential to:

- create electrical arcs (known as flashovers) that can endanger people, animals and objects;
- damage or destroy wires, insulators and supports of the transmission line; and
- interrupt power supply to households, business and industry.

Vegetation under the Powerlink OHTL will continue to be maintained in accordance with Powerlink’s vegetation management specifications for high voltage overhead transmission lines (Powerlink 2018).

5.3 Lightning strike

A lightning strike could cause a fire ignition within or adjoining the Project area, particularly during the fire danger season when dry electrical storms most commonly occur.

5.4 Electrical fire

There is potential for a fire of electrical origin to develop at the BESS or substation. Notwithstanding, this infrastructure will be located on a mineral earth surface and an APZ will be maintained around the perimeter. The APZ will be maintained in a low hazard condition during the fire danger season.

5.5 Construction activities

The use of tracked earthmoving machinery, vehicles driving or parking in long grass, hot works and people smoking has potential to cause a bushfire during the construction phase of the Project.

5.6 Operational activities

Similar risks may exist during the operational phase of the Project that existed during the construction phase, ie vehicles driving or parking in long grass, hot works and people smoking. However, worker numbers will be significantly reduced, and access will be on constructed tracks.

6 Bushfire mitigation plan

This chapter identifies bushfire mitigation measures that must be implemented during the construction and operational phases of the Project.

The bushfire mitigation measures will reduce the risk of bushfire hazards to a tolerable level which in this BMP means compliance with the Bushfire overlay code.

It is the total of the mitigation measures in this chapter that will reduce the risk of bushfire hazards to a tolerable level. Failure to implement all of the mitigation measures in their entirety could result in an increased level of exposure to bushfire hazards.

6.1 Asset protection zone

An APZ must be established and maintained around the perimeter of the BESS, operations and maintenance compound and substation as shown in Figure 6.1.

It must be pegged out on-site during the construction phase to ensure that it is maintained consistently during the operational phase.

The APZ must be cleared of weeds and woody vegetation and have a mineral earth or grass surface. Where a grass surface is used, it must be maintained at a height ≤ 10 centimetres (or as low as is practically possible) during the fire danger season.

An APZ must also be provided for the temporary laydown area as shown in Figure 6.1. However, it must be established and maintained within the temporary laydown area by preventing storage within 10 m of the perimeter.

6.2 Surface under infrastructure

The BESS, substation, operations and maintenance compound and temporary laydown area shown in Figure 6.1 must have a mineral earth surface. The mineral earth surface must be maintained free of any vegetation, ie weeds, woody regrowth and grass.

When used in the context of bushfire management, mineral earth surface means a non-flammable surface, either natural or prepared, which has no vegetation or litter. As a result, it provides a barrier to fire travelling on or near the ground surface.

6.3 Cleared vegetation

Vegetation cleared from the Project area must be mulched and used in rehabilitation works or removed from the site. It must not be wind rowed or stockpiled adjacent to development footprints or along access tracks

6.4 Fire-fighter access tracks

Fire-fighter access tracks for RFB operations must be established around the BESS compound and adjacent to the southern elevation of the operations and maintenance compound and substation as shown in Figure 6.1. In combination with the formal access roads which are also shown in Figure 6.1, they provide opportunities for the containment of vegetation fires and backburning.

The fire-fighter access tracks must meet the following specifications:

- trafficable surface width of 4 m inside a 6 m wide vegetation clearing;
- vehicle surface carrying capacity suitable for a vehicle mass of 15 t and an axle load of 9 t;
- maximum grade of not more than 15° and crossfall of not more than 6°;

- appropriately designed drainage structures;
- minimum vertical clearance of 4 m; and
- capacity for passing is provided every 250 m comprising:
 - a widened trafficable surface of at least 6 m for a length of at least 20 m; or
 - a parking bay turnaround measuring 6 m wide and 8 m long.

Short sections which do not comply with the slope and width criteria outlined above are permissible where topography or environmental constraints do not permit compliance.

Fire-fighter access tracks must be inspected at regular intervals during the calendar year and maintained in accordance with the specifications above prior to the onset of the annual fire danger season.

6.5 Fire-fighter water supply

The indicative location of a fire-fighter water supply outlet point is shown in Figure 6.1. It must be connected to a fire-fighter water storage tank which is made of metal or concrete, has a minimum capacity of 40,000 litres and kept full of water. It must not be used for activities other than bushfire management. The specific location of the fire-fighter water supply outlet point, and water storage tank will be subject to further engineering design.

The fire-fighter water storage tank and outlet point must be fitted with RFB fire-fighting fittings – we recommend contacting the local RFB to confirm the standard RFB fittings in use at the locality. All above ground fittings, ie connections, valves and pipes must be made of metal.

There must be a hardstand area for a RFB vehicle to park within 4 m of the fire-fighter water outlet point. The hardstand areas must have the load bearing capacity and dimensions suitable for a vehicle mass of 15 t and an axel load of 9t.

The fire-fighter water outlet point must be identified by reflective wayfinding signage along the fire-fighter vehicle access track or formal vehicle access tracks shown in Figure 6.1. An example of the wayfinding signage is provided below. It must have a reflective white background and black symbology which is at least 125 mm high.



As stated in Section 4.9, the recommendations in this section are separate to any requirements for hydrants and static fire water storage specified under the NCC-BCA and QDC.

6.6 Buildings

Buildings and structures must comply with the fire resistance and safe access and egress requirements of the NCC-BCA and governing Queensland laws, codes and standards that apply to the building industry.

Fire detection and first attack fire-fighting equipment in buildings must comply with specifications in the NCC-BCA and any Queensland specific requirements.

These matters will be dealt with in detail through the building certification and approvals process.

6.7 Construction phase

6.7.1 Staging of construction works

The fire-fighter water supply and APZ must be installed at the earliest possible stage of construction.

6.7.2 Fire extinguishers and protection equipment

Fire extinguishers, appropriate to the identified emergency scenario, must be provided at construction facilities and fitted in construction vehicles and mobile plant.

Fire protection equipment must be provided for any storage of hazardous materials in accordance with *Managing risks of hazardous chemicals in the workplace – Code of Practice* (SWA 2023), applicable safety data sheets, and otherwise in accordance with *Queensland Work Health and Safety Act 2011* and its regulations.

6.7.3 Communications equipment and communications planning

The construction office, vehicles and mobile plant must be fitted with an ultra-high frequency (UHF) radio.

The construction contractor must ensure the following is in place by the time construction commences:

- site personnel are aware of the mitigation measures in this BMP;
- an emergency contact number is available online and is attended to at all times by trained personnel;
- contingency communication systems are in place for the onsite representative of the construction contractor in case of failed telephone communication attempts; and
- a mechanism to provide periodical updates to the local QFD and RFBs and neighbouring landowners as the Project is progressively built.

6.7.4 Restrictions during the fire danger season

QFD restrictions during the fire danger season must be adhered to. These are advertised online at <https://www.fire.qld.gov.au/safety-education/using-fire-outdoors/fire-bans-and-restrictions> or can be obtained from the Darling Downs office by calling (07) 4592 5306.

Vehicles and mobile plant and equipment must not be operated or parked in long grass unless fire management controls are in place.

Smoking must be restricted to prescribed areas.

Mobile water carts must be located adjacent to construction work areas during the fire danger season.

6.7.5 Hot works

Hot works must be managed under a hot works permit system.

Hot works and other high fire risk activities, eg the operation of tracked machinery, must be monitored for ignitions and only performed if fire management controls are in place.

6.7.6 Safety documentation

Construction activities must be governed by safety documentation, including safe work method statements. Activity specific bushfire risk management controls must be identified through the safety

documentation. Where required, the safety documentation must be managed through a permit to work system which must provide an additional layer of control around bushfire risk management.

6.7.7 Training

Bushfire awareness training must be provided to the construction workforce. It must cover the topics of fire line safety, appropriate personal protective equipment and clothing, principles of fire behaviour, types of fuel, hazards and precautions, effects of weather and topography on fires and bushfire danger season and responsibilities during a fire emergency.

6.7.8 Emergency management plan

An emergency management plan must be prepared for the construction phase prior to the construction contractor mobilising to site. As a minimum, it must detail the arrangements for managing emergencies, include site details, procedures, resources and training.

6.8 Operational phase

6.8.1 Information transfer

Prior to commencing the operational phase of the Project, spatial data which identifies the location of the Project's infrastructure, access tracks, gates and fire-fighter water supply tank must be provided to the QFD so that it can be uploaded into the QFD online incident management system and is readily available for bushfire emergency planning.

The operational contractor must consult with the QFD to determine the information and data format requirements and the specifics of the data transfer.

6.8.2 Fire-fighter operations plan

Prior to commencing the operational phase of the Project, a fire-fighter operations plan must be prepared for the Project and provided to the local RFBs. It must be in the format of a poster plan that can be rolled out and used in the field.

The fire-fighter operations plan must identify (as a minimum) the location of infrastructure, APZs, access tracks, gates, fire-fighter water outlet point and reference wayfinding signage. It must also include contact and communications information, instructions for operating around electrical infrastructure and operational guidelines for fire control.

6.8.3 Bushfire preparedness activities

Non-fire danger period

Preparedness activities that must be undertaken during the non-fire danger period include:

- service plant and fire protection systems and equipment;
- conduct site-wide bushfire preparedness inspections of the APZ, access tracks, fire-fighter water supply, signage and building fire protection systems;
- maintain the APZ, access tracks, fire-fighter water supply, signage and building fire protection systems in accordance with the relevant sections of this BMP;
- facilitate a bushfire preparedness meeting with the local QFD and RFBs; and
- review emergency management plans.

The operational contractor must invite the local QFD and RFBs to participate in an annual bushfire preparedness meeting. The meeting will be used to familiarise these stakeholders with the location of the APZ, access tracks, gates and fire-fighter water supply tank and fittings, communication procedures and safety requirements for operating within the Project area. It will also provide an opportunity to review any bushfire incidents within or adjacent to the Project area and any plans for hazard reduction burns by the neighbouring landowners and an opportunity to run a bushfire response training drill with the local QFD and RFBs.

Fire danger period

Preparedness activities that must be undertaken during the fire danger period include:

- monitor the FDR for the Southern Downs region four days in advance at <https://www.fire.qld.gov.au/prepare/bushfire/fire-danger-ratings>;
- modify site activities based on elevated FDRs, ie high, extreme and catastrophic;
- conduct weekly inspections of the APZ, access tracks, fire-fighter water supply, signage and building fire protection systems;
- implement travel plans to avoid driving through high and very high potential bushfire intensity areas on days with an extreme or catastrophic FDR.

Modification of site activities must be advised by a site-based risk assessment and may include:

- limiting non-essential activities on days with a high or above FDR;
- limiting travel on days with an extreme or catastrophic FDR;
- postponing planned maintenance;
- include bushfire ignition hazards in job safety risk based management process; and
- communicating modified activities and expectations to site personnel and visitors.

6.8.4 Access rules

Access to the Project area must be conditional on site personnel and visitors completing an induction and complying with entry rules, including rules regarding smoking.

Smoking must only be permitted in cleared areas.

6.8.5 Safety documentation

Activities during the operational phase of the Project must be governed by safety documentation as specified for the construction phase in Section 6.7.6.

6.8.6 High voltage overhead transmission line

Fire-fighting operations near the Powerlink OHTL must be planned and implemented in accordance with the *National Guidelines on Electrical Safety for Emergency Service Personnel* (ENA DOC 008-2006) and Powerlink's instructions.

6.8.7 Emergency management planning

An emergency management plan must be prepared for the operational phase of the Project in accordance with requirements of the *Australian Standard (AS 3745-2010) Planning for emergencies in facilities* (Standards Australia 2018).

The emergency management plan must include procedures to be followed in the event of a bushfire warning by the QFD and identify the location of safe assembly/evacuation areas and the access routes to these areas.

In the event of a fire ignition that cannot be safely extinguished with available resources, the following procedure must be followed:

1. Contact the QFD via a 000 call.
2. Notify neighbouring landowners of the fire ignition.
3. Evacuate site personnel and visitors to a safe assembly/evacuation area and account for all site personnel and visitors.
4. Meet the QFD or RFB and provide information relevant to the fire emergency.
5. Resume activities when advised by the QFD or RFB that it is safe to do so.

6.8.8 Electrical safety

The Project must be operated in compliance with the Queensland *Electrical Safety Act 2002* and its regulations and the electrical safety codes of practice by the Electrical Safety Office of Queensland (ESO 2020a, ESO 2020b and ESO 2021).

Electrical equipment installed to support the operational phase of the Project must be regularly inspected in accordance with the manufacturer's guidance (where this applies) or in accordance with industry best practice.

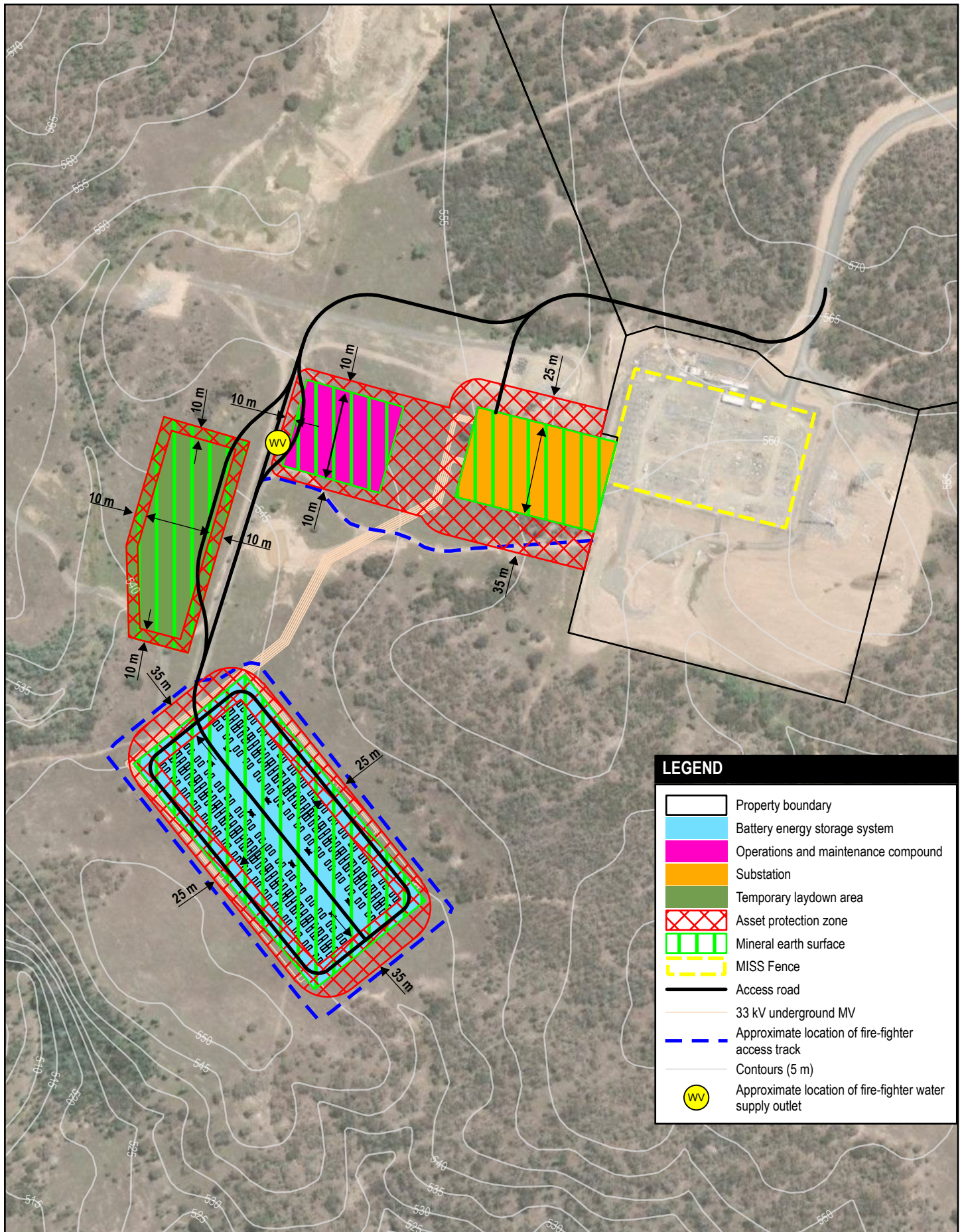
6.8.9 Hazardous materials

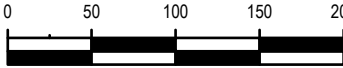
Storage or handling of hazardous materials must be in accordance with *Managing risks of hazardous chemicals in the workplace – Code of Practice* (SWA 2023), applicable safety data sheets, and otherwise in accordance with Queensland *Work Health and Safety Act 2011* and its regulations.

6.8.10 Lighting fires

Lighting fires to burn waste is prohibited within the Project area.

Prescribed burns to contain unplanned fires or to achieve fuel hazard reduction or conservation outcomes are permitted within the Project area subject to compliance with the Queensland *Fire and Emergency Services Act 1990*.



 LEC Land and environment consultants	Client: Saunders Havill Group Pty Ltd		Bushfire management plan Karara BESS Carbean Road, Karara		Aerial image: Maxar Scale: 1:4,500	
	Design: Land and Environment Consultants Date Saved: 25/11/2024 8:33 AM Created by: LW Scale: 1:4,500 Name: J24052_ArcGISProject_Karara_BESS_Figure_6-1		Title: Bushfire mitigation plan		Figure 6.1	
					 	

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7 Closing

This BMP was prepared by a suitably qualified person and is in general accordance with the SPP guidance material – bushfire and the BRC guide.

A bushfire hazard assessment determined the Project area is affected by bushfire hazard. Therefore, the development application for the Project must demonstrate compliance with the Bushfire overlay code.

Mitigation measures that must be included in the design of the Project and implemented during the construction and operational phases of the Project are specified in Chapter 6. With the implementation of these mitigation measures the development application for the Project is considered to be compliant with the Bushfire overlay code as demonstrated in Appendix 4.

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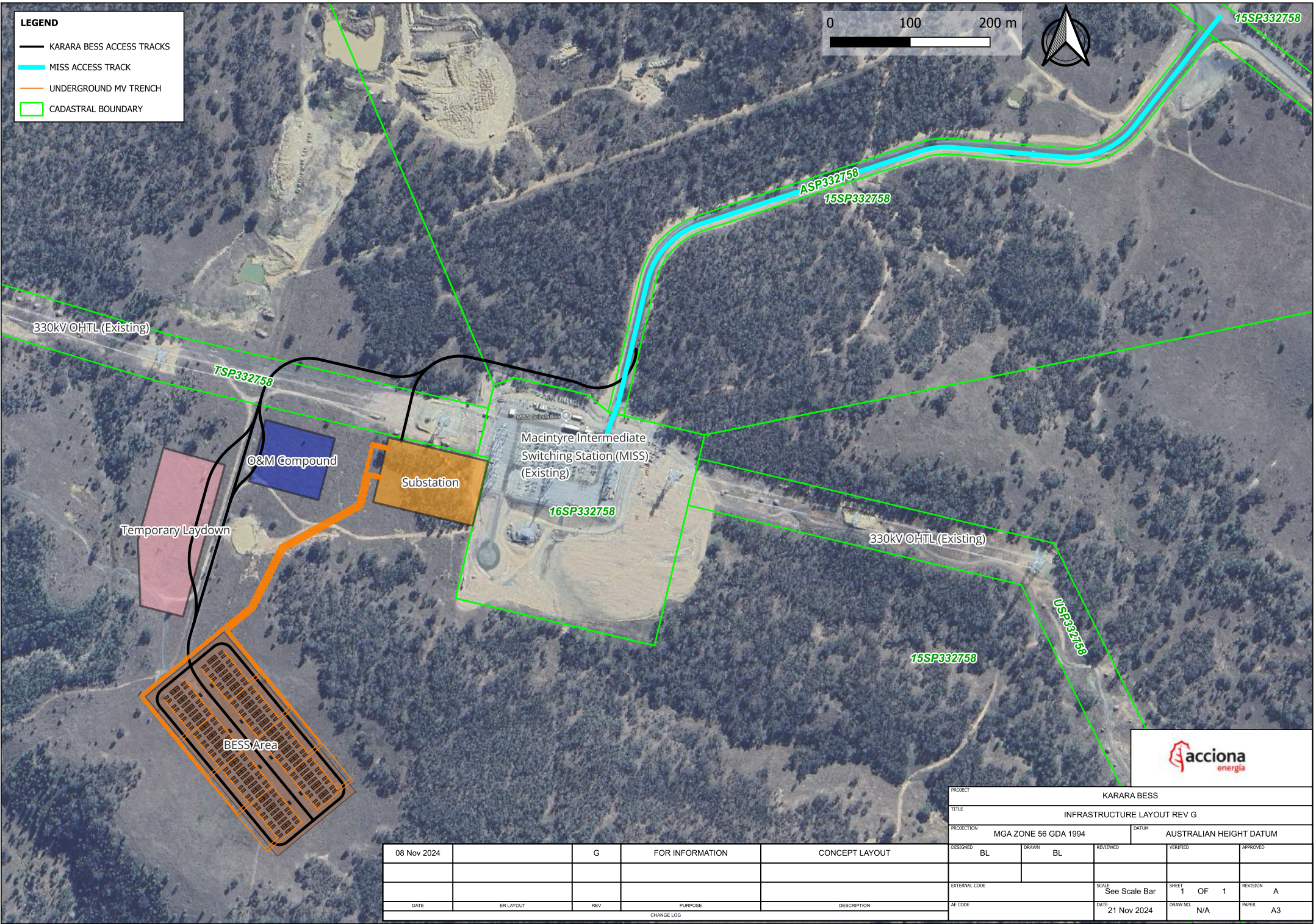
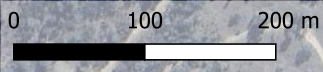
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Appendix 1 Infrastructure layout

LEGEND

- KARARA BESS ACCESS TRACKS
- MISS ACCESS TRACK
- UNDERGROUND MV TRENCH
- CADASTRAL BOUNDARY



PROJECT					KARARA BESS				
TITLE					INFRASTRUCTURE LAYOUT REV G				
PROJECTION			MGA ZONE 56 GDA 1994		DATUM		AUSTRALIAN HEIGHT DATUM		
DESIGNED	BL	DRAWN	BL	REVIEWED		VERIFIED		APPROVED	
EXTERNAL CODE					SCALE	See Scale Bar	SHEET	1 OF 1	REVISION
AE CODE					DATE	21 Nov 2024	DRAW NO.	N/A	PAPER
					A3				

08 Nov 2024		G	FOR INFORMATION	CONCEPT LAYOUT
DATE	IR LAYOUT	REV	PURPOSE	DESCRIPTION
CHANGE LOG				

Appendix 2 Bushfire prone area map



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Legend

Drawn Polygon Layer

Override 1

Cadastre (150k)



Cadastre (150k)

Bushfire prone area



Very High Potential Bushfire Intensity



High Potential Bushfire Intensity



Medium Potential Bushfire Intensity



Potential Impact Buffer



Date: 06/03/2024

Queensland Government

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State Planning Policy

Making or amending a local planning instrument
and designating land for community infrastructure

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Appendix 3 Radiant heat exposure assessment

Bushfire attack scenario A

- Forest fire danger index – 64
- Vegetation - VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
- Understorey fuel load – 12.8 tonnes/hectare (t/ha)
- Total fuel load – 14.4 t/ha
- Effective slope – 0° slope (vegetation is up slope of the development footprint)
- Site slope – 0° slope
- Flame width – 100 metres (m)
- Flame temperature – 1,090 Kelvin (K)



Calculated June 19, 2024, 1:45 pm (MDC v.4.9)

J24052

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	64	Rate of spread	0.98 km/h
Vegetation classification	Woodland	Flame length	8.109999999999999 m
Understorey fuel load	12.8 t/ha	Flame angle	54 °, 64 °, 73 °, 78 °, 80 ° & 85 °
Total fuel load	14.4 t/ha	Elevation of receiver	3.28 m, 3.64 m, 3.88 m, 3.97 m, 3.99 m & 4.04 m
Vegetation height	n/a	Fire intensity	7,313 kW/m
Effective slope	0 °	Transmissivity	0.885, 0.873, 0.854, 0.832, 0.82 & 0.748
Site slope	0 °	Viewfactor	0.588, 0.4357, 0.2921, 0.1966, 0.1596 & 0.0439
Flame width	100 m	Minimum distance to < 40 kW/m²	6.8 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	9.199999999999999 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	13.7 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	20.2 m
		Minimum distance to < 10 kW/m²	24.5 m

Rate of Spread - Mearthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Bushfire attack scenario B

- Forest fire danger index – 64
- Vegetation - VHC 13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
- Understorey fuel load – 12.8 t/ha
- Total fuel load – 14.4 t/ha
- Effective slope – 7° slope
- Site slope – 0° slope
- Flame width – 100 m
- Flame temperature – 1,090 K



Calculated June 19, 2024, 1:48 pm (MDe v.4.9)

J24052

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	64	Rate of spread	1.59 km/h
Vegetation classification	Woodland	Flame length	12.08 m
Understorey fuel load	12.8 t/ha	Flame angle	53 °, 63 °, 71 °, 76 °, 78 ° & 83 °
Total fuel load	14.4 t/ha	Elevation of receiver	4.82 m, 5.38 m, 5.71 m, 5.86 m, 5.91 m & 5.99 m
Vegetation height	n/a	Fire intensity	11,855 kW/m
Effective slope	7 °	Transmissivity	0.877, 0.86, 0.837, 0.8120000000000001, 0.798 & 0.733
Site slope	0 °	Viewfactor	0.5976, 0.4422, 0.2982, 0.2021, 0.1643 & 0.0448
Flame width	100 m	Minimum distance to < 40 kW/m²	10 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	13.5 m
Heat of combustion	18,500 kJ/kg	Minimum distance to < 19 kW/m²	19.9 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	28.4 m
		Minimum distance to < 10 kW/m²	33.9 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Bushfire attack scenario C

- Forest fire danger index – 56
- conversion to Grassfire danger index - 91
- Vegetation - VHC 40.4 Continuous low grass or tree cover
- Understorey fuel load – 4.5 t/ha
- Total fuel load – 5 t/ha
- Effective slope – 5° slope
- Site slope – 0° slope
- Flame width – 100 m
- Flame temperature – 1,090 K



Calculated June 19, 2024, 1:50 pm (MDC v.4.9)

J24052

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	91	Rate of spread	16.7 km/h
Vegetation classification	Grassland	Flame length	7.83 m
Understorey fuel load	4.5 t/ha	Flame angle	54 °, 64 °, 73 °, 78 °, 80 ° & 85 °
Total fuel load	5 t/ha	Elevation of receiver	3.16 m, 3.51 m, 3.74 m, 3.82 m, 3.85 m & 3.9 m
Vegetation height	n/a	Fire intensity	43,151 kW/m
Effective slope	5 °	Transmissivity	0.886, 0.874, 0.855, 0.834, 0.822 & 0.75
Site slope	0 °	Viewfactor	0.5929, 0.4343, 0.2903, 0.1958, 0.1596 & 0.0437
Flame width	100 m	Minimum distance to < 40 kW/m²	6.5 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	8.9 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	13.3 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	19.6 m
		Minimum distance to < 10 kW/m²	23.7 m

Rate of Spread - Noble et al, 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999; Sullivan et al., 2003; Douglas & Tan, 2005

Appendix 4 Bushfire overlay code assessment

Performance outcomes	Acceptable outcomes	Compliance assessment
Section A		
Reconfiguring a lot (RaL) – where creating lots of more than 2,000 square metres		
PO1 The subdivision layout: (a) enables future buildings to be located away from slopes and land forms that expose people or property to an intolerable risk to life or property; and (b) facilitates emergency access and operational space for firefighters in a reduced fuel area between future buildings and structures and hazardous vegetation, that reduce risk to an acceptable or tolerable level. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	AO1.1 A development footprint plan is identified for each lot that avoids ridgelines, saddles and crests where slopes exceed 15 per cent.	Not applicable The Karara Battery Energy Storage System (the Project) does not involve the reconfiguration of a lot.
	AO1.2 A development footprint plan is identified for each lot that is separated from the closest edge to the adjacent mapped medium, high or very high potential bushfire intensity area by: (a) a distance that is no closer than the distances specified in Table 5 at all development footprint plan boundaries; or (b) a distance that achieves a radiant heat flux level of 29 kW/m² or less at all development footprint plan boundaries. Note – This separation area is often termed an asset protection zone. Note – The radiant heat flux levels can be established by undertaking a bushfire hazard assessment in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document.	Not applicable The Project does not involve the reconfiguration of a lot.
PO2 The subdivision layout enables: (a) future buildings to be located as close as possible to property entrances to facilitate safe evacuation during a bushfire event; and (b) future site access to be located and designed to allow safe evacuation of the site by occupants and maintain access by emergency services under critical event conditions.	AO2 A development footprint plan is identified for each lot that: (a) is located within 60 metres of the street frontage; and (b) sited to enable a route between the development footprint plan and the street frontage with a gradient that does not exceed of 12.5 per cent.	Not applicable The Project does not involve the reconfiguration of a lot.
Section B		
Reconfiguring a lot (RaL) – where creating lots of 2,000 square metres or less		
PO3 The subdivision layout: (a) avoids creating lots on slopes and land forms that expose people or property to an intolerable risk to life or property; and (b) facilitates emergency access and operational space for firefighters in a reduced fuel area between future	AO3.1 The subdivision layout results in lots that are sited so that they are separated from the closest edge to the adjacent mapped medium, high or very high potential bushfire intensity area by: (a) a distance that is no closer than the distances specified in Table 5 at all lot boundaries; or :	Not applicable The Project does not involve the reconfiguration of a lot.

Performance outcomes	Acceptable outcomes	Compliance assessment
buildings and structures and hazardous vegetation, that reduce risk to an acceptable or tolerable level. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment, in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	(b) a distance that achieves a radiant heat flux level of 29 kW/m² or less: (i) at the building envelope, if identified at RaL stage; or (ii) where a building envelope is not identified, at all lot boundaries. Note – This separation area is often termed an asset protection zone. Note – The radiant heat flux levels can be established by undertaking a bushfire hazard assessment in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document. Note – For staged developments, temporary separation areas may be absorbed as part of subsequent stages. Note - Existing cleared areas external to the site may only be used in calculating necessary separation where tenure ensures that the land will remain cleared of hazardous vegetation (for example the land is a road, watercourse or highly managed park in public ownership).	
	A03.2 The subdivision layout does not create lots that are within bushfire prone areas and on ridgelines, saddles and crests where slopes exceed 15 per cent (roads and parks may be located in these areas).	Not applicable The Project does not involve the reconfiguration of a lot.
Section C		
Reconfiguring a lot (RaL) – where creating more than 20 lots		
PO4 The subdivision layout is designed to minimise the length of the development perimeter and number of lots exposed to hazardous vegetation. Note – For example, avoid finger-like subdivision patterns or substantive vegetated corridors between lots.	A04 No acceptable outcome is prescribed	Not applicable The Project does not involve the reconfiguration of a lot.
PO5 The subdivision layout provides for adequate access and egress and safe evacuation routes, to achieve an acceptable or tolerable risk to people.	A05.1 The subdivision layout: (a) avoids the creation of bottle-neck points in the movement network within the development (for example, avoids hourglass patterns); and (b) ensures the road network has sufficient capacity for	Not applicable The Project does not involve the reconfiguration of a lot.

Performance outcomes	Acceptable outcomes	Compliance assessment
	the evacuating population.	
	A05.2 The subdivision layout ensures evacuation routes: (a) direct occupants away from rather than towards or through areas with a greater potential bushfire intensity; and (b) minimise the length of route through bushfire prone areas. Refer Figure 5.	Not applicable The Project does not involve the reconfiguration of a lot.

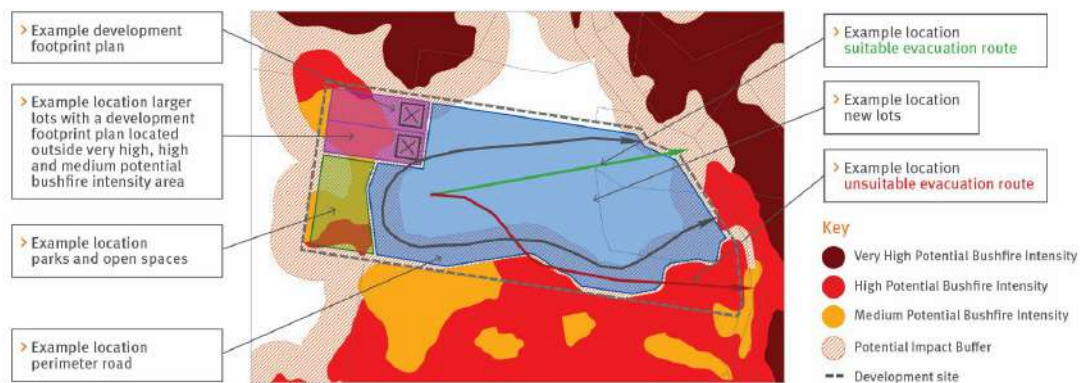
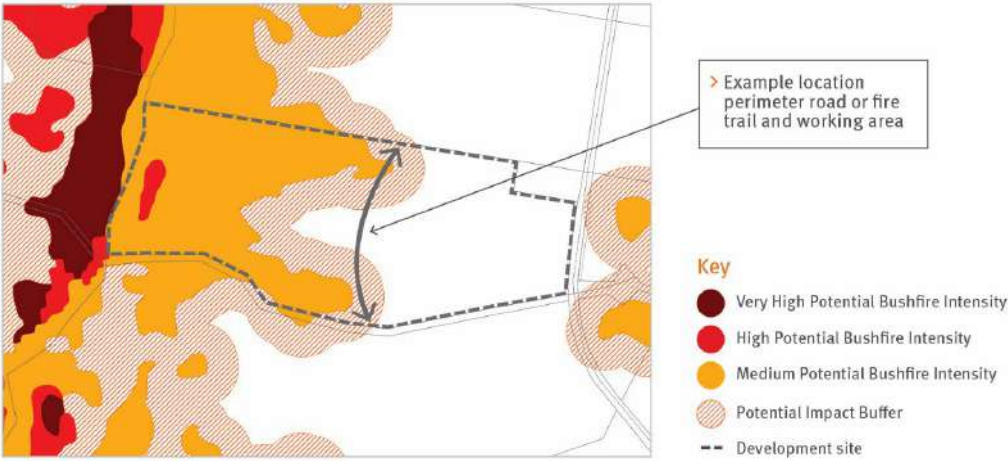


Figure 5 – Subdivision layout and evacuation routes

PO6 The subdivision layout provides adequate buffers between hazardous vegetation and development. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment, in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	A06.1 The subdivision layout results in an asset protection zone being located to create a separation area from adjacent mapped medium, high or very high potential bushfire intensity areas.	Not applicable The Project does not involve the reconfiguration of a lot.
	A06.2 The asset protection zone is comprised of: (a) parks and open spaces; and/or (b) lots greater than 2000 square metres; and/or (c) public roads (termed perimeter roads). Note – Parks and open space may be located within the mapped medium, high and very high potential bushfire intensity areas to create a separation between the development and the balance of the bushfire prone area. Note – Portions of lots greater than 2000 square metres may be located within the mapped medium, high and very high potential bushfire intensity areas. Refer Figure 5.	Not applicable The Project does not involve the reconfiguration of a lot.
	A06.3 Where the asset protection zone	Not applicable

Performance outcomes	Acceptable outcomes	Compliance assessment
	includes lots greater than 2000 square metres a development footprint plan is identified for each lot that is located in accordance with AO1.2.	The Project does not involve the reconfiguration of a lot.
PO7 Parks or open space provided as part of the asset protection zone do not create additional bushfire prone areas. Note –The undertaking of a bushfire hazard assessment, in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document may assist in demonstrating compliance with this performance outcome.	AO7 Where the asset protection zone includes parks or open spaces, they: (a) comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, cultivated gardens and nature strips; or (b) are designed to ensure a potential available fuel load is maintained at less than eight tonnes/hectare in aggregate and with a fuel structure that remains discontinuous. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres.	Not applicable The Project does not involve the reconfiguration of a lot.
PO8 Perimeter roads are accessible for fire-fighting vehicles, to facilitate emergency access and operational space for fire- fighting, maintenance works and hazard reduction activities.	AO8.1 Where the asset protection zone includes a perimeter road it: (a) has a two-lane sealed carriageway clear of hazardous vegetation; and (b) is connected to the wider public road network at both ends and at intervals of no more than 200 metres; and (c) does not include design elements that may impede access for fire-fighting and maintenance for fire- fighting purposes (for example traffic calming involving chicanes).	Not applicable The Project does not involve the reconfiguration of a lot.
	AO8.2 Where the subdivision contains a reticulated water supply, the road network and fire hydrants are designed and installed in accordance with: (a) <i>Fire Hydrant and Vehicle Access Guidelines for residential, commercial and industrial lots</i>, Queensland Fire and Emergency Services, 2015, unless otherwise specified by the relevant water entity; and	Not applicable The Project does not involve the reconfiguration of a lot.

Performance outcomes	Acceptable outcomes	Compliance assessment
	(b) the <i>Road Planning and Design Manual 2nd edition</i> , Department of Transport and Main Roads, 2013.	
Section D		
Reconfiguring a lot (RaL) – where creating additional lots for the purpose of residential development and a reticulated water supply is not provided.		
PO9 The subdivision layout provides for perimeter roads or fire trail and working areas that are accessible by the type of fire-fighting vehicles servicing the area, to facilitate emergency access and operational space for fire-fighting, maintenance works and hazard reduction activities.	AO9.1 The subdivision layout includes: (a) a fire trail and working area designed and constructed in accordance with the design parameters in Table 6 that separates the residential lot or development footprint plan from adjacent mapped medium, high or very high potential bushfire intensity areas; or (b) a perimeter road designed and constructed in accordance with AO8.1. Refer Figure 6.	Not applicable The Project is not for a residential development.
 Figure 6 – Siting of fire trail and working area		
Section E		
Material change of use		
PO10 Site layout achieve an acceptable or tolerable risk to people. Landscape or open space provided as part of the development: (a) acts as a buffer between hazardous vegetation and development; and	AO10.1 Site layout places the landscape and open spaces within the site between premises and adjacent mapped medium, high or very high potential bushfire intensity areas. Refer Figure 7.	Complies with AO10.1 An appropriately designed asset protection zone (APZ) will be established and maintained around the development footprint of infrastructure as specified in Section 6.1 of the bushfire management plan (BMP).

Performance outcomes	Acceptable outcomes	Compliance assessment
(b) does not create additional bushfire prone areas. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	AO10.2 This landscaping and open space comprises protective landscape treatments that: (a) comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses and cultivated gardens; or (b) are designed to ensure a potential available fuel load is maintained at less than 8 tonnes/hectare in aggregate and that fuel structure remains discontinuous. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres.	Complies with AO10.2 The APZ will be established as a mineral earth surface (where located inside compounds) or grass area. Mineral earth surfaces will be maintained free of woody regrowth, weeds and grass cover. A grass area within the APZ will be maintained at a nominal height of ≤ 10 centimetres (cm) (or as low as is practically possible) during the fire danger season.

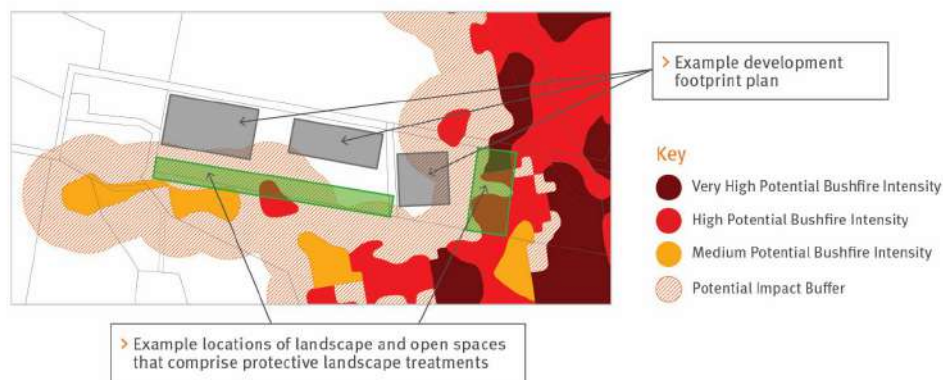


Figure 7 – Siting of protective landscape treatments

PO11 The development establishes evacuation areas, to achieve an acceptable or tolerable risk to people.	AO11 If in an isolated location, development establishes direct access to a safe assembly/evacuation area. Note – Guidance on identifying safe evacuation areas is contained in the QFES <i>Bushfire resilient communities</i> document.	Complies with AO11 Section 6.8.7 of the BMP requires separate emergency response plans to be prepared for the construction and operations and maintenance phases of the Project. The emergency response plans will identify the location of safe assembly/evacuation areas and the access routes to these areas.
PO12 If on a lot of over 2,000 m², where involving a new premises or an existing premises with an increase in development footprint, development: (a) locates occupied areas as close as possible to property entrances to facilitate safe	AO12 No acceptable outcome is prescribed.	Complies with PO12 Specifications for fire-fighter access tracks are provided in Section 6.4 of the BMP.

Performance outcomes	Acceptable outcomes	Compliance assessment
evacuation during a bushfire event; and (b) ensures vehicular access is located and designed to allow safe evacuation of the site by occupants and maintain access by emergency services under critical event conditions		
PO13 Development is located within a reticulated water supply area or includes a dedicated static water supply that is available solely for fire-fighting purposes and can be accessed by fire-fighting vehicles. Note – Swimming pools, farm ponds and dams are not considered reliable sources of static water supply in Queensland due to regular drought events. Note for Local Government – Information on how to provide an appropriate static water supply, may form a condition of a development approval. For further information on preferred solutions refer to the QFES <i>Bushfire resilient communities</i> document.	AO13 No acceptable outcome is prescribed	Complies with PO13 The fire-fighter water supply will comply with specifications in Section 6.5 of the BMP.
PO14 Vulnerable uses listed in Table 7 are not established or intensified within a bushfire prone area unless: (a) there is an overriding need in the public interest for the new or expanded service the development provides; and (b) there are no other suitable alternative locations within the required catchment; and (c) site planning can appropriately mitigate the risk (for example, siting ovals for an educational establishment between the hazardous vegetation and structures. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document may assist in demonstrating compliance with this performance outcome	AO14.1 No acceptable outcome is prescribed.	Not applicable The Project does not involve a vulnerable use.
PO15 Community infrastructure providing essential services listed in Table 7 are not established within a bushfire prone area unless: (a) there is an overriding need in the public interest for the new or expanded service the development provides (for	AO15 No acceptable outcome is prescribed.	Complies with PO15 The battery energy storage system (BESS) and substation have been considered in the BMP as community infrastructure providing essential services. The development footprint for electrical infrastructure within the

Performance outcomes	Acceptable outcomes	Compliance assessment
example, there are no other suitable alternative locations that can deliver the required level of service or meet emergency service response times during and immediately after a bushfire event); and (b) the infrastructure can function effectively during and immediately after a bushfire event. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document may assist in demonstrating compliance with this performance outcome.		BESS and substation will have an APZ which is designed to achieve a radiant heat flux level ≤ 10 kilowatts/square metre (kW/m^2) at the development footprint for electrical infrastructure. This radiant heat flux outcome is identified as an acceptable outcome in <i>Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'</i> 2019.
PO16 Development avoids or mitigates the risks to public safety and the environment from the manufacture or storage of materials listed in Table 7 that are hazardous in the context of bushfire to an acceptable or tolerable level. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document may assist in demonstrating compliance with this acceptable outcome. Editor's note – In addition to the requirements of this code the <i>Work Health and Safety Act 2011</i> and associated Regulation and Guidelines, the <i>Environmental Protection Act 1994</i> and the relevant building assessment provisions under the <i>Building Act 1975</i> contain requirements for the manufacture and storage of hazardous substances. Information is provided by Business Queensland on the requirements for storing and transporting hazardous chemicals, available at: www.business.qld.gov.au/running-business/protecting-business/risk-management/hazardous-chemicals/storing-transporting.	AO16 No acceptable outcome is prescribed.	Complies with PO16 Storage or handling of hazardous chemicals during the construction and operations and maintenance phases of the Project will not occur in vegetated areas and will be in accordance with <i>Managing risks of hazardous chemicals in the workplace – Code of Practice 2020</i>, applicable safety data sheets, and otherwise in accordance with <i>Queensland Work Health and Safety Act 2011</i> and its regulations.
Section F		
Where involving an asset protection zone		
PO17 Asset protection zones are designed and managed to ensure they do not increase the potential for bushfire hazard. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the QFES <i>Bushfire resilient communities</i> document may assist in demonstrating compliance with this performance outcome.	AO17.1 Landscaping treatments within any asset protection zone comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks. Note – Minimal fuel condition means there is insufficient fuel available to	Complies with AO17.1 The APZ will be established as a mineral earth surface (where located inside of compounds) or grass area. Mineral earth surfaces will be maintained free of woody regrowth, weeds and grass cover. A grass area within the APZ will be maintained at a nominal height of ≤ 10 cm (or as low as is practically

Performance outcomes	Acceptable outcomes	Compliance assessment
	significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres. OR	possible) during the fire danger season.
	AO17.2 Landscaping management within any asset protection zone maintains a: (a) potential available fuel load which is less than eight tonnes/hectare in aggregate; and (b) fuel structure which is discontinuous. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the <i>QFES Bushfire resilient communities</i> document may assist in demonstrating compliance with this acceptable outcome.	Complies with AO17.2 See response to AO17.1.
Section G		
Where planning provisions or conditions of approval require revegetation or rehabilitation		
PO18 Revegetation or rehabilitation areas are designed and managed to ensure they do not result in an unacceptable level of risk or an increase in bushfire intensity level. Note – The undertaking of a bushfire hazard assessment in accordance with the methodology in the <i>QFES Bushfire resilient communities</i> document may assist in demonstrating compliance with this performance outcome.	AO18.1 Required revegetation or rehabilitation: (a) is located outside of any asset protection zone; or (b) maintains a potential available fuel load which is less than eight tonnes/hectare in aggregate and fuel structure which is discontinuous. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the <i>QFES Bushfire resilient communities</i> document may assist in demonstrating compliance with acceptable outcome (b).	Not applicable The Project does not involve revegetation or rehabilitation.
	AO18.2 Revegetation or rehabilitation of areas located within mapped medium, high or very high potential bushfire intensity areas, revegetate and rehabilitate in a manner that maintains or reduces the existing fuel load. OR Revegetation or rehabilitation of areas located within the mapped potential impact buffer area, revegetate and rehabilitate in a manner that maintains or reduces the existing fuel load. Note – The preparation of a vegetation management plan undertaken in accordance with the methodology in the <i>QFES Bushfire resilient communities</i> document may assist in demonstrating compliance with this acceptable outcome.	Not applicable The Project does not involve revegetation or rehabilitation.

Table 6 – Fire trail and working area design parameters

Parameter	Provisions
Width	Contains a width of at least 20 metres including: 1. A trafficable area (cleared and formed); a. with a minimum width of 4 metres than can accommodate a rural firefighting vehicle b. with no less than 4.8 metres vertical clearance from canopy vegetation c. with no adjacent inhibiting embankments or retaining walls 2. A working area each side of the trafficable area: a. with a minimum width of 3 metres each side b. cleared of all flammable vegetation greater than 10 centimetres in height 3. The balance (i.e. 10 metre width) managed vegetation area: a. sited to separate the trafficable area from adjacent mapped medium, high or very high potential bushfire intensity areas managed vegetation b. comprising managed vegetation clear of major surface hazards.
Access	Access is granted in favour of the local government and Queensland Fire and Emergency Services Note – this access is commonly granted in the form of a easement that is to be maintained by the grantor.
Egress	Contains trafficable vehicle routes in to low hazard areas, every 200 metres

Table 7 – Vulnerable uses, community infrastructure for essential services and materials that are hazardous in the context of bushfire hazard

Group	Uses
Vulnerable uses	<i>childcare centre, community care centre, detention facility, educational establishment, hospital, nature-based tourism, relocatable home park, rooming accommodation, residential care facility, resort complex, retirement facility, tourist park</i>
Community infrastructure for essential services	<i>educational establishment, emergency services, hospital</i>
Hazardous materials in the context of bushfire hazard	Hazardous chemicals that are present at the levels or in the quantities that would constitute the use being a hazardous chemical facility Hazardous materials that are present in the quantities in the Work Health and Safety Regulation, schedule 15