

APPENDIX C BUSHFIRE REPORT



NGH



Bushfire Assessment and Management Plan

Muskerry Solar Power Station

October 2022

Project Number: 19-941



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Acronyms and abbreviations

AS 3959-2018	Australian Standard – Construction of Buildings in Bushfire Prone Areas
BAL	Bushfire Attack Level
BESS	battery energy storage system
BFAR	bushfire assessment report
BMO	Bushfire Management Overlay
BPA	Bushfire Prone Area
CFA	Country Fire Authority
DELWP	Department of the Environmental, Land, Water and Planning
EMEP	Emergency Management Evacuation Plan
FFDI	(Forest) Fire Danger Index (also FDI)
Ha	hectare
km	kilometre
kW/m ²	kilowatts per square metre (being a measure of radiant heat)
MSPS	Muskerry Solar Power Station
MW	megawatt
NCC	National Construction Standard (comprising Building Code of Australia)
PV	photovoltaic
The proposal	the MSPS

1. Introduction

This Bushfire Assessment Report (BFAR) has been prepared to support a Ministerial Planning Permit application seeking the Ministers approval of a proposed maximum 250-megawatt (MW) renewable solar energy facility and 800MWh (i.e., 200MW power output for four hours) Battery Energy Storage System (BESS) at Muskerry, Victoria 3557. The proposal hereafter is referred to as Muskerry Solar Power Station (MSPS). This BFAR has been prepared by NGH on behalf of the proponent, Edify Energy.

The Edify Energy MSPS proposal is located north of the Axedale-Toolleen Road, approximately 33 kilometres (km) east of Bendigo (refer to Figure 2-1) in the localities of Muskerry and Toolleen, Victoria.

The proposed MSPS includes the installation of energy generating solar infrastructure including up to 496.21hectares (ha) of single axis (tracking) solar array, inverters, Battery Energy Storage System (BESS) (co-located with the substation or distributed within array), substation, transmission line connection, access roads, site entries and buffer areas. The entire proposal including BESS options have been considered in this BFAR.

The proposal site is split over two local government areas (LGA) as follows:

- Greater Bendigo City Council LGA (south of Dwyer Lane).
- Campaspe Shire Council LGA (north of Dwyer Lane).

The proposal site was identified and chosen due to the traversing high voltage transmission line and relatively flat landscape, providing good connectivity and efficient construction opportunities. The proposal has been designed iteratively to address site constraints associated with surrounding rural dwellings and the protection of reasonable amenity, ecology of the site including flora, fauna and waterways, heritage considerations, and cumulative impacts of the approved Axedale Solar Farm.

The built form on the site would comprise of the following:

- Solar infrastructure (photovoltaic (PV) modules) consisting of 'array blocks' typically of 3 megavolt-amperes (MVA) and 6MVA.
- BESS.
- Site office and car park.
- Access and perimeter tracks.
- Buildings including operations and maintenance.
- High voltage substation.

The objectives of the MSPS proposal are to:

- Develop a commercial scale solar electricity generation proposal.
- Include on-site energy storage to support the high voltage transmission network.
- Assist to mitigate the effects of climate change through the transition to renewable energy.
- Meet and exceed all relevant environmental and regulatory requirements for the proposal, in collaboration with key stakeholders.
- Provide local and regional employment opportunities and other social benefits during the construction and operation of the facility.

1.1 Purpose of assessment

This BFAR provides an assessment of the proposed MSPS. Specifically, this reports outlines:

- The statutory and policy requirements for bushfire protection in Victoria.
- The proposed layout can incorporate prescribed bushfire protection measures
- Best practice bushfire planning.

The existing and potential bushfire hazards present through the surrounding landscape are assessed against the methodology and specification prescribed by the Country Fire Authority (CFA) Design Guidelines and Model Requirements: Renewable Energy Facilities (CFA, 2022). The CFA guidelines outline the requirements for layout and management of renewable energy installation, with regard to fire safety.

The CFA guidelines also refer to additional guidance material released by the Department of the Environmental, Land, Water and Planning (DELWP); Solar Energy Facilities: Design and Development Guideline (DELWP, 2019). The guidelines released by DELWP state that Clause 13.02-1S Bushfire Planning (DELWP, 2018) sets out the policy objectives and strategies for managing bushfire risk in Victoria. Subsequently, Clause 13.02-1S has been applied to assess the bushfire risk to/from the proposal within this BFAR.

This BFAR has considered the planning proposal against relevant legislation and agency guidelines referred to above. A summary of key sections addressed by this assessment are outlined in Table 1-1 below.

Table 1-1 Summary of bushfire protection considerations.

Key considerations	Report Section
Planning considerations	Section 3
Bushfire hazard site assessment	Section 4
Bushfire hazard landscape assessment	Section 5
Bushfire management statement	Section 6
Emergency and evacuation planning	Section 7
Bushfire management and mitigation measures	Section 8

2. The Proposal

2.1 Project description

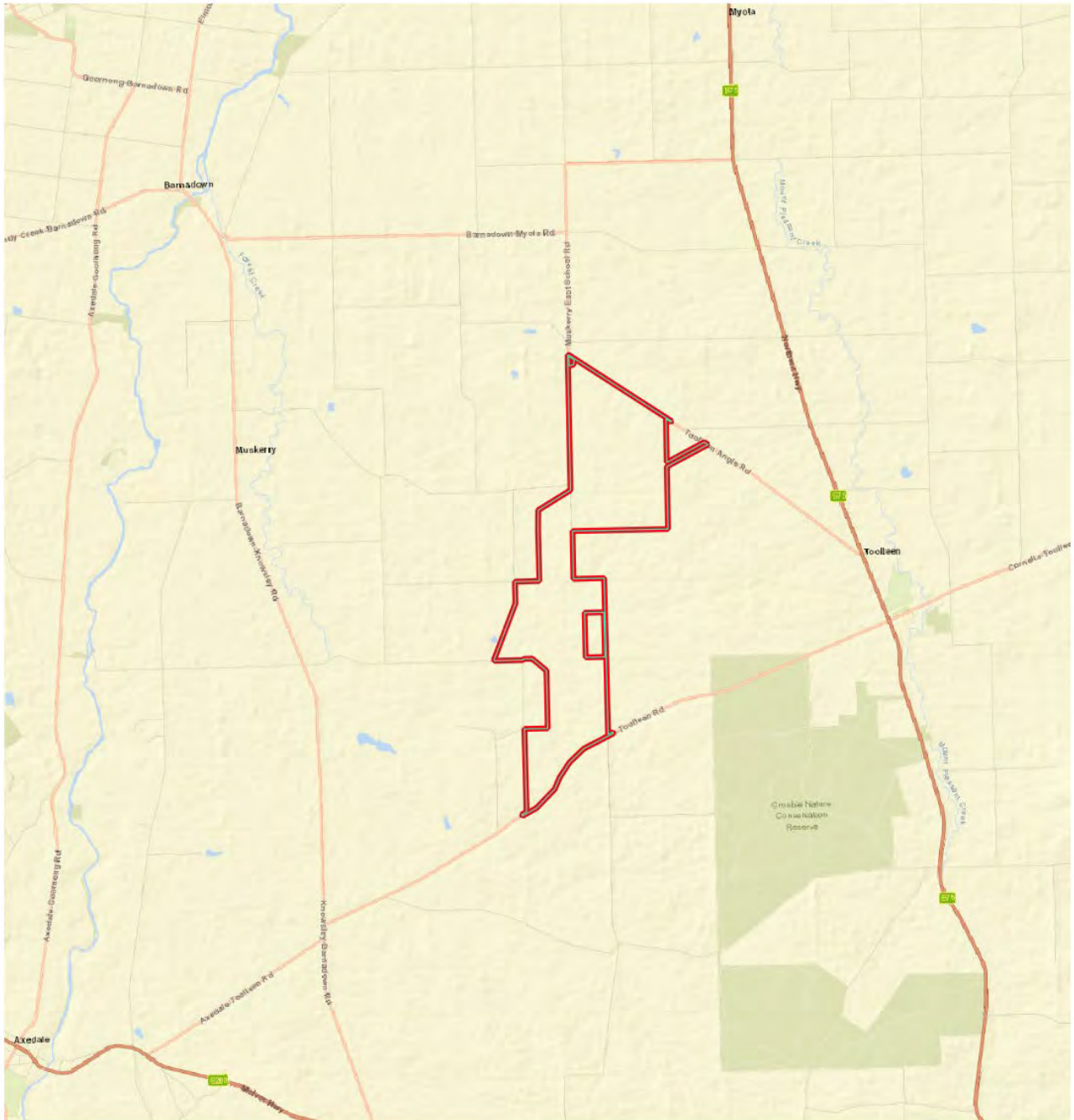
The key features of the proposal are summarised in the summary table below. The component specifications are subject to change during detailed design. The proposal layout is mapped in Figure 2-2, Figure 2-3 and Figure 2-4.

Summary of key features of the proposal

Proposal element	Description
Proposal	Muskerry Solar Power Station.
Proponent	Edify Energy.
Capacity	Approximately 250MW.
Subject Land	Approximately 937ha (investigation area).
Proposal site	Approximately 496.21ha (potential impact area-solar plant and associated works). Solar panel coverage in the north of the site is 170ha. In the south solar panel coverage is 220ha.
Site description	Rural land bound by Axedale-Toolleen Rd, Murphy's Lane, Muskerry East School Rd, and Toolleen Angle Rd, comprising land from 4 separate land holdings. All land is zoned as Farm Zone (FZ and FZ1) under the Greater Bendigo and Campaspe planning schemes.
Local Government	Greater Bendigo City Council LGA and Campaspe Shire Council LGA.
Subdivision	Subdivision of land for the location of assets, which would become the property of AusNet. A new Lot would be registered, along with an access road that provides unimpeded site access for AusNet.
Solar array	Number of panels: Approximately 500,000. Area of panels: Approximately 3,900,000m ² . Row spacing: Approximately 6.5m. Height: approximately 4.0m (at full tilt towards the horizon).
Substation	Approximately 1.0ha. 220kV outdoor substation. 275MVA x 220/33kV transformers and associated infrastructure. Maximum height of 20m subject to final design (i.e., lightning poles being tallest component with other equipment maximum of 8-10m high).
Energy storage – Battery Energy Storage System (BESS)	The project is considering two options for integrating the project's battery energy storage system. <ul style="list-style-type: none"> Option A considers a centralised BESS, located within the northern portion of the site close to the substation and laydown area. Option B considers a decentralised BESS, with battery and power conversion units distributed throughout the site, integrated in a 'DC-coupled' configuration.

Proposal element	Description
	<p>With an electricity storage capacity of up to 800MWh (i.e., 200MW power output for four hours) and comprising of lithium-ion batteries with inverters.</p> <p>Modular enclosures or shipping container style enclosures (approximately 12m in length each). The final number of units would be determined by the technology chosen, and the layout or clustering of units is dependent on option A or B configuration.</p>
Site access	<p>The site access for construction and operation vehicles would be exclusively via Toolleen Angle Road and Muskerry 'north', with a site entrance established north of the proposal site.</p> <p>Muskerry 'south' would be accessed exclusively for construction and operation vehicles via the internal access tracks from Muskerry 'north', running south through Lot 1//TP892631 and Lot 7B/D/PP3243. This internal access would provide diagonal access through the site.</p> <p>An emergency access point only would be provided in the south off Axedale Toolleen Road, allowing for safe access away from smoke or fire spread in both the north and south.</p> <p>Access between the north and south portions of the MSPS is via the proposed transmission easement.</p>
Access tracks	<p>Internal access tracks: Approximately 41.10km of 5.0m wide unsealed gravel.</p>
Operations and maintenance buildings	<p>Steel framed, Colorbond finish demountable buildings to accommodate:</p> <ul style="list-style-type: none"> • 33kV switch gear. • Control and protection equipment. • Site office. • Staff amenities. • Warehouse.
Security fencing, lighting, and CCTV	<p>Steel security fence 2.3m high.</p> <p>Security system with CCTV and local flood lighting.</p>
Construction hours	<p>Standard daytime construction hours would be 7.00am to 6.00pm Monday to Friday and 8.00am to 1.00pm on Saturdays.</p> <p>Any construction outside of these standard construction hours, if required, would only be undertaken with prior approval from relevant authorities, or unless in emergency circumstances e.g., to make work safe.</p>
Construction timing	<p>About 15 to 18 months commencing 2023.</p>
Workforce	<p>Construction – approximately 350 staff during peak construction (approximately 4 – 5 months).</p> <p>Operation – around 5 full time equivalent staff.</p>
Operation period	<p>Anticipated to be 30 years.</p>
Decommissioning	<p>The site would potentially be returned to its pre-works state. All above ground infrastructure would be removed to a depth of 500mm. The site would be rehabilitated consistent with land use requirements.</p>

Proposal element	Description
	All infrastructure would be removed with the exception of the T connection. The site would be rehabilitated consistent with future land use requirements.



Locality

Legend

- Subject land/study area

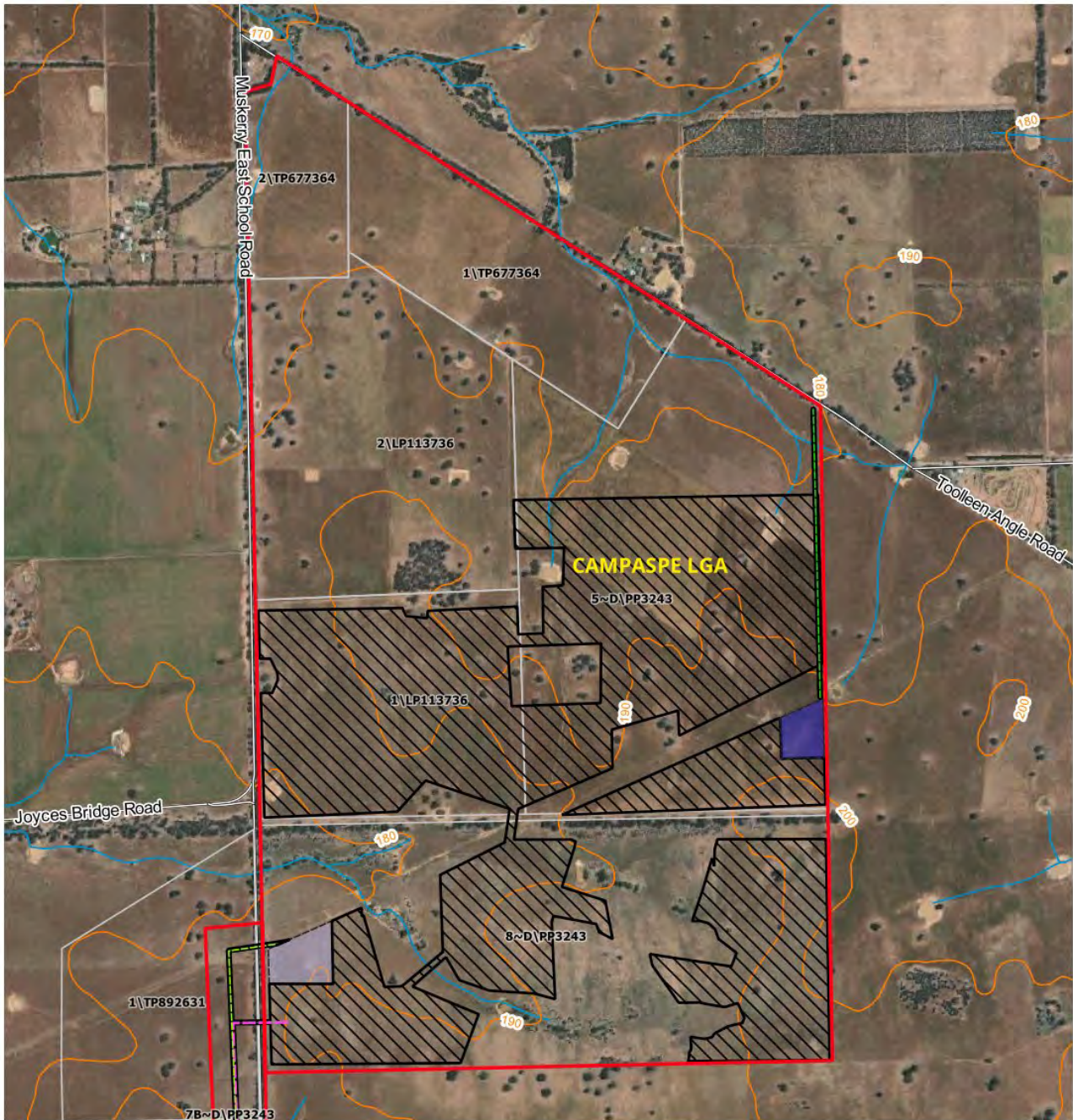
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Figure 2-1 Locality of the Proposal



Muskerry Solar Farm - Study Area

Legend

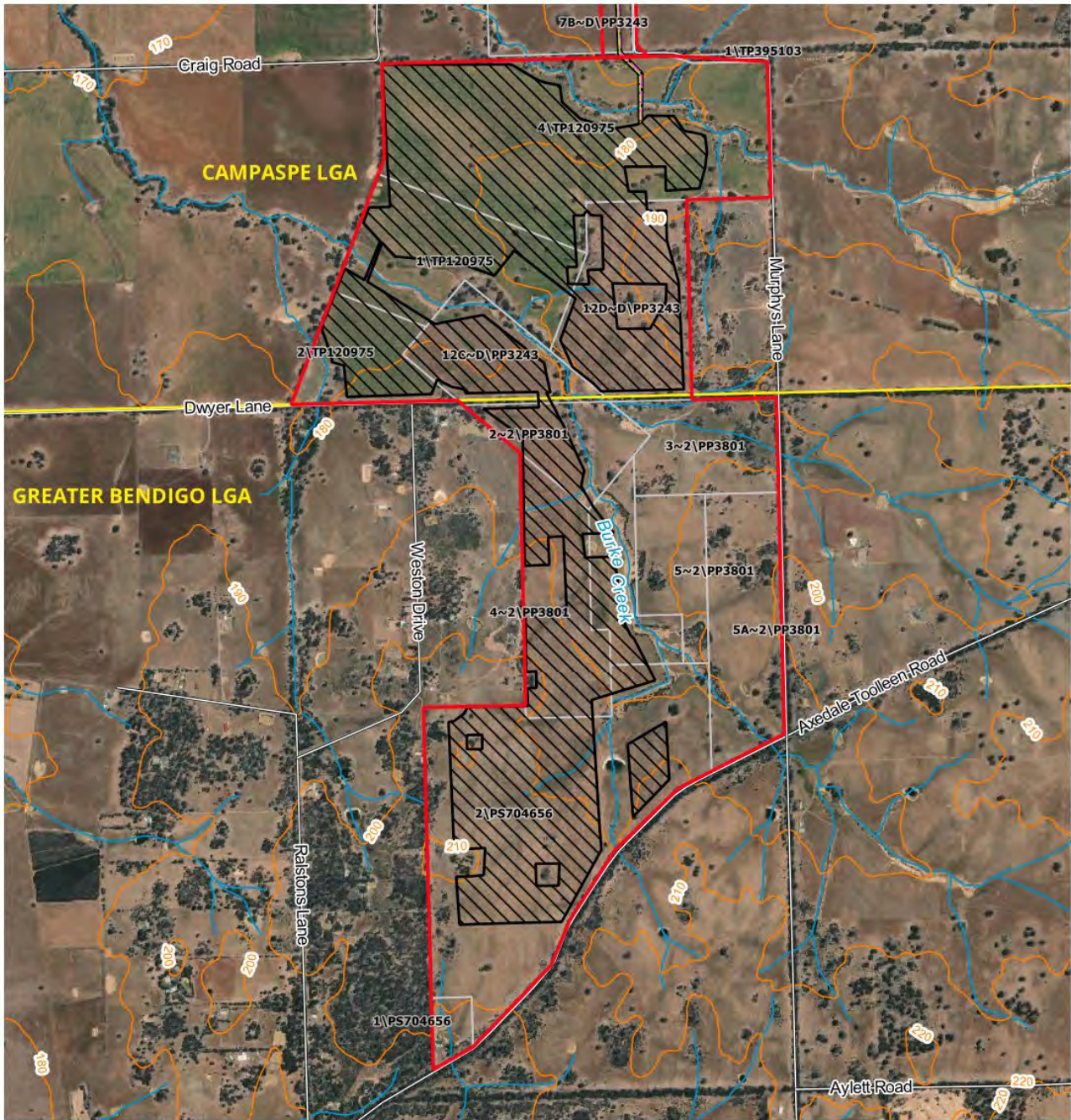
- | | |
|-------------------------------|--------------------------|
| Study Area | Roads |
| Available Area for Solar Farm | LGA |
| Substation Option a) | Easement and Access |
| Substation Option b) | Easement Option A |
| Easement | Easement Option B |
| Waterways | Substation / Access Road |
| Contour lines | |
| Lot Plan | |

0 400 800 m

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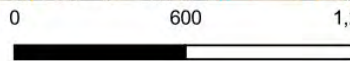
Figure 2-2 Proposal layout - Muskerry Solar Power Station (North)



Muskerry Solar Farm - Study Area

Legend

- | | |
|-------------------------------|---------------------|
| Study Area | Lot Plan |
| Development Footprint | Roads |
| Available Area for Solar Farm | LGA |
| Easement | Easement and Access |
| Waterways | Easement Option A |
| Contour lines | Easement Option B |



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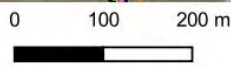
Figure 2-3 Proposal layout - Muskerry Solar Power Station (South)



Muskerry Solar Farm - Study Area

Legend

- | | |
|-------------------------------|---------------------|
| Study Area | Roads |
| Available Area for Solar Farm | LGA |
| Substation Option a) | Easement and Access |
| Easement | Easement Option A |
| Waterways | Easement Option B |
| Contour lines | |
| Lot Plan | |



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Figure 2-4 Proposal layout - Muskerry Power Station (easement)

3. Planning Considerations

The relevant legislative requirements for development on bushfire prone areas (BPA) and Bushfire Management Overlay (BMO) are outlined below.

3.1 Planning and Environment Act 1987

The purpose of the *Planning and Environment Act 1987* (the P&E Act) is to establish a framework for planning the use, development, and protection of land in Victoria in the present and long-term interests of all Victorians.

The Act gives effect to the planning schemes that apply to the proposal. The P&E Act also includes provisions for planning permits, developer contributions, etc that would guide the process for determination of the proposal.

The Act establishes procedures for preparing and amending the Victorian Planning Provisions and the Greater Bendigo and Campaspe Planning Schemes.

3.2 Building Act 1993

The main purposes of the *Building Act 1993* are:

- (a) to regulate building work and building standards; and*
- (b) to provide for the accreditation of building products, construction methods, building components and building systems; and*
- (c) to provide an efficient and effective system for issuing building and occupancy permits and administering and enforcing related building and safety matters and resolving building disputes; and*
- (d) to regulate building practitioners and plumbers; and*
- (e) to regulate plumbing work and plumbing standards; and*
- (f) to provide for the accreditation, certification and authorisation of plumbing work, products and materials; and*
- (g) to regulate cooling tower systems; and*
- (h) to limit the periods within which building actions and plumbing actions may be brought.*

The project includes building and plumbing works associated with the O&M building, etc and is therefore subject to the Building Act. The project site is also located in a Bushfire Prone Area (BPA) with fire management requirements linked with the Building Act.

As the project is located within a rural and regional area, the Country Fire Authority's (CFA's) Guidelines for renewable energy installations (CFA, 2022) has been considered for information about bushfire risk management and other risk management matters. This assessment outlines full consideration of CFA bushfire requirements (Section 8.1) and includes an overview of consultation with CFA (Section 9).

3.3 Planning Schemes

3.3.1 Greater Bendigo and Campaspe Planning Policy Framework

The Planning Policy Framework governing Greater Bendigo and Campaspe provides a clear and consistent framework within which decisions about the use and development of land can be made.

Clause 13 Environmental Risks and Amenity provides the objective of strengthening the resilience and safety of communities by adopting best practice environmental management and risk managements planning approaches. Planning should aim to avoid and minimise natural hazards including bushfires and climate change impacts.

3.3.2 Clause 13.02

Clause 13-02 and Clause 13.02-1S of the Planning Schemes specify that planning for bushfire risk should be considered on all land that is identified as:

- Within a designated bushfire prone area.
- Subject to a Bushfire Management Overlay.
- Proposed to be used in a way that may create a bushfire hazard.

The objective of the policy is to strengthen the resilience of settlements and communities to bushfire risk through risk-based planning that prioritises the protection of human life. The policy also outlines the appropriate assessment for bushfire hazard identification.

Clause 13.02-1S outlines the following land uses that specifically require a bushfire risk assessment.

- Subdivisions of more than 10 lots.
- Accommodation.
- Childcare 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.

The proposal could be considered a place of assembly, or otherwise generally a development that would result in people congregating in large numbers (temporary for the purpose of construction). The construction workforce could range between 150 – 350 persons being situated on site (during construction hours), for a period of 15-18 months.

3.3.3 Clause 44.06 Bushfire Management Overlay

The purpose of Clause 44.06 Bushfire Management Overlay is to implement the Municipal Planning Strategy and the Planning Policy Framework of the Greater Bendigo Planning Scheme. To this effect, the intent is to identify areas where the bushfire hazard warrants bushfire protection measures to be implemented, to enable the potential impacts of bushfire to be reduced to an acceptable level. The BMO is only mapped within a portion of the proposal site that is situated within Greater Bendigo. No permit is triggered under Clause 44.06. As such, Clause 44.06 does not need to be addressed for this proposal. Clause 53.02 also does not apply as a permit is not triggered under Clause 44.06.

3.4 Guidelines and Standards

3.4.1 Victorian Country Fire Authority (CFA) Design Guidelines and Model Requirements: Renewable Energy Facilities (2022)

The purpose of the CFA guidelines (CFA, 2022) is to provide standard measures and processes in relation to fire safety, risk and emergency management that should be considered when designing, constructing, and operating new renewable energy facilities and upgrading existing facilities. Renewable energy facilities that support the generation of electricity in Victoria include wind energy facilities, solar energy facilities and battery energy storage facilities which are the focus of this guideline.

Requirements such as siting and design, access and fire protection measures associated with solar and BESS infrastructure is outlined in Section 8.1 below.

3.4.2 Department of the Environmental, Land, Water and Planning (DELWP), Solar Energy Facilities: Design and Development Guideline

The DELWP Solar Energy Facilities: Design and Development Guideline (DELWP, 2019) has been prepared to guide the development of ground-mounted PV solar structures. The DELWP guideline refers to Clause 13.02-1S Bushfire Planning, which sets out the policy objectives and strategies for managing bushfire risk in Victoria.

The DELWP guidelines, with specific regard to bushfire risk have been addressed in Section 8.2 below.

3.4.3 Australian Standards 3959-2018 Construction of Buildings in Bushfire-prone Areas

The AS 3959 Construction of buildings in bushfire prone areas is a standard that is applied throughout Australia. The requirements of AS 3959 can be applied to all buildings. The standard aims to provide a building with an acceptable level of protection to reduce the risk of ignition from a bushfire as the fire front passes.

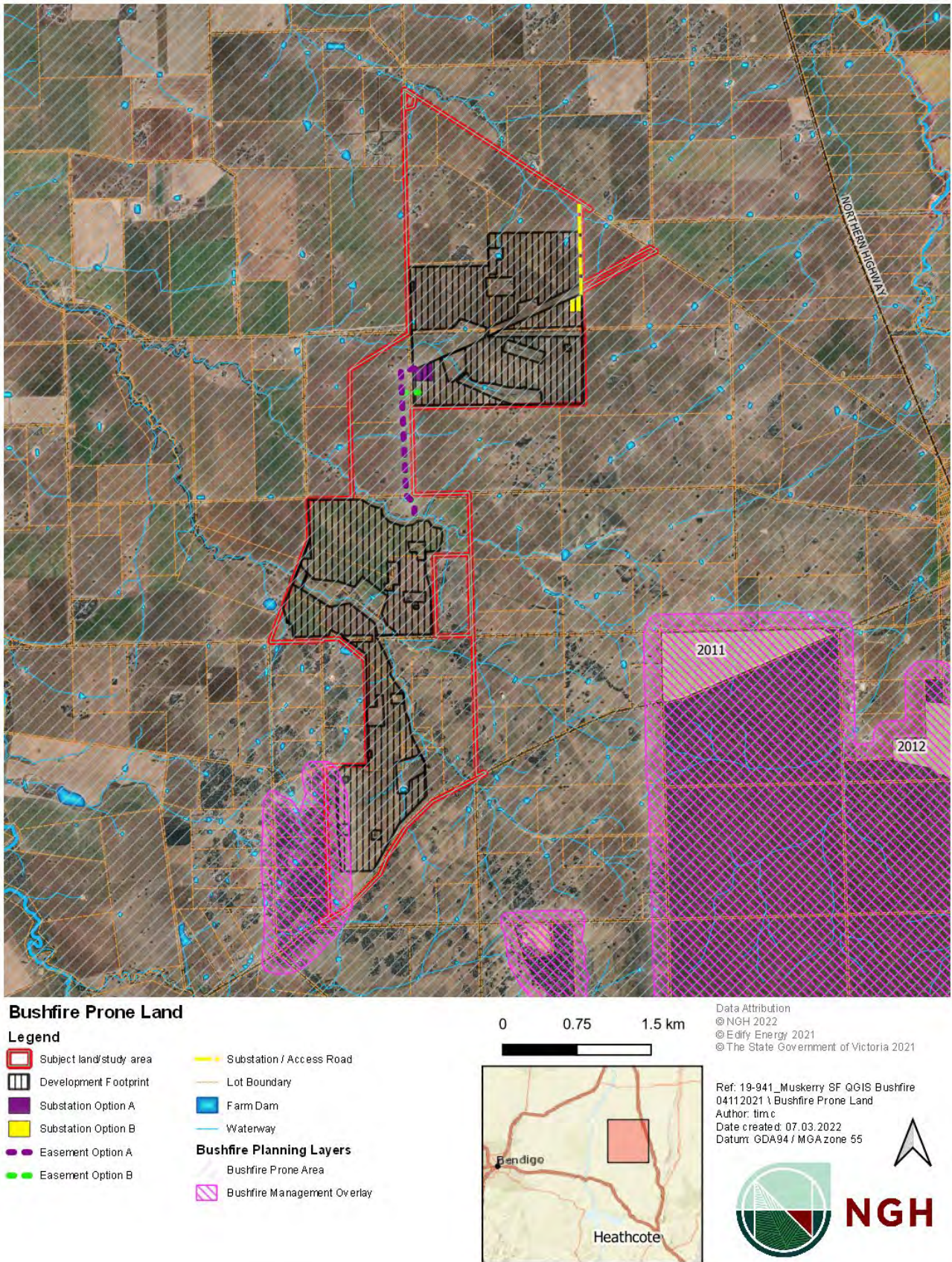


Figure 3-1 Bushfire Prone Land (BFA & BMO) mapping

4. Bushfire Hazard Site Assessment

4.1 Proposal Site

The MSPS proposal site would cover approximately a 496.21ha area (development footprint and easements) located within the 937ha subject land (study area) shown at Figure 2-2, Figure 2-3, and Figure 2-4.

4.2 Existing use and development

The proposal site is predominately agricultural land with rural dwellings. Farming operations would continue on rural land located outside of the fenced boundary of the MSPS.

The subject land has road frontage to Axedale-Toolleen Rd, Murphy's Lane, Muskerry East School and Toolleen Angle Rds. The proposal site is zoned:

- Under the Greater Bendigo Planning Scheme:
 - Farming zone - FZ; and
- Under the Campaspe Planning Scheme,
 - Farming Zone 1 - FZ1.

Further to the land zoning identified above, the existing environment is described as predominantly rural land, subject to agricultural activities. With regards to the existing land use, it is acknowledged that existing on-site ignition sources are present, which include:

- Agricultural activities.
- Lightning strikes.
- Machinery and vehicles operating in a grassland environment.

4.2.1 Proposed project phases

The proposed MSPS involves the construction, operation and decommissioning of a ground-mounted PV solar array and BESS. Approximately 250MW of renewable energy would be generated and supplied directly to the national electricity grid by the solar array, the BESS would have an electricity storage capacity of up to 800MWh (i.e., 200MW power output for four hours) and comprising of lithium-ion batteries with inverters

The MSPS would provide enough clean, renewable energy for about 93,000 average Victorian homes while displacing approximately 521,000 metric tons of carbon dioxide annually. It would also assist the Victorian and Commonwealth Governments to meet Australia's renewable energy targets.

The proposal would consist of solar panels mounted on a frame which tracks the sun to generate energy. The panels would be connected to inverter stations which convert the DC power to AC power, and using integrated transformers step the voltage up to 33kV. A medium voltage AC network would be installed in underground trenches to connect each inverter to a central switchgear. The switchboard is adjacent to the step-up substation, which is owned and operated by the network operator, AusNet. This substation would step up the voltage to 220kV for injecting the green energy into the transmission network operated by AusNet.

The project is considering two options for integrating the project's battery energy storage system.

- Option A considers a centralised BESS, located within the northern portion of the site close to the substation and laydown area.
- Option B considers a decentralised BESS, with battery and power conversion units distributed throughout the site, integrated in a 'DC-coupled' configuration, this option allows the batteries and solar panels to share a common inverter. The batteries would be placed beside the PCU in each sub-array.

Batteries would be modular enclosures or shipping container style enclosures (approximately 12m in length each). The final number of units would be determined by the technology chosen, and the layout or clustering of units is dependent on option A or B configuration.

The development would contain the following infrastructure:

- PV solar panels.
- Tracking system.
- Piled foundations.
- DC/AC Inverter stations.
- BESS.
- Internal access tracks.
- Underground medium voltage network.
- Administration and amenities building.
- Vehicle car park.
- Security fencing.
- Substation.

4.2.2 Construction phase

The proposal would take an estimated 15-18 months to construct with a view to maximise local employment wherever possible. Key stages of construction are listed below:

Stage 1 – Premobilisation/early works

Pre-mobilisation activities for each area of development would typically occur over a 1-2 month period and include the following as required:

1. Temporary fencing of site offices and facilities for construction.
2. Fencing of areas for development. The fence would be compliant with the Development Consent and designed to enable movement of fauna across the site post construction.
3. Removal of any woody vegetation within the areas to be developed.
4. Laydown of temporary offices and facilities. These would be temporary prefabricated buildings used for construction projects.

The current site works requirements include:

- Office facilities (1,400sq metres).
- Changing rooms.
- Toilets.
- Showers.
- Offices.
- First aid.

- Lunchrooms.
- Parking x 12.
- Lay down area x 2 (approximately 1,800 sq metres and 2,300 sq metres).
- Guard room (18 sq metres).

Stage 2 – Construction

Construction activities would include the installation of the PV arrays, BESS (Option A or B) and supporting infrastructure. The PV arrays, BESS and site office components would largely be built off-site and transported to the site in modulated sections. Construction on-site would be limited to the unloading and joining together of the modulated sections and trenching electrical and control cabling to the electricity grid and control room.

Construction activities are planned to occur during daylight hours only.

The proposal would consist of installing the following components:

- Arrays of solar PV modules arranged in a series of long rows (generally 85 m) typically no higher than 2.1m above the ground and supported by a steel and/or aluminium mounting structure including framing and piles which are either screwed or driven into the ground.
- A series of prefabricated, containerised inverters distributed throughout the PV arrays.
- BESS (option B), a series of prefabricated, containerised batteries grouped with inverters distributed throughout the PV arrays.
- Electrical connections between PV arrays, associated monitoring and protection equipment, and central inverters and BESS (option B) via underground or frame secured cabling.
- A tracker actuation system.
- Substation and BESS (option A) a series of prefabricated, containerised batteries grouped in an enclosure adjacent to the substation.
- Network connection to connect the proposal to the high voltage power lines within the site via an overhead or trenched transmission line from the proposed substation, including a main power transformer, switchgear, protection, metering, and communications equipment.

Construction activities for the PV arrays and their indicative timeframes (there may be overlap in timing) would include:

- Pile driving or screwing mounting pylons (~4 months).
- Trenching or underground cabling connecting PV (~2 months).
- Mounting pre constructed PV modules (~4 months).
- Network interconnection (~1 week).
- Establishing revegetation as screening (~1-2 years).

To facilitate the future operational and maintenance activities on site the following infrastructure would be constructed:

- Site office and operations and maintenance facilities.
- Site entry road, internal access tracks and car park.
- Site fencing and associated security equipment.

4.2.3 Operational phase

The project is expected to operate for a minimum of 30 years. Solar facilities generally require minimal regular maintenance. The majority of operations would be automated.

Ongoing work would include landscaping, maintenance, and security. The intention is to employ a full-time site manager and FTE workforce of up to 5 people. On site facilities would include a site office with amenities, car park and laydown area.

Operation and maintenance of the system would involve replacement of modules, battery cells, repair of inverters, trackers, and other supporting equipment, which would be expected to occur on a limited basis at certain points during the system's life cycle. Requirements for cleaning of modules would be around twice per year but would depend on demand and weather conditions.

Other operational considerations include maintenance of the BESS, access roads, site buildings and ongoing management of vegetation using mechanical (slashing) or selective use of herbicides to ensure compliance with CFA guidelines (CFA, 2022).

4.3 Existing access and infrastructure connections

The proposal site benefits from a number of farm entrances. The proposal's site access would be exclusively via Toolleen Angle Road (Muskerry 'north'), with a site entrance established north of the proposal site. Muskerry 'south' would be accessed exclusively via the internal access tracks from Muskerry 'north', running south through 1//TP892631 and Lot 7B/D/PP3243. Refer to Figure 4-1 and Figure 4-2. The proposed site access would provide an option for diagonal access through the site for firefighting purposes.

An emergency access point only would be provided in the south off Axedale Toolleen Road, allowing for safe access away from smoke or fire spread in both the north and south.

A 220kv transmission line crosses the proposal site. The proposal would connect to the 220kv lines via a switching station within the substation and T connection. Transmission lines, trenched (preference) or overhead, would connect Muskerry 'south' with Muskerry 'north' and the proposed substation.

4.4 Vegetation and Topography

Adjacent and nearby land uses primarily comprise two uses: agricultural (pastures and grazing). Agricultural uses through pastures and grazing provides for semi-maintained grassland (that may not regularly cure or hay off).

Most of the historical native vegetation on the proposal site has been cleared and agricultural (grazing and cropping) and horticulture are prevailing land uses. Most of the proposal site is considered a low fuel load environment, typically comprises grass land vegetation.

Scattered trees, or strands of wooded vegetation are present in limited areas throughout the proposal site. An area adjacent the south-western boundary of the proposal site contained wooded vegetation; however a limited fire run is available due to sporadic rural-residential settlements and a continuation of agricultural land uses is the broader locality, refer to Figure 4-1 and Figure 4-2. The surrounding landscape is considered generally level, although areas of gently undulating terrain is present.

Figure 4-1, Figure 4-2 and Table 4-1 below identify and group the results for vegetation and slope assessment, in accordance with AS 3959-2018. The CFA guideline Vegetation Classes, Victorian

Bushfire Management Overlay (CFA, 2014), also provides a description of vegetation to facilitate the analysis of vegetation hazards presented.

Photographs of vegetation types are also identified in Figure 4-3, Figure 4-4 and Figure 4-5.

Table 4-1 Predominant vegetation and topography found within the proposal site

Direction from Site / Transect	Vegetation Classification	Slope
Muskerry Development Footprint - North		
1 – North	Grassland / pasture	Downslope 0 ⁰ - 5 ⁰
2 – East	Grassland / pasture	Upslope / Flat
3 – South	Grassland / pasture	Upslope / Flat
4 – West	Grassland / pasture	Downslope 0 ⁰ - 5 ⁰
Muskerry Development Footprint - South		
1 – North	Grassland / pasture	Downslope 0 ⁰ - 5 ⁰
2 – East	Grassland / pasture Woodland	Upslope / Flat
3 – South	Grassland / pasture	Upslope / Flat
4 – South West	Woodland	Downslope 0 ⁰ - 5 ⁰
5 – West / North West	Grassland / pasture	Downslope 0 ⁰ - 5 ⁰

4.4.1 Grassland

Grassland vegetation as per AS 3959-2018 is defined as widespread and cover not only native grasslands, but also areas of cropping, pasture, and some cultivation. Although trees or shrubs may be present, they are widely spaced, occur only occasionally and form less than 10% canopy cover. Areas of modified woodland or forest that has been converted to pasture or crop are treated as grassland areas. There may be scattered individual trees or tree lines along creeks within an otherwise treeless landscape.

4.4.2 Woodland

Woodland vegetation as per AS 3959-2018 is defined as being dominated by trees and are characterised by a canopy cover of less than 30%. They are normally dominated by eucalypt species, although these may co-dominate with Cypress Pine in inland areas. In general, woodlands are lower than forests in height and are associated with extremes of drought and/or cold. Woodlands also lack the dominant shrubby middle layers normally associated with forests and have a grassier ground layer, typically without ferns.

4.4.3 Low threat

AS 3959-2018 defines low-threat vegetation and non-vegetated areas under the BMO and AS 3959 covers areas that are supported by a permanent water body and have high-moisture and/or high-salt-content plant species.

Low-threat areas are identified in several areas adjacent the proposal area due to the presence of dwelling houses, access roads and a small buffer of management around each residence (i.e., maintained lawns and gardens). Low threat areas are identified in Figure 4-1 and Figure 4-2.

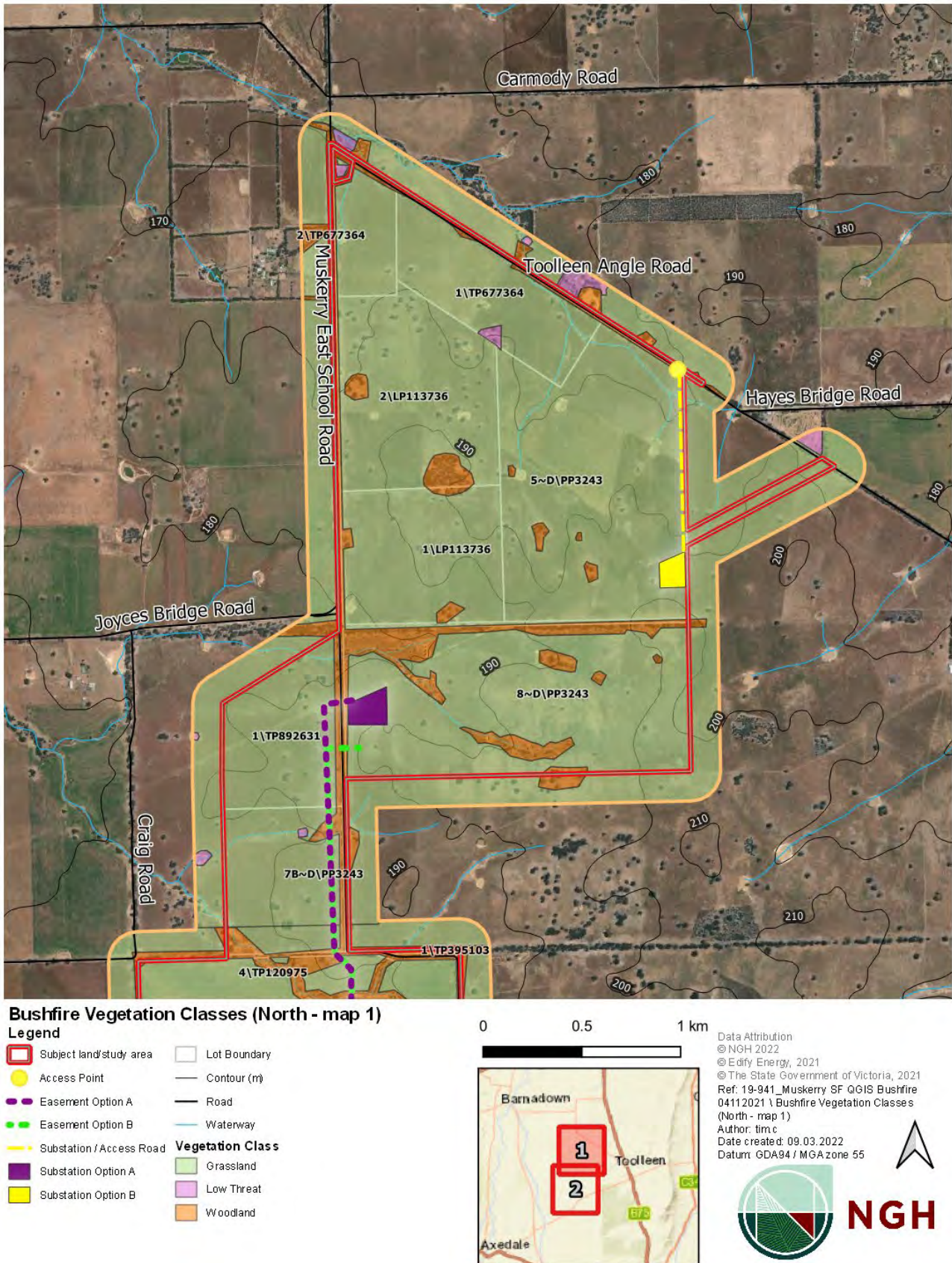
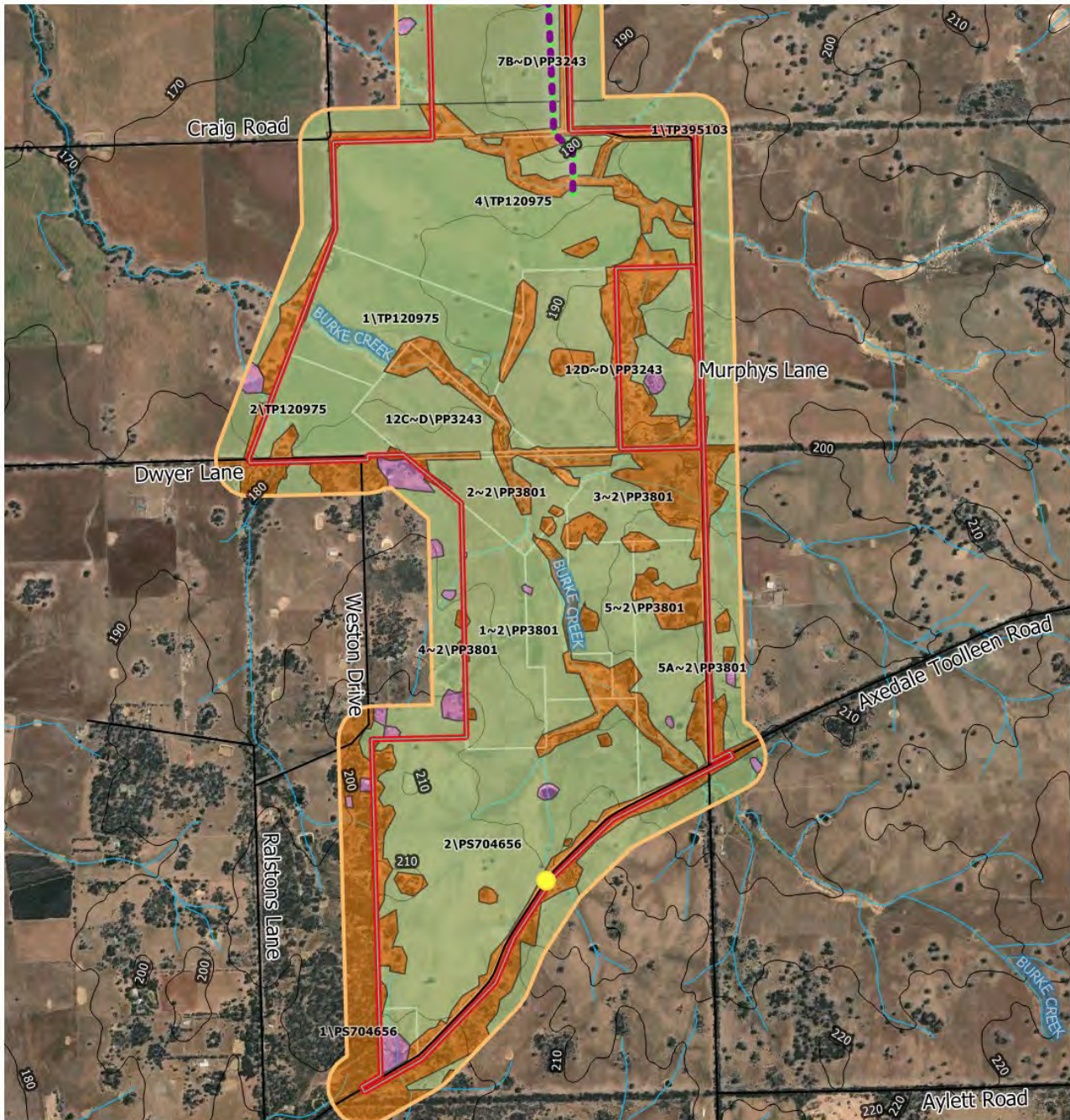


Figure 4-1 Bushfire prone vegetation map (north)



Bushfire Vegetation Classes (South - map 2)

Legend

- Subject land/study area
- Road
- Access Point
- Easement Option A
- Easement Option B
- Lot Boundary
- Contour (m)
- Waterway
- Vegetation Class**
- Grassland
- Low Threat
- Woodland

0 0.5 1 km



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 Ref: 19-941_Muskerry SF QGIS Bushfire
 04112021 \ Bushfire Vegetation Classes
 (South - map 2)
 Author: tim c
 Date created: 09.03.2022
 Datum: GDA94 / MGA zone 55



NGH

Figure 4-2 Bushfire prone vegetation map (south)

4.5 Photographs of the site

The following images identify the existing and surround land uses and infrastructure.



Figure 4-3 Typical woodland vegetation situated within and adjacent the proposal area



Figure 4-4 Typical grassland vegetation, located through the proposal area



Figure 4-5 Sealed public roads adjacent the proposal area. Agricultural land uses present on surrounding land

5. Bushfire hazard landscape assessment

The bushfire hazard landscape assessment provides information on the bushfire hazard more than 150m away from the site. The following assessment has considered the surrounding landscape for approximately 30 kilometres from the proposal site.

5.1 Existing environment (landscape)

The existing landscape surrounding the proposal site generally comprises grassland vegetation, where pastures or tussock areas are present. A significant area within a 2 km radius of the proposal site is primarily grassland, with remnant woodland vegetation (limited in width) located along road or riparian corridors.

Bendigo is the nearest settlement and is located approximately 33km west of the proposal site. Dwellings are scattered throughout the landscape, which compliment agricultural operations that occur around the proposal site.

Crosbie Nature Conservation Reserve is situated approximately 1.7km east of the proposal site, which presents a significant area of wooded vegetation. The northern-most portion of the Reserve was subject to fire in 2011; in the decade since, fuel loads are presumed to have accumulated to a reasonable level.

Mount Sugarloaf Nature Conservation Reserve contains a vast expanse of wooded vegetation that offers a reasonable length fire run towards the proposal site. Ordinarily, in light of prevailing north-west winds, the conservation reserve presents a significant hazard within the broader landscape. Notwithstanding the factor of this hazard, situated between the Mount Sugarloaf Nature Conservation Reserve and the proposal area is a predominant agricultural land use setting, which present a low threat (reduced fuel) environment. This lower hazard environment provides a buffer from higher-fuel forested areas and potential hot dry winds that may exacerbate poor fire conditions.

A number of local roads are situated adjacent the proposal site which provide good access arrangements for emergency services to access the proposal.

Renewable energy projects approved in the immediate area, include:

- Axedale Solar Farm, proposed by UPC Renewables. Located 7.5km northeast of Axedale, to the west of the proposal site. The project was approved in March 2020.
- Goornong Solar Farm, proposed by ACEnergy. Located 19km northeast of Bendigo, to the northwest of the proposal site. The project was approved May 2021.

The abovementioned solar farm developments situated in the locality are identified in Figure 5-1 below. The future low-risk environment of managed solar facilities, combined with the agricultural land, scattered settlements and infrastructure provide a low fuel environment, when compared to forested areas which would provide higher fuel loads.



Figure 5-1 Proximity of the MSPS subject land to the Axedale Solar Farm (Source: Vic Plan, 2021)

5.2 Bushfire history

A 30km radius of MSPS has been analysed for a fire history, refer to Figure 3-1. Large areas of wooded vegetation exist between 10 – 30km from the proposal site. Within a 10km buffer, vegetation is predominantly grassland (cultivated land) with remnant woodland vegetation present. Heavily vegetated reserves do exist and have been subject to previous fire events. Grassland vegetation is primarily located adjacent the proposal site boundary, providing for a lower fuel environment adjacent the proposal.

5.3 Potential fire behaviour

Table 2.1 of AS3959-2018 identifies a Forest Fire Danger Index (FFDI) for regional Victoria of 100. Table 5-1 below has used the AS3959 inputs from Table 4-1 above, to determine the potential fire behaviour (impact of bushfire mechanisms) against the proposal.

Table 5-1 Determination of Bushfire Attack Level in accordance with AS 3959

Direction from Site / Transect	Vegetation Classification	Slope	Separation Distance (m = metres)	Bushfire Attack Level (BAL) – AS3959-2018
Muskerry Development Footprint - North				
1 – North	Grassland / pasture	Downslope 0° - 5°	>22 metres	BAL-12.5
2 – East	Grassland / pasture	Upslope / Flat	>19 metres	BAL-12.5
3 – South	Grassland / pasture	Upslope / Flat	>19 metres	BAL-12.5
4 – West	Grassland / pasture	Downslope 0° - 5°	>22 metres	BAL-12.5
Muskerry Development Footprint - South				
1 – North	Grassland / pasture	Downslope 0° - 5°	>22 metres	BAL-12.5

Direction from Site / Transect	Vegetation Classification	Slope	Separation Distance (m = metres)	Bushfire Attack Level (BAL) – AS3959-2018
		5°		
2 – East	Grassland / pasture Woodland	Upslope / Flat	>19 metres > 33 metres	BAL-12.5
3 – South	Grassland / pasture	Upslope / Flat	>19 metres	BAL-12.5
4 – South West	Woodland	Downslope 0° - 5°	>41 metres	BAL-12.5
5 – West / North West	Grassland / pasture	Downslope 0° - 5°	>22 metres	BAL-12.5

Key infrastructure would be sited on site, using the above setbacks as a reference point, to achieve and inform BAL-12.5 setbacks from the property boundary and/or landscape screening.

5.4 Shelter and Refuge Options

On site shelter for construction workers and full-time maintenance crews are not proposed. Bendigo (west) and Heathcote (south) offer a number of off-site refuge options in the case of an emergency. The proposal site has access to a number of roads which provide egress options in several directions, to facilitate off-site evacuation from an approaching fire.

5.5 Landscape Typology

Planning Practice Note 65 provides a typology of bushfire landscapes. The landscape typologies are identified in Table 5-2 below.

Table 5-2 Landscape Typology

Type 1	Type 2	Type 3	Type 4
<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> The broader landscape presents an extreme risk. Evacuation options are limited or not available.

Type 1	Type 2	Type 3	Type 4
<ul style="list-style-type: none"> Immediate access is available to a place that provides shelter from bushfire. 	<p>managed in a minimum fuel condition.</p> <ul style="list-style-type: none"> Access is readily available to a place that provides shelter from bushfire. This would often be the surrounding developed area. 	<p>an area that is not managed in a minimum fuel condition.</p> <ul style="list-style-type: none"> Access to an appropriate place that provides shelter from bushfire is not certain. 	

The proposed development and subject land are categorised as reflecting a Type 3 Landscape. The assessment acknowledges that there is the potential for bushfire to approach the site from multiple aspects, however the classified vegetation is typically classified as Grassland.

Management of vegetation would also occur over adjacent farmland and nearby rural-residential settlements. A landscape hazard analysis has been prepared in accordance with the DELWP Bushfire Management Overlay Technical Guide (DELWP, 2017), refer to Figure 5-2.

Due to the isolation of the site, a fire front could potentially approach the site from multiple aspects, and there is no benefit of immediate access to shelter. The proposal, therefore, cannot be considered a Type 2 Landscape.

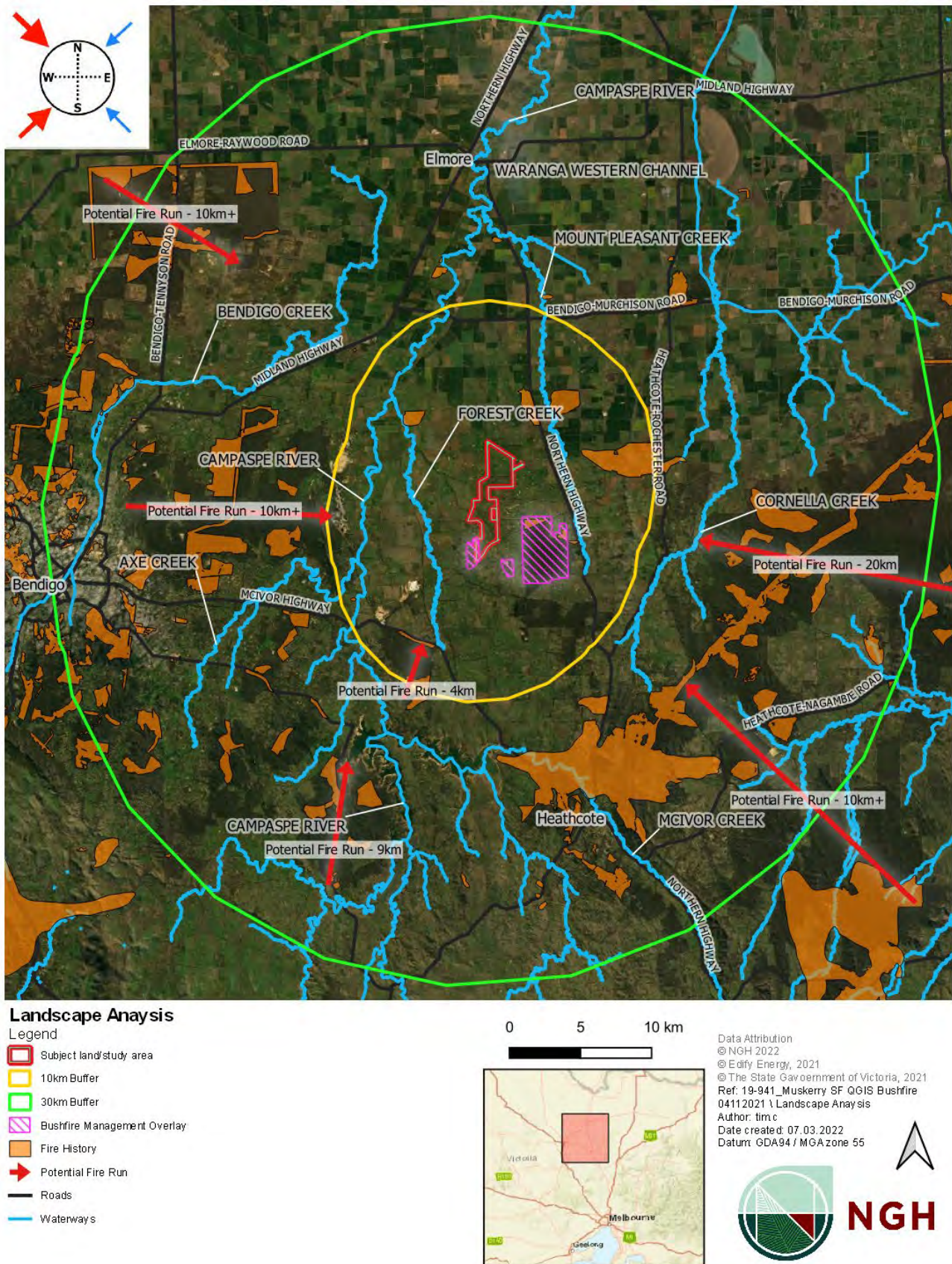


Figure 5-2 Landscape Hazard Analysis

6. Bushfire Management Statement (Bushfire Planning, Clause 13.02-1S)

The following section identifies bushfire risk to and from the MSPS site. The discussion derives from Clause 13.02-1S of the planning schemes as recommended by the DELWP guidelines. The CFA guidelines (CFA, 2022) are also included below and are referenced in order to ensure appropriate measures are incorporated into the proposal.

6.1 Strategies

6.1.1 Protection of human life

Give priority to the protection of human life by:

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

Compliance with measures:

Following consideration of the proposed use and the potential bushfire threat that could generate from within the MSPS site and surrounding area, it is concluded that the proposed development poses a low risk to human life. The proposed development would not significantly increase the risk of bushfire within the landscape, in terms of ignition, fuels or changes in population. The application of mitigation measures and buffers provided around infrastructure would reduce risk to an acceptable level, in light of the low-risk landscape present.

Some risks would be generated from the construction and operation of the MSPS, due to required operations and employment of up to 350 MSPS staff required on site during the construction phase. The risks presented would be mitigation through application of CFA and DELWP guidelines identified in Section 8, which would reduce the vulnerabilities of communities to bushfire, due to a considered design and well-equipped proposal site.

An Emergency Management Plan would be prepared prior to the commencement of on-site activities, which would consider broader landscape risks, on site risks, and evacuation protocols in the event of an emergency.

6.1.2 Bushfire hazard and identification assessment

Identify bushfire hazard and undertake appropriate risk assessment by:

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

- *Applying the Bushfire Management Overlay to areas where the extent of vegetation can create an extreme bushfire hazard.*
- *Considering and assessing the bushfire hazard on the basis of:*
 - *Landscape conditions - meaning conditions in the landscape within 20 kilometres (and potentially up to 75 kilometres) of a site; –*
 - *Local conditions - meaning conditions in the area within approximately 1 kilometre of a site; –*
 - *Neighbourhood conditions - meaning conditions in the area within 400 metres of a site; and –*
 - *The site for the development.*
- *Consulting with emergency management agencies and the relevant fire authority early in the process to receive their recommendations and implement appropriate bushfire protection measures.*
- *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.*
- *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.*

Compliance with measures:

Section 4.4 and Section 5 of this report outline the assessment of hazard vegetation within the MSPS site and the surrounding landscape. The findings have identified that the vegetative landscape is generally of a low fuel nature (primarily grassland is present). In light of the vegetation threat and available potential fuel loads, which provide an analysis of potential bushfire severity and radiant heat flux that the proposal may be subjected to, the proposal has been assessed against the measures prescribed Section 8.

6.1.3 Settlement planning

Plan to strengthen the resilience of settlements and communities and prioritise protection of human life by:

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

Compliance with measures:

Once operational, the proposed development would involve 5 permanent on site personnel, therefore the risk presented is not against a large population base. The surrounding landscape primarily consists of managed farmland and grassland vegetation, so achieving a radiant heat flux of less than 12.5 kW/m² would be easily achieved within the site.

The proposed development would provide an increase in fire risk for the proposal site. However, the level of risk is viewed as low risk, given prescribed on-site management and protection measures required by relevant guidelines (i.e., defensible space, access roads, water supply), monitoring systems (24-remote monitoring) and built-in fire suppression technology (for the BESS). The resulting net risk of the proposed development would be minimal in terms of potential impact to surrounding residents or towns within the locality.

Regional and municipal plans would need to be adjusted to account for the operation of this facility, which would result in a larger presence of fire suppression within the landscape, compared to current circumstances, which would lower the risk further for existing settlements.

6.1.4 Areas of 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 important areas of biodiversity.

Compliance with measures:

The site is situated in a typical agricultural landscape, so a majority of the site comprises grassland vegetation due to historic grazing activities. The proposal footprint has considered areas of high biodiversity conservation value and largely avoids impacts to such areas. Bushfire protection measures can be incorporated within the site without causing unacceptable impacts on biodiversity.

6.1.5 Use and development control in a BPA

Place of assembly / any application which results in large numbers of people – refer to previous section.

Compliance with measures:

As identified in Section 3.3 the proposed development is viewed as a Place of Assembly and/or a place that would result in people congregating in large numbers (up to 350 workers present only during construction) within a BPA. This report and the mitigation measures presented have been prepared in response to this requirement.

6.1.6 Policy guidelines

Consider as relevant:

- *AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).*
- *Building in bushfire-prone areas - CSIRO & Standards Australia (SAA HB36-1993, 1993).*
- *Any bushfire prone area map prepared under the Building Act 1993 or regulations made under that Act.*

Compliance with measures:

The above policy guidelines have been considered, in addition to the CFA (CFA, 2022) (CFA, 2014) and DELWP (DELWP, 2019) guidelines throughout the preparation of this report.

7. Emergency Management Evacuation Plan

7.1.1 Considerations of EMEP

The key objective of an Emergency Management Evacuation Plan (EMEP) is to identify the fire risks and controls associated with the proposal and identify procedures that are to be implemented in case of a fire on site or in the vicinity of the site. Specific objectives include:

- Secure the health, safety, and welfare of all personnel on site.
- Contain an emergency.
- Protect property, plant, equipment, and the environment.
- Manage the recovery and resumption of normal operations.

To achieve this objective, the proponent would:

- Ensure appropriate controls and procedures are implemented during operations to minimise fire risks.
- Ensure appropriate measures are implemented to address the mitigation measures detailed in the bushfire assessment and associated planning report.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements.

In the case of a fire emergency, there would be a high reliance on the procedures for emergency response and off-site evacuation. As with any construction work, there is potential for ignition to occur within the site, therefore a fire could spread to nearby vegetation and result in a large landscape fire, which could impact upon neighbouring communities.

Due to the electrical hazards associated with energy projects, there are additional health and safety considerations for the implementation of effective and appropriate risk control measures. An EMEP would outline appropriate risk control measures for the project.

7.1.2 Monitoring and review

The EMEP should be reviewed after incidents of bushfire or other fires as well as annually at the end of each bushfire season (April through October). It is imperative that the EMEP be amended after the review process, particularly if it would increase the effectiveness of the plan. For example, lessons may be learnt from previous incidents. A monitoring and review process should include, as a minimum:

- Monitoring against the aims and objectives of the EMEP.
- Updating the EMEP based on current best practice guidelines or policy.
- Assessing the risk, obligations, and management measures against any new legislative changes.
- Reviewing and updating emergency procedures annually at the end of each bushfire season and after any fire incident.

8. Bushfire Management and Mitigation Measures

This assessment considers the requirements identified in the CFA guidelines (CFA, 2022). The mitigation measures identified below are a series of controls, when combined, aim to minimise the risk of bushfire attack, and provide protection for emergency services personnel and others assisting firefighting activities.

8.1 Assessment of CFA Guidelines

Due to the proposal comprising a renewable energy land use, the bushfire protection measures outlined below are applied from the CFA guidelines (CFA, 2022), rather than application of Clause 53.02, as this clause and Clause 44.06 do not apply to the proposal.

Section 5 – Fire Risk Management

Guideline requirements		Design response
5.2	<p>How can fire risk be managed?</p> <p>CFA's expectation is that a comprehensive risk management process is undertaken to identify the hazards and risks specific to the facility and develop, implement, maintain, and review risk controls.</p>	<p>A Risk Management Plan incorporating a Fire Management Plan would be prepared for the proposal prior to construction commencing.</p>
<p>CFA recommends the adoption of a risk management process, in line with AS/ISO 31000-2018: Risk Management Guidelines, to identify and address fire risk at renewable energy facilities.</p>		<p>The Risk Assessment/Management Plan would be in line with AS/ISO 31000-2018: Risk Management Guidelines. The plan would describe the risks and hazards and relationship to the BESS and solar/utility installation infrastructure. The plan would address section 6.2 of the CFA Guideline (2022 version or as updated).</p>

Section 6 - Facility Location and Design

Guideline requirements		Design response
6.1	Facility Location and Design	
Model Requirements	<p>Planning applications for all renewable energy facilities proposed in high-risk environments must address the following, in addition to providing an assessment against policy at Clause 13.02-1S (Bushfire Planning):</p> <ul style="list-style-type: none"> a) 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. b) The impact of bushfire on the infrastructure (e.g., ember attack, radiant heat impact, flame contact). c) 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. 	<p>The bushfire hazard and risk to property is considered in the landscape assessment provided in Section 4.4 and 5 of this BFAR. The proposal is considered to be low risk to adjacent land, the site provides for flexibility in design and the proposal would be designed to reduce risks to an acceptable level.</p>
6.2	Facility Design	
6.2.1	Emergency Vehicle Access	
<p>Providing adequate vehicle access to and within facilities assists CFA in responding to and managing fires. The following (model) requirements represent CFA's minimum expectations for emergency vehicle access at renewable energy facilities:</p>		
a)	Construction of a four (4) metre perimeter road within the perimeter fire break.	The proposal layout would provide for a 4 metre access road within a 10 metre perimeter fire break.
b)	Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes.	All access roads within the proposal would be capable of accommodation a minimum 15 tonne fire-fighting appliance.
c)	Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre	The 4 metre or greater trafficable width

Guideline requirements		Design response
	vertical clearance for the width of the formed road surface.	access road would be kept clear of obstructions at all times. No vegetation is present on site that would present vertical obstructions (i.e., overhanging branches) for emergency services.
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.	All access roads and access points would meet the specifications of the model requirements. Any departures, if recommended by the risk management plan, would be in consultation with the CFA.
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. Where roads are less than 600 metres long, at least one passing bay must be incorporated.	
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.	
h)	The provision of at least two (2) but preferably more access points to the facility, to ensure safe and efficient access to and egress from areas that may be impacted or involved in fire. The number of access points must be informed through a risk management process.	
6.2.2	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 water supply and infrastructure must be designed to allow effective response to the risks and hazards at the facility. The quantity of water supply must be established through a comprehensive risk management process that considers all relevant hazards. The model requirements are:		
a)	Water access points must be clearly identifiable and unobstructed to ensure efficient access.	The proposal layout would provide unobstructed access to the proposal area,

Guideline requirements		Design response
		including locations of static water supply.
b)	Static water storage tank installations are to comply with <i>AS 2419.1-2005: Fire hydrant installations – System design, installation and commissioning</i> .	On site static water supply arrangements would comply with the model requirements. Any departures, if recommended by the Risk Management Plan, would be in consultation with the CFA.
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 entrances to the facility and must be positioned at least 10m 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, 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 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 (i.e., bollards) where necessary.	
k)	Where the access road has one entrance, a ten (10) metre radius turning circle must be provided at the tank.	

Guideline requirements		Design response
l)	An external water level indicator must be provided to the tank and be visible from the hardstand area.	An external water level indicator would be provided to the tank.
m)	Signage indicating 'FIRE WATER' and the tank capacity must be fixed to each tank.	Clear signage would be fixed in a prominent position to each static water supply tank.
n)	Signage must be provided at the front entrance to the facility, indicating the direction to the static water tank.	Clear signage would be fixed in a prominent position at the entrance of the proposal area, indicating the direction of each static water supply tank.
6.2.2	Solar Energy Facilities (Firefighting water supply)	
A fire protection system must be provided for solar energy facilities. The fire protection system must be designed to allow a safe, adequate response to the risks and hazards at the facility, in consultation with CFA. Model requirements are:		
a)	The fire protection system for solar energy facilities must incorporate at least one (1) x 45,000L static water tank for every 100ha. For example, a 500ha site requires a minimum of five (5) x 45,000L static water tanks.	The site has an area of approximately 496.21ha (potential fenced area-solar plant and associated works). A minimum of five (5) x 45,000L static water tanks would be provided.
b)	A fire water tank must be located at the primary vehicle access point to the facility, and elsewhere in consultation with CFA.	A fire water tank would be provided at the primary vehicle access point to the facility and as determined by the proposed Risk Management Plan.
c)	Fire water must be provided to cover buildings, control rooms, substations, and grid connections, in consultation with CFA.	Fire water would be provided to all facilities as determined by the proposed Risk Management Plan.
d)	Additional fire protection systems or equipment required under any Australian Standards for	Noted. Fire water would be provided as

Guideline requirements		Design response
	dangerous goods must be provided as prescribed.	determined by the proposed Risk Management Plan.
6.2.2	BESS (Firefighting water supply)	
A fire protection system suitable for the risks and hazards at the facility must be provided. For facilities with battery energy storage systems, the fire protection system must include the following model requirements at a minimum:		
a)	A fire hydrant system that meets the requirements of AS 2419.1-2005: Fire hydrant installations, Section 3.3: Open Yard Protection, and Table 3.3: 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.	Access to hydrants would be provided where possible, or a static water supply would be supplied as per point b) below.
b)	Where no reticulated water is available, a fire water supply in static storage tanks, where: <ul style="list-style-type: none"> 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 2419.1-2005 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 2419.1-2005, Table 3.3. (E.g., For battery installations with an aggregate area of over 27,000m², 4 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 2419.1-2005: Fire hydrant installations - 	Where hydrants aren't accessible, a fire water supply in static storage tanks of no less than 288,000L would be designed and constructed in accordance with the model requirements and determined based on the BESS final layout (either design option A (next to substation) or B (distributed through the site) as described in section 2.1 of this BFAR).

Guideline requirements		Design response
	Section 5: Water storage.	
6.2.2	Substations (Firefighting water supply)	
	Fire water must be available to substations.	Where hydrants aren't accessible, a fire water supply in static storage tanks would be located to be available for the substation.
6.2.3	Landscape Screening and On-Site Vegetation	
	Any vegetation, proposed or existing, must be considered in the Risk Management Plan for its potential to intensify and propagate fire within and away from the site.	The Risk Management Plan would consider the vegetation that would be within the fenced site, and/or as proposed in the Landscape Character and Visual Impact Assessment and any recommendations of the Ecology Assessment for the proposal. A Landscape Plan and Vegetation Management Plan would be developed based on the findings of the Risk Management Plan.
6.2.4	Fire Breaks	
	A fire break is a gap in fuel (vegetation) that reduces the potential for fire to enter or leave an area. Fire breaks may also be used for emergency vehicle access. The width of fire breaks must be a minimum of 10m, and at least the distance where radiant heat flux (output) from the vegetation does not create the potential for ignition of on-site infrastructure. 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.	The fire break width would be determined by the Risk Management Plan. The proposal would achieve a minimum width of at least ten (10) metres around the perimeter of the

Guideline requirements		Design response
		proposal site.
b)	The perimeter of control rooms, electricity compounds, substations and all other buildings on site.	A minimum 10(m) defensible space would be incorporated around the perimeter of site facilities and buildings.
6.2.4	BESS (Fire Breaks)	
	A fire break must be established and maintained around battery energy storage systems and related infrastructure.	The fire break width around the BESS would be determined by the Risk Management Plan. The Risk Management Plan would consider radiant heat flux output from any near vegetation and the BESS in determining the appropriate width.
6.2.5	Design Specific to Facility Type	
6.2.5	Solar energy facilities (Design Specific to Facility Type)	
	Adequate separation of solar panel banks facilitates safe and effective firefighting operations. Solar energy facilities are to have a minimum six (6) metre separation between solar panel banks.	The separation between solar panel banks would be determined by the Risk Management Plan. The proposal would achieve a minimum separation of at least 6m.
6.2.5	BESS (Design Specific to Facility Type)	
1	The design of the facility must incorporate:	
a)	A separation distance that prevents fire spread between battery containers/enclosures and: <ul style="list-style-type: none"> • Other battery containers/enclosures. • On-site buildings. 	The detailed design and Risk Management Plan would address separation requirements.

Guideline requirements		Design response
	<ul style="list-style-type: none"> • Substations. • Any other site buildings. • Vegetation. <p>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.</p>	
b)	<p>A fire break around the battery energy storage system and related infrastructure, of a width of no less than 10m, 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.</p>	<p>The detailed design and management plans would address proposed and ongoing fire break and landscaping requirements.</p>
c)	<p>A layout of site infrastructure that:</p> <ol style="list-style-type: none"> 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. 	<p>The detailed design and Risk Management Plan would address safety and minimisation of fire potential.</p>
2	<p>Battery energy storage systems must be:</p>	
a)	<p>Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).</p>	<p>The detailed design and Risk Management Plan would address BESS design and location.</p> <p>Any departures (specifically if Option B-dispersed BESS was incorporated into the final design), would be assessed in the Risk Management Plan in consultation with the CFA, noting guideline requirements:</p> <p><i>Where proposed in multiple locations, such</i></p>

Guideline requirements		Design response
		<i>as dispersed throughout solar energy facilities rather than grouped in a single location on-site, battery energy storage systems must be separated from adjacent infrastructure, such as solar panel banks. Separation must be to at least the distance where the radiant heat flux (output) from the battery energy storage system container/enclosure fully involved in fire does not create the potential for ignition of the adjacent infrastructure.</i>
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).	The detailed design and management plans would address the proposed fire water location.
c)	Provided with in-built detection and suppression systems. Where these systems are not provided, measures to effectively detect and/or suppress fires within containers must be detailed within the Risk Management Plan.	
d)	Provided with suitable ember protection to prevent embers from penetrating battery containers/enclosures.	The detailed design and Risk Management Plan would address BESS design and location and compliance with the model requirements.
e)	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.	
f)	Installed on a non-combustible surface such as concrete.	
g)	Provided with adequate ventilation.	
h)	Provided with impact protection to at least the equivalent of a W guardrail-type barrier, to prevent mechanical damage to battery containers/enclosures.	

Guideline requirements		Design response
i)	Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection.	
j)	Provided with spill containment that includes provision for management of fire water runoff.	

Section 7 – Facility Construction and Commissioning

Guideline requirements		Design response
7.1	Recommended Risk Controls	
	CFA recommends the following risk controls for the construction of facilities. This is not an exhaustive list and must be supplementary to the outcomes of the site-specific risk management process and any relevant requirements under legislation.	Fire risk controls would be developed as part of the Risk Management Plan and preparation of the detailed design plans and would include measures for fire detection and details of systems for suppression of fire. Relevant measures would be incorporated into the proposed Emergency Management Evacuation Plan (EMEP) or other management plans for the site including providing opportunities for personnel training and addressing OH&S.

Section 8 – Facility Operation

Guideline requirements		Design response
8.1	Vegetation and Fuel Management (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.	A Vegetation Management Plan would be prepared for the proposal and would include measures for maintaining grass during declared Fire Danger Periods.

Guideline requirements		Design response
b)	Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation.	A Vegetation Management Plan would include measures for maintaining vegetation during construction or operation and or maintenance to minimise fire risk.
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).	Environmental Management Plans for the proposal would include measures specific to Fire Danger Periods.
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.	
Solar Energy Facilities (Vegetation and Fuel Management)		
	Solar energy facilities must have grass maintained to no more than 100mm under solar panels during the Fire Danger Period. Operators of solar energy facilities on grazed paddocks must ensure that if additional measures to maintain grass to this level are required, they are implemented prior to, and for the duration of the Fire Danger Period.	Environmental Management Plans (including the Vegetation Management Plan) for the proposal would include measures specific to Fire Danger Periods.
BESS (Vegetation and Fuel Management)		
	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.	Environmental Management Plans (including the Vegetation Management Plan) for the proposal would include measures specific to fire breaks and vegetation maintenance.
Substations and Electric Lines (Vegetation and Fuel Management)		
	Vegetation management within any electric line easement is to be such that falling trees would not impact the transmission lines, towers, and associated infrastructure.	Environmental Management Plans (including the Vegetation Management Plan) for the proposal would include measures specific to maintenance of easements (where applicable).
8.2	Maintenance (All facilities)	

Guideline requirements		Design response
	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.	A maintenance procedure for the proposal and would incorporate relevant AS or manufacturer's requirements. The procedure would be incorporated into the EMP for the site.
	BESS (Maintenance)	
	<p>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:</p> <ul style="list-style-type: none"> • 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. <p>Any identified issues must be immediately rectified.</p>	The maintenance procedure for the proposal would include measures for the BESS.
8.3	Dangerous Goods Storage and Handling	
	<p>Signage and labelling compliant with the Dangerous Goods (Storage and Handling) Regulations 2012 and the relevant Australian Standards must be provided at the site entrance, dangerous goods storage locations, and storage tanks where applicable. Appropriate material for the clean-up of dangerous goods spills and leaks (including absorbent, neutralisers, tools, disposal containers and personal protective equipment) must be provided and available on-site. Training must be provided for site personnel on the hazards, safe use and emergency response for spills, leaks and fire involving dangerous goods. All dangerous goods stored on-site must have a current Safety Data Sheet (SDS). Safety Data Sheets must be provided within the facility's Emergency Information Book(s), in the Emergency Information Container(s). The requirements of the dangerous goods legislative framework, and all relevant Australian Standards must be complied with for all facilities, including facilities with battery energy storage systems.</p>	A Dangerous Goods Storage and Handling procedure would be incorporated into the EMP for the site. The procedure would comply with the CFA guidelines and or other agency requirements.

Guideline requirements		Design response
8.4	Facility and System Monitoring (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, and any fire is notified to 000 immediately.	Facility and system monitoring would be incorporated into the EMP for the site and would be consistent with the CFA guidelines.
	BESS (Facility and System Monitoring)	
	<p>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:</p> <ul style="list-style-type: none"> • Any shorts, faults, temperature increases above normal parameters (eg. precursor to thermal events/runaway). • Equipment failures with the potential to ignite or propagate fire. • Off-gassing, smoke, or fire. <p>The provision for direct alarm monitoring to the fire brigade for battery energy storage system automatic detection systems must be considered.</p>	BESS monitoring and relevant measures would be incorporated into the EMP for the site and would be consistent with the CFA guidelines.
8.5	Risk Management Review	
	<p>CFA recommends that facility operators prepare and have peer reviewed the following documents:</p> <ul style="list-style-type: none"> • Risk Management Plan, • Fire Management Plan, • Emergency Management Plan, 	Plans would be prepared as required by Sections 5, 9, and 10 of the CFA guidelines and Section 7 of this BFAR. The plans would be peer reviewed if required by DELWP.

8.2 Assessment of DELWP Guidelines

The Solar Energy Facilities Design and Development Guidelines (DELWP, 2019) are identified below, with a corresponding response on how the proposal layout has applied the design recommendations.

Guideline requirements	Design response
DELWP Solar Energy Facilities Design and Development Guidelines	
Design stage	The proposal site provides sufficient flexibility, and the layout is able to comply with good design planning for siting facility components, including setbacks from boundaries, separation between solar zones to enable emergency vehicles, BESS options A or B, and providing landscape screening.
Landscape screening	The proposal layout would provide landscape screening around parts of the perimeter of the proposal area.
Natural hazard risk management – Bushfire	The proposal layout has considered the impacts of a landscape bushfire event. The application of mitigation measures, in accordance with CFA (CFA, 2022) and VIC planning guidelines would be incorporated into the proposal.
Dangerous goods and building fire safety	The proposal would store dangerous goods and flammable materials in secure, non-combustible, bunded environments. Buildings within the proposal area would be provided with ember protection measures, to improve a buildings performance against the mechanisms of bushfire attack.
Risk and emergency management planning	A Risk and Emergency Management Plan would be prepared, consistent with <i>AS 3745-2010 Planning for emergencies in facilities</i> .
Battery storage unit	If the BESS contains any dangerous goods, the proposed system would comply with the <i>Dangerous Goods Act 1985</i> . The BESS and all parts of the facility would be provided with the required fire water in static tanks, where reticulated water is not available.
Clause 65 Decision guidelines	The proposal layout is considered consistent with the requirements of bushfire planning guidelines. The application of prescribed measures would reduce the potential impacts of fire

Guideline requirements	Design response
	hazard to an acceptable level.
Fire and emergency management plan	A Fire and Emergency Management Plan would be prepared prior to the commencement of construction works.

9. Consultation with the CFA

In December 2021, NGH consulted with Mick Sporton (Commander Operations – North West Region) of the CFA. Mick Sporton provided the following input from a fire services (fire-fighting) perspective.

- *Access points to the site should be diagonally opposite where possible for safe access away from smoke or fire spread.*
- *MSDS and site plans available at access points.*
- *Additional access points for critical infrastructure such as substations, admin offices and battery storages.*
- *A 6m fire break around the perimeter of the site.*
- *Sufficient fire fighting mediums available on site, such as water (as per PN14), Dry chem and CO2 extinguisher banks available on site.*
- *A grass fire attack capability such as a slip on unit or a mule with water for initial grass fire attack.*
- *On site maintenance or supervisor availability with contact detail 24/7. As Fire services will not enter an area until it has been de-energised by the site supervisor.*

The proposal is considered to meet the requirements for the location of primary and emergency access points as discussed in this report. The remaining points above would be considered and addressed in a site-specific management emergency plan. Follow up advice was requested due to the updated 2022 CFA guidelines. No further changes to the design were recommended.

With reference to Section 8 of this report, the proposal would adequately incorporate relevant measures from CFA (CFA, 2022) (CFA, 2014) and DELWP guidelines (DELWP, 2019) into the detailed design phase of the project.

10. Conclusion

Clause 13.02 places a strong emphasis on the protection of human life. The proposal would incorporate well designed safety outcomes consistent with bushfire planning requirements, CFA (CFA, 2022) (CFA, 2014) and DELWP guidelines (DELWP, 2019).

The risk to human life is considered low for the following reasons:

- Once operational, a low number of full-time staff would be present on site.
- Existing conditions of the immediate surrounding landscape are considered low risk.
- Existing site conditions (grassland vegetation fuel loads) are considered low risk.
- The site can provide for good access arrangements for emergency services and egress of workers.
- The design, mitigation and safety measures described above would further reduce fire risk.

The proposed MSPS is considered an acceptable proposal as adequate mitigation measures would be incorporated into the design and layout, which provide a beneficial outcome when considering existing landscape hazards. The proposal would provide for a low risk setting, with appropriate provisions for emergency management.

An EMEP would be prepared prior to construction, which would identify safety measures through detailed design layout planning, detailed risk and mitigation measures and emergency procedures. The EMEP would be prepared in consultation with the CFA.

11. References

Country Fire Authority (CFA) (2022) *Design Guidelines and Model Requirements for Renewable Energy Facilities*. VIC. [Renewable Energy Fire Safety | CFA \(Country Fire Authority\)](#)

Country Fire Authority (CFA) (2014) *Vegetation classes: Victorian Bushfire Management Overlay*. VIC. <https://www.cfa.vic.gov.au/ArticleDocuments/392/Vegetation-Classes-Victorian-Bushfire-Management-Overlay-v0-3.pdf.aspx?Embed=Y>

Department of Environment, Land, Water and Planning (DELWP) (2018) *13.02-1S – Bushfire planning*. VIC. https://planning-schemes.delwp.vic.gov.au/schemes/vpps/13_02-1S.pdf

Department of Environment, Land, Water and Planning (DELWP) (2019) *Solar Energy Facilities: Design and Development Guidelines*. VIC. [https://www.planning.vic.gov.au/_data/assets/pdf_file/0028/428275/Solar-Energy-Facilities-Design-and-Development-Guideline-Aug_\(CFA, 2014\)ust-2019.pdf](https://www.planning.vic.gov.au/_data/assets/pdf_file/0028/428275/Solar-Energy-Facilities-Design-and-Development-Guideline-Aug_(CFA,_2014)ust-2019.pdf)