# YADNARIE
# RENEWABLE ENERGY FACILITY

## Proposed PV Ultra (Solar Cogeneration) and Thermal Hydro Facility

VOLUME 2

## TECHNICAL REPORTS

For Photon Energy AUS SPV 4 Pty Ltd

225 Broadview Road, 4543 Birdseye Highway
and Lot 28 Pine Corner Road,
Cleve, South Australia

# 1

# ECOLOGICAL ASSESSMENT

# Proposed Yadnarie PV Ultra (Solar Cogeneration) And Thermal Hydro Facility for Photon Energy Aus SPV 4 Pty Ltd

## Ecological Assessment

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# Ecological Assessment

22 October 2024

Version 6

Prepared by EBS Ecology for MasterPlan Pty Ltd

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Cover photograph: *Eucalyptus socialis ssp. socialis* mallee over *Triodia irritans* found within the Project Area.

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# GLOSSARY AND ABBREVIATION OF TERMS

| | |
|---|---|
| ~ | Approximately |
| ALA | Atlas of Living Australia |
| BAM | Bushland Assessment Method |
| BCM | Nature Conservation Society of South Australia’s Bushland Condition Monitoring methodology (Croft *et al.* 2005-2009) |
| BDBSA | Biological Database of South Australia (maintained by DEW) |
| CEMP | Construction Environmental Management Plan |
| COEMP | Construction and Operational Environmental Management Plan |
| DCCEEW | Department of Climate Change, Energy, the Environment and Water (formerly known as DAWE: Department of Agriculture Water and the Environment) |
| DEW | Department of Environment and Water (formerly known as DEWNR: Department of Environment, Water and Natural Resources) |
| EP | Eyre Peninsula |
| EPBC Act | *Environmental Protection and Biodiversity Conservation Act 1999* |
| EPBGW | Eyre Peninsula Blue Gum Woodland |
| FPAL | Finalised Priority Assessments List |
| GWh | Gigawatt hours |
| ha | hectares |
| IBRA | Interim Biogeographical Regionalisation of Australia |
| km | kilometres |
| LSA Act | *Landscapes South Australia Act 2019* |
| mm | millimetres |
| NPW Act | *National Parks and Wildlife Act 1972* |
| NV Act | *Native Vegetation Act 1991* |
| NVC | Native Vegetation Council |
| NVIS | Native Vegetation Information System |
| MW | Megawatt |
| PDI Act | *Planning and Development Act 2016* |
| pers. comm. | personal communications |
| Photon Energy | Photon Energy AUS SPV 4 Pty Ltd |
| PMST | Protected Matters Search Tool (under the EPBC Act, maintained by DCCEEW) |
| Project | Yadnarie Solar Storage Project |
| Project Area | Area outlined in Figure 1 |
| RayGen | RayGen Resources Pty Ltd |
| SA | South Australia(n) |
| Search Area | 5 km buffer around the Project Area |
| SEB | Significant Environmental Benefit |
| SHD | Sandhill Dunnart |
| sp. | Species |
| spp. | Species (plural) |

| | |
|---|---|
| ssp. | Sub-species |
| STAM | Scattered Tree Assessment Method |
| TBS | Total Biodiversity score |
| TEC | Threatened Ecological Community |
| TSSC | Threatened Species Scientific Committee |
| UBS | Unit Biodiversity Score |
| VA | Vegetation Associations |
| WoNS | Weeds of National Significance |

# EXECUTIVE SUMMARY

EBS Ecology (EBS) was engaged by RayGen Resources Pty Ltd (RayGen) via MasterPlan Pty Ltd (Masterplan) to undertake an ecological assessment of a proposed solar storage installation (the Project) at Cleve approximately 530 kilometres (km) north-west of Adelaide, in South Australia.

The final Project design was supplied by MasterPlan to EBS on the 12 April 2024.

The ecological assessment was broken into two different stages, an ecological desktop assessment followed by an ecological field assessment. The scope of works of the desktop assessment included the following:

- Identify, describe and map state and nationally threatened flora and fauna and ecological communities across the Project Area to enable assessment by State *National Parks and Wildlife Act 1972* (NPW Act) and Commonwealth regulators *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act), including native as well as introduced species.
- Determine the likelihood of presence likelihood of presence and status of State and Commonwealth, listed flora and fauna species and ecological communities, including Weeds of National Significance (WoNS) and other weed species.
- Assess the impacts the proposed works are likely to have on any matters of State and/or National Environmental Significance.
- Review existing information on flora and fauna species and tree data.
- Determine the habitat value of native vegetation present in the Project Area.
- Review information regarding the habits and habitat requirements of threatened species.
- Identify any specify requirements and recommendations for future field assessments.

The scope of works of the field assessment included the following:

- Determine the type, condition, and species composition of vegetation in the Project Area in accordance with methodology required for an application to clear native vegetation under the *Native Vegetation Act 1991* (NV Act).
- Identification of any national and/or State listed flora species of known or likely to occur in the area, including any threatened ecological communities/species.
- Determine whether the proposed Project is likely to impact on any Matters of National Environmental Significance (MNES) under the EPBC Act.
- Identify fauna species and/or suitable fauna habitat present in the Project Area.
- Identification of any “Declared plants under the *Landscape South Australia Act 2019* (LSA Act) that may be significant in relation to the Project requirements.

- Provide recommendations for the proposed Project to help avoid, minimise, or mitigate potential impacts to native vegetation, fauna habitat and flora and fauna species and communities.

The desktop assessment outlined that one Threatened Ecological Community (TEC), the nationally Endangered Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland (EPBGW) is Likely occurring within 5 km of the Project Area (Search Area).

A total of 11 Nationally listed flora species protected under the EPBC Act and one State listed flora species protected under the NPW Act were identified as potentially occurring within the Search Area. Five of these species were assessed as possibly occurring, this includes small herbaceous orchids that would not have been observed during the time of the field survey:

- *Caladenia brumalis* (Winter Spider-orchid) – Nationally and State Vulnerable.
- *Caladenia tensa* (Greencomb Spider-orchid) – Nationally Endangered.
- *Pterostylis mirabilis* (Nodding Rufoushood) - Nationally and State Vulnerable.
- *Pterostylis sp. Hale (R. Bates 21725)* (Hale Dwarf Greenhood) – Nationally Endangered and State Vulnerable.
- *Pterostylis xerophila* (Desert Greenhood) – Nationally and State Vulnerable.

A total of 12 Nationally listed fauna species protected under the EPBC Act and one migratory species were identified as potentially occurring within the Search Area. No threatened fauna records were identified in the Biological Database of South Australia (BDBSA) search. Six fauna species were assessed as potentially occurring:

- Blue-winged Parrot (*Neophema chrysostoma*) – Nationally and State Vulnerable.
- Diamond Firetail (*Stagonopleura guttata*) – Nationally and State Vulnerable.
- Fork-tailed Swift (*Apus pacificus*) – Nationally Vulnerable and Migratory (Marine).
- Grey Falcon (*Falco hypoleucos*) – Nationally Vulnerable and State Rare.
- Malleefowl (*Leipoa ocellata*) – Nationally and State Vulnerable.
- Sandhill Dunnart (*Sminthopsis psammophila*) – Nationally Endangered and State Vulnerable.

The field assessment observed the following across the Project Area:

- No threatened flora or fauna.
- 36 fauna species were observed within the Project Area, consisting of 32 bird species, three mammals, and one reptile. Six of these fauna species were introduced species.
- The survey recorded 147 plant species across the entire Project Area, of which 33 were introduced/exotics. Seven introduced plant species are declared plants under the LSA Act.

- A total of 149.816 ha of native vegetation was surveyed, which included a total of nine Vegetation Associations (VAs).
- Mallee was the dominant VA across the Project Area, totalling 139.50 hectares (ha) of the Project Area. Followed by *Austrostipa* grasslands (8.173 ha) and *Enchylaena tomentosa* and *Sclerolaena diacantha* shrubland (2.144 ha).

Management of potential impacts on flora and fauna should follow the mitigation hierarchy of;

a) avoiding,

b) minimising,

c) rehabilitating, and

d) offsetting impact.

This can be achieved by taking the following considerations into account:

- Ensure that the Project design and construction methods minimise impacts to all native vegetation, as much as possible.
- Where possible, avoid and/or minimise clearance of any native vegetation, revegetated areas and/or important amenity vegetation/habitat identified in the Project Area.
- Placing infrastructure within the open areas in cropping paddocks away from native vegetation patches, water courses and inundation areas to reduce the overall ecological impact of the Project.
- Retain high value vegetation where possible, particularly those areas assessed as having high flora or fauna habitat value.
- Appropriate weed hygiene methods should be implemented as part of a Construction Environmental Management Plan (CEMP) and/or Construction and Operational Environmental Management Plan (COEMP) particularly Declared weeds and WoNS the LSA Act and to reduce the ongoing threat of weed establishment.
- Locate the solar heliostats away from areas of biodiversity value of the site, as well as the surrounding habitat, to minimise indirect impacts on surrounding vegetation and the suitability of habitat for fauna.
- Undertake an EPBC Self-Assessment for all threatened species likely to be impacted by the proposed Project. This Self-Assessment will inform whether the need for a referral under the EPBC Act will be required.
- Calculate the Significant Environmental Benefit (SEB) impact and prepare a Native Vegetation Clearance Data Report required for assessment and approval by the Native Vegetation Council, under NV Act *Regulation 12 (34): Infrastructure*.

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# 1 INTRODUCTION

EBS Ecology was engaged by Photon Energy AUS SPV 4 Pty Ltd (Photon Energy) and RayGen Resources Pty Ltd (RayGen) via MasterPlan Pty Ltd to undertake an ecological assessment of a proposed solar storage installation, known as Yadnarie Renewable Energy Facility (the Project) at Cleve approximately 530 kilometres (km) north-west of Adelaide within the Eyre Peninsula (EP). Currently, this project is in the planning and designing phase of the process and this report is based on the design provided to EBS on the 12 April 2024.

Photon Energy a global project developer, has developed a strategic partnership with RayGen, with the objective of developing global renewable energy projects suitable for the roll-out of RayGen's unique solar power and electricity storage technologies.

Photon Energy proposes to utilise RayGen's technology for the generation of solar power and for energy storage at the Yadnarie Renewable Energy Facility. The technology proposed and scale of electricity storage is new to the South Australian renewable energy sector and comprises RayGen's.

The ecological assessment was broken into two different stages; the first stage was an ecological desktop assessment; the second stage was an ecological field assessment.

## 1.1 Desktop assessment objectives

The overall objective of the desktop ecological assessment was to determine if any ecological constraints exist for the proposed Project.

The scope of works of the desktop ecological assessment included the following:

- Identify, describe, and map state and nationally threatened flora and fauna and ecological communities across the Project Area to enable assessment by State *National Parks and Wildlife Act 1972* (NPW Act) and Commonwealth regulators *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act), including native as well as introduced species.
- Determine the likelihood of presence likelihood of presence and status of State and Commonwealth, listed flora and fauna species and ecological communities, including Weeds of National Significance (WoNS) and other weed species.
- Assess the impacts the proposed works are likely to have on any matters of State and/or National Environmental Significance.
- Review existing information on flora and fauna species and tree data.
- Determine the habitat value of native vegetation present in the Project Area.
- Review information regarding the habits and habitat requirements of threatened species.
- Identify any specify requirements and recommendations for future field assessments.

## 1.2 Field assessment objectives

The scope of works of the field assessment included the following:

- Determine the type, condition, and species composition of vegetation in the Project Area in accordance with methodology required for an application to clear native vegetation under the *Native Vegetation Act 1991* (NV Act).
- Identification of any flora species of national, state, or local conservation significance known or likely to occur in the area including any threatened ecological communities/species.
- Determine whether the proposed works is likely to impact on any Matters of National Environmental Significance (MNES) under the EPBC Act.
- Identify fauna species and suitable habitat present in the Project Area.
- Identification of any “Declared” plants under the *Landscape South Australia Act 2019* (LSA Act) that may be significant in relation to the Project requirements.
- Identify Significant Environmental Benefit (SEB) offset requirements as per the *Guide for Calculating a Significant Environmental Benefit* (NVC 2020c).
- Provide recommendations for the proposed Project to help avoid, minimise, or mitigate potential impacts to native vegetation, fauna habitat and flora and fauna species and communities.

# 2 BACKGROUND INFORMATION

Photon Energy Group are investigating a solar storage project near Cleve on the Eyre Peninsula, South Australia. The proposed Project will utilize RayGen's (raygen.com) solar technology in combination with its energy storage solution. EBS Ecology has been engaged to undertake an ecological desktop assessment and field assessment for the Project to identify potential environmental constraints associated with the subject land.

## 2.1 Project Area

A broad overview of the location of the Project Area is presented in Figure 1. The Project is on farming land (Rural Zone) west of Cleve. The Project will connect to the Yadnarie substation or existing transmission lines located adjacent to the Birdseye Highway. An overview of land parcel details is presented in Table 1 and Figure 2.

**Table 1. Project Area details.**

| Volume | Folio | Hundred | IBRA Association |
|---|---|---|---|
| CT/5940/707 | Section 56 | Yadnarie | Cleve |
| | Section 55 | Yadnarie | Cleve |
| | Section 44 | Yadnarie | Cleve |
| | Sections 46 | Yadnarie | Cleve |
| | Section 394 | Yadnarie | Cleve |
| | Section 395 | Yadnarie | Cleve |
| CT/6205/513 | Section 39 | Yadnarie | Cleve |
| CT/6274/890 | Section 28 | Yadnarie | Hambridge and Cleve |

### *2.1.1 Administrative boundaries*

The Project Area is located within the Local Government Area of Cleve, the Eyre Peninsula Landscape Management Region, and the Hundred of Yadnarie.

### *2.1.2 Previous assessments*

The following assessments were undertaken by EBS Ecology, to identify ecological constraints of the proposed Project (Table 2).

**Table 2. Summary of previous assessment for the Yadnarie Project.**

| Project name | Year | Field dates | Report type | EBS Project Code and reference |
|---|---|---|---|---|
| Photon Energy Solar Storage Project Desktop assessment | 2021 | - | Desktop report outlining ecological constraints for the Project. | EX211105 (EBS Ecology 2021) |
| Photon Energy Solar Storage Ecological Assessment | 2022 | 28 February to 3 March & 21 to 25 November | Ecological report highlighting on-ground vegetation condition and outline of constraints. | E211105 (EBS Ecology 2022a) |

| Project name | Year | Field dates | Report type | EBS Project Code and reference |
|---|---|---|---|---|
| Desktop letter for EPBC threatened species | 2022 | - | Letter memo investigating potential threatened species within a new area. | EX211105B (EBS Ecology 2022b) |
| Yadnarie Solar Farm Native Vegetation Clearance Data Report | 2024 | - | Native Vegetation Clearance Data report, with the impact area and Significant Environmental Benefit calculation to Offset the Project. | EX240519 (EBS Ecology 2024a) |
| Yadnarie Solar Farm Ecological Assessment | 2024 | 25 August 2023 | Updates to the Ecological Report with a new Project Area. | This report |

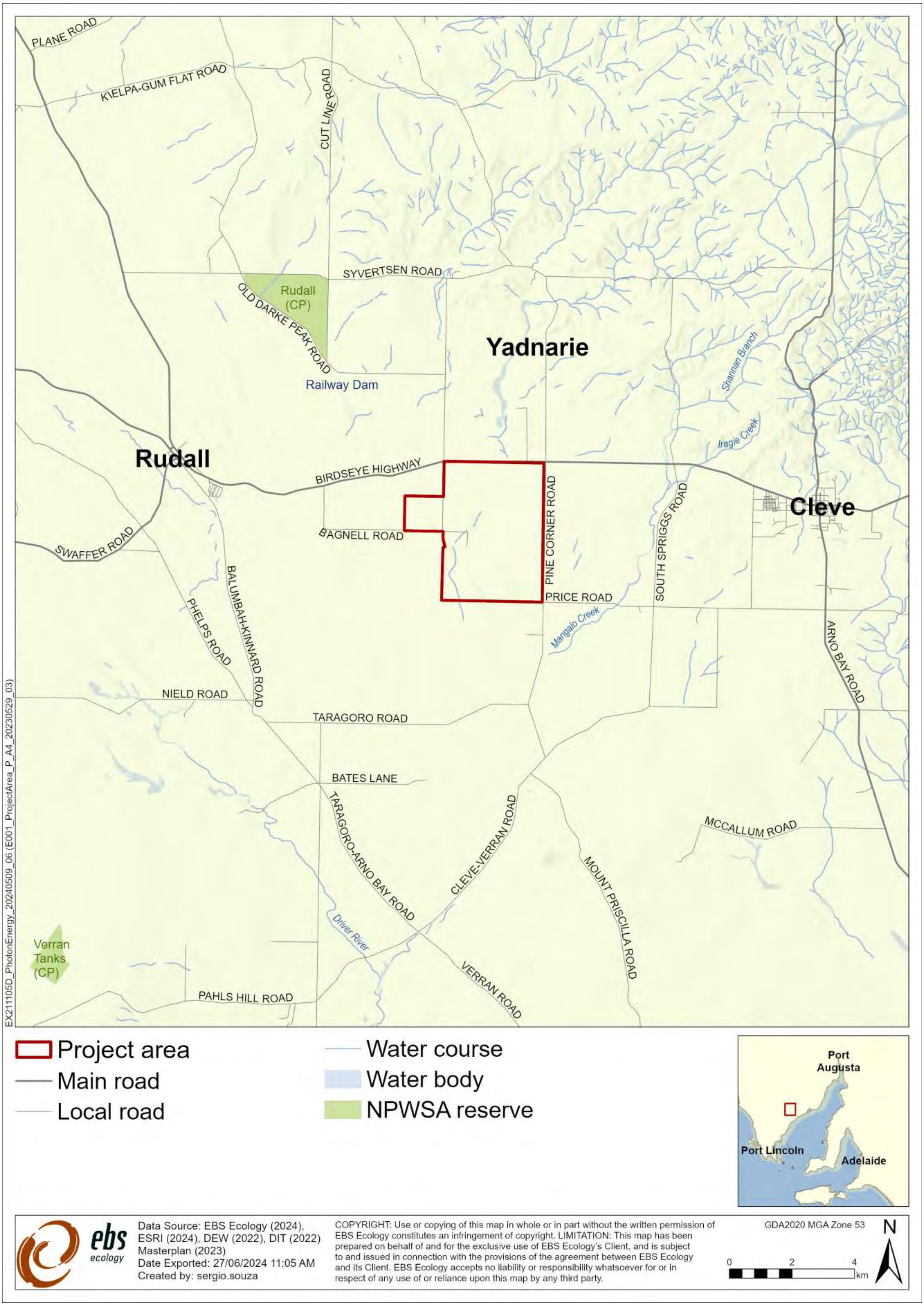

**Figure 1. Location of the Project Area.**

Data Source: EBS Ecology (2024), ESRI (2024), DEW (2022), DIT (2022) Masterplan (2023)
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Created by: sophie.haswell

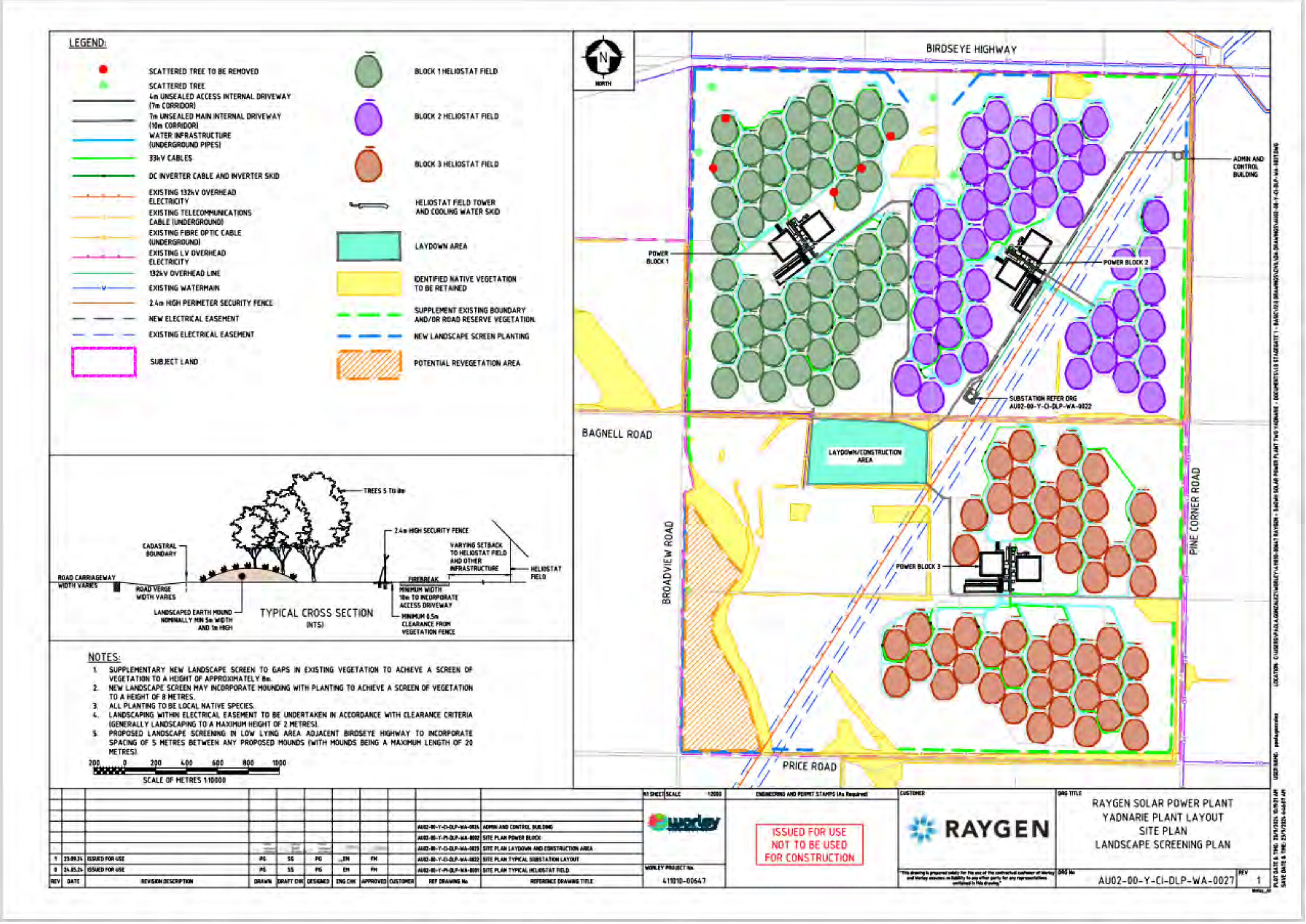
**Figure 2. The Project Area outlining the cadastral boundaries.**

## 2.2 Project details

The Project will develop 150 megawatts (MW) of solar generation, a 90 MW grid connection, at least 720 MW hours of storage (and eight hours of dispatchable energy), with connection to the Yadnarie substation or 132 kilovolt overhead transmission line and ancillary infrastructure.

The solar farm will involve the construction of 150 fields of rotational mirrors (heliostats) orientated north. Each field comprises 273 individual heliostats. Each heliostat is approximately between 2.6 and 5.6 metres above the ground and mounted on a steel post. Heliostat heights will vary throughout the day as they track the sun. Each field has one receiver mounted on a tower 40-45 metres high. The receiver faces the field of mirrors in a southward direction. Each receiver has electrical switchgear and water pumping infrastructure at the base of its tower. For every two fields, there is one inverter for a total of 75 inverters. Additional project components include:

- Three (3) thermal hydro pit units comprising:
  - 3 cold pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
  - 3 hot pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
- Three Thermal Hydro plants, each comprising:
  - An Organic Rankine Cycle (ORC) engine and generator, with net capacity of 30MW
  - Heat Exchangers
  - Tanks
  - Various pumps
  - Large Chiller and Heat Pump units
  - connecting pipework.
  - Electrical infrastructure including switch rooms and transformers
- Underground electrical cable reticulation on site.
- Switch yard and connection via overhead transmission connection to the Yadnarie substation.
- Operations, maintenance building and compound.
- Temporary construction compound.
- Security fencing around the site.
- Internal access roads.



NOTES:

1. SUPPLEMENTARY NEW LANDSCAPE SCREEN TO GAPS IN EXISTING VEGETATION TO ACHIEVE A SCREEN OF VEGETATION TO A HEIGHT OF APPROXIMATELY 8m.
2. NEW LANDSCAPE SCREEN MAY INCORPORATE MOUNDING WITH PLANTING TO ACHIEVE A SCREEN OF VEGETATION TO A HEIGHT OF 8 METRES.
3. ALL PLANTING TO BE LOCAL NATIVE SPECIES.
4. LANDSCAPING WITHIN ELECTRICAL EASEMENT TO BE UNDERTAKEN IN ACCORDANCE WITH CLEARANCE CRITERIA (GENERALLY LANDSCAPING TO A MAXIMUM HEIGHT OF 2 METRES).
5. PROPOSED LANDSCAPE SCREENING IN LOW LYING AREA ADJACENT BIRDSEYE HIGHWAY TO INCORPORATE SPACING OF 5 METRES BETWEEN ANY PROPOSED MOUNDS (WITH MOUNDS BEING A MAXIMUM LENGTH OF 20 METRES).

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| 0 | 24.05.24 | ISSUED FOR USE | PS | SS | PG | EM | FM | |

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| AU02-00-Y-PI-DLP-WA-0002 | SITE PLAN POWER BLOCK |
| AU02-00-Y-CI-DLP-WA-0029 | SITE PLAN LAYDOWN AND CONSTRUCTION AREA |
| AU02-00-Y-CI-DLP-WA-0022 | SITE PLAN TYPICAL SUBSTATION LAYOUT |
| AU02-00-Y-PI-DLP-WA-0001 | SITE PLAN TYPICAL HELIOSTAT FIELD |

RAYGEN SOLAR POWER PLANT
YADNARIE PLANT LAYOUT
SITE PLAN
LANDSCAPE SCREENING PLAN

"This drawing is prepared solely for the use of the contractual customer of Worley and Worley assumes no liability to any other party for any representations contained in this drawing."

Figure 3. **Project design supplied to EBS by MasterPlan 24/9/2024.**

## 2.3 Environmental setting

### *2.3.1 Wetlands and watercourses*

There are no wetlands present within the Project Area. Two small water courses are present in the southern section of the Project Area (see Figure 1). However, these watercourses are only seasonally inundated.

### *2.3.2 Interim Biogeographical Regionalisation of Australia*

The Interim Biogeographical Regionalisation of Australia (IBRA) identifies geographically distinct bioregions based on common climate, geology, landform, native vegetation, and species information. The bioregions are further refined into subregions and environmental associations (Thackway and Cresswell 1995). The Project Area is located within the Eyre Yorke Block IBRA Bioregion and within two IBRA Subregions:

- A majority of the Project Area falls within the Eyre Hills IBRA subregion, 29% (338,248 hectares (ha)) of this subregion is mapped as native vegetation, of which 44% (149,029 ha) is formally conserved (Table 3, Figure 4).
- A small pocket to the southeast of the Project Area falls within the Eyre Mallee IBRA subregion, where 38% (877,417 ha) is mapped as native vegetation, of which 54% (473,079 ha) is formally conserved (Table 3, Figure 4).

The Project Area falls within two IBRA environmental associations:

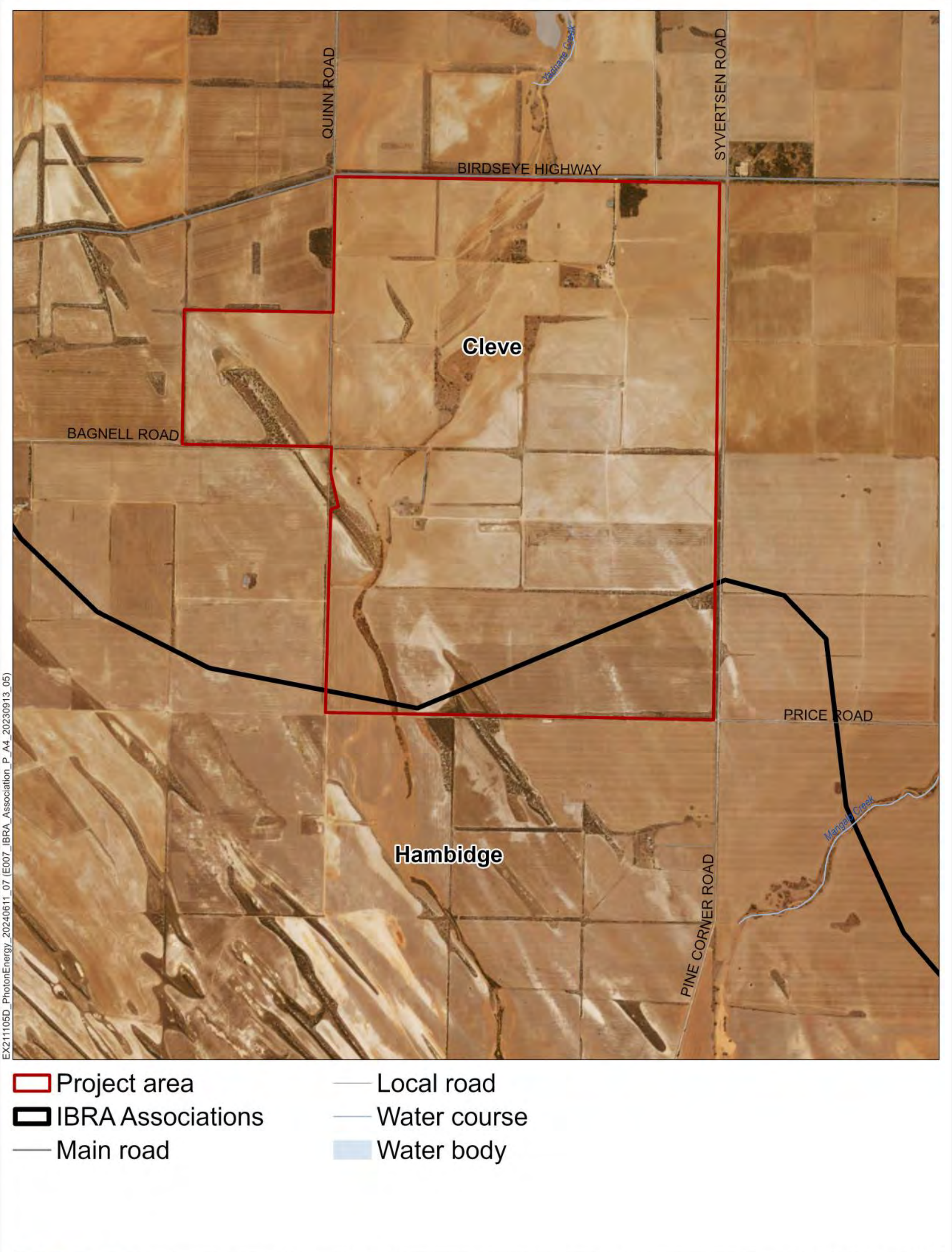
- Cleve, 17% (16,796 ha) of the association is mapped as remnant native vegetation, of which 17% (2,795 ha) is formally conserved (Table 3, Figure 4).
- Hambridge, 28% (99,466 ha) of the association is mapped as remnant native vegetation, of which 74% (73,409 ha) is formally conserved (Table 3, Figure 4).

**Table 3. IBRA bioregion, subregion, and environmental association environmental landscape summary.**

| **Eyre Yorke Block IBRA bioregion** |
|---|
| Archaean basement rocks and Proterozoic sandstones overlain by undulating to occasionally hilly calcarenite and calcrete plains and areas of aeolian quartz sands, with mallee woodlands, shrublands and heaths on calcareous earths, duplex soils and calcareous to shallow sands, now largely cleared for agriculture. |
| **Eyre Hills IBRA subregion** |
| This subregion consists of the southern section of the uplands along the east coast of the Eyre Peninsula, and the undulating to low hilly plains to the west. The uplands rise abruptly from a narrow coastal foreland to altitudes of between 200m and 400m then slope gradually to the west where they merge into the undulating plain. The eastern and highest section of the uplands is formed of metasediments, predominantly quartzite, and is mainly hilly while the slightly lower-lying western part constitutes a dissected laterite plateau. Moderately deep yellow duplex soils with lateritic concretions occur on the uplands and support low open woodland of *Eucalyptus cladocalyx, E. odorata* and *E. leucoxylon*. The plains to the south and west are formed predominantly on old alluvium, or on calcarenite near the coastal fringe where some dunes and cliffs occur. Shallow reddish loams with rock outcrops support *E. incrassata / Melaleuca uncinata* mallee on the plains or *Melaleuca lanceolata* woodland along the coastal fringe. Lincoln National Park occupies the south eastern tip of the subregion and consists of 15, 971 ha of coastal mallee. The majority of this subregion is cleared for winter cereal cultivation and grazing livestock. |

| | |
|---|---|
| Remnant vegetation | Approximately 29% (338,248 ha) of the subregion is mapped as remnant native vegetation, of which 44% (149,029 ha) is formally conserved. |
| Landform | Low limestone dune ridges: small granitic islands with dunes. |
| Geology | Ripon Calcrete; Loveday Soil in aeolian sand sheets, dune sand and red soils (terra rossa). |
| Soil | Sands soils of minimal pedologic development, brown calcareous earths, brown sand soils, Shallow red brown sandy soils, sandy soils with yellow clayey mottled subsoil. |
| Vegetation | Mallee heath and shrublands. |
| Conservation significance | 102 species of threatened fauna, 155 species of threatened flora.<br>7 wetlands of national significance. |
| **Cleve IBRA environmental association** | |
| Remnant vegetation | Approximately 17% (16,796 ha) of the association is mapped as remnant native vegetation, of which 17% (2,795 ha) is formally conserved. |
| Landform | Gently sloping sandy plains and footslopes with some dunes and low cliffs along the coastline. |
| Geology | Sand and metasediments. |
| Soil | Red calcareous earths, hard pedal red duplex soils, brownish sands, and whitish calcareous sands. |
| Vegetation | Open scrub of beaked red mallee and yorrell, sometimes with ridge-fruited mallee and broombush, open heath of coast daisy bush, coast beard heath and coastal wattle. |
| Conservation significance | 28 species of threatened fauna, 23 species of threatened flora.<br>1 wetlands of national significance. |
| **Eyre Mallee IBRA subregion** | |
| This subregion is distinguished climatically by being more arid than regions to the south. The mallee that once dominated this subregion has been cleared for wheat cultivation. The northern margin is formed by the dune fields of the Great Victoria Desert and the eastern margin of the Gawler Ranges. The region consists of an undulating plain with an extensive cover of dunes and sand sheets. A mallee association of *Eucalyptus socialis* and *E. gracilis* occurs on the shallow calcareous earths or deeper duplex soils of the plains with *E. incrassata/Melaleuca uncinata* mallee on the dune sands. To the east the subregion includes hilly uplands on metasediments small intramontane basins. Isolated quartzite ranges and granite outcrops form prominent inselbergs such as Darke Peake and Wudinna Hill which occur throughout the region. Livestock grazing and cereal cropping has resulted in the clearance and/or degradation of much of the native vegetation in this subregion. | |
| Remnant vegetation | Approximately 38% (877,417 ha) of the subregion is mapped as remnant native vegetation, of which 54% (473,079 ha) is formally conserved. |
| Landform | Stable NW-SE longitudinal dunes, locally broken by granite hills and ridges of metamorphic rocks. Dunes closely spaced. |
| Geology | Vast dune sand & interdune corridors of clay, silt & very fine sand; evaporite deposits in numerous salt lakes (gypsum and halite), kopi ridges & dunes, some silcrete & calcrete (rare). |
| Soil | Sandy soils with weak pedologic development, red calcareous earths, red siliceous sands. |
| Vegetation | Mallee heath and shrublands. |
| Conservation significance | 85 species of threatened fauna, 114 species of threatened flora.<br>4 wetlands of national significance. |
| **Hambidge IBRA environmental association** | |
| Remnant vegetation | Approximately 28% (99,466 ha) of the association is mapped as remnant native vegetation, of which 74% (73,409 ha) is formally conserved. |

| | |
|---|---|
| Landform | Extensive undulating plain with parallel dunes and occasional low inselbergs and with tidal flats and sand dunes on the coastal margin. |
| Geology | Sand, calcrete, inselberg, alluvium and metamorphic. |
| Soil | Sandy pedal mottled-yellow duplex soils, brownish sands, dense brown loams, grey calcareous loams and whitish calcareous sands. |
| Vegetation | Open scrub of ridge-fruited mallee, narrow leaved mallee and broombush, low woodland of mangroves, low chenopod shrubland of samphire and low shrubland of coastal wattle and coast beard heath. |
| Conservation significance | 18 species of threatened fauna, 57 species of threatened flora.<br>0 wetlands of national significance. |



Data Source: EBS Ecology (2024), ESRI (2024), DEW (2022), DIT (2022) Masterplan (2023)
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**Figure 4. The Interim Biogeographical Regionalisation of Australia regions across the Project Area.**

# 3 COMPLIANCE AND LEGISLATIVE SUMMARY

Impacts on biodiversity because of the Project, including clearing of native vegetation and impact to threatened species and ecological communities, are subject to Commonwealth and State legislation as listed in Table 4. The relevance of this legislation to the Project is discussed further in the following sections.

**Table 4. Commonwealth and South Australian legislation relevant to the Project Area.**

| Jurisdiction | Legislation |
|---|---|
| Commonwealth | • *Environment Protection and Biodiversity Conservation Act 1999* |
| South Australia | • *Native Vegetation Act 1991* – Heritage Agreement<br>• *National Parks and Wildlife Act 1972*<br>• *Landscape South Australia Act 2019*<br>• *Planning Development and Infrastructure Act 2016* |

Note: This summary is not intended to be a substitute for particular legal advice and does not address the legal implications of every set of circumstances.

## 3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act and the Environment Protection and Biodiversity Conservation Regulations 2000 provide a legal framework to protect and manage Nationally and Internationally important flora, fauna, ecological communities and heritage places – defined in the Act as MNES (DoE 2013a). The nine MNES protected under the Act are:

1. World Heritage properties;
2. National Heritage places;
3. Wetlands of international importance (listed under the Ramsar Convention);
4. Listed threatened species and ecological communities;
5. Migratory species protected under international agreements;
6. Commonwealth marine areas;
7. The Great Barrier Reef Marine Park;
8. Nuclear actions (including uranium mines); and
9. A water resource, in relation to coal seam gas development and large coal mining development.

Matters 4 and 5 are of relevance to the Project and are discussed further in Section 5.

Any action that has, will have, or is likely to have a significant impact on MNES requires referral under the EPBC Act. Substantial penalties apply for undertaking an action that has, will have, or is likely to have a significant impact on a MNES without approval.

The EPBC Act Significant Impact Guidelines provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance.

## 3.2 Native Vegetation Act 1991

The Project Area is currently subject to the NV Act. Native vegetation within the Project Area is protected under the NV Act and *Native Vegetation Regulations 2017*. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the NV Act Principles of Clearance and requires approval from the Native Vegetation Council (NVC). A net environmental benefit, either through contribution to the Native Vegetation Fund or via implementation of an on-ground SEB, is generally conditional on an approval being granted.

Native vegetation refers to any naturally occurring local plant species that are indigenous to South Australia, from small ground covers and native grasses to large trees and water plants.

“Clearance", in relation to native vegetation, means:

- The killing or destruction of native vegetation.
- The removal of native vegetation.
- The severing of branches, limbs, stems, or trunks of native vegetation.
- The burning of native vegetation.

Any other substantial damage to native vegetation, including the draining or flooding of land, or any other act or activity, that causes the killing or destruction of native vegetation, the severing of branches, limbs, stems or trunks of native vegetation or any other substantial damage to native vegetation.

Approval must be obtained before performing any activity that could cause substantial damage to native plants. This also applies to dead trees that may provide habitat for animals. These activities include but are not limited to:

- The cutting down, destruction or removal of whole plants.
- The removal of branches, limbs, stems, or trunks (including brush cutting and woodcutting).
- Burning.
- Poisoning.
- Slashing of understorey.
- Drainage and reclamation of wetlands.
- Grazing by animals (in some circumstances).
- Change of land use.

Under the NV Act, the NVC considers applications to clear native vegetation under ten principles. Native vegetation should not be cleared if it is significantly at odds with these principles:

- It contains a high level of diversity of plant species.
- It is an important wildlife habitat.
- It includes rare, vulnerable, or endangered plant species.

- The vegetation comprises a plant community that is rare, vulnerable, or endangered.
- It is a remnant of vegetation in an area which has been extensively cleared.
- It is growing in, or association with, a wetland environment.
- It contributes to the amenity of the area.
- The clearance of vegetation is likely to contribute to soil erosion, salinity, or flooding.
- The clearance of vegetation is likely to cause deterioration in the quality of surface or underground water.
- After clearance, the land is to be used for a purpose which is unsustainable.

The principles apply in all cases, except where the clearance of native vegetation fits an exemption set out in the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving a SEB to offset the clearance. The requirement for a SEB also applies to several of the exemptions. Potential SEB offsets include:

- The establishment and management of a set-aside area to encourage the natural regeneration of native vegetation.
- The protection and management of an established area of native vegetation.
- Entering into a Heritage Agreement on land where native vegetation is already established to further preserve or enhance the area in perpetuity.
- A payment to the Native Vegetation Fund.

The Regulations that may be relevant to this Project and any requirements are listed in (Table 5).

**Table 5. Native Vegetation Regulations that may be relevant to the Project.**

| Regulation (Schedule 1 activity) | Description of Activity | Proponent must comply with the following requirements |
|---|---|---|
| Regulation 12 (34) – Infrastructure | To allow clearance of vegetation incidental to the construction or expansion of a building or infrastructure (and associated services) where the Minister has declared that the clearance is in the public interest.<br>‘Infrastructure’ is defined in the definitions of the regulations. | 1. Clearance incidental to the construction or expansion of a building or infrastructure where it is deemed the clearance is in the public interest; and/or<br>2. Clearance is required in connection with the provision of infrastructure or services to a building or place provided that consent under the **Development Act 1993* has been obtained; and/or<br>3. Clearance is undertaken in accordance with an Native Vegetation Council approved Standard Operating Procedure. |

***the *Development Act 1993* was superseded by the *Planning Development and Infrastructure Act 2016*.**

## 3.3 National Parks and Wildlife Act 1972

Native plants and animals in South Australia are protected under the NPW Act. It is an offence to take a native plant or protected animal without approval. Threatened plant and animal species are listed in Schedules 7 (Endangered species), 8 (Vulnerable species) and 9 (Rare species) of the Act. Persons must not:

- Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land.
- Take a native plant of a prescribed species on private land. Take a native plant on private land without the consent of the owner (such plants may also be covered by the NV Act).
- Take a protected animal or the eggs of a protected animal without approval.
- Keep protected animals unless authorised to do so.
- Use poison to kill a protected animal without approval.

Conservation rated flora and fauna species listed on Schedules 7, 8, or 9 of the NPW Act may occur within the Project Area. Persons must comply with the conditions imposed upon permits and approvals.

## 3.4 Landscape South Australia Act 2019

The LSA Act repealed the *Natural Resources Management Act 2004*. Under the LSA Act, new regional landscape boards have been established. The aim is to deliver Landscape related services to regional communities, including effective water management, pest plant and animal control, soil and land management and support for broader sustainable primary production programs.

Under the LSA Act, landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

The Project Area is in the Northern and Yorke Management Region.

## 3.5 Planning Development and Infrastructure Act 2016

The *Planning Development and Infrastructure Act 2016* (PDI Act) repealed the *Development Act 1993*. The PDI Act, along with *the Planning, Development and Infrastructure (General) Regulations 2017* (PDI Regs) and *Planning and Design Code*, provide the legislative framework for carrying out planning and development works within the state. The *Planning and Design Code* is the planning policy for assessing development applications. No development can be undertaken without an appropriate Development Approval being obtained from the relevant authority after an application and assessment process.

# 4 METHODS

## 4.1 Desktop assessment

A desktop assessment was undertaken to determine the potential for any additional threatened flora and fauna species as well as Threatened Ecological Communities (TECs) (both Commonwealth and State listed) to occur within the Project Area.

### *4.1.1 Protected Matters Search Tool*

A Protected Matters Search Tool (PMST) report was generated on 3 June 2024 to identify MNES under the EPBC Act (DCCEEW 2023) within 5 km of the Project Area (Search Area). The PMST is maintained by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and was used to identify flora and fauna species or ecological communities of national environmental significance that may occur or have suitable habitat within the Project Area. Marine and/or wetland species were omitted from the scoresheets given the Project Area impacts terrestrial habitats only.

### *4.1.2 Biological Database of South Australia*

A Biological Database of South Australia (BDBSA) search was obtained from the Department of Environment and Water (DEW) on 11 June 2024 (Recordset number: DEWNRBDBSA240611-2) to identify threatened flora and fauna species previously recorded within the Search Area (DEW 2021). The BDBSA is comprised of an integrated collection of corporate databases which meet DEW standards for data quality, integrity and maintenance. In addition to DEW biological data, the BDBSA also includes data from partner organisations (Birds Australia, Birds SA, Australasian Wader Study Group, SA Museum, and other State Government Agencies).

### *4.1.3 Assessment of the likelihood of occurrence*

The likelihood of each threatened flora and fauna species potentially occurring within the Project Area was assessed. A likelihood of occurrence rating (Highly Likely, Likely, Possible, Unlikely) was assigned to each threatened species identified in the desktop database searches. The ratings take the following criteria into consideration:

**Table 6. Criteria for the likelihood of occurrence of threatened species.**

| Likelihood | Criteria |
|---|---|
| Highly Likely | Records in the last 10 years, the species does not necessarily have highly specific needs, and the habitat is largely intact. |
| Likely | Records in the last 10 years, the species does not have highly specific habitat needs and the habitat is largely intact, or<br>Records in the last 10 years, the species does have highly specific habitat needs and these needs occur in the area. |
| Possible | No records, survey effort is considered not adequate, suitable habitat does occur (or isn't known if it does occur) and species of similar habitat needs have been recorded in the area, or<br>Records within the last 40 years, and the area is not largely intact, or<br>Records in the last 10 years, the species does not have highly specific needs, and habitat is largely intact. |
| Unlikely | No records despite survey effort considered adequate, or |

| Likelihood | Criteria |
|---|---|
| | No records and survey effort are considered not adequate, and no suitable habitat is known to occur in the area, or<br>No records and survey effort are not considered adequate, and no suitable is known to occur in the area, and species of similar habitat needs have no records either. |

## 4.2 Field assessment

A total of two individual field assessments were conducted for the Project:

- Survey of cadastral boundary S39, S44, S46, S55, S56, S394, S395, from the 28 February to 3 March 2022 by Ecologists E. West and N. Piscioneri.
- Survey of cadastral boundary S28 from the 21 to 25 November 2022 by Ecologist E. West and NVC accredited consultant E. Tremain.

The condition of all remnant native vegetation patches and remnant isolated trees contained within the Project Area was assessed in accordance with the Bushland Assessment Method (BAM) (NVC 2020a) and the Scattered Tree Assessment Manual (STAM) (NVC 2020b). These methods require desktop and field assessments to determine the SEB offset requirements and potential values for payment into the Native Vegetation Fund resulting from the clearance of native vegetation.

EBS Ecology operates under the following research and ethics permits/licenses:

- Scientific Research Permit No. K25613-22 (Department for Environment and Water).

The survey methods are summarised below in the following sections.

### *4.2.1 Vegetation associations and condition*

Vegetation associations and condition were surveyed according to the BAM. The SA Government’s Native Vegetation Management Unit developed the BAM to assess areas of native vegetation requiring clearance and to calculate the SEB requirements. The method is derived from the Nature Conservation Society of South Australia’s Bushland Condition Monitoring (BCM) methodology (Croft *et al.* 2005-2009). The BAM requires quantitative on ground and desktop assessments of native vegetation and ecological values.

When using the BAM, each area to be assessed (i.e., each application area) is termed a ‘Block’, which is further stratified into ‘Sites’. Each Site relates to a vegetation association found within the Block, which are assessed in representative 1- ha quadrats and compared to BCM ‘benchmark’ vegetation communities.

Three components of the biodiversity value of the Site are measured and scored:

- Landscape context;
- Vegetation condition; and
- Conservation significance.

The factors that influence each of these components and their score ranges are described in Table 7. The scores of these three components are combined to provide the Unit Biodiversity Score (UBS) (per ha) and then multiplied by the size (ha) of each Site to provide the Total Biodiversity Score for each Site.

**Table 7. Factors that influence the value in the BAM scoresheet (NVC 2020a).**

| Component | Factors | Score range |
|---|---|---|
| Landscape context | • Percentage vegetation cover within 5 km.<br>• Block shape (cleared perimeter: area ratio).<br>• Native vegetation rampancy of IBRA Association.<br>• Percentage of native vegetation protected within the IBRA Association; and<br>• The presence of riparian vegetation, swamps, or wetlands. | 1.00-1.25 |
| Vegetation condition | • Native plant species diversity.<br>• Number of native lifeforms and their cover.<br>• Number of regenerating species.<br>• Weed cover and the level of invasiveness of dominant weed species.<br>• Mature tree health, fallen timber, hollow bearing trees, and tree canopy; and<br>• Native: exotic understorey biomass. | max 80.00 |
| Conservation significance | • The presence of federal or state listed threatened ecological communities, and their conservation rating.<br>• Number of threatened plant species recorded at the site, and their conservation rating; and<br>• Number of threatened fauna species and their conservation rating or potential habitat occurs within the site. | 1.00-1.50 |
| Mean annual rainfall | • The mean annual rainfall for the site. | - |
| Area of clearance | • The area of native vegetation (ha) to be cleared for the Project. | - |

BAM assessments were undertaken in all identified patches of native vegetation within the Project Area. Conservation significance scores were calculated using direct observations of flora and direct and historical observations of fauna species of conservation significance (i.e., desktop analysis results). Historical fauna observations within 5 km of the Project Area were obtained from the PMST and BDBSA. Only BDBSA and NatureMaps records since 1995, with a reliability of less than (<) 1 kilometre (unless denatured) were used. For the PMST, only species or species habitat *known to occur* within a 5 km buffer were included (as per the BAM manual; NVC 2020a). Marine and/or wetland species were omitted from the SEB scoresheets given the Project Area impacts terrestrial habitats only.

The mean annual rainfall used for the BAM scoresheets was obtained from the climate overlay on NatureMaps ‘Mean Annual Rainfall 1976 – 2005’ (DEW 2023).

Due to the variation in vegetation across the Project Area, blocks were determined after the field survey. Sites within each block were based on the BCM Community and dominant species within each site.

Block B was established as the sites within this block are in a similar condition and in close proximity to each other although some sites are not contiguous and greater than 30 metre apart.

Other blocks within the Project Area were established due to the contiguous nature of vegetation.

#### *4.2.2 Scattered Tree Assessment Method*

The STAM is derived from the *Scattered Tree Clearance Assessment in South Australia*: *Streamlining, Guidelines for Assessment and Rural Industry Extension* report (Cutten and Hodder 2002). The STAM is suitable for assessing scattered trees in the following instances:

- Individual scattered trees (i.e., canopy does not overlap). The spatial distribution of trees may vary from approaching what would be considered their original distribution (pre-European) through to single isolated trees in the middle of a paddock; or
- Dead trees (when a dead tree is considered native vegetation); or
- Clumps of trees (contiguous overlapping canopies) if the clump is small (approximately <0.1 ha); and
- For both scattered trees and clumps:
    - The ground layer comprises wholly or largely of introduced species;
    - Some scattered colonising native species may be present, but represent <5% of the ground cover; and
    - The area around the trees consists of introduced pasture or crops.

Details of the scattered tree Point Scoring System are outlined in the Scattered Tree Assessment Manual (NVC 2020b).

Where any trees had already been pruned, the height and condition of a nearby tree of approximate or larger size was used as a proxy for the height. The extent of the pruning was also estimated.

The numbers of threatened scattered tree using fauna species entered into the Scattered Tree Scoresheet were calculated by cross-referring the BDBSA data extract and the lists of scattered-tree-using fauna in the Scattered Tree Assessment Manual (NVC 2020b). The resource use of each species identified was considered when determining each tree's suitability for threatened fauna species (e.g. species that only use hollows in scattered trees were only assigned to scattered trees containing hollows).

#### *4.2.3 Fauna*

All native and exotic vertebrate fauna species opportunistically encountered during the field survey (directly observed, or tracks, scats, burrows, nests, and other signs of presence) were recorded across the Project Area. Potential fauna refuge sites, such as hollows, rock crevices and creek lines were noted as an indication of availability of suitable habitat. Particular attention was given to identifying potential habitat for threatened species. For each opportunistic fauna observation, the species, number of individuals, GPS location, detection methodology (sight, sound, or sign) and habitat were recorded.

## 4.3 Limitations

### *4.3.1 Desktop assessment*

The desktop assessment was based on existing datasets and references from a range of sources. EBS Ecology has not attempted to verify the accuracy of any such information. The findings and conclusions expressed by EBS Ecology are based solely upon information in existence at the time of the assessment.

Flora and fauna records were sourced from the PMST and BDBSA. The BDBSA only includes verified flora and fauna records submitted to DEW or partner organisations. It is recognised that knowledge is poorly captured, and it is possible that significant species occur that are not reflected by database records. Although much of the BDBSA data has been through a variety of validation processes, the lists may contain errors and should be used with caution. DEW give no warranty that the data is accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

The EPBC Act protected matters report, NatureMaps extract and BDBSA flora and fauna records were limited to a 5 km buffer around the Project Area. Fauna species, in particular birds can traverse distances in excess of 20 km. It is also acknowledged that the presence of species may not be adequately represented by database records. Hence the EPBC and BDBSA results may not highlight all potential threatened flora and fauna species that may occur in the area. A precautionary approach has therefore been adopted, with reference to existing EPBC and BDBSA records and native vegetation cover. The combination of database records and background research have provided a solid baseline foundation for determining the flora and fauna that are likely to, or are known to, occur within the Project Area.

Threatened species, ecological communities and key threatening processes that are protected under the EPBC Act undergo revisions. Furthermore, new species nominated by the public are added to Finalised Priorities Lists for assessment to determine if they are eligible for including on the list of threatened fauna, flora, or ecological communities, or on the list of key threatening processes under the EPBC Act. The Threatened Species Scientific Committee (TSSC) considers the nominations in June each year and prepares a proposed priority assessment list for the Minister to consider (DCCEEW 2023). Threatened species listed in the report are based solely upon information in existence at the time of the assessment. Therefore, future assessment may be required.

### *4.3.2 Flora*

At the time the survey was undertaken, not all plant species may have been visibly present. Some species such as native orchids and lilies are particularly hard to detect when not in flower. It is possible that some flora species were present but not detected. Grasses and forbs lacked diagnostic features such as flowers and seed heads, which made identification to species level difficult.

### *4.3.3 Spatial data limitations*

All spatial data has been captured or converted to the following coordinate reference system.

**Datum:** Geocentric Datum of Australia 2020 (GDA2020).

**Projection:** Map Grid of Australia 2020 (MGA2020), Zone 53H.

All location coordinates listed in this report are expressed using this system. Spatial data converted from other coordinate reference systems may have accuracy limitations.

#### *4.3.4 Survey site naming*

The survey site naming (e.g. A1, B1) has been developed to support this Ecological Assessment and naming of sites have been chosen by the author of the report. As the Project Area has changed for each iteration of this report, the naming of the sites has also changed.

# 5 DESKTOP RESULTS

This section presents the results of the desktop assessment, including a summary of both the PMST and BDBSA search results within the Search Area. This also includes an assessment of the likelihood of identified threatened species and TECS occurring within the Project Area.

## 5.1 Matters of National Environmental Significance

The PMST report identified that four MNES protected under the EPBC Act occur within the Search Area:

- One TEC.
- 23 Nationally threatened species.
- Nine Migratory species.

This information is summarised in Table 8 and the relevant MNES protected by the EPBC Act are discussed in more detail further below. Marine species are not further discussed in this report as the Project Area is entirely terrestrial, and as such Marine species are not relevant.

**Table 8. Matters of National Environmental Significance potentially occurring within the Search Area (DCCEEW 2024).**

| Matters of National Environmental Significance | Identified within the search area (5 km buffer) |
|---|---|
| World Heritage Properties | None |
| National Heritage Places | None |
| Wetlands of International Importance | None |
| Great Barrier Reef Marine Park | None |
| Commonwealth Marine Area | None |
| Listed Threatened Ecological Communities | 1 |
| Listed Threatened Species | 23 (11 flora and 12 fauna species) |
| Listed Migratory Species | 9 |
| **Other Matters Protected by the EPBC Act** | |
| Commonwealth Lands | None |
| Commonwealth Heritage Places | None |
| Listed Marine Species: | 15 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |
| Habitat Critical to the Survival of Marine Turtles: | None |

## 5.2 Threatened Ecological Communities

One TEC was identified as Likely within the Search Area, this includes the Endangered Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland (EPBGW) (Figure 5). The EPBGW grows within the Eyre Hills sub-regions of the southern and eastern Eyre Peninsula. They are usually found within low-lying areas along creeks and water courses. This TEC is primarily described by the dominant overstorey plants, the EP Blue Gum, species that are likely to co-exist with EP Blue Gum include, Dropping Sheoaks, Sugar Gums, Peppermint Box and Mallee box. The midstorey is likely to consist of small sclerophyllous shrubs and small trees such as Bitter-peas, Wattles, and Grevilleas. The understorey consists of low grasses and sedges such as Wallaby grass, Spear grass and herbaceous forbs such as native orchids and lilies (Natural Resources Eyre Peninsula 2019).

## 5.3 Threatened flora

### *5.3.1 Nationally listed flora species*

A total of 11 Nationally listed threatened flora species were identified from the PMST as occurring within the Search Area (Table 10 and Figure 5). No species have been assessed as likely occurring. However, five following species have been assessed as possibly occurring due to suitable habitat within the Project Area, this includes:

- *Caladenia brumalis* (Winter Spider-orchid) – Nationally and State Vulnerable.
- *Caladenia tensa* (Greencomb Spider-orchid) – Nationally Endangered.
- *Pterostylis mirabilis* (Nodding Rufoushood) - Nationally and State Vulnerable.
- *Pterostylis sp. Hale (R. Bates 21725)* (Hale Dwarf Greenhood) – Nationally Endangered and State Vulnerable.
- *Pterostylis xerophila* (Desert Greenhood) – Nationally and State Vulnerable.

### *5.3.2 State listed flora species*

One additional species were identified from the BDBSA data request, this includes the State Rare *Eucalyptus Cretata* (Darke Peak Mallee). This species has been assessed as unlikely occurring within the Project Area as this species was not identified during any of the field surveys.

**Table 9. Likelihood occurrence of threatened flora species within the Search Area (green shading = likely/known to occur, orange shading = possible occurrence).**

| Scientific name | Common name | Conservation status | | Source | PMST Presence / Year | Likelihood within the Project Area |
|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | |
| *Acacia enterocarpa* | Jumping-jack Wattle | EN | E | 1 | May occur | Unlikely |
| *Acacia praemorsa* | Senna Wattle | VU | E | 1 | Likely to occur | Unlikely |
| *Acacia rhetinocarpa* | Neat Wattle | VU | V | 1 | Likely to occur | Unlikely |
| *Caladenia brumalis* | Winter Spider-orchid | VU | V | 1 | May occur | **Possible** |

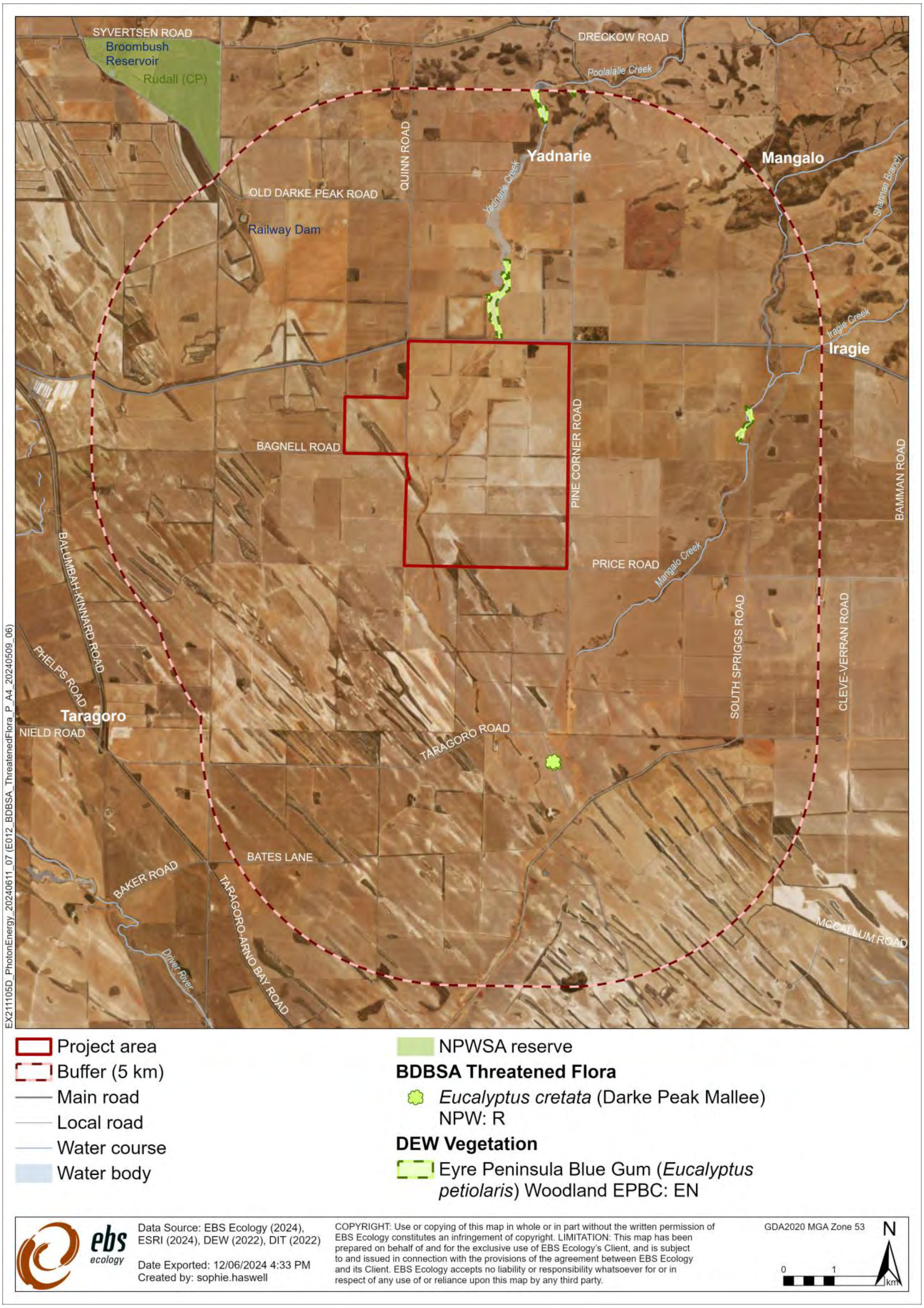
| Scientific name | Common name | Conservation status | | Source | PMST Presence / Year | Likelihood within the Project Area |
|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | |
| *Caladenia tensa* | Greencomb Spider-orchid | EN | - | 1 | Likely to occur | **Possible** |
| *Eucalyptus cretata* | Darke Peak Mallee | | R | 2 | 2013 | Unlikely |
| *Limosella granitica* | Granite Mudwort | VU | | 1 | May occur | Unlikely |
| *Olearia pannosa ssp. pannosa* | Silver Daisy-bush | VU | V | 1 | May occur | Unlikely |
| *Pterostylis mirabilis* | Nodding Rufoushood | VU | V | 1 | Likely to occur | **Possible** |
| *Pterostylis sp. Hale (R. Bates 21725)* | Hale Dwarf Greenhood | EN | V | 1 | May occur | **Possible** |
| *Pterostylis xerophila* | Desert Greenhood | VU | V | 1 | May occur | **Possible** |
| *Swainsona pyrophila* | Yellow Swainson-pea | VU | R | 1 | May occur | Unlikely |

**Conservation status**

**EPBC Act:** (*Environment Protection and Biodiversity Conservation Act 1999*). **NPW Act** (*National Parks and Wildlife Act 1972*).
**Conservation Codes**: **CE**: Critically Endangered. **EN/E**: Endangered, **R**: Rare.

**Source of Information**

1. EPBC Act Protected Matters Report (DCCEEW 2024) – 5 km buffer applied to Project Area.
2. Biological Database of South Australia data extract (DEW 2024) - 5 km buffer applied to Project Area.



Data Source: EBS Ecology (2024), ESRI (2024), DEW (2022), DIT (2022)

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**Figure 5. Location of threatened flora and Threatened Ecological Community located within the Search Area.**

## 5.4 Threatened fauna

The BDBSA search did not identify any State fauna records within the Search Area (DEW 2024).

### *5.4.1 Nationally threatened fauna*

A total of 12 listed threatened fauna species were identified by the PMST as potentially occurring within the Search Area (Table 10). One species, Southern Whiteface (*Aphelocephala leucopsis*) were assessed as likely to occur within the Project Area. An additional five species were assessed as having possible occurrence within the Project Area:

- Blue-winged Parrot (*Neophema chrysostoma*) – Nationally and State Vulnerable.
- Diamond Firetail (*Stagonopleura guttata*) – Nationally and State Vulnerable.
- Grey Falcon (*Falco hypoleucos*) – Nationally Vulnerable and State Rare.
- Malleefowl (*Leipoa ocellata*) – Nationally and State Vulnerable.
- Sandhill Dunnart (*Sminthopsis psammophila*) – Nationally Endangered and State Vulnerable.

**Table 10. Likelihood occurrence of threatened fauna species within the Search Area (green shading = likely/known to occur, orange shading = possible occurrence).**

| Scientific name | Common name | Conservation status | | Source | PMST Presence / Year of records | Likelihood within the Project Area |
|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | |
| **AVES** | | | | | | |
| *Aphelocephala leucopsis* | Southern Whiteface | VU | - | 1 | Likely to occur | **Likely** |
| *Calidris acuminata* | Sharp-tailed Sandpiper | VU, Mi (W) | - | 1 | May occur | Unlikely |
| *Calidris ferruginea* | Curlew Sandpiper | CE | E | 1 | May occur | Unlikely |
| *Falco hypoleucos* | Grey Falcon | VU | R | 1 | May occur | **Possible** |
| *Gallinago hardwickii* | Latham’s Snipe | VU, Mi (W) | - | 1 | May occur | Unlikely |
| *Grantiella picta* | Painted Honeyeater | VU | R | 1 | May occur | **Possible** |
| *Leipoa ocellata* | Malleefowl | VU | V | 1 | Likely to occur | **Possible** |
| *Neophema chrysostoma* | Blue-winged Parrot | VU | V | 1 | Likely to occur | **Possible** |
| *Pedionomus torquatus* | Plains-wanderer | CE | E | 1 | May occur | Unlikely |
| *Rostratula australis* | Australian Painted Snipe | EN | E | 1 | Likely to occur | Unlikely |
| *Stagonopleura guttata* | Diamond Firetail | VU | V | 1 | Likely to occur | **Possible** |
| **MAMMALIA** | | | | | | |
| *Sminthopsis psammophila* | Sandhill Dunnart | EN | V | 1 | Likely to occur | **Possible** |

**Conservation status**

**EPBC Act:** (*Environment Protection and Biodiversity Conservation Act 1999*). **NPW Act** (*National Parks and Wildlife Act 1972*).
**Conservation Codes**: **CE**: Critically Endangered. **EN/E**: Endangered, **R**: Rare.

**Source of Information**

1. EPBC Act Protected Matters Report (DCCEEW 2024a) - 5 km buffer applied to Project Area.
2. Biological Database of South Australia data extract (DEW 2024b) - 5 km buffer applied to Project Area.

### *5.4.2 Migratory fauna*

A total of nine species listed Migratory were located within the Search Area. The Fork-tailed Swift were assessed as possibly occurring as a fly over only (Table 11).

**Table 11. Likelihood occurrence of migratory fauna species within the Search Area green shading = likely/known to occur, orange shading = possible occurrence).**

| Scientific name | Common name | Conservation status | | PMST Presence / Year of records | Likelihood within the Project Area |
|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | |
| **AVES** | | | | | |
| *Actitis hypoleucos* | Common Sandpiper | Mi (W) | R | May occur | Unlikely |
| *Apus pacificus* | Fork-tailed Swift | VU, Mi (Ma) | | Likely to occur | **Possible** – flyover only |
| *Calidris acuminata* | Sharp-tailed Sandpiper | Mi (W) | | May occur | Unlikely |
| *Calidris ferruginea* | Curlew Sandpiper | CE, Mi (W) | E | May occur | Unlikely |
| *Calidris melanotos* | Pectoral Sandpiper | Mi (W) | R | May occur | Unlikely |
| *Charadrius veredus* | Oriental Plover | Mi (W) | | May occur | Unlikely |
| *Gallinago hardwickii* | Latham's Snipe | Mi (W) | R | May occur | Unlikely |
| *Motacilla cinerea* | Grey Wagtail | CE, Mi (T) | | May occur | Unlikely |
| *Motacilla flava* | Yellow Wagtail | VU, Mi (T) | | May occur | Unlikely |

**Conservation status**

**EPBC Act:** (*Environment Protection and Biodiversity Conservation Act 1999*). **NPW Act** (*National Parks and Wildlife Act 1972*).
**Conservation Codes**: **CE**: Critically Endangered. **EN/E**: Endangered, **R**: Rare.

**Source of Information**

1. EPBC Act Protected Matters Report (DCCEEW 2024a) ‐ 5 km buffer applied to Project Area.
2. Biological Database of South Australia data extract (DEW 2024b) - 5 km buffer applied to Project Area.

# 6 FIELD SURVEY RESULTS

## 6.1 Flora

The field surveys recorded 147 plant species the entire Project Area, of which 33 were introduced exotic species.

No species listed as threatened under the NPW Act and/or the EPBC Act were recorded within the Project Area. Plants observed during the survey are listed in Appendix 1.

## 6.2 Fauna

A total of 36 fauna species (or evidence of) were observed within the Project Area or between sites during the field surveys (Appendix 2). This included 32 bird species, three mammals, and one reptile. Four of these fauna species were introduced. Warrens of the European Rabbit (*Oryctolagus cuniculus*) were present in the centre of the Project Area.

No fauna species listed as threatened under the NPW Act or EPBC Act were recorded.

### *6.2.1 Fauna habitat*

The remnant old growth mallee that remains within the Project Area contains significant small, medium and large hollows (Figure 6). These hollows provide essential breeding and roosting habitat for numerous fauna species.

**Figure 6. Example of a large hollow in a *Eucalyptus* sp. tree within the Project Area.**

## 6.3 Weeds

A total of 33 introduced plants were recorded during the field surveys. Of these, seven are Declared plants under the LSA Act, as indicated in Table 12. Three species, *Asparagus asparagoides f.* (Bridal Creeper), *Lycium ferocissimum* (African Boxthorn) and *Solanum elaeagnifolium* (Silver-leaf Nightshade) are also listed as WoNS.

**Table 12. Introduced plants recorded during the survey.**

| Scientific Name | Common Name | LSA Act Status | WoNS |
|---|---|---|---|
| *Agave* | | - | - |
| *Aira* sp. | Hair-grass | - | - |
| *Aizoon pubescens* | Coastal Galenia | - | - |
| *Asphodelus fistulosus* | Onion Weed | - | - |
| *Avena barbata* | Bearded Oat | - | - |
| *Arctotheca calendula* | Cape Weed | - | - |
| *Asparagus asparagoides* f. | Bridal Creeper | Declared | Yes |
| *Asphodelus fistulosus* | Onion Weed | - | - |
| *Avena barbata* | Bearded Oat | - | - |
| *Avena fatua* | Wild Oat | - | - |
| *Brassica* sp. | | - | - |
| *Bromus diandrus* | Great Brome | - | - |
| *Carrichtera annua* | Ward's Weed | - | - |
| *Citrullus* sp. | Wild Melon | - | - |
| *Conyza bonariensis* | Flax-leaf Fleabane | - | - |
| *Cucumis myriocarpus* ssp. *myriocarpus* | Paddy Melon | - | - |
| *Echium plantagineum* | Salvation Jane | Declared | - |
| *Ehrharta calycina* | Perennial Veldt Grass | - | - |
| *Euphorbia terracina* | False Caper | - | - |
| *Gazania linearis* | Gazania | Declared | - |
| *Gazania* sp. | African Daisies | Declared | - |
| *Heliotropium europaeum* | Common Heliotrope | - | - |
| *Hordeum vulgare* | Barley Grass | - | - |
| *Lolium perenne* | Perennial Ryegrass | - | - |
| *Lycium ferocissimum* | African Boxthorn | Declared | Yes |
| *Malva* sp. | Mallow | - | - |
| *Malva parviflora* | Small-flower Marshmallow | - | - |
| *Marrubium vulgare* | Horehound | Declared | |
| *Mesembryanthemum crystallinum* | Common Iceplant | - | - |
| *Medicago* sp. | Medic | - | - |
| *Oxalis pes-caprae* | Soursob | - | - |
| *Reichardia tingitana* | False Sowthistle | - | - |
| *Rumex hypogaeus* | Three-corner Jack | - | - |
| *Salvia verbenaca* var. | Wild Sage | - | - |
| *Sisymbrium* sp. | Wild Mustard | - | - |
| *Solanum elaeagnifolium* | Silver-leaf Nightshade | Declared | Yes |
| *Solanum nigrum* | Black Nightshade | - | - |

| Scientific Name | Common Name | LSA Act Status | WoNS |
|---|---|---|---|
| *Tribulus terrestris* | Caltrop | Declared | - |
| *Thinopyrum elongatum* | Tall Wheat-grass | - | - |
| *Trifolium arvense* var. *arvense* | Hare's-foot Clover | - | - |
| *Vulpia* sp. | Fescue | - | - |

**LSA Act: *Landscape of South Australia Act 2017.* WoNS: Weeds of National Significance.**

## 6.4 Vegetation associations

The survey identified and mapped nine VA across the Project Area across 149.816 ha of vegetation, as listed in Table 13 and show in **Figure 7**.

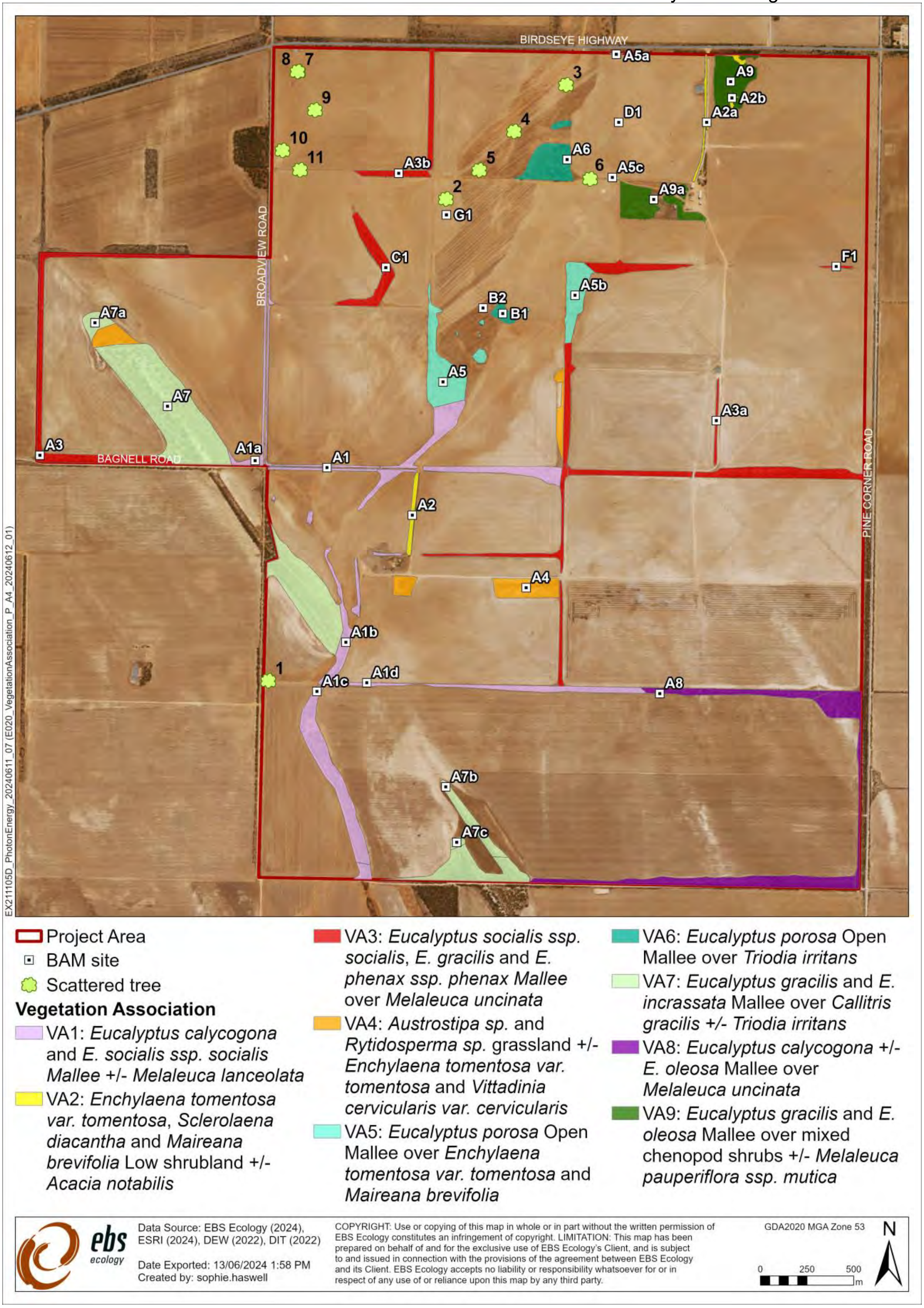
The VAs in the Project Area but was mostly dominated by mallee community (139.500 ha), which consisted of numerous *Eucalyptus* species such as, *Eucalyptus calycogona* (Square-fruit Mallee, *E. socialis* (Beaked Red Mallee), *E. gracilis* (Yorrell), *E. phenax* (White Malle), *E. incrassata* (Ridge-fruited Mallee) and *E. porosa* (Mallee box). The soil type influenced the variation in mallee, with inland sandy low dunes inhabiting open mallee over sclerophyllous shrubs over *Triodia irritans* (Spinifex). Clay loam flats gave way to mallee over chenopods shrubs such as *Enchylaena tomentosa* (Ruby Saltbush), *Salsola australis* (Buckbush) and *Atriplex* spp. (Saltbush).

Due to the clearance history of the area, these VAs now exist as isolated patches within cropping land and along road reserves.

Vegetation condition was mostly in poor to good condition across this Site.

**Table 13. Vegetation associations located within the Project Area.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted | Block | Reference |
|---|---|---|---|---|---|
| VA 1 | *Eucalyptus calycogona* and *E. socialis* ssp. *socialis* Mallee +/- *Melaleuca lanceolata* | 28.122 | 2.915 | A, B and G | Table 14 |
| VA 2 | *Enchylaena tomentosa* var. *tomentosa*, *Sclerolaena diacantha* and *Maireana brevifolia* Low shrubland +/- *Acacia notabilis* | 2.144 | 0.577 | A and D | Table 15 |
| VA 3 | *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata* | 30.005 | 11.892 | A, C, D and F | Table 16 |
| VA 4 | *Austrostipa* sp. and *Rytidosperma* sp. Grassland +/- *Enchylaena tomentosa* var. *tomentosa* and *Vittadinia cervicularis* var. *cervicularis* | 8.173 | 1.425 | A | Table 17 |
| VA 5 | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 | A, B and D | Table 18 |
| VA 6 | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 | B and E | Table 19 |
| VA 7 | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0 | A and B | Table 20 |
| VA 8 | *Eucalyptus calycogona +/- E. oleosa* Mallee over *Melaleuca uncinata* | 15.034 | 0.132 | A and B | Table 21 |
| VA 9 | *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica* | 9.784 | 4.961 | D | Table 22 |
| **TOTAL (ha)** | | **149.816** | **33.425** | | |



Data Source: EBS Ecology (2024), ESRI (2024), DEW (2022), DIT (2022)

Date Exported: 13/06/2024 1:58 PM
Created by: sophie.haswell

**Figure 7. Vegetation Associations, Bushland Assessment (BAM) sites and scattered trees within the Project Area.**

**Table 14. VA 1: *Eucalyptus calycogona* and *E. socialis* ssp. *socialis* Mallee +/- *Melaleuca lanceolata*.**

<table>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="2"><b>Upper Storey</b></td><td colspan="2"><b>Mid Storey</b></td><td><b>Lower Storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus calycogona</i><br><i>E. socialis</i> ssp. <i>socialis</i><br><i>E. phenax</i> ssp. <i>phenax</i><br><i>E. gracilis</i></td><td colspan="2"><i>Acacia halliana</i><br><i>Melaleuca lanceolata</i><br><i>Santalum acuminatum</i></td><td><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Atriplex crassipes</i> var. <i>crassipes</i><br><i>Sclerolaena diacantha</i><br><i>Maireana brevifolia</i><br><i>Salsola australis</i><br><i>Vittadinia cuneata</i> var. <i>cuneata</i></td></tr>
<tr><td colspan="5">Mallee dominated by <i>Eucalyptus calycogona</i> (Ridge-fruited Mallee) and <i>E. socialis</i> ssp. <i>socialis</i> (Beaked Mallee). Other tree species present include <i>E. phenax</i> ssp. <i>phenax</i> (White Mallee) and <i>E. gracilis</i> (Yorrell).<br>Open, low chenopod and shrub understorey with <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Sclerolaena diacantha</i> (Grey Bindyi) and <i>Maireana brevifolia</i> (Short-leaf Bluebush). Isolated tall shrubs of <i>Acacia halliana</i> (Hall's Wattle), <i>Melaleuca lanceolata</i> (Dryland Tea-tree) and <i>Santalum acuminatum</i> (Quandong) are also present.<br>Ground strata is dominated by <i>Austrostipa</i> sp. (Spear-grass), <i>Enneapogon</i> sp. (Bottle-washers/Nineawn) and <i>Atriplex crassipes</i> var. <i>crassipes</i> with some weed intrusions.<br>The VA occurs in the southern to central part of the Project Area on clay loam soil flats.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 6.2 Mallee with Open Shrub Understorey on Clay loam Soil Flats.</td></tr>
<tr><td><b>Survey Sites</b></td><td>A1, A1a, A1b, A1c, A1d and G1</td><td><b>Vegetation Condition Score</b></td><td><b>Block A:</b> 37.892<br><b>Block G:</b> 35.100</td><td><b>Area (ha)</b></td><td>28.122</td></tr>
</table>

**Table 15. VA 2: *Enchylaena tomentosa* var. *tomentosa, Sclerolaena diacantha* and *Maireana brevifolia* Low shrubland +/- *Acacia notabilis.***

<table>
<tr><td rowspan="3"><b>General Description</b></td><td><b>Upper Storey</b></td><td><b>Mid Storey</b></td><td colspan="4"><b>Lower Storey</b></td></tr>
<tr><td>N/A</td><td><i>Acacia notabilis</i></td><td colspan="4"><i>Maireana brevifolia</i><br><i>Sclerolaena diacantha</i><br><i>Salsola australis</i><br><i>Atriplex crassipes</i> var. <i>crassipes.</i></td></tr>
<tr><td colspan="6">Historical clearing has resulted in the degradation of the Mallee resulting in what now exists as a low open shrubland of <i>Enchylaena tomentosa var. tomentosa</i> (Ruby Saltbush), <i>Sclerolaena diacantha</i> (Grey Bindyi) and <i>Maireana brevifolia</i> (Short-leaf Bluebush) with scattered tall shrubs of <i>Pittosporum angustifolium</i> (Native Apricot). Ground strata is dominated by <i>Austrostipa</i> spp. (Spear-grass), <i>Rytidosperma caespitosum</i> (Common Wallaby-grass) and <i>Enneapogon</i> sp. (Bottle-washers/Nineawn). Weed cover at this VA was high with dominance from <i>Carrichtera annua</i> (Ward’s Weed) with some weed intrusions.<br>The VA occurs in the northern east and south west parts of the Project Area amongst planted vegetation and adjacent intact mallee.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="6">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td><b>Survey Sites</b></td><td>A2, A2a and A2b</td><td><b>Vegetation Condition Score</b></td><td><b>Block A:</b> 21.457</td><td><b>Area (ha)</b></td><td colspan="2">2.144</td></tr>
</table>

**Table 16. VA 3: *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata.***

<table>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="3">**General Description**</td><td colspan="2">**Upper Storey**</td><td colspan="2">**Mid Storey**</td><td>**Lower Storey**</td></tr>
<tr><td colspan="2">*Eucalyptus socialis* ssp. *socialis*<br>*E. phenax* ssp. *phenax*<br>*E. gracilis*<br>*E. incrassata*<br>*E. porosa*</td><td colspan="2">*Pittosporum angustifolium*<br>*Melaleuca uncinata*<br>*Callitris verrucosa*<br>*Santalum acuminatum*</td><td>*Triodia irritans*<br>*Enchylaena tomentosa* var. *tomentosa*<br>*Maireana brevifolia*<br>*Salsola australis*</td></tr>
<tr><td colspan="5">Mallee dominated by *Eucalyptus socialis* ssp. *socialis* (Beaked Red Mallee), *E. gracilis* (Yorrell) and *E. phenax* ssp. *phenax* (White Mallee). Other tree species present include *E. incrassata* (Ridge-fruited Mallee) and *E. porosa* (Mallee box). Open, low chenopod and shrub understorey with *E. tomentosa* var. *tomentosa* (Ruby Saltbush), *Maireana brevifolia* (Short-leaf Bluebush) and *Atriplex* spp. (Saltbush) Isolated tall shrubs of *Pittosporum angustifolium* (Native Apricot), *Melaleuca uncinata* (Broombush) and *Callitris verrucosa* (Scrub cypress Pine) are also present. Ground strata is dominated by *Dysphania cristata* (Crested Crumbweed) and *Austrostipa spp.* (Spear-grass) with weed species *Galenia pubescens* (Coastal Galenia) and *Mesembryanthemum crystallinum* (Common Iceplant) also common.<br>The VA is scattered across the Project Area boarding cropping paddocks.</td></tr>
<tr><td>**Benchmark Community**</td><td colspan="5">EP 5.2 Mallee on Sandy Loams of inland swales and low dunes</td></tr>
<tr><td>**Survey Sites**</td><td>A3, A3a, A3b, C1, F1</td><td>**Vegetation Condition Score**</td><td>**Block A:** 27.600<br>**Block C:** 37.89<br>**Block F**: 21.60</td><td>**Area (ha)**</td><td>30.005</td></tr>
</table>

**Table 17. VA 4: *Austrostipa sp.* and *Rytidosperma* sp. grassland +/- *Enchylaena tomentosa* var. *tomentosa* and *Vittadinia cervicularis* var. *cervicularis.***

<table>
<tr><td rowspan="3"><b>General Description</b></td><td><b>Upper Storey</b></td><td colspan="3"><b>Mid Storey</b></td><td><b>Lower Storey</b></td></tr>
<tr><td>N/A</td><td colspan="3"><i>Acacia rigens</i> (regeneration)<br><i>Melaleuca lanceolata</i> (regeneration)<br><i>Atriplex</i> spp.</td><td><i>Chloris truncata</i><br><i>Rytidosperma</i> sp.<br><i>Austrostipa</i> spp.<br><i>Enneapogon</i> sp.</td></tr>
<tr><td colspan="5">Grassland dominated by <i>Austrostipa</i> sp. (Spear-grass), and <i>Rytidosperma</i> sp. (Wallaby-grass) with species <i>Chloris truncata</i> and <i>Enneapogon</i> sp. (Bottle-washers/Nineawn) also present. Open, isolated chenopod and shrub understorey with <i>Acacia rigens</i> (Nealie), <i>Melaleuca lanceolata</i> (Dryland Tea-tree), <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Atriplex</i> spp. (Saltbush) and <i>Vittadinia cervicularis</i> var. <i>cervicularis</i> (Waisted New Holland Daisy).<br>The VA occurs in the southern, western and central parts of the Project Area.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td><b>Survey Sites</b></td><td>A4</td><td><b>Vegetation Condition Score</b></td><td><b>Block A:</b> 22.10</td><td><b>Area (ha)</b></td><td>8.173</td></tr>
</table>

**Table 18. VA 5: *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* and *Maireana brevifolia.***

<table>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="2"><b>Upper Storey</b></td><td colspan="2"><b>Mid Storey</b></td><td><b>Lower Storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus porosa</i></td><td colspan="2"><i>Alectryon oleifolius</i> ssp. <i>canescens</i><br><i>Acacia notabilis</i><br><i>A. halliana</i></td><td><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Maireana brevifolia</i><br><i>Salsola australis</i><br><i>Austrostipa</i> sp.<br><i>Tragus australianus</i><br><i>Enneapogon</i> sp.</td></tr>
<tr><td colspan="5">Open mallee dominated by <i>Eucalyptus porosa</i> (Mallee Box) and open, low chenopod and shrub understorey with <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Maireana brevifolia</i> (Short-leaf Bluebush) and <i>Salsola australis</i> (Buckbush). Isolated tall shrubs of <i>Alectryon oleifolius</i> ssp. <i>canescens</i> (Bullock Bush), <i>Acacia notabilis</i> (Notable Wattle) and <i>Acacia halliana</i> (Hall's Wattle) are also present.<br>Large patches of this VA were isolated within the centre of the Site. Smaller isolated patches were located towards the northern end of the Site.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td><b>Survey Sites</b></td><td>A5, A5a, A5b, A5c and B2</td><td><b>Vegetation Condition Score</b></td><td><b>Block A:</b> 36.980<br><b>Block B:</b> 30.980</td><td><b>Area (ha)</b></td><td>10.699</td></tr>
</table>

**Table 19. VA 6: *Eucalyptus porosa* Open Mallee over *Triodia irritans*.**

<table>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td><b>Upper Storey</b></td><td colspan="2"><b>Mid Storey</b></td><td colspan="2"><b>Lower Storey</b></td></tr>
<tr><td><i>Eucalyptus porosa</i></td><td colspan="2"><i>Acacia halliana</i><br><i>A. ligulata</i><br><i>Pittosporum angustifolium</i></td><td colspan="2"><i>Triodia irritans</i><br><i>Rytidosperma caespitosum</i><br><i>Austrostipa</i> spp.<br><i>Enneapogon</i> sp.<br><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Maireana brevifolia.</i></td></tr>
<tr><td colspan="5">Very open mallee dominated by <i>Eucalyptus porosa</i> (Mallee Box) with an open, low chenopod, shrub and hummock grass understorey consisting of <i>Enchylaena tomentosa var. tomentosa</i> (Ruby Saltbush), <i>Triodia irritans</i> (Spinifex) and <i>Maireana brevifolia</i> (Short-leaf Bluebush). Isolated tall shrubs of <i>Acacia halliana</i> (Hall’s Wattle), <i>A. ligulata</i> (Umbrella Bush) and <i>Pittosporum angustifolium</i> (Native Apricot).<br>Ground strata is dominated by native grasses such as <i>Chloris truncata</i> (Windmill Grass), <i>Rytidosperma caespitosum</i> (Common Wallaby-grass) and <i>Austrostipa</i> spp. (Spear-grass) with some weed intrusions.<br>The VA occurs in the centre of the Project Area on sand-loam soils.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey</td></tr>
<tr><td><b>Survey Sites</b></td><td>A6, B1 and D1</td><td><b>Vegetation Condition Score</b></td><td><b>Block A:</b> 47.740<br><b>Block B:</b> 19.910<br><b>Block D:</b> 18.430</td><td><b>Area (ha)</b></td><td>5.758</td></tr>
</table>

**Table 20. VA 7: *Eucalyptus gracilis* and *E. incrassata* Mallee over *Callitris gracilis* +/- *Triodia irritans*.**

<table>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="2"><b>Upper Storey</b></td><td colspan="2"><b>Mid Storey</b></td><td><b>Lower Storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus gracilis</i><br><i>E. incrassata</i></td><td colspan="2"><i>Acacia rigens</i><br><i>A. ligulata</i><br><i>Triodia irritans</i><br><i>Melaleuca uncinata</i><br><i>Callitris gracilis</i></td><td><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Maireana brevifolia</i><br><i>Rytidosperma</i> sp.<br><i>Austrostipa</i> spp.<br><i>Enneapogon</i> sp.</td></tr>
<tr><td colspan="5">Mallee dominated by <i>Eucalyptus gracilis</i> (Yorrell) and <i>Eucalyptus incrassata</i> (Ridge-fruited Mallee) and <i>Callitris gracilis</i> (Southern Cypress Pine). Open, low chenopod and shrub understorey with <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Maireana brevifolia</i> (Short-leaf Bluebush) and <i>Vittadinia</i> spp. (New Holland Daisy). Isolated tall shrubs of <i>Acacia rigens</i> (Nealie), <i>Acacia ligulata</i> (Umbrella Bush), <i>Melaleuca uncinata</i> (Broombush) and <i>Thryptomene micrantha</i> (Ribbed Thryptomene) are also present. Ground strata is dominated by <i>Austrostipa</i> sp. (Spear-grass), <i>Enneapogon</i> sp. (Bottle-washers/Nineawn) and <i>Carpobrotus rossii</i> (Native Pigface) with some weed intrusions.<br>This VA occurs in the southeast corner of the Project Area on inland swales in sandy soil and is not being impacted based on the current design.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 5.1 Mallee on Inland Sand Dunes and Deep Sands.</td></tr>
<tr><td><b>Survey Sites</b></td><td>A7, A7a, A7b and A7c</td><td><b>Vegetation Condition Score</b></td><td><b>Block A:</b> 25.958</td><td><b>Area (ha)</b></td><td>40.098</td></tr>
</table>

**Table 21. VA 8 *Eucalyptus calycogona +/- E. oleosa Mallee over Melaleuca uncinata.***

<table>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="2"><b>Upper Storey</b></td><td colspan="2"><b>Mid Storey</b></td><td><b>Lower Storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus oleosa</i> ssp. <i>oleosa</i><br><i>E. calycogona</i><br><i>E. socialis</i> ssp. <i>socialis</i></td><td colspan="2"><i>Melaleuca lanceolata</i><br><i>M. uncinata</i><br><i>Callitris verrucosa</i></td><td><i>Maireana brevifolia</i><br><i>Enchylaena tomentosa</i> var.<br><i>Sclerolaena diacantha</i></td></tr>
<tr><td colspan="5">This mallee has a medium vegetation condition score with a mixture of life forms varying from shrubs, forbs and vines with a number of regenerating species. Exotic species counts for these VAs has high with cover of <i>Galenia pubescens</i> var<i>. pubescens</i> (Coastal Galenia) and <i>Mesembryanthemum crystallinum</i> (Common Iceplant).<br>This VA was found along the outside of cropping paddocks to the north east side of the Project Area.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td><b>Survey Sites</b></td><td>A8</td><td><b>Vegetation Condition Score</b></td><td><b>Block A</b>: 40.840</td><td><b>Area (ha)</b></td><td>15.034</td></tr>
</table>

**Table 22. VA 9: *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora ssp. mutica.***

<table>
<tr><td colspan="7"></td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="2"><b>Upper Storey</b></td><td colspan="3"><b>Mid Storey</b></td><td><b>Lower Storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus oleosa</i><br><i>E. gracilis</i></td><td colspan="3"><i>Geijera linearifolia</i><br><i>Pittosporum angustifolium</i><br><i>Melaleuca pauperiflora</i> ssp. <i>mutica</i></td><td><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Maireana brevifolia</i><br><i>Sclerolaena diacantha</i><br><i>Salsola australis</i></td></tr>
<tr><td colspan="6">Mallee dominated by <i>Eucalyptus oleosa</i> (Red Mallee) and <i>E. gracilis</i> (Yorrell). Open, low mixed chenopod and shrub understorey with <i>Enchylaena tomentosa</i> var<i>. tomentosa</i> (Ruby Saltbush)<i>, Maireana</i> brevifolia (Short-leaf Bluebush) and <i>Sclerolaena diacantha</i> (Grey Bindyi)<i>.</i> Isolated tall shrubs of <i>Geijera linearifolia</i> (Sheep Bush)<i>, Pittosporum angustifolium</i> (Native Apricot) and <i>Melaleuca pauperiflora</i> ssp<i>. mutica</i> (Boree) are also present but not common. Ground strata is dominated by <i>Austrostipa</i> spp. (Spear-grass) and <i>Ptilotus seminudus</i> (Rabbit-tails) with dominance from weed species such as, <i>Galenia pubescens</i> (Coastal Galenia) and <i>Mesembryanthemum crystallinum</i> (Common Iceplant).<br>The VA mostly occurs in the northeast part of the Project Area.</td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="6">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td><b>Survey Sites</b></td><td>A9 and A9a</td><td colspan="2"><b>Vegetation Condition Score</b></td><td><b>Block A</b>: 37.020</td><td><b>Area (ha)</b></td><td>9.784</td></tr>
</table>

### *6.4.1 Scattered trees*

A total of 11 scattered trees consisting of five different native species were present in the Project Area (**Figure 7**), consisting of:

- *Eucalyptus porosa* (Mallee Box),
- *E. leptophylla* (Narrow-leaved Mallee)
- *E. gracilis* (Yorrell),
- *E. petiolaris* (Eyre Peninsula Blue Gum); and
- *E. socialis* (Beaked Red Mallee).

A high dieback percentage was common, however, most of the scattered trees had numerous and good hollows. Five (5) out of the 11 scattered trees will be impacted by the Project (Table 23).

**Table 23. Scattered trees assessed within the Project Area. Rows highlighted in red indicate trees impacted by the design.**

| Tree # | Scientific name | Common name | No in clump | Height (m) | Diameter (cm) | Dieback (%) | Hollows (s, m, l) | Impact action |
|---|---|---|---|---|---|---|---|---|
| 1 | *Eucalyptus gracilis* | Yorrell | 1 | 7.0 | 37 | 40 | 0 | Not impacted |
| 2 | *E. socialis* | Beaked Red Mallee | 1 | 6.5 | 44 | 55 | 10, 2, 2 | **Impacted** |
| 3 | *E. porosa* | Mallee box | 1 | 8.0 | 61 | 60 | 5, 2, 2 | Not impacted |
| 4 | *E. petiolaris* | Eyre Peninsula Blue Gum | 1 | 5.0 | 80 | 8 | 0 | **Impacted** |
| 5 | *E. porosa* | Mallee box | 1 | 6.5 | 45 | 30 | 2 small | **Impacted** |
| 6 | *E. porosa* | Mallee box | 1 | 6.5 | 32 | 2 | 0 | Impacted |
| 7 | *E. leptophylla* | Narrow-leaf Red Mallee | 1 | 7.0 | 105 | 40 | 5, 3, 2 | Not impacted |
| 8 | *E. socialis* | Beaked Red Mallee | 1 | 7.0 | 100 | 40 | 5, 3, 2 | Not impacted |
| 9 | *E. socialis* | Beaked Red Mallee | 1 | 8.0 | 45 | 50 | 0 | **impacted** |
| 10 | *E. socialis* | Beaked Red Mallee | 1 | 7.0 | 110 | 60 | 5, 2, 0 | Not impacted |
| 11 | *E. socialis* | Beaked Red Mallee | 1 | 6.5 | 32 | 40 | 0 | **Impacted** |

**Hollow code: s = small, m=medium, l=large.**

## 6.5 Impacted vegetation

A total of 33.425 ha of native vegetation and five scattered trees will be impact based on the Project design (Figure 8). For more information of the SEB offset and clearance summary please refer to the Yadnarie Solar Farm NVC Data Report (EBS 2024a).

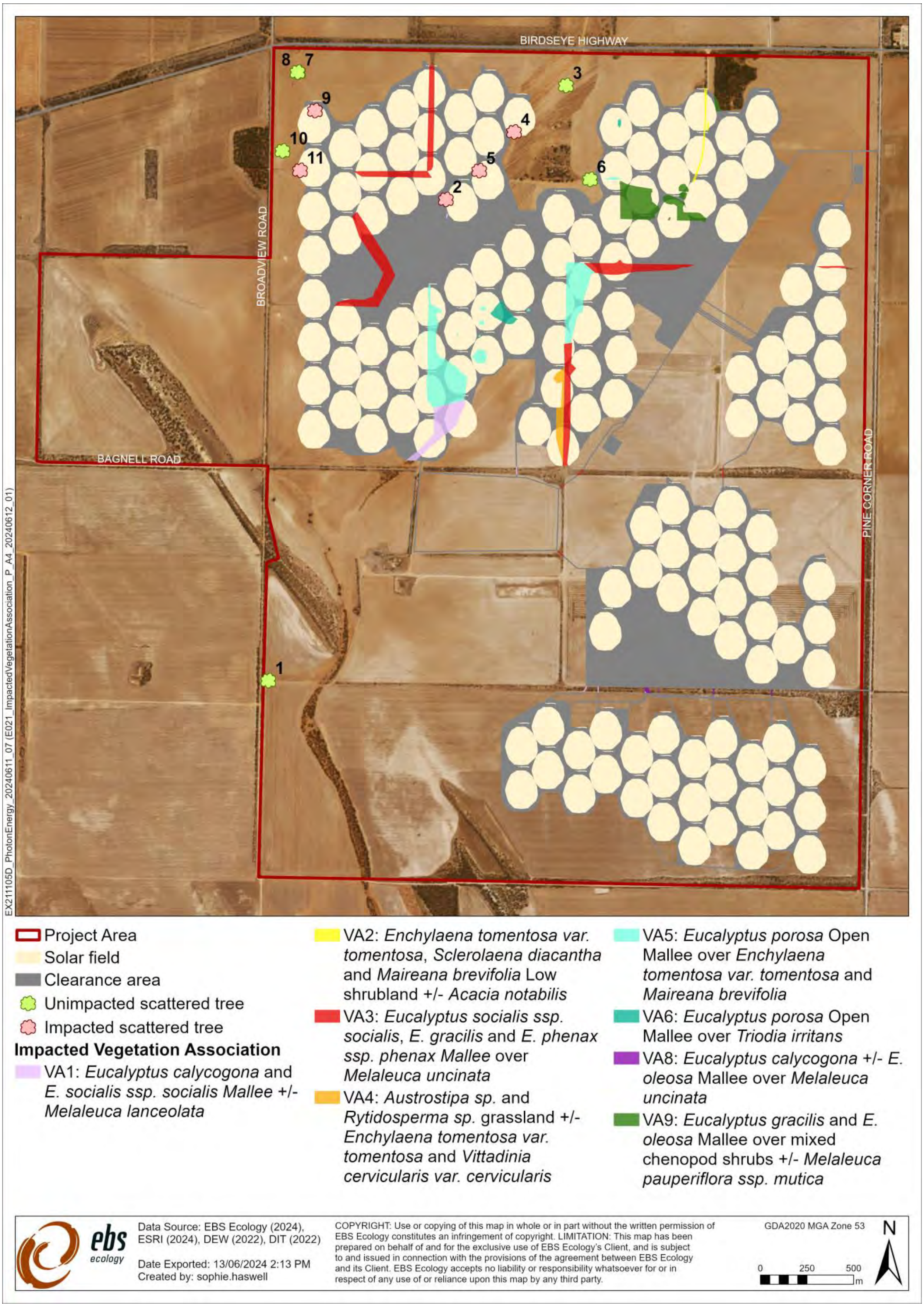


**Figure 8. Impacted vegetation within the Project Area.**

# 7 DISCUSSION

This report intended to identify the likely presence of MNES and other ecological constraints within the Project Area and provide recommendations for the proponent to avoid and minimise impacts to these species and ecological matters.

The presence of scattered and isolated patches of native vegetation across the Project Area presents an opportunity to avoid and minimise impacts to native vegetation and therefore, potential habitat for threatened species. State (NVC) and national regulators (DCCEEW) consider application of the mitigation hierarchy to limit the amount of damage an action will have on the environment and includes three steps which must be followed in order and to the greatest extent possible before moving to the next:

1. **Avoid** clearance of native vegetation wherever possible, and in particular avoid placement of infrastructure in areas deemed to be of high habitat quality for listed threatened species; and
2. **Minimise / mitigate** construction footprints by utilising existing cleared or disturbed areas (e.g., roads, easements, cleared land) as much as possible, and reduce the extent, duration and intensity of impacts (whether direct, indirect or cumulative).
3. **Rehabilitate or restore** ecosystems that will be degraded or impacted as a result of the Project, especially those areas which are subject to temporary construction impacts.
4. **Offset** any adverse impacts to native vegetation, ecosystems and species through implementation of a SEB or EPBC Offset which outweighs the impact.

## 7.1 Legislative compliance

### *7.1.1 Assessment under the NV Act*

The Project is deemed in the public interest by the Minister, clearing of native vegetation is permissible under the following regulation:

**Regulation 12(34) – Infrastructure**

Clearance of vegetation:

(a) Incidental to the construction or expansion of a building or infrastructure where the Minister has, by instrument in writing, declared that the Minister is satisfied that the clearance is in the public interest; or

(b) Required in connection with the provision of infrastructure or services to a building or proposed building, or to any place,

provided that any development authorisation required by or under the *Planning, Development and Infrastructure Act 2016* has been obtained.

The *Native Vegetation Regulations 2017* define infrastructure as:

(a) The infrastructure, equipment, structures, works and other facilities used in or in connection with the supply of water or electricity, gas or other forms of energy, the provision of telecommunications, or the drainage, removal or treatment of waste-water or sewage; or

(b) Roads and their supporting structures or works; or

(c) Ports, wharfs, jetties, railways, trams and busways.

The requirements of the proponent to undertake clearance for the construction of infrastructure include:

- Clearance Application to the NVC.
- Provision of sufficient information for the NVC to assess the level of risk to biodiversity.
- Calculation of the SEB obligations required to offset the clearance.
- Development of a SEB Management Plan to be approved by the NVC if providing an on-ground SEB.
- Provision of a SEB in accordance with the Management Plan or payment into the Native Vegetation Fund.

## 7.2 Vegetation condition

Condition of native vegetation ranged from poor to good. All vegetation within the Project Area is impacted by threatening processes such as fragmentation and weed invasion. Larger, less fragmented patches of mallee were in better condition, with higher native plant species diversity and lower weed cover than other sites.

Vegetation located within the Project Area consisted of the following:

- Cropping paddocks, containing no native vegetation. These paddocks contained old crop, which is now dominated by exotic species;
- Scattered trees;
- Paddocks historically cleared of trees and used for grazing that are vegetated with chenopod shrublands and very-open mallee; and
- Patches of remnant mallee and mallee woodland.

Chenopod shrublands in historically cleared paddocks, mallee and scattered trees are protected under the NV Act.

## 7.3 Threatened flora

No flora species listed as threatened under the EPBC Act or NPW Act were recorded during the field survey.

### *7.3.1 ORCHIDACEAE*

A total of five threatened orchid species have been assessed as possibly occurring within the Project Area:

- *Caladenia brumalis* (Winter Spider Orchid), Nationally and State Vulnerable - flowering June to September.
- *Caladenia tensa* (Rigid Spider Orchid), Nationally Endangered - flowering September – October.
- *Pterostylis mirabilis* (Nodding Rufoushood), Nationally and State Vulnerable - flowering October to January.
- *Pterostylis Hale* (R Bates 21725, (Hale Dwarf Greenhood)), Nationally Endangered and State Vulnerable - flowering August to September.
- *Pterostylis xerophila* (Desert Greenhood), Nationally and State Vulnerable - flowering September November.

Due to the Project Area being located on private property, records of these species within the Project Area are likely to be limited. The Project Area contains remnant old growth mallee, where some pockets reflect vegetation that is in a pre-European state and have had little disturbance. VA1, VA3, VA5, VA6, VA7, VA8 and VA9 are considered likely habitat for threatened orchid species. Although no BDBSA records were identified in the desktop assessment, Atlas of Living Australia (ALA) has shown nearby records of *Caladenia brumalis* (Winter Spider Orchid), *C. tensa* (Rigid Spider Orchid) and *Pterostylis mirabilis* (Nodding Rufoushood). Therefore, a more targeted search for Nationally threatened *Caladenia* and *Pterostylis* species is recommended if the Project is to impact on remnant mallee.

No threatened orchids were observed during the November surveys. All other surveys within the rest of the Project Area were undertaken outside of flowering time for these species.

## 7.4 Threatened fauna

No threatened fauna species listed as threatened under the EPBC Act or NPW Act were recorded during the field survey.

### *7.4.1 Blue-winged Parrot (Neophema chrysostoma)*

The Blue-winged Parrot is a slender bird with an olive-green head and upper body, transitioning to light green on the fore-neck. Its upper tail is green-blue with yellow sides and underparts, and it may have an orange belly. A yellow facial patch extends to the eye, and a dark narrow blue band runs across the forehead from eye to eye. This species is named for the distinctive dark blue patch on its wings. Females resemble males but have slightly duller colours (DCCEEW 2023d). The Blue-winged Parrot inhabits a range of coastal, sub-coastal, and inland areas, extending to semi-arid zones. They favour grasslands and grassy woodlands and are often found near wetlands, both near the coast and in semi-arid zones, including chenopod shrubland with native and introduced grasses, herbs, and forbs.

No individuals were observed during the field assessments and the only known record was identified 44km south-east of the Project Area in Franklin Harbour Conservations Park (ALA 2024a). However, suitable habitat does exist, this includes VA4, VA5, VA6 and VA7 (EBS 2024b).

### 7.4.2 Diamond Firetail (Stagonopleura guttata)

The Diamond Firetail is also currently listed as Vulnerable under the EPBC Act and the NPW Act. The Diamond Firetail is a large finch, growing 10-12 cm long and weighing 17 grams. The species has a bright red bill, eyes and rump, with a white throat and lower breast which are separated by a broad black breast-band with white-spotted flanks (DCCEEEW 2023c). Diamond firetails occur on the south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia, and about 300 km inland from the sea. The preferred habitat for Diamond Firetails includes Eucalypt, Acacia or Casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees, preferring areas with relatively low tree density, few large logs, and little litter cover but high grass cover (DCCEEW 2023c).

The closest known records are located only 2.37 km south of the Project Area (ALA 2024a). However, as ALA records are often denatured and these records do not have a date or institute who undertook the survey, these records are considered insufficient in justifying the presence of the species (EBS 2024b). No BDBSA records were identified.

### 7.4.3 Grey Falcon (Falco hypoleucos)

The Grey Falcon occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. It is mainly found where annual rainfall is less than 500 millimetres (mm), except when wet years are followed by drought, when the species might become marginally more widespread. However, it is essentially confined to the arid and semi-arid zones (TSSC 2020). The Grey Falcon frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter. Breeding habitat is generally restricted to tall trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*). Falcons are also known to nest on artificial structures such as telecommunications towers (TSSC 2020).

The Grey Falcon was not observed during the field surveys and there is no suitable breeding habitat within the Project Area, only small to medium sized trees were identified in the Project Area. However, the vegetation within the Project Area may contain suitable foraging habitat for this species.

### 7.4.4 Malleefowl (Leipoa ocellata)

Malleefowl are large ground birds that can grow up to 60 cm in length and weigh up to 2.5 kilograms. Their wings and back are mottled and barred with grey, black, brown, and white. The head and neck are grey, featuring a distinctive black stripe down the fore-neck. They have a short dark bill and large, strong legs and feet. Both sexes appear similar, but male Malleefowl are slightly larger than females. Juveniles can be identified by their smaller size and paler colouring on the head and neck, as well as the dull brown and cream patterning on the upper surfaces of their wings and tail, which lack the white patches seen in adults. Immature Malleefowl resemble adults in appearance (DCCEEW 2010).

The Malleefowl is distributed in the semi-arid to arid zone in shrublands and low woodlands dominated by mallee and associated habitats such as Broombush (*Melaleuca uncinata*) and Scrub Pine (*Callitris* *verrucosa*). In the south of South Australia and Victoria, Malleefowl also occur in Brown Stringybark (*Eucalyptus baxteri*) woodland. Sandy substrates and abundance of leaf litter are clear requirements for the development of the birds' incubator-nests. Densities of the birds are generally greatest in areas of higher rainfall and on more fertile soils and where there is a higher shrub diversity. However, the floristic and structural requirements of the species are not well understood. Chenopod mallee, which typically forms on heavy soils, and heath-dominated habitat are among the least preferred mallee habitats for Malleefowl (Benshemesh 2007).

Targeted species surveys were not undertaken, and no individuals were opportunistically observed. However, a majority of the vegetation associations recorded in the Project Area are considered suitable habitat for the Malleefowl. As determined by field surveys, seven of the nine VA's (VA1, VA3, VA5, VA6-VA9) are considered suitable habitat for Malleefowl, totalling 139.50 ha (EBS 2024b).

### *7.4.5 Sandhill Dunnart (Sminthopsis psammophila)*

Sandhill Dunnarts (SHD) are listed as Nationally Endangered and Vulnerable under State legislation. The SHD is an arid to semi-arid adapted, nocturnal marsupial and is distinguished from 18 other *Sminthopsis* (Dasyuridae) species by its large size (25 to 55 grams) and distinctive crested tail, which has stiff black hairs along the ventral (underside) surface of the end of the tail. They are opportunistic feeders and thought to breed in response to rain when food resources are likely to be abundant (TSSC 2015).

Between 1969 and 2001 the species was recorded from only five sites within three isolated localities; the Middleback Range, Eyre Peninsula, the Ooldea region in South Australia and Mulga Rock and Queen Victoria Spring regions of the Great Victoria Desert in Western Australia (DEW 2019). Specific habitat requirements include sand dunes with presence of mixed age / size spinifex hummocks (*Triodia* spp.) comprising 10 to 70 percent ground cover and preferably low open mallee woodland with diverse shrub layer.

This species was not observed during any of the field surveys and no targeted surveys were undertaken. The closest known records are located over 21 km east of the Project Area, in the Hincks Wilderness Protection Area (ALA 2024a). These records are 20 years old and occur outside of the currently known distribution of the species. No BDBSA records were identified in the desktop assessment. As determined by field surveys, two of the nine VA's (VA6 and VA7) are considered suitable habitat for the Sandhill Dunnart, totalling 45.856 ha. However, these areas are small and isolated from any other large areas of remnant mallee or woodlands. this species is unlikely to inhabit these areas or use these vegetated pockets as wildlife corridors. Therefore, it is unlikely to be impacted by the proposed works.

### *7.4.6 Southern Whiteface (Aphelocephala leucopsis)*

Southern Whiteface have recently been listed as Nationally Vulnerable. The species is not listed under State legislation. Southern Whiteface are small, stocky thornbill-like birds that have a characteristic white bad across the forehead. They are distributed across most of mainland Australia south of the tropics. The species is known to occupy a diversity of open woodlands and shrublands, particularly where there is a grassy or shrubby understorey, on ranges, foothills, lowlands and plains (DCCEEW 2023a).

This species was no observed within the Project Area. However, the closest known record is located approximately 9.5 km east of the Project Area, near the township of Cleve, and an additional record occurs at the southern boundary of Hincks Wilderness Protection Area (ALA 2024a). Majority of the vegetation associations recorded in the Project Area are considered suitable habitat for the Southern Whiteface. Although no BDBSA records were identified in the desktop assessment, ALA has shown nearby records of Southern Whiteface. The Southern Whiteface is considered to be sedentary; however, ALA records indicate that individuals may move into wetter areas outside of their normal range during drought years (DCCEEW 2023a). Therefore, the species is considered likely to occur within the Project Area. As determined by field surveys, eight of the nine VA's (VA1-VA3, VA5-VA8) are considered suitable habitat for the Southern Whiteface, totalling 141.644 ha (EBS 2024b).

# 8 RECOMMENDATIONS

Management of potential Project impacts on flora and fauna should follow the mitigation hierarchy of;

a) avoiding,

b) minimising,

c) rehabilitating and

d) offsetting impact.

The following considerations should be taken into account for the proposed Project:

- Ensure that the design and construction methods minimise impacts to all vegetation, as much as possible.
- Where possible, avoid and/or minimise clearance of any native vegetation, revegetated areas and/or important amenity vegetation/habitat identified in the Project Area.
- Placing infrastructure within the open areas in cropping paddocks far away from native vegetation patches, water courses and inundation areas would reduce the overall ecological risk of the Project.
- Utilising existing roads and tracks throughout the Project Area, rather than clearing existing vegetation for access.
- Appropriate weed hygiene methods should be implemented as part of a Construction Environmental Management Plan (CEMP) and/or Construction and Operational Environmental Management Plan (COEMP) particularly Declared weeds and WoNS under the LSA Act and to reduce the ongoing threat of weed establishment.
- The location of the solar photovoltaic cells should be considered in relation to biodiversity value of surrounding habitat, as indirect impacts may negatively influence surrounding vegetation and the suitability of habitat for fauna.
- Once the design footprint has been finalised, additional assessments may be required. In particular, the following survey may be recommended:
    - Targeted species-specific spring surveys for threatened orchid species protected under the EPBC Act.
- Once Project designs are finalised, prepare a Native Vegetation Clearance Data Report required for assessment and approval under NV Act *Regulation 12 (34): Infrastructure.* The report must be prepared by a NVC accredited consultant.
- Undertake an EPBC Self-Assessment for all threatened species likely to be impacted by the proposed Project.
- Submit an EPBC referral for species / communities which are likely to be significantly impacted by the Project to DCCEEW, for approval under the EPBC Act.

# 9 REFERENCES

Atlas of Living Australia (2024a). Spatial analysis (Spatial Portal). Available at: https://spatial.ala.org.au/ [Accessed 19/06/2024].

Benshemesh, J. (2007). *National Recovery Plan for Malleefowl Leipoa ocellata.* Adelaide: Department for Environment and Heritage, South Australia.

Craigie, A.I., Kellermann, J., Lang, P.J., Thompson, I.R., Weber, J.Z. & Wilson, P.J. (2014). Fabaceae (Leguminosae) (partly) (version 2). In: Kellermann, J. (ed.), Flora of South Australia (ed. 5). 87 pp. (State Herbarium of South Australia: Adelaide). www.flora.sa.gov.au/ed5

Department of Agriculture, Water and the Environment (DAWE) (2018). National Vegetation Information System (NVIS) Version 5.1 - Australia - Extant Vegetation (SA).

Department of Agriculture, Water and the Environment (DAWE) (2021). EPBC Protected Matters Report - report created 06/12/2021. Department of Agriculture, Water and the Environment.

Department of Agriculture, Water and the Environment (DAWE) (2021a) Australia's bioregions (IBRA). Available at: https://environment.gov.au/land/nrs/science/ibra [Accessed 22/09/2023].

Department of Agriculture, Water and the Environment (DAWE) (2021c). *Acacia enterocarpa* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021d). *Acacia praemorsa* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021e). *Acacia rhetinocarpa* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021f). *Caladenia brumalis* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021g). *Caladenia tensa* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021h). *Pterostylis mirabilis* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 06 Dec 2021. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021i). *Pterostylis sp.* Hale (R.Bates 21725) in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021j). *Pterostylis xerophila* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021k). *Swainsonia pyrophila* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021l). *Olearia pannosa subsp. pannosa* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021m). *Leipoa ocellata* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 06 Dec 2021. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021n). *Rostratula australis* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 06 Dec 2021. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021o). *Sminthopsis psammophila* in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed 7 April 2023.

Department of Agriculture, Water and the Environment (DAWE) (2021). Interim Bioregionalisation for Australia (IBRA), Version 7 (Subregions). Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023). Finalised priority assessments lists. Retrieved from https://www.dcceew.gov.au/environment/biodiversity/threatened/assessments/fpal

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023a). *EPBC Act Protected Matters Report - report created 31/08/2023.* Canberra: Department of Climate Change, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023b). Species Profile and Threats Database. Department of Agriculture, Water and the Environment. https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl [Accessed 28 June 2023].

Department of Climate Change, Energy, the Environment and Water (2023c). *Conservation Advice for Stagonopleura guttata Diamond Firetail.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023d). *Conservation Advice for Neophema chrysostoma Blue-winged Parrot.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department for Environment and Water (2019). National Recovery Plan for the Sandhill Dunnart (*Sminthopsis psammophila*). Department for Environment and Water, South Australia.

Department of Environment and Water (DEW) (2021). *Native Vegetation Legislation*. Retrieved from http://www.environment.sa.gov.au/topics/native-vegetation/legislation-administration.

Department of Environment and Water (DEW) (2023). South Australian Department for Environment and Water Biological Database of SA - Recordset number DEWNRBDBSA230830-3.

Department of Environment (2013). *Matters of National Environmental Significance Significant Impact Guidelines 1.1.* Canberra: Commonwealth of Australia

EBS Ecology (2021). Photon Energy Solar Storage Project Desktop Assessment. Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2022a). Desktop letter for EPBC threatened species. Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2022b). Desktop letter for EPBC threatened species. Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2022c). Letter memo for Site B and Site C. Letter Memo Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2024a). Yadnarie Solar Farm Native Vegetation Clearance Data Report. Report to RayGen Resources Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2024b). EPBC Self-assessment Yadnarie Solar Farm. Report to RayGen Pty Ltd. EBS Ecology, Adelaide.

Jones, D.L. (2006). Miscellaneous new species of Australian Orchidaceae. *Australian Orchid Research*, *5* (2006), pp.45-111.

Morcombe, M. (2003). *Field Guide to Australian Birds.* Archerfield: Steve Parish Publishing.

Native Vegetation Council (NVC) (2020a). Bushland Assessment Manual July 2020. Native Vegetation Council, Adelaide. Available at: https://www.environment.sa.gov.au/topics/native-vegetation/clearing/vegetation-assessments.

Native Vegetation Council (NVC) (2020b). Scattered Tree Assessment Manual July 2020. Native Vegetation Council, Adelaide. Available at: https://www.environment.sa.gov.au/topics/native-vegetation/clearing/vegetation-assessments.

Native Vegetation Council (NVC) (2020c). Guide for calculating a Significant Environmental Benefit. Native Vegetation Council, Adelaide. Available at: https://cdn.environment.sa.gov.au/environment/docs/native_vegetation_significant_environmental_benefit_guide_1_july_2019.pdf

Natural Resources Eyre Peninsula (2019). Eyre Peninsula Blue Gum Woodlands. Accessed 13/06/2024. Available at: https://cdn.environment.sa.gov.au/landscape/docs/ep/2019-ep-blue-gum-woodland-facts.pdf

New South Wales Government Office of Environment and Heritage (2017). Gilbert's Whistler – profile. Accessed 7 April 2023.

Nicolle, D. (2013). *Native Eucalypts of South Australia*. Dean Nicolle.

Pizzey, G., & Knight, F. (2007). *The Field Guide to the Birds of Australia - 8th Edition.* Harper Collins Australia.

Pobke, K (2007). Draft recovery plan for 23 threatened flora taxa on Eyre Peninsula, South Australia 2007-2012, Department for Environment and Heritage, South Australia.

Department for Environment and Heritage, South Australia.

South Australian Arid Lands Natural Resource Management Board. (n.d.). *Grey Falcon (Falco hypoleucos).* Goverment of South Australia.

Strahan, R. (2004). *The Mammals of Australia.* Sydney: Reed New Holland.

Thackway R. & Cresswell I.D. (ed.) (1995). An Interim Biogeographic Regionalisation for Australia: a framework for setting priorities in the national reserves system cooperative program, Version 4.0. Australian Nature Conservation Agency, Canberra.

Threatened Species Scientific Committee (TSSC) (2005). Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (the Committee) on Amendments to the list of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threatened Species Scientific Committee (TSSC) (2013). Approved Conservation Advice for the Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/124-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2020). Conservation advice *Falco hypoleucos* (Grey Falcon). Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/929-conservation-advice-09072020.pdf. In effect under the EPBC Act from 09-Jul-2020.

# 10 APPENDICES

## 10.1 Appendix 1. Flora species recorded during the surveys

| Scientific Name<br>(* indicates an introduced species) | Common Name | Conservation Status | |
|---|---|---|---|
| | | EPBC Act | NPW Act |
| *Acacia burkittii* | Pin-bush Wattle | - | - |
| *Acacia halliana* | Hall's Wattle | - | - |
| *Acacia ligulata* | Umbrella Bush | - | - |
| *Acacia notabilis* | Notable Wattle | - | - |
| *Acacia oswaldii* | Umbrella Wattle | - | - |
| *Acacia rigens* | Nealie | - | - |
| *Acacia sclerophylla* var. *sclerophylla* | Hard-leaf Wattle | - | - |
| *Agave** | - | - | - |
| *Aira* sp.* | Hair-grass | - | - |
| *Aizoon pubescens** (also known as *Galenia pubescens*) | Coastal Galenia | - | - |
| *Alectryon oleifolius* ssp. *canescens* | Bullock Bush | - | - |
| *Allocasuarina verticillata* | Drooping Sheoak | - | - |
| *Alyxia buxifolia* | Sea Box | - | - |
| *Arctotheca calendula** | Cape Weed | - | - |
| *Asparagus asparagoides f.** | Bridal Creeper | - | - |
| *Asphodelus fistulosus** | Onion Weed | - | - |
| *Atriplex acutibractea* ssp. | Pointed Saltbush | - | - |
| *Atriplex crassipes* var. *crassipes* | - | - | - |
| *Atriplex semibaccata* | Berry Saltbush | - | - |
| *Austrostipa elegantissima* | Feather Spear-grass | - | - |
| *Austrostipa nitida* | Balcarra Spear-grass | - | - |
| *Austrostipa nodosa* | Tall Spear-grass | - | - |
| *Austrostipa scabra* ssp. *scabra* | Rough Spear-grass | - | - |
| *Austrostipa* sp. | Spear-grass | - | - |
| *Avena barbata** | Bearded Oat | - | - |
| *Avena fatua** | Wild Oat | - | - |
| *Brassica* sp.* | - | - | - |
| *Bromus diandrus** | Great Brome | - | - |
| *Callitris glaucophylla* | White Cypress Pine | - | - |
| *Callitris gracilis* | Southern Cypress Pine | - | - |
| *Callitris verrucosa* | Scrub Cypress Pine | - | - |
| *Calytrix* sp. | Fringe Myrtle | - | - |
| *Carpobrotus rossii* | Native Pigface | - | - |
| *Carrichtera annua** | Ward's Weed | - | - |
| *Cassytha* sp. | Dodder-laurel | - | - |
| *Chenopodium album* | Fat Hen | - | - |
| *Chenopodium curvispicatum* | Cottony Goosefoot | - | - |
| *Chenopodium desertorum* ssp. *microphyllum* | Small-leaf Goosefoot | - | - |
| *Chenopodium* sp. | Goosefoot | - | - |
| *Chloris truncata* | Windmill Grass | - | - |

| **Scientific Name (* indicates an introduced species)** | **Common Name** | **Conservation Status** | |
|---|---|---|---|
| | | **EPBC Act** | **NPW Act** |
| *Chrysocephalum apiculatum* | Common Everlasting | - | - |
| *Citrullus* sp.* | Wild Melon | - | - |
| *Clematis microphylla* | Old Man's Beard | - | - |
| *Clematis* sp. | - | - | - |
| *Conyza bonariensis** | Flax-leaf Fleabane | - | - |
| *Cucumis myriocarpus* ssp. *myriocarpus** | Paddy Melon | - | - |
| *Cymbopogon ambiguus* | Lemon-grass | - | - |
| *Dianella brevicaulis* | Short-stem Flax-lily | - | - |
| *Dodonaea bursariifolia* | Small Hop-bush | - | - |
| *Dysphania cristata* | Crested Crumbweed | - | - |
| *Echium plantagineum** | Salvation Jane | - | - |
| *Ehrharta calycina** | Perennial Veldt Grass | - | - |
| *Einadia nutans* ssp. | Climbing Saltbush | - | - |
| *Einadia nutans ssp. oxycarpa* | Pointed-fruit Climbing Saltbush | - | - |
| *Enchylaena tomentosa* var. | Ruby Saltbush | - | - |
| *Enneapogon nigricans* | Black-head Grass | - | - |
| *Enneapogon* sp. | Bottle-washers/Nineawn | - | - |
| *Eucalyptus brachycalyx* | Gilja | - | - |
| *Eucalyptus calycogona* ssp. | Square-fruit Mallee | - | - |
| *Eucalyptus cladocalyx* ssp. *cladocalyx* | Sugar Gum | - | - |
| *Eucalyptus gracilis* | Yorrell | - | - |
| *Eucalyptus incrassata* | Ridge-fruited Mallee | - | - |
| *Eucalyptus oleosa* ssp. *ampliata* | Red Mallee | - | - |
| *Eucalyptus oleosa* ssp. *oleosa* | Red Mallee | - | - |
| *Eucalyptus petiolaris* | Eyre Peninsula Blue Gum | - | - |
| *Eucalyptus phenax* ssp. *phenax* | White Mallee | - | - |
| *Eucalyptus porosa* | Malleebox | - | - |
| *Eucalyptus socialis* ssp. | Beaked Red Mallee | - | - |
| *Eucalyptus* sp. | - | - | - |
| *Euphorbia* sp. | - | - | - |
| *Euphorbia terracina** | False Caper | - | - |
| *Gazania linearis** | Gazania | - | - |
| *Gazania* sp.* | African Daisies | - | - |
| *Geijera linearifolia* | Sheep Bush | - | - |
| *Gnaphalium* sp. | Cudweed | - | - |
| *Grevillea huegelii* | Comb Wattle | - | - |
| *Hakea cycloptera* | Elm-seed Hakea | - | - |
| *Hakea leucoptera* ssp. *leucoptera* | Silver Needlewood | - | - |
| *Halgania andromedifolia* | Scented Blue-flower | - | - |
| *Heliotropium europaeum** | Common Heliotrope | - | - |
| *Hibbertia* sp. | Guinea-flower | - | - |
| *Homoranthus wilhelmii* | Wilhelm's Homoranthus | - | - |
| *Hordeum vulgare** | Barley Grass | - | - |
| *Hybanthus floribundus* ssp. *floribundus* | Shrub Violet | - | - |

| Scientific Name<br>(* indicates an introduced species) | Common Name | Conservation Status | |
|---|---|---|---|
| | | EPBC Act | NPW Act |
| *Lasiopetalum behrii* | Pink Velvet-bush | - | - |
| *Leptospermum coriaceum* | Dune Tea-tree | - | - |
| *Lolium perenne** | Perennial Ryegrass | - | - |
| *Lomandra effusa* | Scented Mat-rush | - | - |
| *Lomandra leucocephala* ssp. *robusta* | Woolly Mat-rush | - | - |
| *Lycium ferocissimum** | African Boxthorn | - | - |
| *Maireana brevifolia* | Short-leaf Bluebush | - | - |
| *Maireana erioclada* | Rosy Bluebush | - | - |
| *Malva parviflora** | Small-flower Marshmallow | - | - |
| *Malva* sp.* | Mallow | - | - |
| *Marrubium vulgare** | Horehound | - | - |
| *Medicago* sp.* | Medic | - | - |
| *Melaleuca acuminata* ssp. *acuminata* | Mallee Honey-myrtle | - | - |
| *Melaleuca lanceolata* | Dryland Tea-tree | - | - |
| *Melaleuca pauperiflora* ssp. *mutica* | Boree | - | - |
| *Melaleuca uncinata* | Broombush | - | - |
| *Mesembryanthemum crystallinum** | Common Iceplant | - | - |
| *Minuria cunninghamii* | Bush Minuria | - | - |
| *Olearia brachyphylla* | Short-leaf Daisy-bush | - | - |
| *Oxalis perennans* | Native Sorrel | - | - |
| *Oxalis pes-caprae** | Soursob | - | - |
| *Pimelea micrantha* | Silky Riceflower | - | - |
| *Pittosporum angustifolium* | Native Apricot | - | - |
| *Podolepis capillaris* | Wiry Podolepis | - | - |
| *Pseudognaphalium luteoalbum* | Jersey Cudweed | - | - |
| *Ptilotus seminudus* | Rabbit tails | - | - |
| *Ptilotus spathulatus* | Pussy-tails | - | - |
| *Reichardia tingitana** | False Sowthistle | - | - |
| *Rhagodia preissii* ssp. *preissii* | Mallee Saltbush | - | - |
| *Rhagodia* sp. | Saltbush | - | - |
| *Roepera glauca* | Pale Twinleaf | - | - |
| *Rumex hypogaeus** | Three-corner Jack | - | - |
| *Rytidosperma auriculatum* | Lobed Wallaby-grass | - | - |
| *Rytidosperma caespitosum* | Common Wallaby-grass | - | - |
| *Rytidosperma* sp. | Wallaby-grass | - | - |
| *Salsola australis* | Buckbush | - | - |
| *Salvia verbenaca* var.* | Wild Sage | - | - |
| *Santalum acuminatum* | Quandong | - | - |
| *Sclerolaena diacantha* | Grey Bindyi | - | - |
| *Sclerolaena parallelicuspis* | Western Bindyi | - | - |
| *Senna artemisioides* ssp. *artemisioides* | Desert Senna | - | - |
| *Senna artemisioides* ssp. *filifolia* | Fine-leaf Desert Senna | - | - |
| *Senna artemisioides* ssp. *petiolaris* | Desert Senna | - | - |
| *Senna artemisioides* ssp. *X coriacea* | Broad-leaf Desert Senna | - | - |
| *Senna* sp. | Senna | - | - |

| Scientific Name (* indicates an introduced species) | Common Name | Conservation Status | |
|---|---|---|---|
| | | EPBC Act | NPW Act |
| *Sida intricata* | Twiggy Sida | - | - |
| *Sisymbrium* sp.* | Wild Mustard | - | - |
| *Solanum elaeagnifolium** | Silver-leaf Nightshade | - | - |
| *Solanum nigrum** | Black Nightshade | - | - |
| *Sonchus oleraceus** | Common Sow-thistle | - | - |
| *Spyridium stenophyllum* ssp. *stenophyllum* | Forked Spyridium | - | - |
| *Templetonia rossii* | Flat Mallee-pea | - | - |
| *Themeda triandra* | Kangaroo Grass | - | - |
| *Thinopyrum elongatum** | Tall Wheat-grass | - | - |
| *Thryptomene micrantha* | Ribbed Thryptomene | - | - |
| *Tragus australianus* | Small Burr-grass | - | - |
| *Tribulus terrestris** | Caltrop | - | - |
| *Trifolium arvense* var. *arvense** | Hare's-foot Clover | - | - |
| *Triodia irritans* | Spinifex | - | - |
| *Triodia scariosa* | Porcupine Grass | - | - |
| *Vittadinia cervicularis* var. *cervicularis* | Waisted New Holland Daisy | - | - |
| *Vittadinia cuneata* var. *cuneata* | Fuzzy New Holland Daisy | - | - |
| *Vulpia* sp.* | Fescue | - | - |
| *Wahlenbergia stricta* ssp. *stricta* | Tall Bluebell | - | - |

**Conservation Status: Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.**

## 10.2 Appendix 2. Fauna species recorded during the surveys

| Scientific Name | Common Name | Scattered Tree Using wildlife | | |
|---|---|---|---|---|
| | | Conservation status in the EP | Resource use | Habitat/status |
| **AVES** | | | | |
| *Acanthagenys rufogularis* | Spiny-cheeked Honeyeater | LC | P,F | w |
| *Acanthiza apicalis* | Inland Thornbills | - | - | - |
| *Alauda arvensis** | Eurasian Skylark | - | - | - |
| *Anthochaera carunculata* | Red Wattlebird | LC | P,F | w/r |
| *Anthus novaeseelandiae* | Australasian Pipit | - | - | - |
| *Aquila audax* | Wedge-tailed Eagle | RA | P,N | w |
| *Artamus cinereus* | Black-faced Woodswallow | NT | P | w |
| *Barnardius zonarius barnardi* | Mallee Ringneck | LC | P,H,F | w |
| *Cincloramphus cruralis** | Brown Songlark | - | - | - |
| *Colluricincla harmonica* | Grey Shrikethrush | LC | F | w |
| *Corvus coronoides* | Australian Raven | LC | P,N | w |
| *Corvus mellori* | Little Raven | LC | P,N | w/r |
| *Eolophus roseicapilla* | Galah | LC | P,H | w/r |
| *Falco berigora* | Brown Falcon | LC | P,N | w/r |
| *Falco cenchroides* | Nankeen Kestrel | LC | P,N | w/r |
| *Gavicalis virescens* | Singing Honeyeater | LC | P,F | w |
| *Grallina cyanoleuca* | Magpielark | LC | P,N | w/r |
| *Gymnorhina tibicen* | Australian Magpie | LC | P,N | r |
| *Manorina flavigula* | Yellow-throated Miner | LC | P,F | w |
| *Melopsittacus undulatus* | Budgerigar | NT | P,H | s |
| *Nymphicus hollandicus* | Cockatiels | RA | P,H | s |
| *Ocyphaps lophotes* | Crested Pigeon | LC | P,N | w/r |
| *Pardalotus striatus* | Striated Pardalote | LC | P,F | w/s |
| *Passer domesticus** | House Sparrows | - | - | - |
| *Phaps chalcoptera* | Common Bronzewing | - | - | - |
| *Phylidonyris novaehollandiae* | New Holland Honeyeater | LC | P,F | w |
| *Platycercus elegans* | Crimson Rosella | - | - | - |
| *Psephotus haematonotus* | Red-rumped Parrot | RA | P,H | w/r |
| *Psephotus varius* | Mulga Parrot | LC | P,H | w/r |
| *Rhipidura leucophrys* | Willie Wagtail | LC | P,N,F | w/r |
| *Smicrornis brevirostris* | Weebill | LC | P,F | w |
| *Sturnus vulgaris** | Common Starling | - | - | - |
| **MAMMALIA** | | | | |
| *Macropus (Osphranter) rufus* | Red Kangaroo | | | |
| *Oryctolagus cuniculus** | European Rabbit | | | |
| *Vulpes vulpes** | Red Fox | | | |
| **REPTILIA** | | | | |
| *Tiliqua rugosa* | Sleepy Lizard | | | |

**Conservation status: LC=Least Concern (Common), NT=Near Threatened (Uncommon), RA=Rare, VU=Vulnerable, EN=Endangered, CR=Critically Endangered. Resource Use: P=perching/roosting, N=nesting, H=using hollow for nesting/roosting, F=feeding. Habitat/status: s=seasonal (includes waterbirds using trees near seasonal wetlands, seasonal and nomadic species), w=woodland birds that occasionally use adjacent scattered trees, r=species that can reside in scattered trees.**

## 10.3 Appendix 3. Likihood assessment for threatened species located within the Search Area

| Scientific name | Common name | Conservation status | | Source | Last sighting (year)/PMST occurrence | Species known habitat preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | Aus | SA | | | | |
| **FLORA** | | | | | | | |
| *Acacia enterocarpa* | Jumping-jack Wattle | EN | E | 1 | May occur | *Acacia enterocarpa* occurs in SA and Victoria. It is found in distinct sub-populations on the EP, YP and SE in South Australia. Found in open woodland, to open forest on sandy alkaline and hard neutral yellow duplex soils. Often associated with *Eucalyptus* spp. such as *Eucalyptus phenax* and *Eucalyptus incrassata* (DAWE, 2021c). | **Unlikely** –*Eucalyptus* associations present in Project Area (i.e. *Eucalyptus phenax ssp.)* but no recent records. This species was not identified during the field survey. |
| *Acacia praemorsa* | Senna Wattle | VU | E | 1 | Likely to occur | Is endemic to SA where it is confined to the EP in localised populations north-east of Cleve. Occurs in mallee woodlands, open scrubs, open heath scrubs and on the lower slopes of small gullies in low, rocky ranges (DAWE, 2021d). | **Unlikely –** Known vegetation associations are not present in Project Area and no recent records. This species was not identified during the field survey |
| *Acacia rhetinocarpa* | Neat Wattle, Resin Wattle | VU | V | 1 | Likely to occur | Located in disjunct locations on the EP where it is confined in scattered areas around Kimba, Cleve and Lock. Normally associated with *Eucalyptus* spp. such as *Eucalyptus dumosa* (DAWE, 2021e). | **Unlikely –** Likely *Eucalyptus* associations present in Project Area (i.e. *Eucalyptus dumosa)* but no recent records. This species was not identified during the field survey |
| *Caladenia brumalis* | Winter Spider-orchid | VU | V | 1 | May occur | Occurs on the YP and EP areas of South Australia. A highly localised species due to loss of habitat. Commonly found in association with *Melaleuca uncinata* in Carapee Hill CP and *Allocasuarina verticillata* or *Eucalyptus diversifolia ssp.* in disturbed areas. (DAWE, 2021f). | **Possible** – No recent records. This species was not identified during the field survey. However, survey was undertaken outside of flowering time. |
| *Caladenia tensa* | Greencomb Spider-orchid | EN | - | 1 | Likely to occur | Occurs in numerous mallee and woodland vegetation associations such as Cypress Pine and Yellow Gum Woodland. Widespread species but uncommon (DAWE, 2021g). | **Possible –** Likely vegetation associations found within Project Area (i.e. mallee woodland, *Eucalyptus spp.)* but no recent records. This species was not identified during the field survey. However, survey was undertaken outside of flowering time. |
| *Eucalyptus cretata* | Darke Peak Mallee | - | R | 2 | 2013 | Known only to occur on the EP in South Australia. Particularly common in Darke Peak and Carapee Hill and often associated with *Eucalyptus* spp. such | **Unlikely –** *Eucalyptus spp.* woodland present in Project Area. Recent a record in South of Project |

| Scientific name | Common name | Conservation status | | Source | Last sighting (year)/PMST occurrence | Species known habitat preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | Aus | SA | | | | |
| | | | | | | as *Eucalyptus calycogona,* and *Eucalyptus porosa* over *Melaleuca* spp. (Nicolle, 2013). | Area. However, species not identified during the field survey. |
| *Limosella granitica* | Granite Mudwort | VU | V | 1 | May occur | This species is confined to seasonally wet rock-pools (gnamma holes). the depth and water quality of these pools affect habitat quality for this species. It occurs in areas of winter- dominant annually variable rainfall (180–300 mm/year) in areas of hot summers and mild winters (Pobke, 2007). | **Unlikely** – no gnamma holes were identified within the Project Area. |
| *Olearia pannosa ssp. pannosa* | Silver Daisy-bush | VU | V | 1 | Likely to occur | Widespread but rare species occurring on the FP, YP and in 2 main sub populations on the EP in South Australia. Found in association with *Eucalyptus* spp. such as *Eucalyptus phenax* ssp. *phenax* (DAWE, 2021l). | **Unlikely –** *Eucalyptus spp.* known to occur in the Project Area. The species is widespread and found in close proximity to Cleve. Recent records present. This species not observed during the field assessment. |
| *Pterostylis mirabilis* | Nodding Rufoushood | VU | V | 1 | Likely to occur | Endemic to the EP in South Australia where it occurs in the 300mm rainfall zone between Cleve and Kimba. Found in stony brown loam soils and among rocks with *Melaleuca uncinata* (DAWE, 2021h). | **Possible –** Occurs in areas of higher rainfall than the Project Area, no recent records. |
| *Pterostylis sp. Hale (R. Bates 21725)* | Hale Dwarf Greenhood | EN | V | 1 | May occur | Endemic to SA where it occurs on the EP, Southern Lofty Ranges and Murraylands. Grows in mallee on the EP (DAWE, 2021i) | **Possible** – Mallee species present in Project Area but no recent records. |
| *Pterostylis xerophila* | Desert Greenhood | VU | V | 1 | May occur | Occurs in many areas of inland SA and VIC including the EP. Grows in generally remote locations in semi-desert environments in rocky outcrops under low shrubland (DAWE, 2021j) | **Possible** – Widespread distribution and some rocky areas within Project Area but no recent records. No suitable habitat identified during the field survey |
| *Swainsona pyrophila* | Yellow Swainson-pea | VU | R | 1 | Likely to occur | Occurs across SA, NSW and VIC and in present in a number of areas on the EP. Grows in association with *Eucalyptus oleosa* over *Melaleuca uncinata* tall shrubland (DAWE, 2021k) | **Unlikely -** Known vegetation associations present in the Project Area but no recent records. |
| **AVES** | | | | | | | |
| *Actitis hypoleucos* | Common Sandpiper | Mi(W) | R | 1 | May occur | Uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and | **Unlikely-** No suitable habitat for this species identified within the Project Area. |

| Scientific name | Common name | Conservation status | | Source | Last sighting (year)/PMST occurrence | Species known habitat preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | Aus | SA | | | | |
| | | | | | | occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (DCCEEW 2023a). | |
| *Aphelocephala leucopsis* | Southern Whiteface | VU | - | 1 | Likely to occur | The Southern Whiteface occurs in open woodland and shrubland habitat with an understorey of grasses and / or low shrubs. Suitable habitat is usually dominated by Acacia spp. or Eucalyptus spp. on ranges, foothills, lowlands and plains. | **Likely** – suitable habitat within the Project Area. Record within Cleve (ALA 2023). |
| *Apus pacificus* | Fork-tailed Swift | Mi (Ma) | - | 1 | Likely to occur | Widespread but almost exclusively aerial. Mostly occur over inland plains, over cliffs and beaches and sometimes well out to sea or in dry or open habitats (DCCEEW 2023a). | **Possible – flyover only. N**o recent records however this species may fly over the Project Area. |
| *Calidris acuminata* | Sharp-tailed Sandpiper | Mi (W) | - | 1 | May occur | During the non-breeding season most of the world population of Sharp-tailed Sandpipers occurs in Australia. In SA, numbers are generally highest between January and early February. In Gulf St Vincent, SA, some arrive during September–October, with the greatest numbers during December. Movements occur during the non-breeding period where birds appear to be dispersive, moving to temporary or flooded wetlands and leaving them when they dry. On migration, they forage and roost on rocky and sandy beaches, freshwater habitats and inland saltwater habitats (DCCEEW 2023a). | **Unlikely –** no recent records and no suitable wetland or tidal habitat available in Project Area. |
| *Calidris ferruginea* | Curlew Sandpiper | CE, Mi (W) | E | 1 | May occur | Migratory species which prefers tidal mudflats, saltmarsh, salt fields and fresh, brackish or saline wetlands. (Pizzey and Knight, 2007) | **Unlikely –** no recent records and no suitable wetland or tidal habitat available in Project Area. |
| *Calidris melanotos* | Pectoral Sandpiper | Mi (W) | - | 1 | May occur | Shallow fresh to saline wetlands. Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DCCEEW 2023a). | **Unlikely –** no recent records and no suitable wetland or tidal habitat available in Project Area. |
| *Charadrius leschenaultii* | Greater Sand Plover | VU, MI | R | 1 | May occur | Inhabits wide, sandy or shelly beaches, tidal mudflats, salt marsh; seldom far inland. (Pizzey and Knight, 2007). | **Unlikely –** no recent records and no suitable wetland or tidal habitat available in Project Area. |
| *Charadrius veredus* | Oriental Plover, Oriental Dotterel | Mi (W) | - | 1 | May occur | Shallow fresh to saline wetlands. Coastal lagoons, estuaries, bays, swamps, lakes, inundated | **Unlikely -** There is no suitable habitat present in Project Area and |

| Scientific name | Common name | Conservation status | | Source | Last sighting (year)/PMST occurrence | Species known habitat preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | Aus | SA | | | | |
| | | | | | | grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Pizzey and Knight, 2007). | no historical records in the Search Area. |
| *Falco hypoleucos* | Grey Falcon | VU | R | 1 | May occur | The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and WA. Preferred habitat includes lightly treed inland plains, sand ridges and pastoral plains. (Pizzey and Knight, 2007) | **Possible** – no recent records but potential suitable habitat within Project Area. |
| *Gallinago hardwickii* | Latham's Snipe, Japanese Snipe | Mi (W) | R | 1 | May occur | Preferred habitat includes open, freshwater wetlands with low, dense vegetation. Saline or brackish water, modified or artificial habitats, and in habitats located close to humans or human activity (DCCEEW 2023a). | **Unlikely** – no recent records and suitable habitat within Project Area is not preferred |
| *Grantiella picta* | Painted Honeyeater | VU | R | 1 | May occur | Sparsely distributed from southern Victoria and south-eastern SA to far northern QLD and eastern Northern Territory Forest, woodland, dry scrub, often with abundant mistletoe. (Birdlife International 2021). | **Unlikely** – no recent records and suitable habitat within Project Area, including *Amyema sp.* is not preferred. |
| *Leipoa ocellata* | Malleefowl | VU | V | 1 | Likely to occur | Inhabits semi-arid regions of southern Australia. In SA, the Malleefowl is distributed from the south-east, north to the Murray-Mallee region and west to Streaky Bay. Occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine *Callitris* woodlands, *Acacia* shrublands, or coastal heathlands. (DAWE 2021m) | **Possible** – no recent records, however, suitable habitat within Project Area. |
| *Motacilla cinerea* | Grey Wagtail | Mi (T) | - | 1 | May occur | European and Asian species. Migrates south in winter, usually to Indonesia and NG. Rarely reaches Australia, but when it does, favours habitat near freshwater streams (BirdLife Australia, 2023). | **Unlikely** – no recent records and suitable habitat within Project Area is not preferred. |
| *Motacilla flava* | Yellow Wagtail | Mi (T) | - | 1 | May occur | Open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground (BirdLife Australia, 2023). | **Unlikely** – no recent records and suitable habitat within Project Area is not preferred. |
| *Neophema chrysostoma* | Blue-winged Parrot | VU | | 1 | Likely to occur | Prefers grasslands and grassy woodlands but will inhabit a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones (Birdlife Australia ND). | **Possible -** Suitable habitat within the Project Area. |

| Scientific name | Common name | Conservation status | | Source | Last sighting (year)/PMST occurrence | Species known habitat preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | Aus | SA | | | | |
| *Pedionomus torquatus* | Plains-wanderer | CR | E | 1 | May occur | Present in very small numbers in SE South Australia occurring in sparse, treeless native grasslands and/or low shrubland (Pizzey and Knight, 2007) | **Unlikely** – no recent records and suitable habitat within Project Area is not preferred. |
| *Rostratula australis* | Australian Painted Snipe | EN | E | 1 | Likely to occur | The Australian Painted Snipe is most common in eastern Australia and has been recorded in south-eastern SA. It generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans with rank emergent tussocks of grass, sedges, rushes or reeds with scattered clumps of lignum *Muehlenbeckia,* canegrass or sometimes tea-tree (*Melaleuca*) (DAWE 2021n) | **Unlikely –** no recent records and no suitable wetland or tidal habitat available in Project Area. |
| *Stagonopleura guttata* | Diamond Firetail | VU | - | 1 | Likely to occur | Reside in a wide range of Eucalypt dominated vegetation communities that have a grassy understorey, including woodland, forest and mallee. Most occur on the inland slopes of the Great Dividing Ranges, with only small pockets near the coast (DEH 2008). | **Possible-** Suitable habitat within the Project Area. Record within Project Area. |
| **Mammals** | | | | | | | |
| *Sminthopsis psammophila* | Sandhill Dunnart | EN | V | 1 | Likely to occur | The sandhill dunnart occurs in isolated sandy arid and semi-arid areas in the Great Victoria Desert and the Eyre Peninsula. It occurs in vegetation dominated by hummock (*Triodia*) grassland (DAWE 2021o) | **Possible** – no recent records but potentially suitable *Triodia* habitat within Project Area. |

**Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. Abbreviations within Species known habitat preferences: EP: Eyre Peninsula; FP: Fleurieu Peninsula; NSW: New South Wales SE: Southeast / South-Eastern; VIC: Victoria; YP: Yorke Peninsula.**

**Source:**

1. **EPBC Act Protected Matters Report (DCCEEW 2024) – 5 km buffer applied to Project Area.**
2. **Biological Database of South Australia data (DEW 2024) – 5 km buffer applied to the Project Area.**

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# 2

# NATIVE VEGETATION DATA REPORT

# Yadnarie PV Ultra (Solar Cogeneration) and Thermal Hydo Facility for Photon Energy Aus SPV 4

# Native Vegetation Clearance

## Data Report

Clearance under the *Native Vegetation Regulations 2017*

22 October 2024

Prepared by E. West – EBS Ecology

# Yadnarie Solar Farm Native Vegetation Clearance Data Report

22 October 2024

Version 4

Prepared by EBS Ecology for Master Plan SA Pty Ltd on behalf of RayGen Resources Pty Ltd.

| Document Control | | | | | |
|---|---|---|---|---|---|
| **Revision No.** | **Date issued** | **Authors** | **Reviewed by** | **Date Reviewed** | **Revision type** |
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Project Number: EX240519

CITATION: EBS Ecology (2024) Yadnarie Solar Farm Native Vegetation Clearance Data Report. Report to Master Plan SA Pty Ltd. EBS Ecology, Adelaide.

Cover photograph: Linear remnant mallee woodland bordering two cropped paddocks.

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# Glossary and abbreviations

| | |
|---|---|
| **%** | Percent |
| **<** | Less than |
| **>** | More than |
| **BAM** | Bushland Assessment Method |
| **BDBSA** | Biological Database of South Australia (maintained by DEW) |
| **BESS** | Battery and Energy Storage System |
| **CEMP** | Construction Environmental Management Plan |
| **DCCEEW** | Department of Climate Change, Energy, the Environment and Water (Commonwealth) |
| **DEW** | Department for Environment and Water (South Australia) |
| **EBS** | Environment and Biodiversity Services Pty Ltd (trading as EBS Ecology) |
| **EPBC Act** | *Environment Protection and Biodiversity Conservation Act 1999* |
| **EPBGW** | Eyre Peninsula Blue Gum Woodland |
| **HA** | Heritage Agreement |
| **ha** | Hectare(s) |
| **Heliostats** | Rotational mirror solar arrays |
| **IBRA** | Interim Biogeographical Regionalisation of Australia |
| **km** | Kilometre(s) |
| **m** | Metre(s) |
| **mm** | Millimetre(s) |
| **MasterPlan** | Master Plan SA Pty Ltd, the client |
| **NatureMaps** | Initiative of DEW that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format |
| **Non-perennial watercourse** | Non-perennial includes watercourses that flow only for a short time after rainfall events and intermittent rivers that regularly cease to flow for a period of time, leaving behind dry riverbeds and residual water bodies |
| **NPW Act** | *National Parks and Wildlife Act 1972* |
| **NV Act** | *Native Vegetation Act 1991* |
| **NVC** | Native Vegetation Council |
| **PDI Act** | *Planning, Development and Infrastructure Act 2016* |
| **Photon Energy** | Photon Energy AUS SPV 4 Pty Ltd, the proponent along with RayGen Resources Pty Ltd |
| **PMST** | Protected Matters Search Tool (under the EPBC Act; maintained by DCCEEW) |
| **Project** | Yadnarie Solar Farm |
| **Project Area** | The area of works, as outlined in Figure 1 |
| **RAM** | Rangelands Assessment Method |
| **RayGen** | RayGen Resources Pty Ltd, the proponent along with Photon Energy |
| **SA** | South Australia(n) |
| **Search Area** | 5 km buffer of the Project Area considered in the desktop assessment database searches |
| **SEB** | Significant Environmental Benefit |
| **sp.** | Species |
| **spp.** | Species (plural) |
| **ssp.** | Sub-species |
| **STAM** | Scattered Tree Assessment Method |
| **TBS** | Total Biodiversity score |
| **TEC** | Threatened Ecological Community |
| **UBS** | Unit Biodiversity Score |
| **VA(s)** | Vegetation Association(s) |
| **var.** | Variety (a taxonomic rank below that of species and subspecies, but above that of form) |
| **WoNS** | Weeds of National Significance |

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Attachment 2 - Scattered Tree Assessment Scoresheet (excel format)

Attachment 3 – Spatial data package (shapefiles)

# 1. APPLICATION INFORMATION

Details of the native vegetation clearance applicant are summarised in Table 1 with a summary of the proposed clearance provided in Table 2.

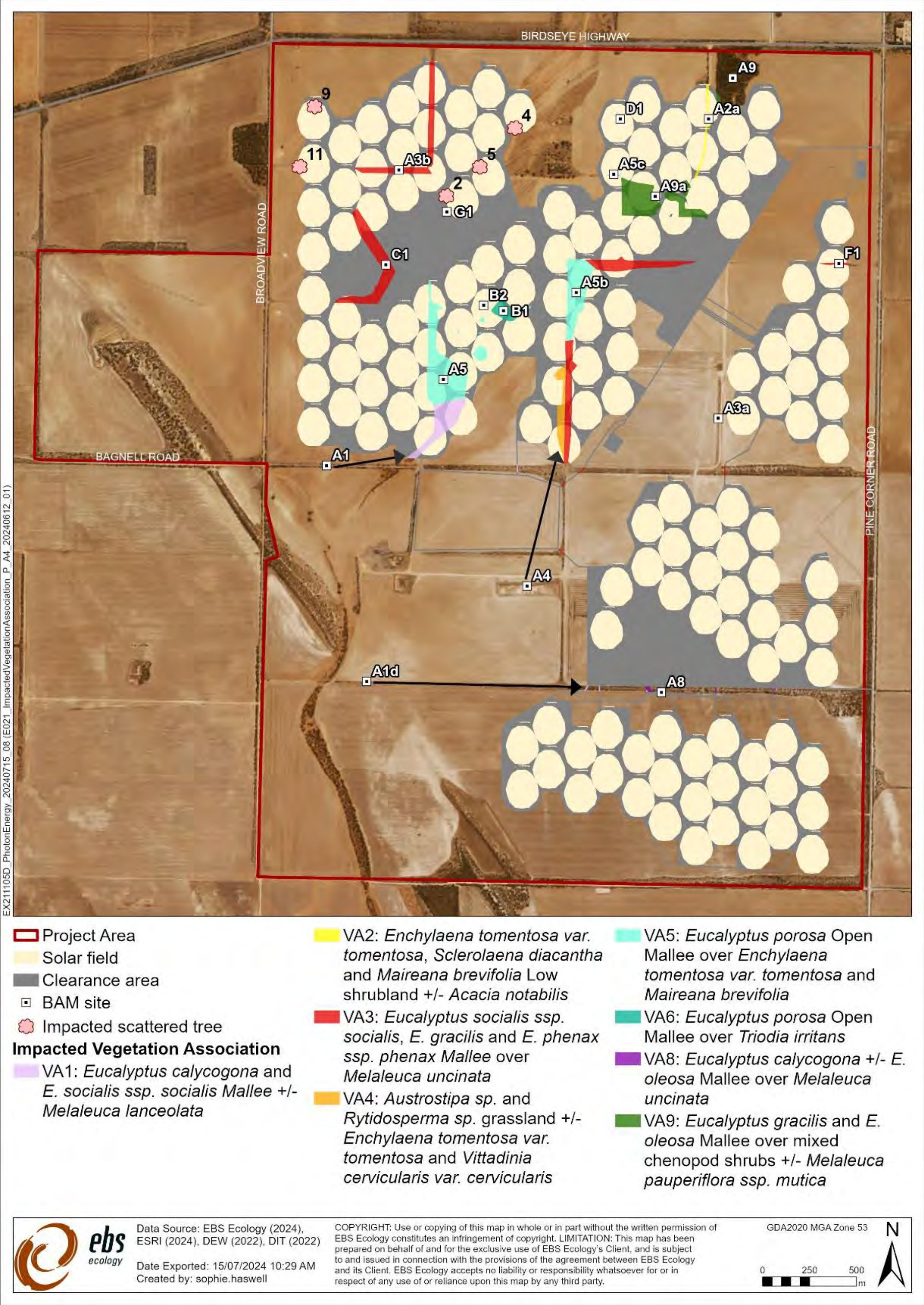
**Table 1. Application details.**

| | | | |
|---|---|---|---|
| **Applicant:** | Master Plan SA Pty Ltd, on behalf of Photon Energy AUS SPV 4 Pty Ltd (Photon Energy) and RayGen Resources Pty Ltd (RayGen) | | |
| **Key contact:** | Ivar Houcke \| Photon Energy<br>Senior Project Manager<br>Level 5, 219-241 Cleveland Street, Redfern NSW 2016<br>E: ivar.houcke@photonenergy.com<br>P: 0434 848 309 | | |
| **Landowner:** | R & K Quinn Superannuation Pty Ltd<br>34 Third Street, Cleve SA 5640<br><br>Robert Michael and Karen Joy Quinn<br>PO Box 196, Cleve SA 5640 | | |
| **Site Address:** | 4543 Birdseye Highway, Cleve South Australia | | |
| **Local Government Area:** | District Council of Cleve | **Hundred:** | Yadnarie |
| **Title ID:** | CT/5940/707<br>CT/6205/513<br>CT/6274/890 | **Parcel ID** | H533400 SE44<br>H533400 SE46<br>H533400 SE55<br>H533400 SE56<br>H533400 SE394<br>H533400 SE395<br>H533400 SE39<br>H533400 SE28 |

**Table 2. Summary of the proposed clearance.**

| | |
|---|---|
| **Purpose of clearance:** | Native vegetation clearance is required for the construction of a renewable energy facility (PV Solar Cogeneration and Thermal Hydro Facility) west of Cleve, South Australia. |
| **Native Vegetation Regulation:** | Regulation 12, clause 34, Infrastructure |
| **Description of the vegetation under application:** | Nine Vegetation Associations (VAs):<br>• **VA 1**: *Eucalyptus calycogona* and *E. socialis* ssp. *socialis* Mallee +/- *Melaleuca lanceolata.*<br>• **VA 2**: *Enchylaena tomentosa* var. *tomentosa, Sclerolaena diacantha* and *Maireana brevifolia* Low shrubland +/- *Acacia notabilis.*<br>• **VA 3**: *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata.*<br>• **VA 4**: *Austrostipa* spp. and *Rytidosperma* sp. Grassland +/- *Enchylaena tomentosa* var. *tomentosa* and *Vittadinia cervicularis* var. *cervicularis.*<br>• **VA 5**: *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia.*<br>• **VA 6**: *Eucalyptus porosa* Open Mallee over *Triodia irritans*.<br>• **VA 8**: *Eucalyptus calycogona +/- E. oleosa* Mallee over *Melaleuca uncinata.* |

| | |
|---|---|
| | • **VA 9**: *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica.*<br>Five Scattered Trees, including three *Eucalyptus socialis* ssp. *socialis,* one *Eucalyptus petiolaris* and one *Eucalyptus porosa*. |
| **Total proposed clearance – area (ha) and/or number of trees:** | Five (5) Scattered Trees and 33.425 hectares (ha) of native vegetation is proposed to be cleared from the following VAs:<br>• **VA 1**: 2.915 ha.<br>• **VA 2**: 0.577 ha.<br>• **VA 3**: 11.892 ha.<br>• **VA 4**: 1.425 ha.<br>• **VA 5**: 10.575 ha.<br>• **VA 6**: 0.949 ha.<br>• **VA 8**: 0.132 ha.<br>• **VA 9**: 4.961 ha. |
| **Level of clearance:** | Level 4 |
| **Overlay (Planning and Design Code):** | Native Vegetation |

<table>
<tr>
<td><b>Map of proposed clearance area:</b></td>
<td>


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<tr>
<td><b>Mitigation Hierarchy:</b></td>
<td>
<b>Avoidance</b><br>
The Project has undergone six design iterations following the receipt of ecological survey results and recommendations. Following the initial surveys and the identification of ecological constraints, it was concluded that the Project would need to be reduced in size (from an initial 300MW design) or that additional land would be required to increase the size of the Project Area. Surveys in the areas under consideration confirmed the presence of the EPBGW TEC, as highlighted in Figure 4. As such, the Project Area was not expanded as so to avoid impacting this EPBC Act listed TEC.<br><br>
Photon Energy requested EBS' advice to highlight areas of high ecological value vegetation within the Project Area so avoidance could be considered. This resulted in further design iterations and the majority
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| | |
|---|---|
| | of infrastructure (i.e., heliostat fields, receiving towers, power plants and vehicle access tracks) being located within cropped paddocks and in areas devoid of native vegetation.<br>The design of the Project, as submitted in the Development Application, has been reduced in size and now avoids structurally diverse woodlands, including the entirety of VA 7 (*Eucalyptus gracilis* and *E. incrassata* Mallee over *Callitris gracilis* +/- *Triodia irritans*). Further, under the current Project design, 116.391 ha of remnant vegetation and six scattered trees have been retained through the strategic positioning of infrastructure.<br>**Minimization**<br>Where possible, infrastructure has been placed in areas of more disturbed vegetation (e.g., VA 2 and VA 4), or vegetation with fewer habitat resources (i.e., upper storey vegetation, dense vegetation, and water sources). Where the clearance of more intact native vegetation has been deemed necessary (i.e., creating access points through contiguously tree-lined fence lines), micro-siting has been undertaken to select areas that are more disturbed or that contain vegetation in the poorest condition.<br>**Rehabilitation**<br>Restoration of vegetation will be permitted in the heliostat fields following the initial construction impact, including (re)generation of low grasses and shrubs under the installed heliostats and in alternate 'gap' corridors initially used for access. Rehabilitation of native vegetation is preferable for the project to reduce dust accumulation on the heliostats and associated maintenance.<br>Locally native flora species will be planted along the perimeter of the Project Area to act as a visual screening barrier. Further, an area of approximately 50 ha adjacent to Broadview and Price Roads, and to the southwest of VA 1 (*Eucalyptus calycogona* and *E. socialis* ssp. *socialis* Mallee +/- *Melaleuca lanceolata*) is proposed to be revegetated.<br>**Offset**<br>The client proposes to pay the offset value into the Native Vegetation Fund. |
| **SEB Offset proposal** | The total SEB offset required for the clearance of 33.425 ha of native vegetation and five Scattered Trees is a payment of $446,309.77**,** including an administrative fee payment of $23,067.42. |

# 2. PURPOSE OF THE CLEARANCE

## 2.1. Description

Photon Energy Australia (Photon Energy) and RayGen Resources Pty Ltd (RayGen) are proposing to construct the Yadnarie Solar Farm (the Project) on private land at 4543 Birdseye Highway (CT/5940/707, CT/6205/513, CT/6274/890). The land under application (the Project Area) is located approximately 8.9 kilometres (km) west of the township of Cleve in the Eyre Peninsula region of South Australia (SA).

EBS Ecology (EBS) were instructed by Master Plan SA Pty Ltd (MasterPlan), who have acted on behalf of RayGen, to undertake a native vegetation clearance assessment and prepare a clearance report for the proposed facility within a 1,530 hectare (ha) area (the Project Area, Figure 1).

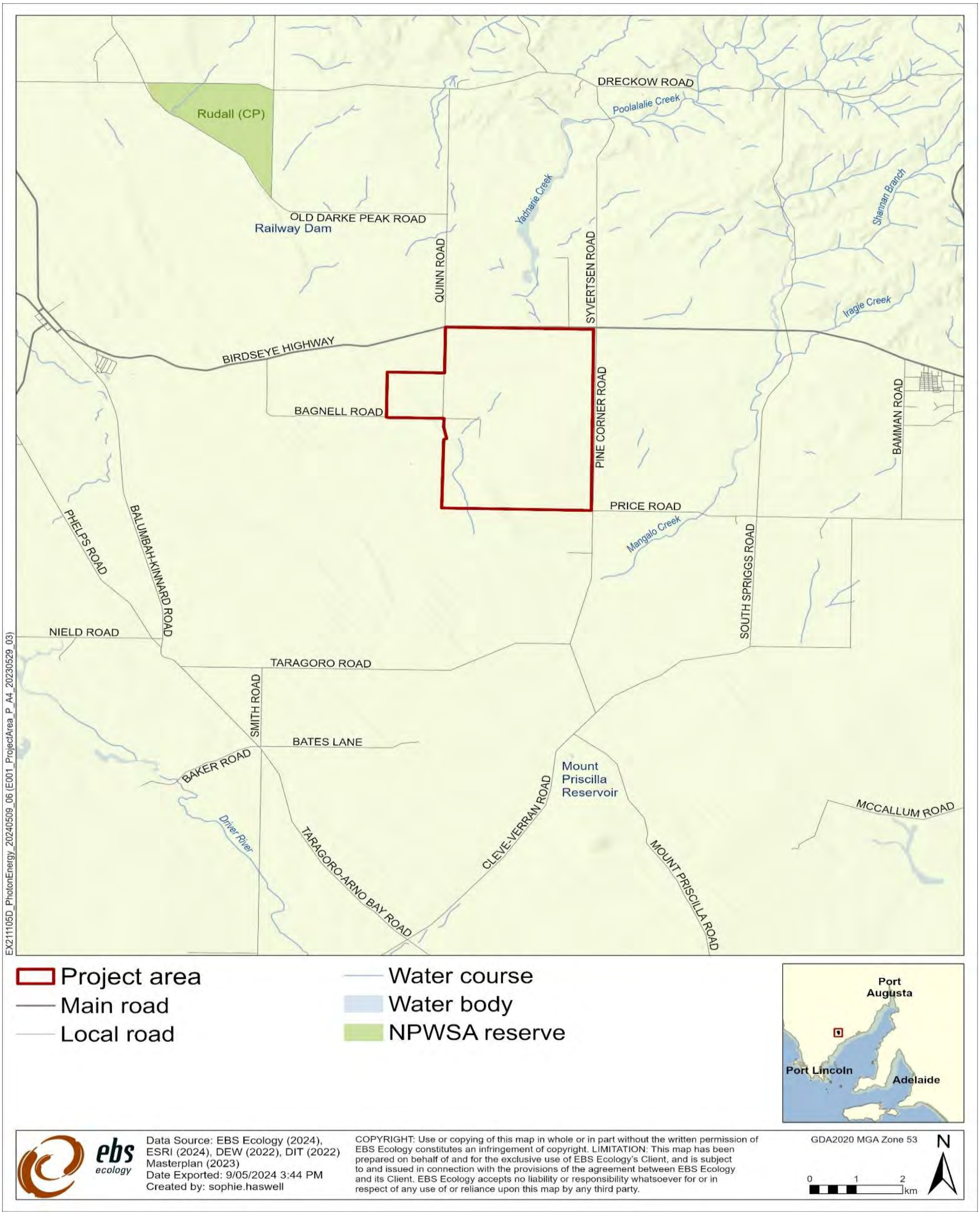
**Objectives**

This native vegetation assessment, in accordance with the *Native Vegetation Act 1991* (NV Act) and *Native Vegetation Regulations 2017*, had the following objectives:

- To undertake a desktop assessment of the likelihood of occurrence of threatened ecological communities, flora and fauna protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the State *National Parks and Wildlife Act 1972* (NPW Act);
- To assess native vegetation within the Project Area by applying the Native Vegetation Council (NVC) endorsed Bushland Assessment Method (BAM) in accordance with the NV Act;
- To identify any "Declared" plants under the *Landscape South Australia Act 2019* or Weeds of National Significance (WoNS) that may be significant in relation to the Project requirements; and
- To calculate the Significant Environmental Benefit (SEB) offset requirements for the Project based on the client supplied impact footprint.

## 2.2. General location map

The Project Area is indicated on the map in Figure 1.



Data Source: EBS Ecology (2024), ESRI (2024), DEW (2022), DIT (2022) Masterplan (2023)
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**Figure 1. Regional context of the Project Area.**

## 2.3. Background

Two terms are used to describe the location of the Project:

- Project Area – the area where native vegetation clearance is proposed (i.e. the footprint of the Project).
- Search Area – a 5-kilometre (km) buffer surrounding the Project Area and used for the desktop component of this clearance data report.

The Project has been proposed to be constructed in the District Council of Cleve within the Eyre Peninsula landscape management region and the Hundred of Yadnarie (DEW 2024a). Most of the Project Area has historically been cleared of vegetation and converted into agricultural land. The site receives approximately 343 millimetres (mm) of rainfall annually.

The closest National Parks and Wildlife Service South Australia estate to the Project Area is Rudall Conservation Park (357 ha), approximately 5.1 km to the northeast. There is one Heritage Agreement (HA) area, protected under the NV Act, within 5 km of the Project Area (HA 61) and is contiguous with Rudall Conservation Park. There is one fragmented SEB area (2012_2010) west of the land under application, with the closest pocket approximately 200 metres (m) away (DEW 2024a). There is also one Roadside Significant Site (1041) 1.5 km to the east on the righthand side of the Birdseye Highway (DEW 2024a). The Project, in its current form, will not impact any of the aforementioned areas protected under the NPW and NV Acts.

**Interim Biogeographic Regionalisation of Australia**

The Interim Biogeographic Regionalisation of Australia (IBRA) was designed to provide a framework for reporting on geographically distinct landscapes. These landscapes broadly describe areas of similar topography, geology, soil, and vegetation composition.

The Project Area falls across two IBRA associations, Cleve and Hambidge, which belong to the Eyre Hills and Eyre Mallee subregions, respectively. These IBRA entities are encompassed by the broader Eyre Yorke Block.

Approximately 16,696 ha (17 %) and 99,466 ha (28 %) of remnant native vegetation is mapped within the Cleve and Hambridge IBRA associations. Of this, only 279 ha (17 %) and 73,409 ha (74 %) are protected by conservation estates and by HA agreements. Outside formal conservation areas, remnant vegetation is largely concentrated along fence lines, road corridors, watercourses, disused paddocks, and as isolated scattered trees.

**Previous assessments**

The following assessments have been undertaken by ESB Ecology to identify ecological constraints associated with the Project (Table 3).

**Table 3. Summary of previous assessments for the Project.**

| Project name | Year | Field dates | Report type | EBS Project Code and reference |
|---|---|---|---|---|
| Photon Energy Solar Storage Project Desktop assessment | 2021 | - | Desktop report outlining ecological constraints for the Project | EX211105 (EBS Ecology 2021) |
| Photon Energy Solar Storage Ecological Assessment | 2022 | 28 February to 3 March &<br>21 to 25 November | Ecological report highlighting on-ground vegetation condition and outline of constraints | E211105 (EBS Ecology 2022a) |
| Desktop letter for EPBC threatened species | 2022 | - | Letter memo investigating potential threatened species within a new area. | EX211105B (EBS Ecology 2022b) |
| Yadnarie Solar Farm Ecological Assessment | 2024 | 25 August 2023 | Updates to the Ecological Report with a new Project Area | EX240519 (EBS Ecology 2024) |
| Yadnarie Solar Farm Native Vegetation Clearance Data Report | 2024 | - | Native Vegetation Clearance Data report, with the impact area and Significant Environmental Benefit calculation to Offset the Project. | This report |

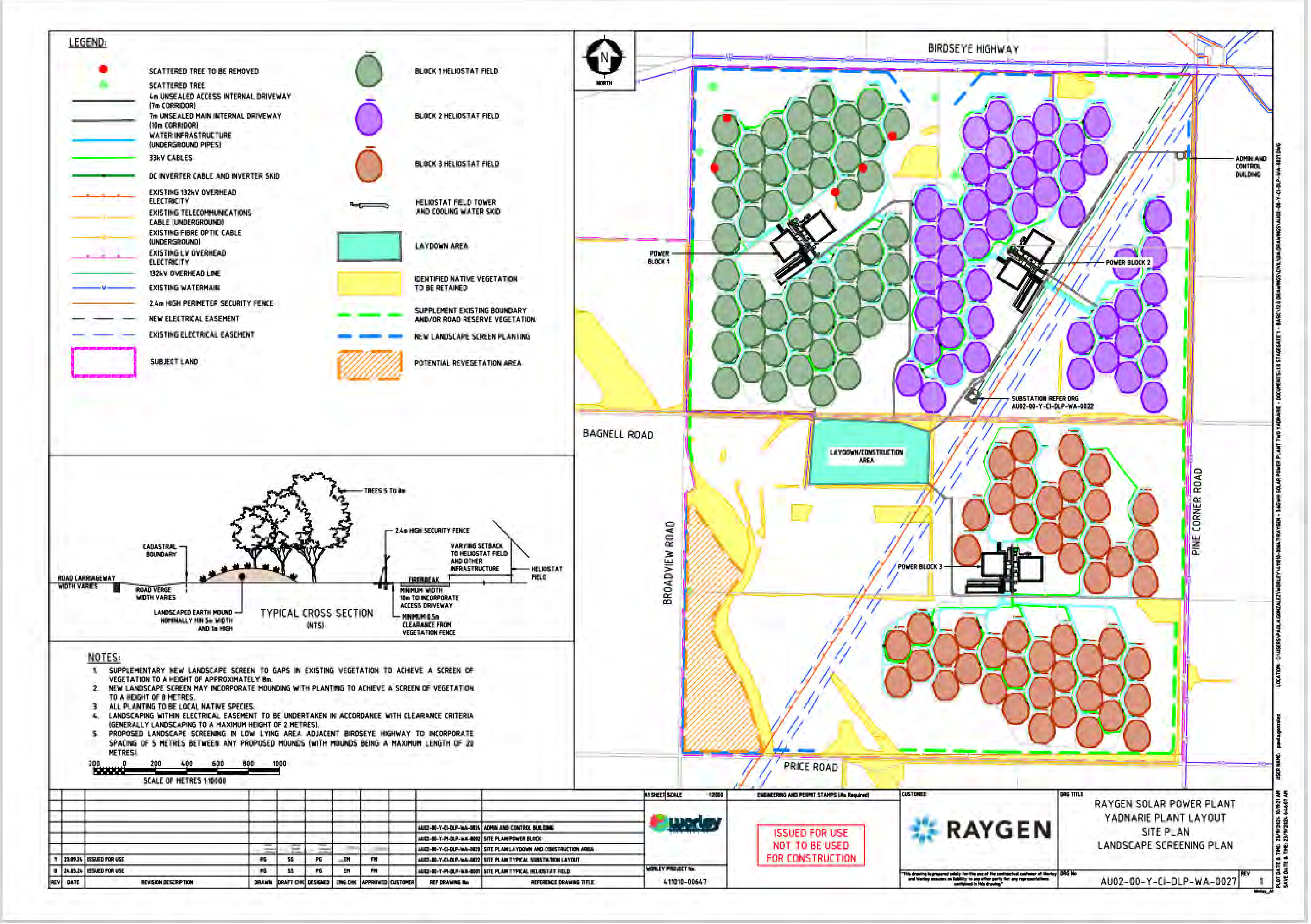
## 2.4. Details of the proposal

The Project will include the development of a solar farm with the capacity to generate 150 megawatts (MW) of renewable energy, a 90 MW grid connection, at least 720 MW hours of storage (and eight hours of dispatchable energy), with connection to the Yadnarie substation or 132 kilovolt overhead transmission line and ancillary infrastructure.

The solar farm will involve the construction of 150 fields of rotational mirrors (heliostats) orientated north. Each field comprises 273 individual heliostats. Each heliostat is approximately between 2.6 and 5.6 metres above the ground and mounted on a steel post. Heliostat heights will vary throughout the day as they track the sun. Each field has one receiver mounted on a tower 40-45 metres high. The receiver faces the field of mirrors in a southward direction. Each receiver has electrical switchgear and water pumping infrastructure at the base of its tower. For every two fields, there is one inverter for a total of 75 inverters. Additional project components include:

- Three (3) thermal hydro units, with each comprising:
    - Three (3) cold pits (each pit/tank is 28,000 square metres) with a height above ground level of 3 m.
    - Three (3) hot pits (each pit/tank is 28,000 square metres) with a height above ground level of 3 m.
- Three (3) thermal hydro plants, with each comprising an Organic Rankine Cycle engine and generator, heat exchangers, water tanks, pumps, pipework and transformers.
- Underground electrical cable reticulation.
- Switchyard and connection via overhead transmission lines to the Yadnarie substation.
- Operations and maintenance building and compound.

- Temporary construction compound.
- Security fencing around the perimeter of the Project Area.
- Internal access roads.



NOTES:

1. SUPPLEMENTARY NEW LANDSCAPE SCREEN TO GAPS IN EXISTING VEGETATION TO ACHIEVE A SCREEN OF VEGETATION TO A HEIGHT OF APPROXIMATELY 8m.
2. NEW LANDSCAPE SCREEN MAY INCORPORATE MOUNDING WITH PLANTING TO ACHIEVE A SCREEN OF VEGETATION TO A HEIGHT OF 8 METRES.
3. ALL PLANTING TO BE LOCAL NATIVE SPECIES.
4. LANDSCAPING WITHIN ELECTRICAL EASEMENT TO BE UNDERTAKEN IN ACCORDANCE WITH CLEARANCE CRITERIA (GENERALLY LANDSCAPING TO A MAXIMUM HEIGHT OF 2 METRES).
5. PROPOSED LANDSCAPE SCREENING IN LOW LYING AREA ADJACENT BIRDSEYE HIGHWAY TO INCORPORATE SPACING OF 5 METRES BETWEEN ANY PROPOSED MOUNDS (WITH MOUNDS BEING A MAXIMUM LENGTH OF 20 METRES).

**Figure 2. The current design of the Yadnarie Solar Farm, provided to EBS by MasterPlan on 24 September 2024.**

## 2.5. Approvals required *or* obtained

### 2.5.1. *Native Vegetation Act 1991 (NV Act)*

The Project is subject to the NV Act, which is the subject of this Data Report, and fulfils the requirements of the NV Act to clear native vegetation.

### 2.5.2. *Planning, Development and Infrastructure Act 2016 (PDI Act)*

This Data Report is in support of a Development Application being prepared by MasterPlan.

### 2.5.3. *Environment Protection and Biodiversity Conservation Act 1999 (EBPC Act)*

EBS were instructed by MasterPlan, on behalf of RayGen, to undertake an EPBC Self-assessment to inform whether any Matters of Environmental Significance (MNES) listed under the EPBC Act would be significantly impacted (as per the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*) by the Project (EBS 2024). Through the preparation of a Protected Matters Search Tool (PMST) report, the EPBC Self-assessment identified the seven MNES entities as 'likely' to occur in the Project Area. Some of these MNES are also threatened under the State *National Parks and Wildlife Act 1972*. The relevant MNES are listed below:

- Two EPBC Act listed threatened flora species:
    - *Caladenia tensa* (Greencomb Spider-orchid) – nationally Endangered.
    - *Pterostylis mirabilis* (Nodding Rufoushood) – nationally and State Vulnerable.
- Five EPBC Act listed threatened fauna species (four birds and one mammal):
    - Blue-winged Parrot (*Neophema chrysostoma*) – nationally and State Vulnerable.
    - Diamond Firetail (*Stagonopleura guttata*) – nationally and State Vulnerable.
    - Malleefowl (*Leipoa ocellata*) – nationally and State Vulnerable.
    - Sandhill Dunnart (*Sminthopsis psammophila*) – nationally Endangered and State Vulnerable.
    - Southern Whiteface (*Aphelocephala leucopsis*) – nationally Vulnerable.

The EPBC Self-assessment concluded that there would be no significant impact to any MNES resulting from the proposed Project.

### 2.5.4. *National Parks and Wildlife Act 1972 (NPW Act)*

The flora and fauna survey conducted as part of this native vegetation clearance application was undertaken by EBS under Scientific Research License K25613-23.

### 2.5.5. *Landscapes South Australia Act 2019 (LSA Act)*

All landowners have a responsibility to promote sustainable management of the State's landscape, which includes minimising occurrence, transport and spread of weeds including those listed as Declared under the LSA Act. Standard procedures, such as those outlined in a Construction Environmental Management Plan (CEMP) should be in place to prevent the encroachment of weeds and other potential environmental impacts.

### 2.5.6. *Aboriginal Heritage Act 1998*

Approval will be required if any items of cultural significance are uncovered during construction works. A 'Stop Work' procedure should be in place if any items of this nature are located.

## 2.6. Native Vegetation Regulation

The proposed clearance will be assessed under Regulation 12, clause 34, Infrastructure.

## 2.7. Development Application information (if applicable)

A review of the South Australian Property and Planning Atlas found that the Project Area falls within the Rural zone and is located within the Hazards (Bushfire – Regional) and Native Vegetation overlays. DA information that is relevant to this native vegetation clearance application is listed in Table 4.

**Table 4. Development Application information.**

| **Local Government Area** | District Council of Cleve |
|---|---|
| **Hundred** | Yadnarie |
| **Parcel** | H533400 SE44<br>H533400 SE55<br>H533400 SE56<br>H533400 SE394<br>H533400 SE395<br>H533400 SE39<br>H533400 SE28 |
| **Title** | CT/5940/707, CT/6205/513, CT/6274/890 |
| **Zone** | Rural |
| **Overlays** | Hazards (Bushfire – Regional)<br>Key Outback and Rural Routes<br>Native Vegetation<br>Water Resources |
| **DA number** | DA 24017660 |

# 3. METHODOLOGY

## 3.1. Flora assessment

Two separate flora assessments were undertaken by EBS for the Project:

- From 28 February to 3 March 2022 by Ecologists E. West and N. Piscioneri; and
- From 21 to 25 November 2022 by Ecologist E. West and NVC accredited consultant E. Tremain.

All flora assessments were performed in accordance with the Bushland Assessment Method (BAM) (NVC 2020a) and the Scattered Tree Assessment Method (STAM) (NVC 2020b).

### 3.1.1. *Bushland Assessment Method*

The BAM is derived from the Nature Conservation Society of South Australia's Bushland Condition Monitoring methodology (Croft *et al.* 2007, 2008a, 2008b, 2009; Milne and Croft 2012; Milne and McCallum 2012). The BAM is used to assess areas of native vegetation requiring clearance and calculate the SEB requirements.

Details of site selection/stratification and assessment protocols, and the biodiversity value components assessed and the factors that influence these components are outlined in the *Bushland Assessment Manual* (NVC 2020a).

The Conservation Significance Scores were calculated from direct observations of flora and direct and historical observations of fauna species of conservation significance. All fauna identified as known or likely to occur in the PMST, and fauna with Biological Database of South Australia (BDBSA) records since 1995 and with a spatial reliability of less than 1 km, within 5 km of the Project Area, were included in the BAM scoresheets. Species determined as unlikely to occur within the Project Area will be removed by the Native Vegetation Branch if the finding is supported. Marine and/or wetland species were omitted from the scoresheets given the entire Project Area is terrestrial and there are no permanent watercourses or wetlands present.

### 3.1.2. *Scattered Tree Assessment Method*

The STAM is derived from the *Scattered Tree Clearance Assessment in South Australia: Streamlining, Guidelines for Assessment and Rural Industry Extension* report (Cutten and Hodder 2002). The STAM is suitable for assessing scattered trees in the following instances:

- Individual scattered trees (i.e., canopy does not overlap). The spatial distribution of trees may vary from approaching what would be considered their original distribution (pre-European) through to single isolated trees in the middle of a paddock; or
- Dead trees (when a dead tree is considered native vegetation); or
- Clumps of trees (contiguous overlapping canopies) if the clump is small (approximately <0.1 ha); and

- For both scattered trees and clumps:
- The ground layer comprises wholly or largely of introduced species;
- Some scattered colonising native species may be present, but represent <5% of the ground cover; and
- The area around the trees consists of introduced pasture or crops.

Details of the scattered tree Point Scoring System are outlined in the *Scattered Tree Assessment Manual* (NVC 2020b). The numbers of uncommon and threatened scattered tree using fauna species entered into the Scattered Tree Scoresheet were calculated by cross-referring the BDBSA data extract (see Section 3.2.2) and the lists of scattered trees using fauna in the *Scattered Tree Assessment Manual* (NVC 2020). The resource use of each species identified was considered when determining each tree's suitability for threatened fauna species (e.g., species that only use hollows in scattered trees were only assigned to scattered trees containing hollows).

### 3.1.3. *Provisional list of threatened ecosystems*

The *Provisional List of Threatened Ecosystems* (Department for Environment and Heritage 2005) was reviewed to determine whether any vegetation associations impacted meet the criteria for listing as a threatened ecosystem at the State level.

## 3.2. Fauna assessment

A desktop assessment was undertaken to determine the potential for any threatened fauna species and TECs to occur within the Project Area. This included species listed under both the EPBC Act and the NPW Act.

The search was undertaken by applying a 5 km buffer around the Project Area, referred to as the Search Area. The following databases were searched to obtain records of threatened species:

- PMST Report generated by the Department of Climate Change, Energy, Environment and Water (DCCEEW) to identify any MNES that may or are known to occur in the search Area.
- BDBSA data extract obtained from the Department for Environment and Water (DEW) that identifies the location of historical records of flora and fauna in the Search Area.

### 3.2.1. Protected Matters Search Tool report

A PMST report was generated on 3 June 2024 to identify flora, fauna and TECs listed under the EPBC Act as threatened or migratory (DCCEEW 2024a). Only species and TECs identified in the PMST report as known to occur within the Search Area were assessed for their likelihood of occurrence within the Project Area. A complete threatened species assessment can be seen in Appendix 3.

### 3.2.2. Biological Database of South Australia data extract

A data extract from the BDBSA was obtained from DEW to identify flora and fauna species that have been recorded within 5 km of the Project Area (data extracted 11/06/2024; DEW 2024a Recordset number: DEWNRBDBSA2406211-2).

The BDBSA is comprised of an integrated collection of species records from the South Australian Museum, conservation organisations, private consultancies, Birds SA, Birdlife Australia, and the Australasian Wader Study Group, which meet the DEW’s standards for data quality, integrity, and maintenance. Only species with records since 1995 and a spatial reliability of less than 1 km were assessed for their likelihood of occurrence.

All threatened fauna identified by the BDBSA extract were entered into the scoresheets for the purposes of calculating the threatened fauna score, conservation significance score and SEB obligations of the clearance. Species assessed as unlikely to occur in the Project Area may be removed by the NVC during the approvals process.

### 3.2.3. Fauna field survey

Fauna surveys were conducted in conjunction with the vegetation assessment. Weather conditions during the survey were favourable. All native and exotic fauna species opportunistically encountered (directly observed, or tracks, scats, burrows, nests, and other signs of presence) during the native vegetation clearance assessment were recorded. Potential fauna refuge sites, such as hollows, were noted as an indication of availability of suitable habitat. Particular attention was paid to identifying habitat for threatened species identified in the desktop assessment. For each opportunistic fauna observation, the species, number of individuals, GPS location, detection methodology (sight, sound, or sign) and habitat were recorded.

## 3.3. Likelihood of occurrence

Threatened species and TECs that were identified by the desktop assessment were assessed for their likelihood of occurrence in the Project Area. All species with historical records since 1995 with a spatial reliability of < 1 km and species listed as ‘known to occur’ by the PMST report were assessed.

The assessment was based on recency or records, habitat preferences and the results of the field survey, with criteria for the likelihood of occurrence described in Table 5.

**Table 5. Criteria for the likelihood of occurrence of threatened species within the Project Area.**

| Likelihood | Criteria |
|---|---|
| Highly Likely/Known | Recorded in the last 10 years, the species does not have highly specific niche requirements, the habitat is present and falls within the known range of the species distribution or;<br>The species was recorded as part of field surveys. |
| Likely | Recorded within the previous 20 years, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species. |
| Possible | Recorded within the previous 20 years, the area falls inside the known distribution of the species, but the area provides limited habitat or feeding resources for the species.<br>Recorded within 20 - 40 years, survey effort is considered adequate, habitat and feeding resources present, and species of similar habitat needs have been recorded in the area. |
| Unlikely | Recorded within the previous 20 years, but the area provides no habitat or feeding resources for the species, including perching, roosting or nesting opportunities, corridor for movement or shelter.<br>Recorded within 20 - 40 years; however, suitable habitat does not occur, and species of similar habitat requirements have not been recorded in the area.<br>No records despite adequate survey effort. |

## 3.4. Limitations

### 3.4.1. Survey limitations

Flora and fauna records were retrieved from the PMST and BDBSA extract. The BDBSA only includes verified flora and fauna records submitted to DEW or partner organisations. It is recognised that information is imperfectly captured, and it is possible that significant species may occur in the Project Area that are not reflected by database records. Although much of the BDBSA data has been through a variety of validation processes, the lists may contain errors and should be used with caution. DEW gives no warranty that the data is accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

No species-specific targeted flora or fauna surveys were undertaken.

### 3.4.2. Spatial data limitations

All spatial data has been captured or converted to the following coordinate reference system.

**Datum:** Geocentric Datum of Australia 2020 (GDA2020).

**Projection:** Map Grid of Australia 2020 (MGA2020), Zone 53.

All location coordinates listed in this report are expressed using this system. Spatial data converted from other coordinate reference systems may have accuracy limitations.

# 4. ASSESSMENT OUTCOMES

## 4.1. Vegetation assessment

### 4.1.1. General description of the vegetation, the site and matters of significance

The dominant landform in the Project Area is a plain that has been extensively cleared for agriculture and which continues to be cropped. Consequently, remnant vegetation is largely concentrated along paddock boundaries and fence lines (Figure). Outside of these areas remnant vegetation is comprised of small, discontinuous pockets of mallee woodland and scattered trees. In some areas, where cropping has ceased, there has been some natural regeneration by degraded grassland and chenopod communities.

Vegetation condition reflects historical land use and ranges from high-quality intact mallee woodland (i.e., VA 1) to degraded mallee with a high rate of exotic incursions (i.e., VA 6).

The field surveys mapped 149.816 ha of native vegetation across the Project Area, assigned to nine vegetation associations:

- VA 1 *Eucalyptus calycogona* and *E. socialis* ssp. *socialis* Mallee +/- *Melaleuca lanceolata*
- VA 2 *Enchylaena tomentosa* var. *tomentosa*, *Sclerolaena diacantha* and *Maireana brevifolia* Low shrubland +/- *Acacia notabilis*
- VA 3 *Eucalyptus socialis* ssp. *socialis*, *E. gracilis* and *E. phenax* ssp. *phenax* Mallee *over Melaleuca uncinata*
- VA 4 *Austrostipa* sp. and *Rytidosperma* sp. Grassland +/- *Enchylaena tomentosa* var. *tomentosa* and *Vittadinia cervicularis* var. *cervicularis*
- VA 5 *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia*
- VA 6 *Eucalyptus porosa* Open Mallee over *Triodia irritans*
- VA 7 *Eucalyptus gracilis* and *E. incrassata* Mallee *over Callitris gracilis +/- Triodia irritans*
- VA 8 *Eucalyptus calycogona* +/- *E. oleosa* Mallee over *Melaleuca uncinata*
- VA 9 *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica.*

A total of 11 Scattered Trees is located across the Project Area, consisting of:

- 5 *Eucalyptus socialis* (Beaked Red Mallee)
- 3 *E. porosa* (Mallee Box)
- 1 *E. petiolaris* (Eyre Peninsula Blue Gum)
- 1 *E. leptophylla* (Narrow-leaf Red Mallee)

- 1 *E. gracilis* (Yorrell)

A total of 148 flora species were recorded, as listed in 8.1 Appendix 1 - Flora species recorded by the field survey, including 115 native and 33 introduced species. Of these, seven are Declared under the LSA Act and three are also listed as WoNS:

- *Asparagus asparagoides* f. (Bridal Creeper) – Declared and WoNS;
- *Echium plantagineum* (Salvation Jane) – Declared;
- *Gazania linearis* (Gazania) – Declared;
- *Gazania* sp. (African Daisy) – Declared;
- *Lycium ferocissimum* (African Boxthorn) – Declared and WoNS;
- *Marrubium vulgare* (Horehound) – Declared;
- *Solanum elaeagnifolium* (Silver-leaved Nightshade) – Declared and WoNS; and
- *Tribulus terrestris* (Caltrop) – Declared.

No wetlands are present in the Project Area, although there are three unnamed non-perennial watercourses located in the south (Figure 1). These did not contain water the time of the field surveys. Soils across the site were of a clay-loam constitution.

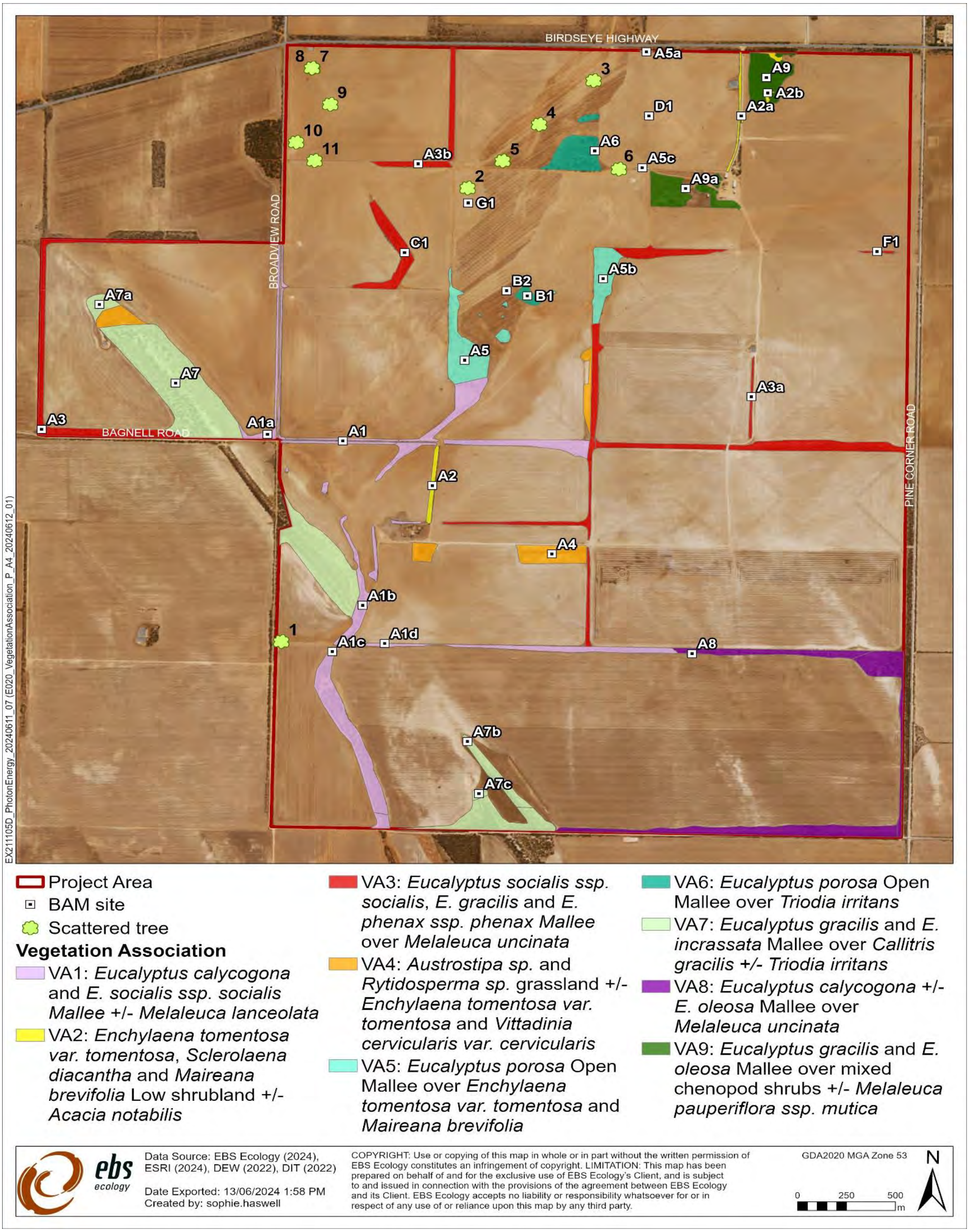


**Figure 3. Distribution of vegetation associations across the Project Area, scattered trees and the location of BAM survey sites.**

### 4.1.2. Details of the vegetation associations proposed to be impacted

Through the strategic positioning of infrastructure in areas of bare earth (i.e., cropped paddocks), the Project will require the clearance of 33.425 ha (~22.3 %) of native vegetation present within the Project Area (Table 6).

**Table 6. Vegetation associations (VAs) located within the Project Area.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted | Reference |
|---|---|---|---|---|
| VA 1 | *Eucalyptus calycogona* and *E. socialis* ssp. *socialis* Mallee +/- *Melaleuca lanceolata* | 28.122 | 2.915 | Table 7 |
| VA 2 | *Enchylaena tomentosa* var. *tomentosa, Sclerolaena diacantha* and *Maireana brevifolia* Low shrubland +/- *Acacia notabilis* | 2.144 | 0.577 | Table 8 |
| VA 3 | *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata* | 30.005 | 11.892 | Table 9 |
| VA 4 | *Austrostipa* sp. and *Rytidosperma* sp. Grassland +/- *Enchylaena tomentosa* var. *tomentosa* and *Vittadinia cervicularis* var. *cervicularis* | 8.173 | 1.425 | Table 10 |
| VA 5 | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 | Table 11 |
| VA 6 | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 | Table 12 |
| VA 7 | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis* +/- *Triodia irritans* | 40.098 | 0 | - |
| VA 8 | *Eucalyptus calycogona* +/- *E. oleosa* Mallee over *Melaleuca uncinata* | 15.034 | 0.132 | Table 13 |
| VA 9 | *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica* | 9.784 | 4.961 | Table 14 |
| **TOTAL (ha)** | | **149.816** | **33.425** | |

As per Table 6, eight of the nine mapped VAs within the Project Area will be impacted as a result of the Project. These VAs are described in further detail in Table 7 to Table 14, which include descriptions of the condition, composition and structure of these communities. The relevant BAM scoresheets are provided as Attachment 1.

**Table 7. Summary of VA 1.**

<table>
<tr><td><b>Vegetation Association</b></td><td colspan="5"><b><i>Eucalyptus calycogona</i> and <i>E. socialis</i> ssp. <i>socialis</i> Mallee +/- <i>Melaleuca lanceolata.</i></b></td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 6.2 Mallee with Open Shrub Understorey on Clay loam Soil Flats.</td></tr>
<tr><td colspan="6"><br>VA 1 (BAM site G1) facing east. Coordinates: Easting 627373, Northing 6270416.</td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="5">Mallee dominated by <i>Eucalyptus calycogona</i> (Ridge-fruited Mallee) and <i>E. socialis</i> ssp. <i>socialis</i> (Beaked Mallee). Other tree species present include <i>E. phenax</i> ssp. <i>phenax</i> (White Mallee) and <i>E. gracilis</i> (Yorrell).<br>Open, low chenopod and shrub understorey with <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Sclerolaena diacantha</i> (Grey Bindyi) and <i>Maireana brevifolia</i> (Short-leaf Bluebush). Isolated tall shrubs of <i>Acacia halliana</i> (Hall's Wattle), <i>Melaleuca lanceolata</i> (Dryland Tea-tree) and <i>Santalum acuminatum</i> (Quandong) are also present.<br>Ground strata is dominated by <i>Austrostipa</i> sp. (Spear-grass), <i>Enneapogon</i> sp. (Bottle-washers/Nineawn) and <i>Atriplex crassipes</i> var. <i>crassipes.</i> Weed intrusions were predominately represented by <i>Lycium ferocissimum</i> (African Boxthorn), <i>Brassica</i> spp. (Mustard), and <i>Carrichtera annua</i> (Ward's Weed).<br>The VA occurs in the southern to central part of the Project Area on clay loam soil flats.</td></tr>
<tr><td colspan="2"><b>Over storey</b></td><td colspan="2"><b>Mid storey</b></td><td><b>Under storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus calycogona</i><br><i>E. socialis</i> ssp. <i>socialis</i><br><i>E. phenax</i> ssp. <i>phenax</i><br><i>E. gracilis</i></td><td colspan="2"><i>Acacia halliana</i><br><i>Melaleuca lanceolata</i><br><i>Santalum acuminatum</i></td><td><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Atriplex crassipes</i> var. <i>crassipes</i><br><i>Sclerolaena diacantha</i><br><i>Maireana brevifolia</i><br><i>Salsola australis Vittadinia cuneata</i> var. <i>cuneata</i></td></tr>
<tr><td><b>Threatened Species or Community</b></td><td colspan="5">This VA did not meet the requirements of a TEC.<br>No species have been identified as 'Known' by the PMST or have BDBSA records within the Search Area.</td></tr>
<tr><td colspan="6"><b>Block A</b></td></tr>
<tr><td><b>Landscape Context Score</b></td><td>1.1</td><td><b>Vegetation Condition Score</b></td><td>32.04</td><td><b>Conservation Significance Score</b></td><td>1</td></tr>
<tr><td><b>Unit Biodiversity Score</b></td><td>35.56</td><td><b>Area (ha)</b></td><td>2.893</td><td><b>Total Biodiversity Score</b></td><td>102.88</td></tr>
<tr><td colspan="6"><b>Block G</b></td></tr>
<tr><td><b>Landscape Context Score</b></td><td>1.09</td><td><b>Vegetation Condition Score</b></td><td>35.10</td><td><b>Conservation Significance Score</b></td><td>1</td></tr>
<tr><td><b>Unit Biodiversity Score</b></td><td>38.26</td><td><b>Area (ha)</b></td><td>0.023</td><td><b>Total Biodiversity Score</b></td><td>0.88</td></tr>
</table>

**Table 8. Summary of VA 2.**

<table>
<tr><td><b>Vegetation Association</b></td><td colspan="5"><b><i>Enchylaena tomentosa</i> var. <i>tomentosa, Sclerolaena diacantha</i> and <i>Maireana brevifolia</i> Low shrubland +/- <i>Acacia notabilis.</i></b></td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td colspan="6">
VA 2 (site A2a) facing south. Coordinates: Easting 628768, Northing 6270911.</td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="5">Historical clearance has resulted in the degradation of the Mallee resulting in what now exists as a low open shrubland of <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Sclerolaena diacantha</i> (Grey Bindyi) and <i>Maireana brevifolia</i> (Short-leaf Bluebush) with scattered tall shrubs of <i>Pittosporum angustifolium</i> (Native Apricot). Ground strata is dominated by <i>Austrostipa</i> spp. (Spear-grass), <i>Rytidosperma caespitosum</i> (Common Wallaby-grass) and <i>Enneapogon</i> sp. (Bottle-washers/Nineawn). Weed cover at this VA was high with dominance from <i>Carrichtera annua</i> (Ward's Weed) with some other weed intrusions.<br>The VA occurs in the north, east and southwest parts of the Project Area amongst planted vegetation and adjacent intact mallee.</td></tr>
<tr><td colspan="2"><b>Over storey</b></td><td colspan="2"><b>Mid storey</b></td><td><b>Under storey</b></td></tr>
<tr><td colspan="2">N/A</td><td colspan="2"><i>Acacia notabilis</i></td><td><i>Maireana brevifolia</i><br><i>Sclerolaena diacantha</i><br><i>Salsola australis</i><br><i>Atriplex crassipes</i> var. <i>crassipes.</i></td></tr>
<tr><td><b>Threatened Species or Community</b></td><td colspan="5">This vegetation association did not meet the requirements of a TEC.<br>No species have been identified as 'Known' by the PMST or have BDBSA records within the Search Area.</td></tr>
<tr><td><b>Landscape Context Score</b></td><td>1.11</td><td><b>Vegetation Condition Score</b></td><td>20.70</td><td><b>Conservation Significance Score</b></td><td>1</td></tr>
<tr><td><b>Unit Biodiversity Score</b></td><td>22.98</td><td><b>Area (ha)</b></td><td>0.577</td><td><b>Total Biodiversity Score</b></td><td>13.26</td></tr>
</table>

**Table 9. Summary of VA 3.**

| | |
|---|---|
| **Vegetation Association** | ***Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata.*** |
| **Benchmark Community** | EP 5.2 Mallee on Sandy Loams of inland swales and low dunes. |

VA 3 (site C1) facing south. Coordinates: Easting 627048, Northing 6270135.

| | |
|---|---|
| **General Description** | Mallee dominated by *Eucalyptus socialis* ssp. *socialis* (Beaked Red Mallee), *E. gracilis* (Yorrell) and *E. phenax* ssp. *phenax* (White Mallee). Other tree species present include *E. incrassata* (Ridge-fruited Mallee) and *E. porosa* (Mallee box). Open, low chenopod and shrub understorey with *E. tomentosa* var. *tomentosa* (Ruby Saltbush), *Maireana brevifolia* (Short-leaf Bluebush) and *Atriplex* spp. (Saltbush) Isolated tall shrubs of *Pittosporum angustifolium* (Native Apricot), *Melaleuca uncinata* (Broombush) and *Callitris verrucosa* (Scrub Cypress Pine) are also present. Ground strata is dominated by *Dysphania cristata* (Crested Crumbweed) and *Austrostipa spp.* (Spear-grass) with weed species *Galenia pubescens* (Coastal Galenia) and *Mesembryanthemum crystallinum* (Common Iceplant) also common.<br>The VA is scattered across the Project Area boarding cropping paddocks. |

| Over storey | Mid storey | Under storey |
|---|---|---|
| *Eucalyptus socialis* ssp. *socialis*<br>*E. phenax* ssp. *phenax*<br>*E. gracilis* | *Pittosporum angustifolium*<br>*Melaleuca uncinata*<br>*Callitris verrucosa*<br>*Santalum acuminatum* | *Triodia irritans*<br>*Enchylaena tomentosa* var. *tomentosa*<br>*Maireana brevifolia* |

| | |
|---|---|
| **Threatened species or community** | This vegetation association did not meet the requirements of a TEC.<br>No species have been identified as 'Known' by the PMST or have BDBSA records within the Search Area. |

| **Block A** | | | | | |
|---|---|---|---|---|---|
| **Landscape Context Score** | 1.11 | **Vegetation Condition Score** | 22.06 | **Conservation Significance Score** | 1 |
| **Unit Biodiversity Score** | 24.49 | **Area (ha)** | 7.844 | **Total Biodiversity Score** | 192.08 |
| **Block C** | | | | | |
| **Landscape Context Score** | 1.09 | **Vegetation Condition Score** | 37.89 | **Conservation Significance Score** | 1 |
| **Unit Biodiversity Score** | 41.30 | **Area (ha)** | 3.90 | **Total Biodiversity Score** | 161.07 |
| **Block F** | | | | | |
| **Landscape Context Score** | 1.09 | **Vegetation Condition Score** | 21.60 | **Conservation Significance Score** | 1 |
| **Unit Biodiversity Score** | 23.54 | **Area (ha)** | 0.147 | **Total Biodiversity Score** | 3.46 |

**Table 10. Summary of VA 4.**

<table>
<tr><td><b>Vegetation Association</b></td><td colspan="5"><b><i>Austrostipa sp.</i> and <i>Rytidosperma</i> sp. grassland +/- <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> and <i>Vittadinia cervicularis</i> var. <i>cervicularis.</i></b></td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td colspan="6"><br>VA 4 (site A4) facing south. Coordinates: Easting 627800, Northing 6268422.</td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="5">Grassland dominated by <i>Austrostipa</i> sp. (Spear-grass), and <i>Rytidosperma</i> sp. (Wallaby-grass) with species <i>Chloris truncata</i> and <i>Enneapogon</i> sp. (Bottle-washers/Nineawn) also present. Open, isolated chenopod and shrub understorey with <i>Acacia rigens</i> (Nealie), <i>Melaleuca lanceolata</i> (Dryland Tea-tree), <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Atriplex</i> spp. (Saltbush) and <i>Vittadinia cervicularis</i> var. <i>cervicularis</i> (Waisted New Holland Daisy).<br>The VA occurs in the southern, western, and central parts of the Project Area.</td></tr>
<tr><td colspan="2"><b>Over storey</b></td><td colspan="2"><b>Mid storey</b></td><td><b>Under storey</b></td></tr>
<tr><td colspan="2">N/A</td><td colspan="2"><i>Acacia rigens</i><br><i>Melaleuca lanceolata</i><br><i>Atriplex</i> spp.</td><td><i>Chloris truncata</i><br><i>Rytidosperma</i> sp.<br><i>Austrostipa</i> spp.<br><i>Enneapogon</i> sp.</td></tr>
<tr><td><b>Threatened species or Community</b></td><td colspan="5">This vegetation association did not meet the requirements of a TEC.<br>No species have been identified as ‘Known’ by the PMST or have BDBSA records within the Search Area.</td></tr>
<tr><td colspan="6"><b>Block A</b></td></tr>
<tr><td><b>Landscape Context Score</b></td><td>1.11</td><td><b>Vegetation Condition Score</b></td><td>22.10</td><td><b>Conservation Significance score</b></td><td>1</td></tr>
<tr><td><b>Unit biodiversity Score</b></td><td>24.53</td><td><b>Area (ha)</b></td><td>1.425</td><td><b>Total Biodiversity Score</b></td><td>34.96</td></tr>
</table>

**Table 11. Summary of VA 5.**

<table>
<tr><td><b>Vegetation Association</b></td><td colspan="5"><b><i>Eucalyptus porosa</i> Open Mallee over <i>Enchylaena tomentosa</i> and <i>Maireana brevifolia.</i></b></td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td colspan="6"><br>VA 5 (site A5) facing northeast. Coordinates: Easting 627355, Northing 6269523.</td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="5">Open mallee dominated by <i>Eucalyptus porosa</i> (Mallee Box) and open, low chenopod and shrub understorey with <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Ruby Saltbush), <i>Maireana brevifolia</i> (Short-leaf Bluebush) and <i>Salsola australis</i> (Buckbush). Isolated tall shrubs of <i>Alectryon oleifolius</i> ssp. <i>canescens</i> (Bullock Bush), <i>Acacia notabilis</i> (Notable Wattle) and <i>Acacia halliana</i> (Hall’s Wattle) are also present.<br>Large patches of this VA were isolated within the centre of the Project Area, with smaller isolated patches located towards the north.</td></tr>
<tr><td colspan="2"><b>Over storey</b></td><td colspan="2"><b>Mid storey</b></td><td><b>Under storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus porosa</i></td><td colspan="2"><i>Alectryon oleifolius</i> ssp. <i>canescens</i><br><i>Acacia notabilis</i><br><i>A. halliana</i></td><td><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Maireana brevifolia</i><br><i>Salsola australis</i><br><i>Austrostipa</i> sp.<br><i>Tragus australianus</i></td></tr>
<tr><td><b>Threatened Species or Community</b></td><td colspan="5">This vegetation association did not meet the requirements of a TEC.<br>No species have been identified as ‘Known’ by the PMST or have BDBSA records within the Search Area.</td></tr>
<tr><td colspan="6"><b>Block A</b></td></tr>
<tr><td><b>Landscape Context score</b></td><td>1.11</td><td><b>Vegetation Condition Score</b></td><td>32.01</td><td><b>Conservation Significance score</b></td><td>1</td></tr>
<tr><td><b>Unit biodiversity Score</b></td><td>35.53</td><td><b>Area (ha)</b></td><td>10.432</td><td><b>Total Biodiversity Score</b></td><td>370.69</td></tr>
<tr><td colspan="6"><b>Block B</b></td></tr>
<tr><td><b>Landscape Context Score</b></td><td>1.09</td><td><b>Vegetation Condition Score</b></td><td>30.98</td><td><b>Conservation Significance score</b></td><td>1</td></tr>
<tr><td><b>Unit Biodiversity Score</b></td><td>33.76</td><td><b>Area (ha)</b></td><td>0.142</td><td><b>Total Biodiversity Score</b></td><td>4.79</td></tr>
</table>

**Table 12. Summary of VA 6.**

| **Vegetation Association** | ***Eucalyptus porosa* Open Mallee over *Triodia irritans*.** | | | | |
|---|---|---|---|---|---|
| **Benchmark Community** | EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey. | | | | |
| <br>VA 6 (site B1). Coordinates: Easting 627675, Northing 6269889. | | | | | |
| **General Description** | Very open mallee dominated by *Eucalyptus porosa* (Mallee Box) with an open, low chenopod, shrub and hummock grass understorey consisting of *Enchylaena tomentosa var. tomentosa* (Ruby Saltbush), *Triodia irritans* (Spinifex) and *Maireana brevifolia* (Short-leaf Bluebush). Isolated tall shrubs of *Acacia halliana* (Hall's Wattle), *A. ligulata* (Umbrella Bush) and *Pittosporum angustifolium* (Native Apricot).<br>Ground strata is dominated by native grasses such as *Chloris truncata* (Windmill Grass), *Rytidosperma caespitosum* (Common Wallaby-grass) and *Austrostipa* spp. (Spear-grass) with some weed intrusions.<br>The VA occurs in the centre of the Project Area on sand-loam soils. | | | | |
| | **Over storey** | **Mid storey** | **Under storey** | | |
| | *Eucalyptus porosa* | *Acacia halliana*<br>*A. ligulata*<br>*Pittosporum angustifolium* | *Triodia irritans*<br>*Rytidosperma caespitosum*<br>*Austrostipa* spp.<br>*Enneapogon* sp.<br>*Enchylaena tomentosa* var. *tomentosa*<br>*Maireana brevifolia.* | | |
| **Threatened Species or Community** | This vegetation association did not meet the requirements of a TEC.<br>No species have been identified as 'Known' by the PMST or have BDBSA records within the Search Area. | | | | |
| **Block B** | | | | | |
| **Landscape Context Score** | 1.09 | **Vegetation Condition Score** | 19.91 | **Conservation Significance Score** | 1 |
| **Unit Biodiversity Score** | 21.70 | **Area (ha)** | 0.886 | **Total biodiversity Score** | 19.22 |
| **Block D** | | | | | |
| **Landscape Context Score** | 1.09 | **Vegetation Condition Score** | 18.43 | **Conservation Significance Score** | 1 |
| **Unit biodiversity Score** | 20.08 | **Area (ha)** | 0.063 | **Total Biodiversity Score** | 1.27 |

**Table 13. Summary of VA 8.**

<table>
<tr><td><b>Vegetation Association</b></td><td colspan="5"><b><i>Eucalyptus calycogona +/- E. oleosa Mallee over Melaleuca uncinata.</i></b></td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td colspan="6"><br>VA 8 (site A8) facing northwards.</td></tr>
<tr><td rowspan="3"><b>General Description</b></td><td colspan="5">This mallee has a medium vegetation condition score with a mixture of life forms varying from shrubs, forbs, and vines with a number of regenerating species. Exotic species counts for these VAs has high with cover of <i>Galenia pubescens</i> var. <i>pubescens</i> (Coastal Galenia) and <i>Mesembryanthemum crystallinum</i> (Common Iceplant).<br>This VA was found along the outside of cropping paddocks in the northeast of the Project Area.</td></tr>
<tr><td colspan="2"><b>Over storey</b></td><td><b>Mid storey</b></td><td colspan="2"><b>Under storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus oleosa</i> ssp. <i>oleosa</i><br><i>E. calycogona</i><br><i>E. socialis</i> ssp. <i>socialis</i></td><td><i>Melaleuca lanceolata</i><br><i>M. uncinata</i><br><i>Callitris verrucosa</i></td><td colspan="2"><i>Maireana brevifolia</i><br><i>Enchylaena tomentosa</i> var.<br><i>Sclerolaena diacantha</i></td></tr>
<tr><td><b>Threatened Species or Community</b></td><td colspan="5">This vegetation association did not meet the requirements of a TEC.<br>No species have been identified as ‘Known’ by the PMST or have BDBSA records within the Search Area.</td></tr>
<tr><td><b>Landscape Context Score</b></td><td>1.11</td><td><b>Vegetation Condition Score</b></td><td>40.84</td><td><b>Conservation Significance Score</b></td><td>1</td></tr>
<tr><td><b>Unit Biodiversity Score</b></td><td>45.33</td><td><b>Area (ha)</b></td><td>0.132</td><td><b>Total Biodiversity Score</b></td><td>5.98</td></tr>
</table>

**Table 14. Summary of VA 9.**

<table>
<tr><td><b>Vegetation Association</b></td><td colspan="5"><b><i>Eucalyptus gracilis</i> and <i>E. oleosa</i> Mallee over mixed chenopod shrubs +/- <i>Melaleuca pauperiflora</i> ssp. <i>mutica.</i></b></td></tr>
<tr><td><b>Benchmark Community</b></td><td colspan="5">EP 8.1 Mallee & Low Woodlands with Open Sclerophyll Shrub & Chenopod Understorey.</td></tr>
<tr><td colspan="6"><br>VA 9 (site A9) facing northwards. Coordinates: Easting 628896, Northing 6271129.</td></tr>
<tr><td rowspan="3"><b>General description</b></td><td colspan="5">Mallee dominated by <i>Eucalyptus oleosa</i> (Red Mallee) and <i>E. gracilis</i> (Yorrell). Open, low mixed chenopod and shrub understorey with <i>Enchylaena tomentosa var. tomentosa</i> (Ruby Saltbush), <i>Maireana</i> brevifolia (Short-leaf Bluebush) and <i>Sclerolaena diacantha</i> (Grey Bindyi). Isolated tall shrubs of <i>Geijera linearifolia</i> (Sheep Bush), <i>Pittosporum angustifolium</i> (Native Apricot) and <i>Melaleuca pauperiflora</i> ssp. <i>mutica</i> (Boree) are also present but not common. Ground strata is dominated by <i>Austrostipa spp.</i> (Spear-grass) and <i>Ptilotus seminudus</i> (Rabbit-tails) with dominance from weed species such as, <i>Aizoon pubescens</i> (Coastal Galenia) and <i>Mesembryanthemum crystallinum</i> (Common Iceplant).<br>The VA mostly occurs in the northeastern part of the Project Area.</td></tr>
<tr><td colspan="2"><b>Over storey</b></td><td colspan="2"><b>Mid storey</b></td><td><b>Under storey</b></td></tr>
<tr><td colspan="2"><i>Eucalyptus oleosa</i><br><i>E. gracilis</i></td><td colspan="2"><i>Geijera linearifolia</i><br><i>Pittosporum angustifolium</i><br><i>Melaleuca pauperiflora</i> ssp. <i>mutica</i></td><td><i>Enchylaena tomentosa</i> var. <i>tomentosa</i><br><i>Maireana brevifolia</i><br><i>Sclerolaena diacantha</i><br><i>Salsola australis</i></td></tr>
<tr><td><b>Threatened Species or community</b></td><td colspan="5">This vegetation association did not meet the requirements of a TEC.<br>No species have been identified as ‘Known’ by the PMST or have BDBSA records within the Search Area, to occupy this vegetation community.</td></tr>
<tr><td><b>Landscape Context score</b></td><td>1.11</td><td><b>Vegetation Condition Score</b></td><td>37.02</td><td><b>Conservation Significance Score</b></td><td>1</td></tr>
<tr><td><b>Unit Biodiversity Score</b></td><td>41.09</td><td><b>Area (ha)</b></td><td>4.961</td><td><b>Total Biodiversity Score</b></td><td>203.84</td></tr>
</table>

### 4.1.3. Details of the scattered trees proposed to be impacted

As per Table 15, five of the 11 Scattered Trees will be impacted as a result of the Project. These trees are described in further detail in Table 16 to Table 20. The STAM scoresheet is provided as Attachment 2.

**Table 15. Scattered trees assessed within the Project Area.**

| Tree # | Scientific name | Common name | No in clump | Height (m) | Diameter (cm) | Dieback (%) | Hollows (s, m, l) | Impact action | Reference |
|---|---|---|---|---|---|---|---|---|---|
| 1 | *Eucalyptus gracilis* | Yorrell | 1 | 7.0 | 37 | 40 | 0 | Not impacted | - |
| 2 | *E. socialis* | Beaked Red Mallee | 1 | 6.5 | 44 | 55 | 10, 2, 2 | **Impacted** | Table 16 |
| 3 | *E. porosa* | Mallee Box | 1 | 8.0 | 61 | 60 | 5, 2, 2 | Not impacted | - |
| 4 | *E. petiolaris* | Eyre Peninsula Blue Gum | 1 | 5.0 | 80 | 8 | 0 | **Impacted** | Table 17 |
| 5 | *E. porosa* | Mallee Box | 1 | 6.5 | 45 | 30 | 2 | **Impacted** | Table 18 |
| 6 | *E. porosa* | Mallee Box | 1 | 6.5 | 32 | 2 | 0 | Impacted | - |
| 7 | *E. leptophylla* | Narrow-leaf Red Mallee | 1 | 7.0 | 105 | 40 | 5, 3, 2 | Not impacted | - |
| 8 | *E. socialis* | Beaked Red Mallee | 1 | 7.0 | 100 | 40 | 5, 3, 2 | Not impacted | - |
| 9 | *E. socialis* | Beaked Red Mallee | 1 | 8.0 | 45 | 50 | 0 | **Impacted** | Table 19 |
| 10 | *E. socialis* | Beaked Red Mallee | 1 | 7.0 | 110 | 60 | 5, 2, 0 | Not impacted | - |
| 11 | *E. socialis* | Beaked Red Mallee | 1 | 6.5 | 32 | 40 | 0 | **Impacted** | Table 20 |

**Hollow code**: s = small, m = medium, l = large.

**Table 16. Summary of Tree 2.**

| | |
|---|---|
| **Tree ID –** Tree 2 | <br>Coordinates: Easting 627371, Northing 6270503. |
| **Tree spp. –** *Eucalyptus socialis* | |
| **Number of Trees –** 1 | |
| **Height (m)** – 6.5 | |
| **Hollows –** 14 (10 small, 2 medium, 2 large) | |
| **Diameter (cm) –** 44 | |
| **Canopy Dieback (%) –** 55 | |
| **Total Biodiversity Score –** 1.94 | |

**Table 17. Summary of Tree 4.**

| | |
|---|---|
| **Tree ID –** Tree 4 | <br>Coordinates: Easting 627736, Northing 6270864. |
| **Tree spp. –** *Eucalyptus petiolaris* (recorded as *E. leucoxylon* ssp. *megalocarpa*) | |
| **Number of Trees –** 1 | |
| **Height (m) –** 5.0 | |
| **Hollows –** 0 | |
| **Diameter (cm) –** 80 | |
| **Canopy Dieback (%) –** 8 | |
| **Total Biodiversity Score –** 2.12 | |

**Table 18. Summary of Tree 5.**

| | |
|---|---|
| **Tree ID –** Tree 5<br>**Tree spp. –** *Eucalyptus porosa*<br>**Number of Trees –** 1<br>**Height (m) –** 6.5<br>**Hollows –** 2 small<br>**Diameter (cm) –** 45<br>**Canopy Dieback (%) –** 30<br>**Total Biodiversity Score –** 1.35 | <br>Coordinates: Easting 627549, Northing 6270658. |

**Table 19. Summary of Tree 9.**

| | |
|---|---|
| **Tree ID –** Tree 9<br>**Tree spp. –** *Eucalyptus socialis*<br>**Number of Trees –** 1<br>**Height (m) –** 8<br>**Hollows –** 0<br>**Diameter (cm) –** 45<br>**Canopy Dieback (%) –** 50<br>**Total Biodiversity Score –** 1.43 | <br>Coordinates: Easting 626669, Northing 6270979. |

**Table 20. Summary of Tree 11.**

<table>
<tr><td><b>Tree ID –</b> Tree 11</td><td rowspan="8"><br>Coordinates: Easting 626589, Northing 6270658</td></tr>
<tr><td><b>Tree spp. –</b> <i>Eucalyptus socialis</i></td></tr>
<tr><td><b>Number of Trees –</b> 1</td></tr>
<tr><td><b>Height (m) –</b> 6.5</td></tr>
<tr><td><b>Hollows –</b> 0</td></tr>
<tr><td><b>Diameter (cm) –</b> 32</td></tr>
<tr><td><b>Canopy Dieback (%) –</b> 40</td></tr>
<tr><td><b>Total Biodiversity Score –</b> 0.64</td></tr>
</table>

### 4.1.4. Site map showing areas of proposed impact

The proposed impacts associated with the Project are provided in Figure 3 on the next page. The map shows both patches of native vegetation and scattered trees.

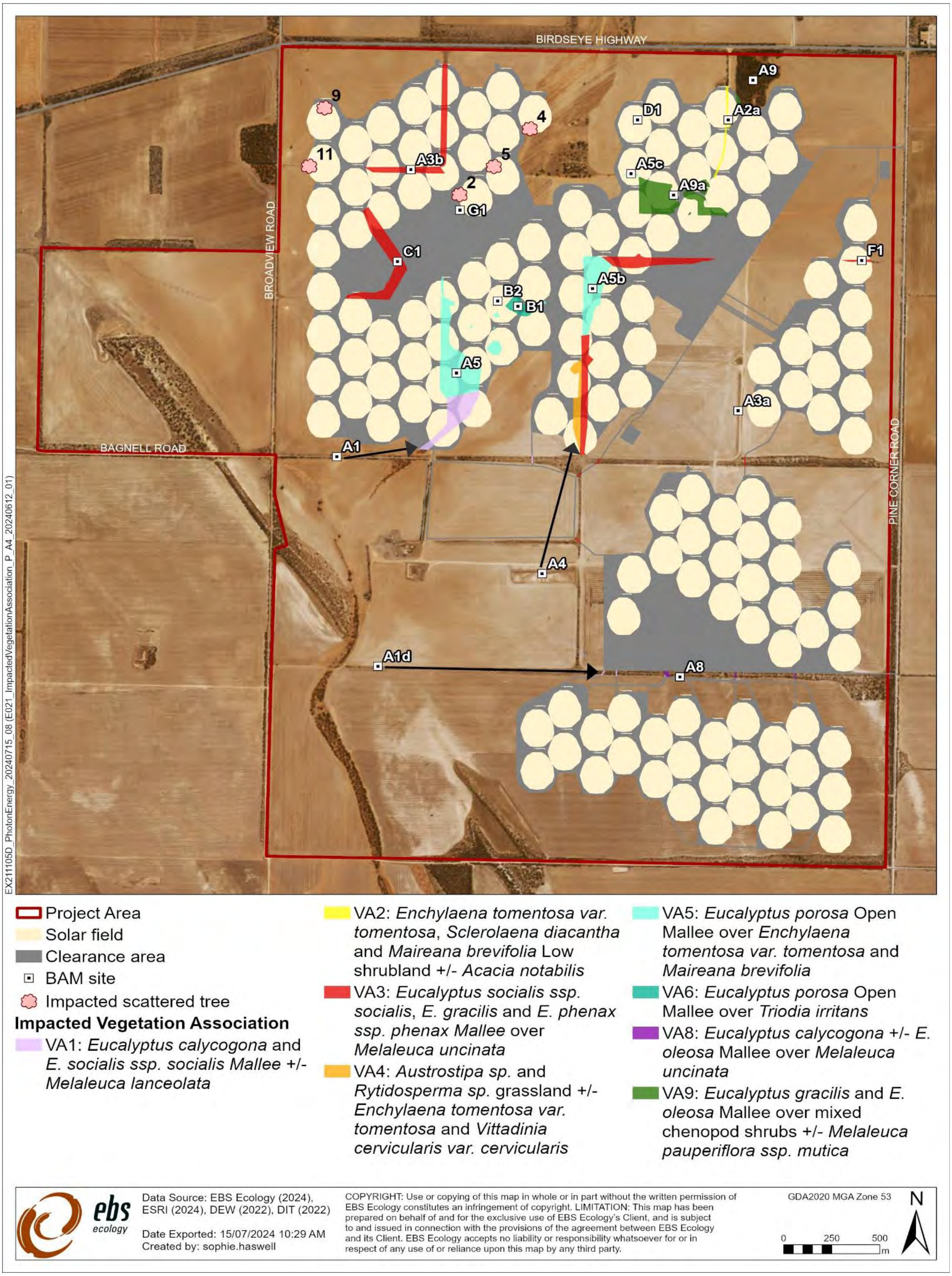


**Figure 3. Vegetation and scattered trees proposed to be impacted by the proposal.**

## 4.2. Threatened Ecological Communities

The PMST search identified one TEC that could potentially occur within the Project Area:

- Endangered Ecological Community Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland (EPBGW).

This TEC was not observed within the Project Area. Database searches found the community mapped in the Search Area (Figure 4).

## 4.3. Threatened species assessment

The desktop database searches identified 27 threatened species (12 flora and 15 fauna) within the Search Area. Of these, 23 are listed as threatened under the EPBC Act and 21 under the NPW Act (8.3 Appendix 3 – Likelihood of Occurrence Assessment). The PMST report did not identify any threatened species as ‘known to occur’.

### 4.3.1. *Threatened fauna*

The PMST report did not identify any threatened species as 'known to occur’. The BDBSA did not return any threatened fauna records that were less than 1 km spatial reliability and greater than 1995.

### 4.3.2. *Threatened flora*

The BDBSA search identified a threatened species within the Search Area (Figure 4) this includes:

- *Eucalyptus cretata* (Darke Peak Mallee) – State Rare.

Despite having records in the local area, the field surveys did not record *E. cretata.* As a tree with clear diagnostic features (i.e., fruiting structures) it was confirmed absent from the Project Area.

A total of 148 flora and 30 fauna species were recorded across the Project Area (8.1 Appendix 1 - Flora species recorded by the field survey and 8.2 Appendix 2 - Fauna species recorded by the field survey). The field survey, however, did not encounter any species listed as threatened under the EPBC and/or NPW Acts.

The full likelihood assessment for all threatened and migratory species identified by the database searches is provided in 8.3 Appendix 3 – Likelihood of Occurrence Assessment.

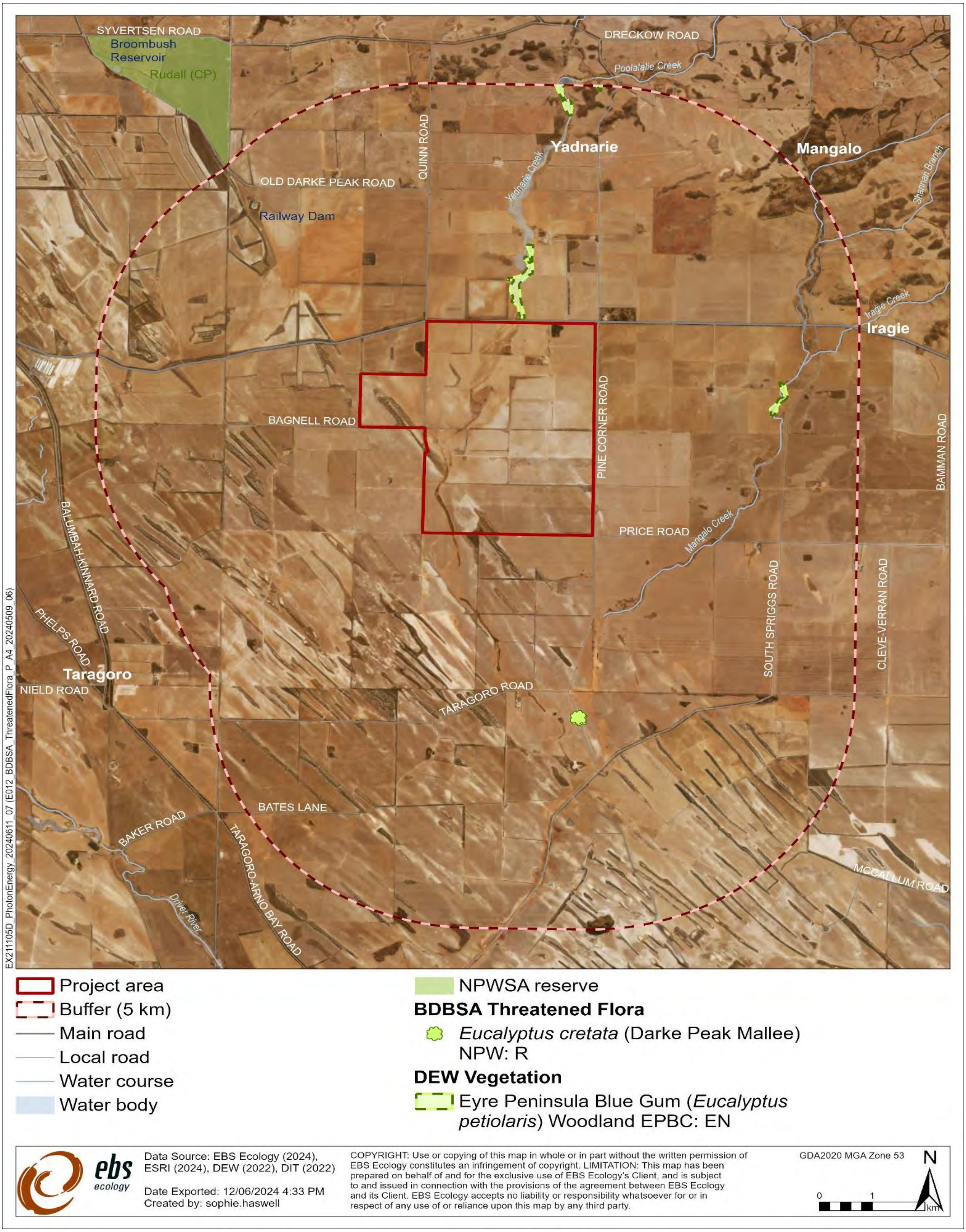


**Figure 4. NPW Act listed threatened species records and EPBC Act listed Threatened Ecological Communities within 5 km of the Project (since 1995, < 1 km reliability (DCCEEW 2024a, DEW 2024b).**

## 4.4. Cumulative impacts

*When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must consider the potential cumulative impact, both direct and indirect, that is reasonably likely to result from a proposed clearance activity.*

The Project will require the removal of up to 33.425 ha of native vegetation and 5 scattered trees for the following purposes:

- Construction of heliostat arrays, power blocks and associated infrastructure (i.e., receivers, inverters, etc);
- Heavy vehicle access onto the Project Area;
- Development of laydown areas and access tracks; and
- Cable trenching.

Indirect impacts to native vegetation and fauna may include:

- Potential increases in dust deposition from clearance associated with project infrastructure installation (until a time when the understory vegetation regenerates);
- Altered hydrology, sunlight and heat radiation from infrastructure changing the composition of retained vegetation communities; and
- The dispersal and importation of weed species through earthworks and the attachment of seeds and other propagules to machinery and vehicles.

## 4.5. Addressing the Mitigation Hierarchy

*When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must have regard to the mitigation hierarchy. The NVC will also consider, with the aim to minimize, impacts on biological diversity, soil, water and other natural resources, threatened species or ecological communities under the EPBC Act or listed species under the NPW Act.*

### ***a) Avoidance – outline measures taken to avoid clearance of native vegetation***

The Project has undergone six design iterations following the receipt of ecological survey results and recommendations. Following the initial surveys and the identification of ecological constraints, it was concluded that the Project would need to be reduced in size (from an initial 300MW design) or that additional land would be required to increase the size of the Project Area. Surveys in the areas under consideration confirmed the presence of the EPBGW TEC, as highlighted in Figure 4. As such, the Project Area was not expanded as so to avoid impacting this EPBC Act listed TEC.

Photon Energy requested EBS' advice to highlight areas of high ecological value vegetation within the Project Area so avoidance could be considered. This resulted in further design iterations and the majority of infrastructure (i.e., heliostat fields, receiving towers, power plants and vehicle access tracks) being located within cropped paddocks and in areas devoid of native vegetation.

The design of the Project, as submitted in the Development Application, has been reduced in size and now avoids structurally diverse woodlands, including the entirety of VA 7 (*Eucalyptus gracilis* and *E. incrassata* Mallee over *Callitris gracilis* +/- *Triodia irritans*). Further, under the current Project design, 116.391 ha of remnant vegetation and six scattered trees have been retained through the strategic positioning of infrastructure.

***b) Minimization – if clearance cannot be avoided, outline measures taken to minimize the extent, duration and intensity of impacts of the clearance on biodiversity to the fullest possible extent (whether the impact is direct, indirect or cumulative).***

Where possible, infrastructure has been placed in areas of more disturbed vegetation (e.g., VA 2 and VA 4), or vegetation with fewer habitat resources (i.e., upper storey vegetation, dense vegetation, and water sources). Where the clearance of more intact native vegetation has been deemed necessary (i.e., creating access points through contiguously tree-lined fence lines), micro-siting has been undertaken to select areas that are more disturbed or that contain vegetation in the poorest condition.

***c) Rehabilitation or restoration – outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimized, such as allowing for the re-establishment of the vegetation.***

Rehabilitation and restoration of vegetation will be permitted in the heliostat fields following their initial construction. This may include the regeneration of low grasses and shrubbery under the installed solar panels and in alternate 'gap' corridors initially used for access and construction. Rehabilitation of native vegetation during operation is preferable for solar farm projects to reduce dust accumulation on panels and associated maintenance.

***d)*** Locally native species will be planted along the perimeter of the Project Area as a visual screening tool. Further, an area of approximately 50 ha adjacent to Broadview and Price Roads, and to the southwest of VA 1 (*Eucalyptus calycogona* and *E. socialis* ssp. *socialis* Mallee +/- *Melaleuca lanceolata*) is proposed to be revegetated. ***Offset – any adverse impact on native vegetation that cannot be avoided or further minimized should be offset by the achievement of a significant environmental benefit that outweighs that impact.***

Any adverse impact on native vegetation or ecosystems that cannot be avoided or minimised will be offset by implementing an SEB that outweighs that impact. The applicant will mitigate in the form of a payment to the Native Vegetation Fund.

*The NVC will only consider an offset once avoidance, minimization and restoration have been documented and fulfilled. The* SEB Policy *explains the biodiversity offsetting principles that must be met.*

## 4.6. Principles of Clearance (Schedule 1, *Native Vegetation Act 1991*)

*The Native Vegetation Council will consider Principles 1(b), 1(c) and 1(d) when assigning a level of Risk under Regulation 16 of the Native Vegetation Regulations. The Native Vegetation Council will consider all the Principles of clearance of the Act as relevant, when considering an application referred under the Planning, Development and Infrastructure Act 2016.*

The clearance is assessed against the Principles of Clearance as set out in Table 21.

**Table 21. Assessment against the Principles of Clearance.**

| Principle of clearance | Considerations |
|---|---|
| **Principle 1(a) – it comprises a high level of diversity of plant species** | **Relevant information**<br>The Project Area contained 148 plant species, of which 115 were native.<br>Native Plant Species Diversity Score:<br>**A1:** 16<br>**A2:** 14<br>**A3:** 9<br>**A4:**18<br>**A5:** 13.33<br>**A8:** 20<br>**A9:** 14<br>**B1:** 14<br>**B2:** 14<br>**C1:** 14<br>**D1:** 9<br>**F1:** 9<br>**G1:** 15 |
| | **Assessment against the principles**<br>Seriously at Variance<br>Not Seriously at Variance<br>At Variance<br>A1, A2, A4, A5, A8, A9, B1, B2, C1 and G1 |
| | **Moderating factors that may be considered by the NVC**<br>The NatureMaps SA Native Vegetation layer indicated that there is 5 % native vegetation coverage within 5 km of the site (DEW 2024a). As the clearance of 33.425 ha represents only 8.5 % of an approximate 392.85 ha of vegetation within a 5 km radius, this moderating factor may apply. |
| **Principle 1(b) – significance as a habitat for wildlife** | **Relevant information**<br>No species have been identified as "known" by the PMST. No threatened fauna records were identified by the BDBSA. Therefore, the likelihood assessment has deemed all threatened species as unlikely based on Table 5. This has resulted in a threatened fauna score of 0 for all the BAM sites.<br>The field surveys did not encounter any threatened fauna species at the Project Area. A total of 30 non-threatened native fauna species were recorded. All were species common in disturbed, largely cleared agricultural landscapes.<br>The Project Area contains habitat features that would provide valuable fauna habitat, including hollow/nest-bearing trees, fallen timber deposits, ephemeral watercourses, and structurally diverse vegetation. Within the Project Area there are networks of contiguous vegetation corridors along fence lines that allow for the movement of animals without exposure in cleared paddocks. Other instances of remnant vegetation remining in the Project Area are patchy and occur in isolated patches surrounded by cropping land. |

<table>
<tr><th>Principle of clearance</th><th>Considerations</th></tr>
<tr><td></td><td>

| Site | Threatened Fauna Score | Unit Biodiversity Score |
|---|---|---|
| A1 | 0 | 35.56 |
| A2 | 0 | 22.98 |
| A3 | 0 | 24.49 |
| A4 | 0 | 24.53 |
| A5 | 0 | 35.53 |
| A8 | 0 | 45.33 |
| A9 | 0 | 41.09 |
| B1 | 0 | 21.70 |
| B2 | 0 | 33.76 |
| C1 | 0 | 41.30 |
| D1 | 0 | 20.08 |
| F1 | 0 | 23.54 |
| G1 | 0 | 38.26 |

A total of 19 species of least concern (uncommon) were identified during the field survey. These species are also scattered tree utilising species (Appendix 2), resulting in a threatened fauna score of 1.

| STAM | Threatened Fauna Score | Unit Biodiversity Score |
|---|---|---|
| Tree 2 | 1 | 2.15 |
| Tree 4 | 1 | 2.33 |
| Tree 5 | 1 | 2.00 |
| Tree 9 | 1 | 2.11 |
| Tree 11 | 1 | 1.07 |

</td></tr>
<tr><td></td><td>

**Assessment against the principles**

Seriously at Variance

Not Seriously at Variance

At Variance

Trees 2, 4, 5, 9, 11

</td></tr>
<tr><td></td><td>

**Moderating factors that may be considered by the NVC**

There are no threatened fauna species records within the 5 km Search Area with records from 1995 and a spatial reliability < 1 km or listed as ‘known’ by the PMST. As such, it is unlikely for any of the aforementioned species to be impacted by the Project.

Areas of higher quality vegetation have been avoided.

</td></tr>
<tr><td><b>Principle 1(c) – plants of a rare, vulnerable or endangered species</b></td><td>

**Relevant information**

No threatened plant species were recorded by the survey.

None of the scattered trees under application are threatened species.

Given the disturbed nature of the Project Area, it is unlikely that any other threatened plant species occur that were not detected during the field survey.

Threatened Flora Score(s) - 0

</td></tr>
</table>

<table>
<tr><th>Principle of clearance</th><th>Considerations</th></tr>
<tr><td rowspan="2"></td><td><b>Assessment against the principles</b><br>Seriously at Variance<br>Not Seriously at Variance<br><br>At Variance<br>Not at Variance</td></tr>
<tr><td><b>Moderating factors that may be considered by the NVC</b><br>Not applicable.</td></tr>
<tr><td rowspan="3"><b>Principle 1(d) – the vegetation comprises the whole or part of a plant community that is Rare, Vulnerable or endangered</b></td><td><b>Relevant information</b><br>No Threatened Ecological Communities are present at the Project Area.<br>Threatened Community Score - 1</td></tr>
<tr><td><b>Assessment against the principles</b><br>Seriously at Variance<br>Not Seriously at Variance<br><br>At Variance<br>Not at Variance</td></tr>
<tr><td><b>Moderating factors that may be considered by the NVC</b><br>Not applicable.</td></tr>
<tr><td rowspan="3"><b>Principle 1(e) – it is significant as a remnant of vegetation in an area which has been extensively cleared</b></td><td><b>Relevant information</b><br>The Project Area contains two IBRA associations, Cleve and Hambidge, which belong to the Eyre Hills and Eyre Mallee subregions, respectively. Vegetation within these IBRA associations has been extensively cleared for agriculture, with remnant vegetation largely concentrated in conservation reserves, heritage agreement areas and road corridors.
<table>
<tr><th>Subregion</th><th>Remnancy</th><th>Association</th><th>Remnancy</th></tr>
<tr><td>Eyre Hills</td><td>338,248 ha (29 %)</td><td>Cleve</td><td>16,696 ha (17 %)</td></tr>
<tr><td>Eyre Mallee</td><td>877,417 ha (37 %)</td><td>Hambidge</td><td>99,496 (28 %)</td></tr>
</table>
The vegetation that is proposed to be cleared consists of mallee woodland, chenopod shrublands and grasslands. All of these communities are common in the vicinity of the Project Area (i.e., road corridors, disused paddocks, and along fence lines).<br><br>Total Biodiversity Score – 1,140.95</td></tr>
<tr><td><b>Assessment against the principles</b><br>Seriously at Variance<br>All VAs and Scattered Trees.</td></tr>
<tr><td><b>Moderating factors that may be considered by the NVC.</b><br>The majority of the Project Area has been historically cleared for agriculture and lacked native vegetation coverage (541.184 ha). By concentrating infrastructure in these areas, the current design retains 116.381 ha (77.69 %) of native vegetation mapped within the Project Area.<br>The Project will reduce remnant vegetation within the Cleve association by 33.293 ha (by 0.20 %) and within the Hambidge association by 0.132 ha (by < 0.01 %). As such, this moderating factor may apply.</td></tr>
<tr><td><b>Principle 1(f) – it is growing in, or in</b></td><td><b>Relevant information</b><br>No wetlands were identified during the field assessment.</td></tr>
</table>

| **Principle of clearance** | **Considerations** |
|---|---|
| **association with, a wetland environment** | **Assessment against the principles**<br>Seriously at Variance<br>Not Seriously at Variance<br>At Variance<br>Not at Variance |
| | **Moderating factors that may be considered by the NVC**<br>Not applicable. |
| **Principle 1(g) – it contributes significantly to the amenity of the area in which it is growing or is situated** | **Relevant information**<br>The Project Area is situated off the Birdseye Highway, 8.9 km west of Cleve. It is adjacent to an existing substation and extensively cleared agricultural land.<br>The road corridor of the Birdseye Highway is intermittently lined with remnant mallee woodland. Access points along this road will be concentrated in areas without timbered vegetation, thereby not impacting the amenity value of the area. |
| | **Assessment against the principles**<br>Seriously at Variance<br>Not Seriously at Variance<br>At Variance<br>Not at Variance |
| | **Moderating factors that may be considered by the NVC.**<br>Not applicable. |

*Principles of Clearance (h-m) will be considered by comments provided by the local NRM Board or relevant Minister. The Data Report should contain information on these principles where relevant and where sufficient information or expertise is available.*

## 4.7. Risk assessment

The level of risk associated with this clearance application is presented in Table 22.

**Table 22. Summary of the level of risk associated with the application.**

| | | |
|---|---|---|
| **Total clearance** | No. of trees | 5 |
| | Area (ha) | 33.425 |
| | Total biodiversity Score | 1,145.49 |
| **Seriously at variance with principle 1(b), 1(c) or 1 (d)** | | N/A |
| **Risk assessment outcome** | | Level 4 |

# 5. CLEARANCE SUMMARY

Clearance summary tables for the clearance application are shown in Table 23 (native vegetation patches) and Table 24 (scattered trees). These summary tables indicate the SEB points and SEB payment obligations associated with this clearance.

The total SEB obligations of the clearance are summarised in Table 25.

**Table 23. Clearance summary and total SEB obligations for vegetation associations impacted by the Project.**

| Block | Site | Species diversity score | Threatened Ecological community Score | Threatened plant score | Threatened fauna score | UBS | Area (ha) | Total Biodiversity score | Loss factor | Loadings | Reductions | SEB Points required | SEB payment($) | Admin Fee ($) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | A1 | 24 | 1 | 0 | 0 | 56.75 | 2.893 | 164.16 | 1 | - | - | 172.37 | 62,669.92 | 3,446.85 |
| | A1d | 8 | 1 | 0 | 0 | 14.37 | 2.893 | 41.59 | 1 | - | - | 43.66 | 15,784.07 | 868.12 |
| | **A1 Mean** | **16** | **1** | **0** | **0** | **35.56** | **2.893** | **102.88** | **1** | - | - | **108.02** | **39,227.00** | **2,157.49** |
| | **A2a** | **14** | **1** | **0** | **0** | **22.98** | **0.577** | **13.26** | **1** | **-** | **-** | **13.92** | **4,988.44** | **274.36** |
| | A3a | 6 | 1 | 0 | 0 | 12.99 | 7.844 | 101.87 | 1 | - | - | 106.96 | 38,330.30 | 2,108.17 |
| | A3b | 12 | 1 | 0 | 0 | 35.99 | 7.844 | 282.29 | 1 | - | - | 296.41 | 106,217.11 | 5,841.94 |
| | **A3 Mean** | **9** | **1** | **0** | **0** | **24.49** | **7.844** | **192.08** | **1** | **-** | **-** | **201.69** | **72,273.71** | **3,975.06** |
| | **A4** | **18** | **1** | **0** | **0** | **24.53** | **1.425** | **34.96** | **1** | **-** | **-** | **36.70** | **13,153.03** | **723.42** |
| | A5 | 14 | 1 | 0 | 0 | 36.42 | 10.432 | 379.95 | 1 | - | - | 398.95 | 142,963.67 | 7,863.00 |
| | A5b | 14 | 1 | 0 | 0 | 41.04 | 10.432 | 428.15 | 1 | - | - | 449.56 | 161,099.63 | 8,860.48 |
| | A5c | 12 | 1 | 0 | 0 | 29.14 | 10.432 | 303.96 | 1 | - | - | 319.16 | 114,370.93 | 6,290.40 |
| | **A5 Mean** | **13.3** | **1** | **0** | **0** | **35.53** | **10.432** | **370.69** | **1** | **-** | **-** | **389.22** | **139,478.08** | **7,671.29** |
| | **A8** | **20** | **1** | **0** | **0** | **45.33** | **0.132** | **5.98** | **1** | **-** | **-** | **6.28** | **1,838.25** | **101.10** |
| | A9 | 22 | 1 | 0 | 0 | 59.51 | 4.961 | 295.25 | 1 | - | - | 310.01 | 111,091.13 | 6,110.01 |
| | A9a | 6 | 1 | 0 | 0 | 22.66 | 4.961 | 112.42 | 1 | - | - | 118.04 | 42,301.00 | 2,326.56 |
| | **A9 Mean** | **14** | **1** | **0** | **0** | **41.09** | **4.961** | **203.84** | **1** | **-** | **-** | **214.03** | **76,696.07** | **4,218.29** |
| B | **B1** | **14** | **1** | **0** | **0** | **21.70** | **0.886** | **19.22** | **1** | **-** | **-** | **20.19** | **7,233.45** | **397.84** |
| | **B2** | **14** | **1** | **0** | **0** | **33.76** | **0.142** | **4.79** | **1** | **-** | **-** | **5.03** | **1,803.94** | **99.22** |
| C | **C1** | **14** | **1** | **0** | **0** | **41.30** | **3.900** | **161.07** | **1** | **-** | **-** | **169.13** | **60,606.43** | **3,333.35** |
| D | **D1** | **9** | **1** | **0** | **0** | **18.43** | **0.063** | **1.27** | **1** | **-** | **-** | **1.33** | **476.07** | **26.18** |
| F | **F1** | **9** | **1** | **0** | **0** | **23.54** | **0.147** | **3.46** | **1** | **-** | **-** | **3.63** | **1,302.25** | **71.62** |
| G | **G1** | **15** | **1** | **0** | **0** | **38.26** | **0.023** | **0.88** | **1** | **-** | **-** | **0.92** | **331.10** | **18.21** |
| | | | | | | **Total** | **33.425** | **1,114.37** | | | | **1,169.86** | **419,407.80** | **23,067.42** |

**Table 24. Clearance summary and total SEB obligations for scattered trees impacted by the Project.**

| Tree Number | Number of Trees | Fauna Habitat Score | Threatened Flora Score | Biodiversity Score | Loss Factor | SEB Points Required | SEB Payment (includes admin fee) |
|---|---|---|---|---|---|---|---|
| 2 | 1 | 1 | 0 | 2.15 | 1 | 2.25 | $851.93 |
| 4 | 1 | 1 | 0 | 2.33 | 1 | 2.45 | $925.61 |
| 5 | 1 | 1 | 0 | 2.00 | 1 | 2.10 | $793.49 |
| 9 | 1 | 1 | 0 | 2.11 | 1 | 2.21 | $836.95 |
| 11 | 1 | 1 | 0 | 1.07 | 1 | 1.13 | $426.56 |
| **Scattered Tree SEB Total** | | | | **31.12** | | **10.14** | **$3,834.55** |

**Table 25. Summary of the total SEB obligations of the clearance.**

| | Total Biodiversity score | Total SEB points required | SEB Payment | Admin Fee | Total Payment |
|---|---|---|---|---|---|
| **Application** | 1,145.49 | 1180.00 | $423,242.35 | $23,267.42 | $446,309.77 |
| **Economies of Scale Factor** | | | | 0.35 | |
| **Rainfall (mm)** | | | | 343 | |

# 6. SIGNIFICANT ENVIRONMENTAL BENEFIT

A SEB is required for approval to clear under Division 5 of the *Native Vegetation Regulations 2017*. The NVC must be satisfied that as a result of the loss of vegetation from the clearance that an SEB will result in a positive impact on the environment that is over and above the negative impact of the clearance.

### ACHIEVING AN SEB

Indicate how the SEB will be achieved by ticking the appropriate box and providing the associated information:

☐ Establish a new SEB Area on land owned by the proponent.

☐ Use SEB Credit that the proponent has established.

☐ Apply to have SEB Credit assigned from another person or body.

☐ Apply to have an SEB to be delivered by a Third Party.

☒ Pay into the Native Vegetation Fund.

### PAYMENT SEB

If a proponent proposes to achieve the SEB by paying into the Native Vegetation Fund, summary information must be provided on the amount required to be paid and the manner of payment:

The total SEB payment for the clearance of 33.425 ha of native vegetation and five Scattered Trees, with a combined Total Biodiversity Score of **1,145.49**, is **$446,309.77** (including an administration fee of **$23,067.42**).

# 7. REFERENCES

Australian Bureau of Statistics (2021). Cleve – 2021. Available at: https://www.abs.gov.au/census/find-census-data/quickstats/2021/LGA41190 [Accessed 12/06/2024]

Croft S.J., Pedler J.A., Milne T.I. (2007). Bushland Condition Monitoring Manual – Northern Agricultural & Yorke Peninsula Regions. Nature Conservation Society of South Australia, Adelaide.

Croft S.J., Pedler J.A., Milne T.I. (2008a). Bushland Condition Monitoring Manual – Eyre Peninsula Region. Nature Conservation Society of South Australia, Adelaide.

Croft S.J., Pedler J.A., Milne T.I. (2008b). Bushland Condition Monitoring Manual – Southern Mt Lofty Ranges Region. Nature Conservation Society of South Australia, Adelaide.

Croft S.J., Pedler J.A., Milne T.I. (2009). Bushland Condition Monitoring Manual – Murray Darling Basin Region. Nature Conservation Society of South Australia, Adelaide.

Cutten J.L., Hodder M.W. (2002). Scattered tree clearance assessment in South Australia: streamlining, guidelines for assessment and rural industry extension. Biodiversity Assessment Services, Department of Water, Land and Biodiversity Conservation, Adelaide.

Department for Environment and Heritage (2005). Provisional List of Threatened Ecosystems. Unpublished and provisional list by the Department for Environment and Heritage, Adelaide.

Department for Environment and Water (DEW) (2024a). NatureMaps. Available at: http://data.environment.as.gov.au/NatureMaps/Pages/default.aspx [Accessed 14/06/2024]

Department for Environment and Water (DEW) (2024b). Biological Databases of South Australia (BDBSA) data extract: Recordset number <DEWNRBDBSA240611-2>. Adelaide.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024a). Protected Matters Search Tool. Available at: https://www.environment.gov.au/epbc/protected-matters-search-tool [Accessed 14/06/2024]

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024b). Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=124 [Accessed 14/06/2024]

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024c). Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl [Accessed 14/06/2024]

EBS Ecology (2021). Photon Energy Solar Storage Project Desktop Assessment. Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2022a). Desktop letter for EPBC threatened species. Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2022b). Desktop letter for EPBC threatened species. Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2024). Yadnarie Solar Farm Ecological Assessment. Report to RayGen Resources Pty Ltd. EBS Ecology, Adelaide.

Milne T.I., Croft T. (2012). Bushland Condition Monitoring Manual – Benchmark Communities of the South East. Nature Conservation Society of South Australia, Adelaide.

Milne T.I., McCallum B. (2012). Bushland Condition Monitoring Manual – Benchmark Communities of Kangaroo Island. Nature Conservation Society of South Australia, Adelaide.

Native Vegetation Council (NVC) (2020a). Bushland Assessment Manual July 2020. Native Vegetation Council, Adelaide. Available at: https://www.environment.sa.gov.au/topics/native-vegetation/clearing/vegetation-assessments.

Native Vegetation Council (NVC) (2020b). Scattered Tree Assessment Manual July 2020. Native Vegetation Council, Adelaide. Available at: https://www.environment.sa.gov.au/topics/native-vegetation/clearing/vegetation-assessments.

Nicolle, D. (2013). *Native Eucalypts of South Australia*. Dean Nicolle.

Pizzey, G., & Knight, F. (2007). *The Field Guide to the Birds of Australia - 8th Edition.* Harper Collins Australia.

Threatened Species Scientific Committee (TSSC) (2013). Approved Conservation Advice for the Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/124-conservation-advice.pdf

# 8. APPENDICES

## 8.1 Appendix 1 - Flora species recorded by the field survey

| Scientific Name<br>(* indicates an introduced species) | Common Name | Conservation Status<br>EPBC Act | <br>NPW Act |
|---|---|---|---|
| *Acacia burkittii* | Pin-bush Wattle | - | - |
| *Acacia halliana* | Hall's Wattle | - | - |
| *Acacia ligulata* | Umbrella Bush | - | - |
| *Acacia notabilis* | Notable Wattle | - | - |
| *Acacia oswaldii* | Umbrella Wattle | - | - |
| *Acacia rigens* | Nealie | - | - |
| *Acacia sclerophylla* var. *sclerophylla* | Hard-leaf Wattle | - | - |
| *Agave** | | - | - |
| *Aira* sp.* | Hair-grass | - | - |
| *Aizoon pubescens** (also known as *Galenia pubescens*) | Coastal Galenia | - | - |
| *Alectryon oleifolius* ssp. *canescens* | Bullock Bush | - | - |
| *Allocasuarina verticillata* | Drooping Sheoak | - | - |
| *Alyxia buxifolia* | Sea Box | - | - |
| *Arctotheca calendula** | Cape Weed | - | - |
| *Asparagus asparagoides* f.* | Bridal Creeper | - | - |
| *Asphodelus fistulosus** | Onion Weed | - | - |
| *Atriplex acutibractea* ssp. | Pointed Saltbush | - | - |
| *Atriplex crassipes* var. *crassipes* | | - | - |
| *Atriplex semibaccata* | Berry Saltbush | - | - |
| *Austrostipa elegantissima* | Feather Spear-grass | - | - |
| *Austrostipa nitida* | Balcarra Spear-grass | - | - |
| *Austrostipa nodosa* | Tall Spear-grass | - | - |
| *Austrostipa scabra* ssp. *scabra* | Rough Spear-grass | - | - |
| *Austrostipa* sp. | Spear-grass | - | - |
| *Avena barbata** | Bearded Oat | - | - |
| *Avena fatua** | Wild Oat | - | - |
| *Brassica* sp.* | | - | - |
| *Bromus diandrus** | Great Brome | - | - |
| *Callitris glaucophylla* | White Cypress Pine | - | - |
| *Callitris gracilis* | Southern Cypress Pine | - | - |
| *Callitris verrucosa* | Scrub Cypress Pine | - | - |
| *Calytrix* sp. | Fringe Myrtle | - | - |
| *Carpobrotus rossii* | Native Pigface | - | - |
| *Carrichtera annua** | Ward's Weed | - | - |
| *Cassytha* sp. | Dodder-laurel | - | - |
| *Chenopodium album* | Fat Hen | - | - |

| **Scientific Name**<br>**(* indicates an introduced species)** | **Common Name** | **Conservation Status** | |
|---|---|---|---|
| | | **EPBC Act** | **NPW Act** |
| *Chenopodium curvispicatum* | Cottony Goosefoot | - | - |
| *Chenopodium desertorum* ssp. *microphyllum* | Small-leaf Goosefoot | - | - |
| *Chenopodium* sp. | Goosefoot | - | - |
| *Chloris truncata* | Windmill Grass | - | - |
| *Chrysocephalum apiculatum* | Common Everlasting | - | - |
| *Citrullus* sp.* | Wild Melon | - | - |
| *Clematis microphylla* | Old Man's Beard | - | - |
| *Clematis* sp. | | - | - |
| *Conyza bonariensis** | Flax-leaf Fleabane | - | - |
| *Cucumis myriocarpus* ssp. *myriocarpus** | Paddy Melon | - | - |
| *Cymbopogon ambiguus* | Lemon-grass | - | - |
| *Dianella brevicaulis* | Short-stem Flax-lily | - | - |
| *Dodonaea bursariifolia* | Small Hop-bush | - | - |
| *Dysphania cristata* | Crested Crumbweed | - | - |
| *Echium plantagineum** | Salvation Jane | - | - |
| *Ehrharta calycina** | Perennial Veldt Grass | - | - |
| *Einadia nutans* ssp. | Climbing Saltbush | - | - |
| *Einadia nutans ssp. oxycarpa* | Pointed-fruit Climbing Saltbush | - | - |
| *Enchylaena tomentosa* var. | Ruby Saltbush | - | - |
| *Enneapogon nigricans* | Black-head Grass | - | - |
| *Enneapogon* sp. | Bottle-washers/Nineawn | - | - |
| *Eucalyptus brachycalyx* | Gilja | - | - |
| *Eucalyptus calycogona* ssp. | Square-fruit Mallee | - | - |
| *Eucalyptus cladocalyx* ssp. *cladocalyx* | Sugar Gum | - | - |
| *Eucalyptus gracilis* | Yorrell | - | - |
| *Eucalyptus incrassata* | Ridge-fruited Mallee | - | - |
| *Eucalyptus oleosa* ssp. *ampliata* | Red Mallee | - | - |
| *Eucalyptus oleosa* ssp. *oleosa* | Red Mallee | - | - |
| *Eucalyptus petiolaris* | Eyre Peninsula Blue Gum | - | - |
| *Eucalyptus phenax* ssp. *phenax* | White Mallee | - | - |
| *Eucalyptus porosa* | Malleebox | - | - |
| *Eucalyptus socialis* ssp. | Beaked Red Mallee | - | - |
| *Eucalyptus* sp. | | - | - |
| *Euphorbia* sp. | | - | - |
| *Euphorbia terracina** | False Caper | - | - |
| *Gazania linearis** | Gazania | - | - |
| *Gazania* sp.* | African Daisies | - | - |
| *Geijera linearifolia* | Sheep Bush | - | - |
| *Gnaphalium* sp. | Cudweed | - | - |
| *Grevillea huegelii* | Comb Wattle | - | - |
| *Hakea cycloptera* | Elm-seed Hakea | - | - |

| **Scientific Name (* indicates an introduced species)** | **Common Name** | **Conservation Status** | |
|---|---|---|---|
| | | **EPBC Act** | **NPW Act** |
| *Hakea leucoptera* ssp. *leucoptera* | Silver Needlewood | - | - |
| *Halgania andromedifolia* | Scented Blue-flower | - | - |
| *Heliotropium europaeum** | Common Heliotrope | - | - |
| *Hibbertia* sp. | Guinea-flower | - | - |
| *Homoranthus wilhelmii* | Wilhelm’s Homoranthus | - | - |
| *Hordeum vulgare** | Barley Grass | - | - |
| *Hybanthus floribundus* ssp. *floribundus* | Shrub Violet | - | - |
| *Lasiopetalum behrii* | Pink Velvet-bush | - | - |
| *Leptospermum coriaceum* | Dune Tea-tree | - | - |
| *Lolium perenne** | Perennial Ryegrass | - | - |
| *Lomandra effusa* | Scented Mat-rush | - | - |
| *Lomandra leucocephala ssp. robusta* | Woolly Mat-rush | - | - |
| *Lycium ferocissimum** | African Boxthorn | - | - |
| *Maireana brevifolia* | Short-leaf Bluebush | - | - |
| *Maireana erioclada* | Rosy Bluebush | - | - |
| *Malva parviflora** | Small-flower Marshmallow | - | - |
| *Malva* sp.* | Mallow | - | - |
| *Marrubium vulgare** | Horehound | - | - |
| *Medicago* sp.* | Medic | - | - |
| *Melaleuca acuminata* ssp. *acuminata* | Mallee Honey-myrtle | - | - |
| *Melaleuca lanceolata* | Dryland Tea-tree | - | - |
| *Melaleuca pauperiflora* ssp. *mutica* | Boree | - | - |
| *Melaleuca uncinata* | Broombush | - | - |
| *Mesembryanthemum crystallinum** | Common Iceplant | - | - |
| *Minuria cunninghamii* | Bush Minuria | - | - |
| *Olearia brachyphylla* | Short-leaf Daisy-bush | - | - |
| *Oxalis perennans* | Native Sorrel | - | - |
| *Oxalis pes-caprae** | Soursob | - | - |
| *Pimelea micrantha* | Silky Riceflower | - | - |
| *Pittosporum angustifolium* | Native Apricot | - | - |
| *Podolepis capillaris* | Wiry Podolepis | - | - |
| *Pseudognaphalium luteoalbum* | Jersey Cudweed | - | - |
| *Ptilotus seminudus* | Rabbit tails | - | - |
| *Ptilotus spathulatus* | Pussy-tails | - | - |
| *Reichardia tingitana** | False Sowthistle | - | - |
| *Rhagodia preissii* ssp. *preissii* | Mallee Saltbush | - | - |
| *Rhagodia* sp. | Saltbush | - | - |
| *Roepera glauca* | Pale Twinleaf | - | - |
| *Rumex hypogaeus** | Three-corner Jack | - | - |
| *Rytidosperma auriculatum* | Lobed Wallaby-grass | - | - |
| *Rytidosperma caespitosum* | Common Wallaby-grass | - | - |

| Scientific Name (* indicates an introduced species) | Common Name | Conservation Status | |
|---|---|---|---|
| | | EPBC Act | NPW Act |
| *Rytidosperma* sp. | Wallaby-grass | - | - |
| *Salsola australis* | Buckbush | - | - |
| *Salvia verbenaca* var.* | Wild Sage | - | - |
| *Santalum acuminatum* | Quandong | - | - |
| *Sclerolaena diacantha* | Grey Bindyi | - | - |
| *Sclerolaena parallelicuspis* | Western Bindyi | - | - |
| *Senna artemisioides* ssp. *artemisioides* | Desert Senna | - | - |
| *Senna artemisioides* ssp. *filifolia* | Fine-leaf Desert Senna | - | - |
| *Senna artemisioides* ssp. *petiolaris* | Desert Senna | - | - |
| *Senna artemisioides* ssp. *X coriacea* | Broad-leaf Desert Senna | - | - |
| *Senna* sp. | Senna | - | - |
| *Sida intricata* | Twiggy Sida | - | - |
| *Sisymbrium* sp.* | Wild Mustard | - | - |
| *Solanum elaeagnifolium** | Silver-leaf Nightshade | - | - |
| *Solanum nigrum** | Black Nightshade | - | - |
| *Sonchus oleraceus** | Common Sow-thistle | - | - |
| *Spyridium stenophyllum ssp. stenophyllum* | Forked Spyridium | - | - |
| *Templetonia rossii* | Flat Mallee-pea | - | - |
| *Themeda triandra* | Kangaroo Grass | - | - |
| *Thinopyrum elongatum** | Tall Wheat-grass | - | - |
| *Thryptomene micrantha* | Ribbed Thryptomene | - | - |
| *Tragus australianus* | Small Burr-grass | - | - |
| *Tribulus terrestris** | Caltrop | - | - |
| *Trifolium arvense* var. *arvense** | Hare's-foot Clover | - | - |
| *Triodia irritans* | Spinifex | - | - |
| *Triodia scariosa* | Porcupine Grass | - | - |
| *Vittadinia cervicularis* var. *cervicularis* | Waisted New Holland Daisy | - | - |
| *Vittadinia cuneata* var. *cuneata* | Fuzzy New Holland Daisy | - | - |
| *Vulpia* sp.* | Fescue | - | - |
| *Wahlenbergia stricta* ssp. *stricta* | Tall Bluebell | - | - |

**Conservation Status: EPBC Act** (*Environment Protection and Biodiversity Conservation Act 1999*). **NPW Act**: South Australia (*National Parks and Wildlife Act 1972*). **Conservation codes: CE**: Critically Endangered. **EN/E**: Endangered. **VU/V**: Vulnerable. **R**: Rare.

## 8.2 Appendix 2 - Fauna species recorded by the field survey

| Scientific Name | Common Name | Scattered Tree Using wildlife | | |
|---|---|---|---|---|
| | | Conservation status in the EP | Resource use | Habitat/status |
| **AVES** | | | | |
| *Acanthagenys rufogularis* | Spiny-cheeked Honeyeater | LC | P,F | w |
| *Acanthiza apicalis* | Inland Thornbills | | | |
| *Alauda arvensis** | Eurasian Skylark | | | |
| *Anthochaera carunculata* | Red Wattlebird | LC | P,F | w/r |
| *Anthus novaeseelandiae* | Australasian Pipit | | | |
| *Aquila audax* | Wedge-tailed Eagle | RA | P,N | w |
| *Artamus cinereus* | Black-faced Woodswallow | NT | P | w |
| *Barnardius zonarius barnardi* | Mallee Ringneck | LC | P,H,F | w |
| *Cincloramphus cruralis** | Brown Songlark | | | |
| *Colluricincla harmonica* | Grey Shrikethrush | LC | F | w |
| *Corvus coronoides* | Australian Raven | LC | P,N | w |
| *Corvus mellori* | Little Raven | LC | P,N | w/r |
| *Eolophus roseicapilla* | Galah | LC | P,H | w/r |
| *Falco berigora* | Brown Falcon | LC | P,N | w/r |
| *Falco cenchroides* | Nankeen Kestrel | LC | P,N | w/r |
| *Gavicalis virescens* | Singing Honeyeater | LC | P,F | w |
| *Grallina cyanoleuca* | Magpielark | LC | P,N | w/r |
| *Gymnorhina tibicen* | Australian Magpie | LC | P,N | r |
| *Manorina flavigula* | Yellow-throated Miner | LC | P,F | w |
| *Melopsittacus undulatus* | Budgerigar | NT | P,H | s |
| *Nymphicus hollandicus* | Cockatiels | RA | P,H | s |
| *Ocyphaps lophotes* | Crested Pigeon | LC | P,N | w/r |
| *Pardalotus striatus* | Striated Pardalote | LC | P,F | w/s |
| *Passer domesticus** | House Sparrows | | | |
| *Phaps chalcoptera* | Common Bronzewing | | | |
| *Phylidonyris novaehollandiae* | New Holland Honeyeater | LC | P,F | w |
| *Platycercus elegans* | Crimson Rosella | | | |
| *Psephotus haematonotus* | Red-rumped Parrot | RA | P,H | w/r |
| *Psephotus varius* | Mulga Parrot | LC | P,H | w/r |
| *Rhipidura leucophrys* | Willie Wagtail | LC | P,N,F | w/r |
| *Smicrornis brevirostris* | Weebill | LC | P,F | w |
| *Sturnus vulgaris** | Common Starling | | | |
| **MAMMALIA** | | | | |
| *Macropus (Osphranter) rufus* | Red Kangaroo | | | |
| *Oryctolagus cuniculus** | European Rabbit | | | |
| *Vulpes vulpes** | Red Fox | | | |
| **REPTILIA** | | | | |
| *Tiliqua rugosa* | Sleepy Lizard | | | |

**Conservation statu**s: **LC**=Least Concern (Common), **NT**=Near Threatened (Uncommon), **RA**=Rare, **VU**=Vulnerable, **EN**=Endangered, **CR**=Critically Endangered. **Resource Use: P**=perching/roosting, **N**=nesting, **H**=using hollow for nesting/roosting, **F**=feeding. **Habitat/status: s**=seasonal (includes waterbirds using trees near seasonal wetlands, seasonal and nomadic species), **w**=woodland birds that occasionally use adjacent scattered trees, **r**=species that can reside in scattered trees.

## 8.3 Appendix 3 – Likelihood of Occurrence Assessment

| Scientific Name | Common Name | Conservation status | | Source of Information | PMST / Date of last record | Habitat Preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | | |
| **Flora** | | | | | | | |
| *Acacia enterocarpa* | Jumping-jack Wattle | EN | E | 1 | May occur | *Acacia enterocarpa* occurs in SA and Victoria. It is found in distinct sub-populations on the EP, YP and SE in South Australia. Found in open woodland, to open forest on sandy alkaline and hard neutral yellow duplex soils. Often associated with *Eucalyptus* spp. such as *Eucalyptus phenax* and *Eucalyptus incrassata* (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. Although associated Eucalyptus vegetation communities are present (i.e., *Eucalyptus phenax* ssp.*)*, the species was not identified during the field survey. |
| *Acacia praemorsa* | Senna Wattle | VU | E | 1 | Likely to occur | Is endemic to SA where it is confined to the EP in localised populations north-east of Cleve. Occurs in mallee woodlands, open scrubs, open heath scrubs and on the lower slopes of small gullies in low, rocky ranges (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. Although associated mallee woodlands were present, the species was not identified during the field survey. |
| *Acacia rhetinocarpa* | Neat Wattle, Resin Wattle | VU | V | 1 | Likely to occur | Located in disjunct locations on the EP where it is confined in scattered areas around Kimba, Cleve and Lock. Normally associated with *Eucalyptus* spp. such as *Eucalyptus dumosa* (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. Although associated open mallee habitat was present, the species was not identified during the field survey. |
| *Caladenia brumalis* | Winter Spider-orchid | VU | V | 1 | May occur | Occurs on the YP and EP areas of South Australia. A highly localised species due to loss of habitat. Commonly found in association with *Melaleuca uncinata* in Carapee Hill CP and *Allocasuarina verticillata* or *Eucalyptus diversifolia ssp.* in disturbed areas. (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. However, suitable habitat was present within the Project Area and the field surveys fell outside of the species flowering window (i.e., June – September), where |

| **Scientific Name** | **Common Name** | **Conservation status** | | **Source of Information** | **PMST / Date of last record** | **Habitat Preferences** | **Likelihood of occurrence within Project Area** |
|---|---|---|---|---|---|---|---|
| | | **EPBC Act** | **NPW Act** | | | | |
| | | | | | | | thereafter it dies back to its perennial tuber. As such, it may have been present and overlooked. |
| *Caladenia tensa* | Greencomb Spider-orchid | EN | | 1 | Likely to occur | Occurs in numerous mallee and woodland vegetation associations such as Cypress Pine and Yellow Gum Woodland. Widespread species but uncommon (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. Although suitable habitat was present within the Project Area, the third field survey fell within the species flowering window (August – October) and did not identify the species. As such, the species is likely absent. |
| *Eucalyptus cretata* | Dark Peak Mallee | | R | 2 | 2013 | Known only to occur on the EP in South Australia. Particularly common in Darke Peak and Carapee Hill and often associated with *Eucalyptus* spp. such as *Eucalyptus calycogona,* and *Eucalyptus porosa* over *Melaleuca* spp. (DCCEEW 2024c). | **Unlikely** – Although there are records from within the last 20 years and suitable habitat was present, the field survey did not encounter this tall mallee (up to 4 m in height). |
| *Limosella granitica* | Granite Mudwort | VU | V | 1 | May occur | This species is confined to seasonally wet rock-pools (gnamma holes). the depth and water quality of these pools affect habitat quality for this species. It occurs in areas of winter- dominant annually variable rainfall (180–300 mm/year) in areas of hot summers and mild winters (DCCEEW 2024c). | **Unlikely –** There are no historical records within the Search Area and the field surveys did not identify any appropriate habitat features (i.e., gnamma holes). |
| *Olearia pannosa ssp. pannosa* | Silver Daisy-bush | VU | V | 1 | Likely to occur | Widespread but rare species occurring on the FP, YP and in 2 main sub populations on the EP in South Australia. Found in association with *Eucalyptus* spp. such as *Eucalyptus phenax* ssp. *phenax* (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. Although associated Eucalyptus vegetation communities are present (i.e., *Eucalyptus phenax* ssp.*),* the species was not |

| Scientific Name | Common Name | Conservation status | | Source of Information | PMST / Date of last record | Habitat Preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | | |
| | | | | | | | identified during the field survey. |
| *Pterostylis mirabilis* | Nodding Rufoushood | VU | V | 1 | Likely to occur | Endemic to the EP in South Australia where it occurs in the 300mm rainfall zone between Cleve and Kimba. Found in stony brown loam soils and among rocks with *Melaleuca uncinata* (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area and the Project Area receives more rainfall (343 mm) than typically associated with the species. The second field survey was held during the species flowering window (late October – early January) and did not record the species. As such it is likely absent. |
| *Pterostylis sp. Hale (R. Bates 21725)* | Hale Dwarf Greenhood | EN | V | 1 | May occur | Endemic to SA where it occurs on the EP, Southern Lofty Ranges and Murraylands. Grows in mallee on the EP (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. Although suitable habitat was present within the Project Area, the second field survey fell within the species flowering window (August – October) and did not identify the species. As such, it is likely absent. |
| *Pterostylis xerophila* | Desert Greenhood | VU | V | 1 | May occur | Occurs in many areas of inland SA and VIC including the EP. Grows in generally remote locations in semi-desert environments in rocky outcrops under low shrubland (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area and no suitable habitat (rocky outcrops). |
| *Swainsona pyrophila* | Yellow Swainson-pea | VU | R | 1 | May occur | Occurs across SA, NSW and VIC and in present in a number of areas on the EP. Grows in association with *Eucalyptus oleosa* over *Melaleuca uncinata* tall shrubland (DCCEEW 2024c). | **Unlikely** – There are no historical records within the Search Area. Although suitable habitat was present within the Project Area, the second field survey fell within the species flowering window (July – October) and did not identify |

| Scientific Name | Common Name | Conservation status | | Source of Information | PMST / Date of last record | Habitat Preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | | |
| | | | | | | | the species. As such, it is likely absent. |
| **Aves** | | | | | | | |
| *Actitis hypoleucos* | Common Sandpiper | Mi (W) | R | 1 | May occur | Uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (DCCEEW 2024c). | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Aphelocephala leucopsis* | Southern Whiteface | VU | | 1 | Likely to occur | The Southern Whiteface occurs in open woodland and shrubland habitat with an understorey of grasses and / or low shrubs. Suitable habitat is usually dominated by Acacia spp. or Eucalyptus spp. on ranges, foothills, lowlands and plains (DCCEEW 2024c). | **Unlikely** –No historical records within the Search Area. However, suitable habitat was recorded within the Project Area. |
| *Apus pacificus* | Fork-tailed Swift | Mi (M) | | 1 | Likely to occur | Widespread but almost exclusively aerial. Mostly occur over inland plains, over cliffs and beaches and sometimes well out to sea or in dry or open habitats (DCCEEW 2024c). | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Calidris acuminata* | Sharp-tailed Sandpiper | VU, Mi (W) | | 1 | May occur | During the non-breeding season most of the world population of Sharp-tailed Sandpipers occurs in Australia. In SA, numbers are generally highest between January and early February. In Gulf St Vincent, SA, some arrive during September–October, with the greatest numbers during December. Movements occur during the non-breeding period where birds appear to be dispersive, moving to temporary or flooded | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |

| Scientific Name | Common Name | Conservation status | | Source of Information | PMST / Date of last record | Habitat Preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | | |
| | | | | | | wetlands and leaving them when they dry. On migration, they forage and roost on rocky and sandy beaches, freshwater habitats and inland saltwater habitats. | |
| *Calidris ferruginea* | Curlew Sandpiper | CE, Mi (W) | E | 1 | May occur | Migratory species which prefers tidal mudflats, saltmarsh, salt fields and fresh, brackish or saline wetlands. (Pizzey and Knight, 2007) | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Calidris melanotos* | Pectoral Sandpiper | Mi (W) | R | 1 | May occur | Shallow fresh to saline wetlands. Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Pizzey and Knight, 2007). | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Charadrius veredus* | Oriental Plover, Oriental Dotterel | Mi (W) | | 1 | May occur | Shallow fresh to saline wetlands. Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Falco hypoleucos* | Grey Falcon | VU | R | 1 | May occur | The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and WA. Preferred habitat includes lightly treed inland plains, sand ridges and pastoral plains. (Pizzey and Knight, 2007) | **Unlikely** –There are no historical records within the Search Area. |
| *Gallinago hardwickii* | Latham's Snipe, Japanese Snipe | VU, Mi (W) | R | 1 | May occur | Preferred habitat includes open, freshwater wetlands with low, dense vegetation. Saline or brackish water, modified or artificial habitats, and in habitats located close to humans or human activity. | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Grantiella picta* | Painted Honeyeater | VU | R | 1 | May occur | Sparsely distributed from southern Victoria and south-eastern SA to far northern QLD and eastern Northern Territory Forest, woodland, dry scrub, often with abundant mistletoe. | **Unlikely -** There is no suitable habitat present in Project Area, including no *Amyema* sp., and no historical records in the Search Area. |
| *Leipoa ocellata* | Malleefowl | VU | V | 1 | Likely to occur | Inhabits semi-arid regions of southern Australia. In SA, the Malleefowl is distributed from the south- | **Unlikely** –No historical records within the Search Area. |

| Scientific Name | Common Name | Conservation status | | Source of Information | PMST / Date of last record | Habitat Preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | | |
| | | | | | | east, north to the Murray-Mallee region and west to Streaky Bay. Occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine *Callitris* woodlands, *Acacia* shrublands, or coastal heathlands. | |
| *Motacilla cinerea* | Grey Wagtail | Mi (T) | | 1 | May occur | European and Asian species. Migrates south in winter, usually to Indonesia and NG. Rarely reaches Australia, but when it does, favours habitat near freshwater streams. | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Motacilla flava* | Yellow Wagtail | Mi (T) | | 1 | May occur | Open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground. | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Neophema chrysostoma* | Blue-winged Parrot | VU | V | 1 | Likely to occur | Prefers grasslands and grassy woodlands but will inhabit a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones. | **Unlikely** – No historical records within the Search Area, although suitable habitat was recorded within the Project Area. |
| *Pedionomus torquatus* | Plains-wanderer | CE | E | 1 | May occur | Present in very small numbers in SE South Australia occurring in sparse, treeless native grasslands and/or low shrubland (Pizzey and Knight, 2007) | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Rostratula australis* | Australian Painted Snipe | EN | E | 1 | Likely to occur | The Australian Painted Snipe is most common in eastern Australia and has been recorded in south-eastern SA. It generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans with rank emergent tussocks of grass, sedges, rushes or reeds with scattered clumps of lignum. | **Unlikely -** There is no suitable habitat present in Project Area and no historical records in the Search Area. |
| *Stagonopleura guttata* | Diamond Firetail | VU | V | 1 | Likely to occur | Reside in a wide range of Eucalypt dominated vegetation communities that have a grassy | **Unlikely** – No historical records within the Search Area, suitable |

| Scientific Name | Common Name | Conservation status | | Source of Information | PMST / Date of last record | Habitat Preferences | Likelihood of occurrence within Project Area |
|---|---|---|---|---|---|---|---|
| | | EPBC Act | NPW Act | | | | |
| | | | | | | understorey, including woodland, forest, and mallee. Most occur on the inland slopes of the Great Dividing Ranges, with only small pockets near the coast. | habitat was recorded within the Project Area. |
| **Mammalia** | | | | | | | |
| *Sminthopsis psammophila* | Sandhill Dunnart | EN | V | 1 | Likely to occur | The sandhill dunnart occurs in isolated sandy arid and semi-arid areas in the Great Victoria Desert and the Eyre Peninsula. It occurs in vegetation dominated by hummock (*Triodia*) grassland. | **Unlikely** – No historical records within the Search Area, although suitable habitat (i.e., *Triodia* sp.) was recorded within the Project Area. |

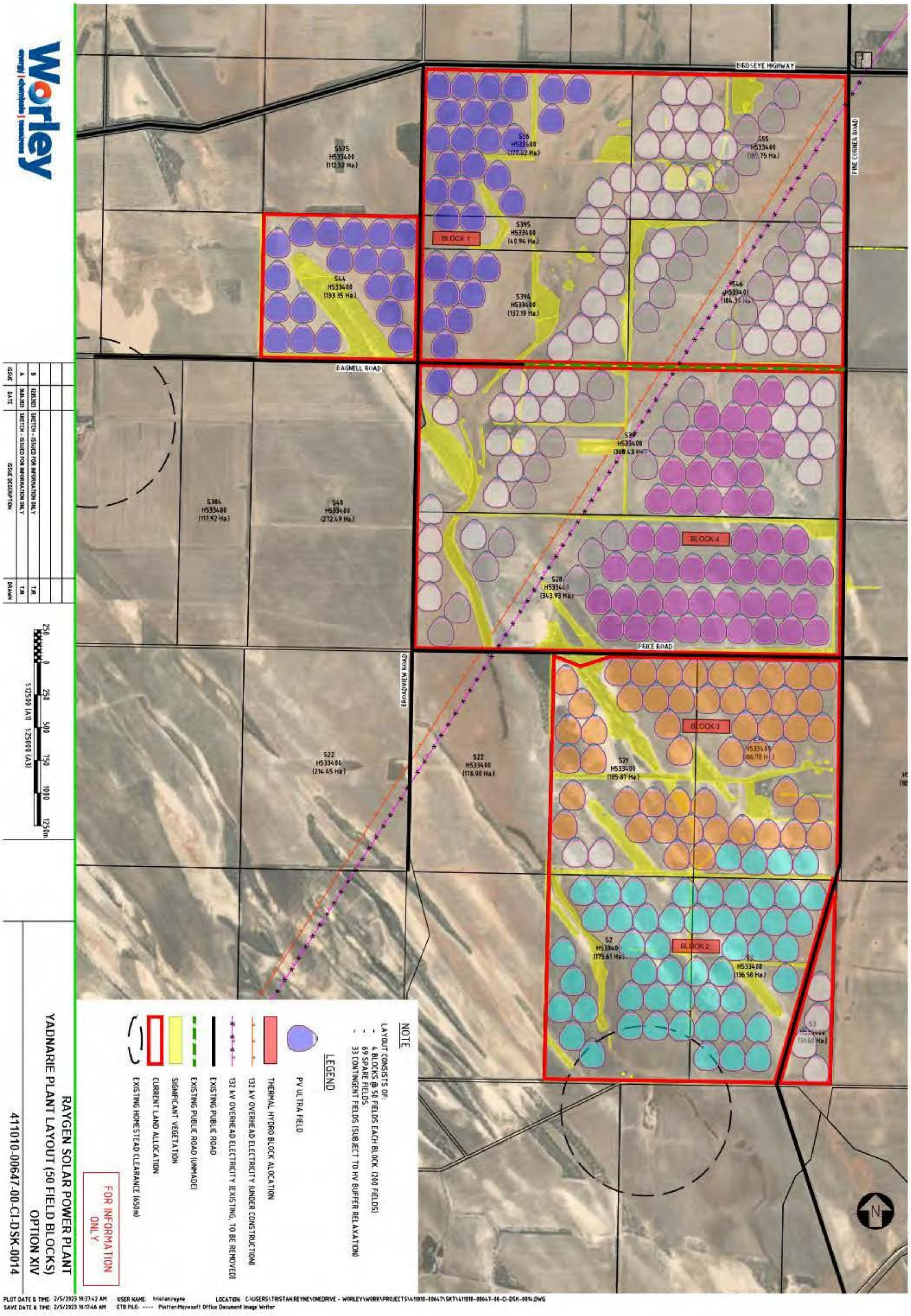
**Conservation status**

**EPBC Act** (*Environment Protection and Biodiversity Conservation Act 1999*). **NPW Act** (*National Parks and Wildlife Act 1972*). **Conservation Codes**: **CE**: Critically Endangered. **EN/E**: Endangered. **VU/V**: Vulnerable. **R**: Rare. **Mi**: listed as migratory under the EPBC Act. **Ma**: listed as marine under the EPBC Act.

**Source of Information**

1. EPBC Act Protected Matters Report (DCCEEW 2024) – 5 km buffer applied to Project Area.
2. Biological Database of South Australia data extract (DEW 2024b) - 5 km buffer applied to Project Area.

## 8.4 Appendix 4 - Previous design (supplied to EBS on 22/05/2023).



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# 3

# EPBC SELF-ASSESSMENT REPORT

# EPBC Self-assessment

## Proposed Yadnarie PV Ultra (Solar Cogeneration) And Thermal Hydro Facility For Photon Energy AUS SPV 4 Pty Ltd

# EPBC Self-assessment
# Proposed Yadnarie PV Ultra (Solar Cogeneration) And Thermal Hydro Facility For Photon Energy AUS SPV 4 Pty Ltd

22 October 2024

Version 4

Prepared by EBS Ecology for RayGen Pty Ltd

| Document Control | | | | | |
|---|---|---|---|---|---|
| Revision No. | Date issued | Authors | Reviewed by | Date Reviewed | Revision type |
| 1 | 14/06/2024 | S. Greer | A. Derry & Dr M. Louter | 18/06/2024 | Draft |
| 2 | 27/06/2024 | S. Greer | - | - | Draft |
| 3 | 29/08/2024 | S. Bulling | - | - | Final |
| 4 | 22/10/2024 | S. Bulling | - | - | Final |

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|---|---|---|---|
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Cover photograph: Vegetation within the Project Area.

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# GLOSSARY AND ABBREVIATION OF TERMS

| | |
|---|---|
| **~** | Approximately |
| **<** | Under |
| **>** | Over |
| **ALA** | Atlas of Living Australia |
| **AOO** | Area of occupancy |
| **BAM** | Bushland Assessment Method |
| **BDBSA** | Biological Database of South Australia (maintained by DEW) |
| **cm** | centimetres |
| **DCCEEW** | Department of Climate Change, Energy, the Environment and Water (Commonwealth) (previously DAWE) |
| **DEW** | Department for Environment and Water (South Australia) |
| **DIT** | Department for Infrastructure and Transport |
| **EBS** | Environment and Biodiversity Services Pty Ltd (trading as EBS Ecology) |
| **EOO** | Extent of occupancy |
| **EPBC Act** | *Environment Protection and Biodiversity Conservation Act 1999* |
| **IBRA** | Interim Biogeographical Regionalisation of Australia |
| **Impact Area** | Area proposed for clearance |
| **km** | Kilometre(s) |
| **mm** | millimetres |
| **MNES** | Matters of National Environmental Significance |
| **NatureMaps** | Initiative of DEW that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format |
| **NPW Act** | *National Parks and Wildlife Act 1972* |
| **NSW** | New South Wales |
| **NV Act** | *Native Vegetation Act 1991* |
| **NVC** | Native Vegetation Council |
| **Photon Energy** | Photon Energy AUS SPV 4 Pty Ltd |
| **PMST** | Protected Matters Search Tool (under the EPBC Act; maintained by DCCEEW) |
| **Project Area** | Area outlined in Figure 1 |
| **Project** | Proposed Yadnarie PV Ultra (Solar Cogeneration) And Thermal Hydro Facility For Photon Energy AUS SPV 4 Pty Ltd |
| **Raygen** | RayGen Resources Pty Ltd |
| **SA** | South Australia(n) |
| **sp.** | Species |
| **spp.** | Species (plural) |
| **ssp.** | Sub-species |
| **STAM** | Scattered Tree Assessment Manual |
| **TEC** | Threatened Ecological Community |
| **TSSC** | Threatened Species Scientific Committee |
| **VA** | Vegetation Association |

# EXECUTIVE SUMMARY

Photon Energy AUS SPV 4 Pty Ltd (Photon Energy), a global project developer, has developed a strategic partnership with RayGen Resources Pty Ltd (RayGen), with the objective of developing global renewable energy projects suitable for the roll-out of RayGen's unique solar power and electricity storage technology.

Photon Energy is proposing to develop a solar power and energy storage renewable energy facility at Yadnarie, South Australia (the Project). The Project includes 150 megawatts (MW) of solar generation, 90 MW grid connection, at least 720 MW hours of storage (and eight of dispatchable energy), with connection to the Yadnarie substation or 132 kilovolt overhead transmission line and ancillary infrastructure.

EBS Ecology (EBS) was engaged by RayGen via MasterPlan Pty Ltd to undertake an Environment Protection and Biodiversity Conservation (EPBC) Self-assessment to inform whether any Matters of National Environmental Significance (MNES) listed under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* could be significantly impacted (as per the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*) by the proposed Project.

The desktop investigations and field surveys undertaken as part of the assessment work completed on the Project, identified the following MNES, as "Likely" or "Known" to occur in the Project Area:

- One Threatened Ecological Community (TEC):
    - Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland – Nationally Endangered.
- Five EPBC listed threatened flora:
    - *Acacia praemorsa* (Senna Wattle) – Nationally Vulnerable;
    - *Acacia rhetinocarpa* (Neat Wattle) – Nationally Vulnerable;
    - *Caladenia tensa* (Greencomb Spider-orchid) – Nationally Endangered;
    - *Olearia pannosa* ssp*. pannosa* (Silver Daisy-bush) – Nationally Vulnerable; and
    - *Pterostylis mirabilis* (Nodding Rufoushood) – Nationally Vulnerable.
- Six EPBC listed threatened fauna (five birds and one mammal):
    - Australian Painted Snipe (*Rostratula australis*) – Nationally Endangered;
    - Blue-winged Parrot (*Neophema chrysostoma*) – Nationally Vulnerable;
    - Diamond Firetail (*Stagonopleura guttata*) – Nationally Vulnerable;
    - Malleefowl (*Leipoa ocellata*) – Nationally Endangered;
    - Sandhill Dunnart (*Sminthopsis psammophila*) – Nationally Endangered; and
    - Southern Whiteface (*Aphelocephala leucopsis*) – Nationally Vulnerable;
- One EPBC listed migratory species:
    - Fork-tailed Swift (*Apus pacificus*).

Previous ecological and vegetation assessment works undertaken for the Project determined that of the MNES identified in the desktop, two flora species (Greencomb Spider-orchid and Nodding Rufoushood) and five fauna species (Southern Whiteface, Malleefowl, Blue-winged Parrot, Diamond Firetail and Sandhill Dunnart) were assessed as possible or likely to occur in the Project Area, due to records and suitable habitat. These species were assessed as per the EPBC Act guidelines and criteria to determine if the proposed works would significantly impact on them.

The EPBC Act Self-assessment found that there will be no significant impact to any MNES resulting from the development of the proposed Project. It is considered that an EPBC referral to the Minister for the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for the Proposed Yadnarie PV Ultra (Solar Cogeneration) and Thermal Hydro Facility for Photon Energy AUS SPV 4 Pty Ltd, in its current form.

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# 1 INTRODUCTION

Photon Energy AUS SPV 4 Pty Ltd (Photon Energy), a global project developer, has developed a strategic partnership with RayGen Resources Pty Ltd (RayGen), with the objective of developing global renewable energy projects suitable for the roll-out of RayGen's unique solar power and electricity storage technology.

Photon Energy propose to utilise RayGen's technology for generation of solar power and energy storage at Yadnarie, west of Cleve on the Eyre Peninsula (the Project). The technology proposed and scale of electricity storage is new to the South Australian renewable energy sector and comprises RayGen's proprietary PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) technologies.

The Project includes 150 megawatts (MW) of solar generation, 90 MW grid connection, at least 720 MW hours of storage (and eight of dispatchable energy), with connection to the Yadnarie substation or 132 kilovolt overhead transmission line and ancillary infrastructure.

EBS Ecology (EBS) was engaged by RayGen via MasterPlan Pty Ltd to undertake to undertake an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Self-assessment. This would be to inform whether any Matters of National Environmental Significance (MNES) listed under the EPBC Act, could be significantly impacted (as per the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*) by the proposed Project.

## 1.1 Objectives and scope of works

The objective of this report was to determine whether any MNES (identified as "likely" or "known" by the Protected Matters Search), will be significantly impacted by the proposed Project. The MNES relevant to this report include Threatened Ecological Communities (TEC), threatened flora and fauna, and migratory species listed under the EPBC Act.

## 1.2 Project Area

The proposed renewablatte energy facility is located is on farming land (Rural Zone) west of Cleve on the Eyre Peninsula, South Australia (the Project Area) (Figure 1). The Project will connect to the Yadnarie substation which is located on the Birdseye Highway or overhead 132 Kilovolt transmission line.

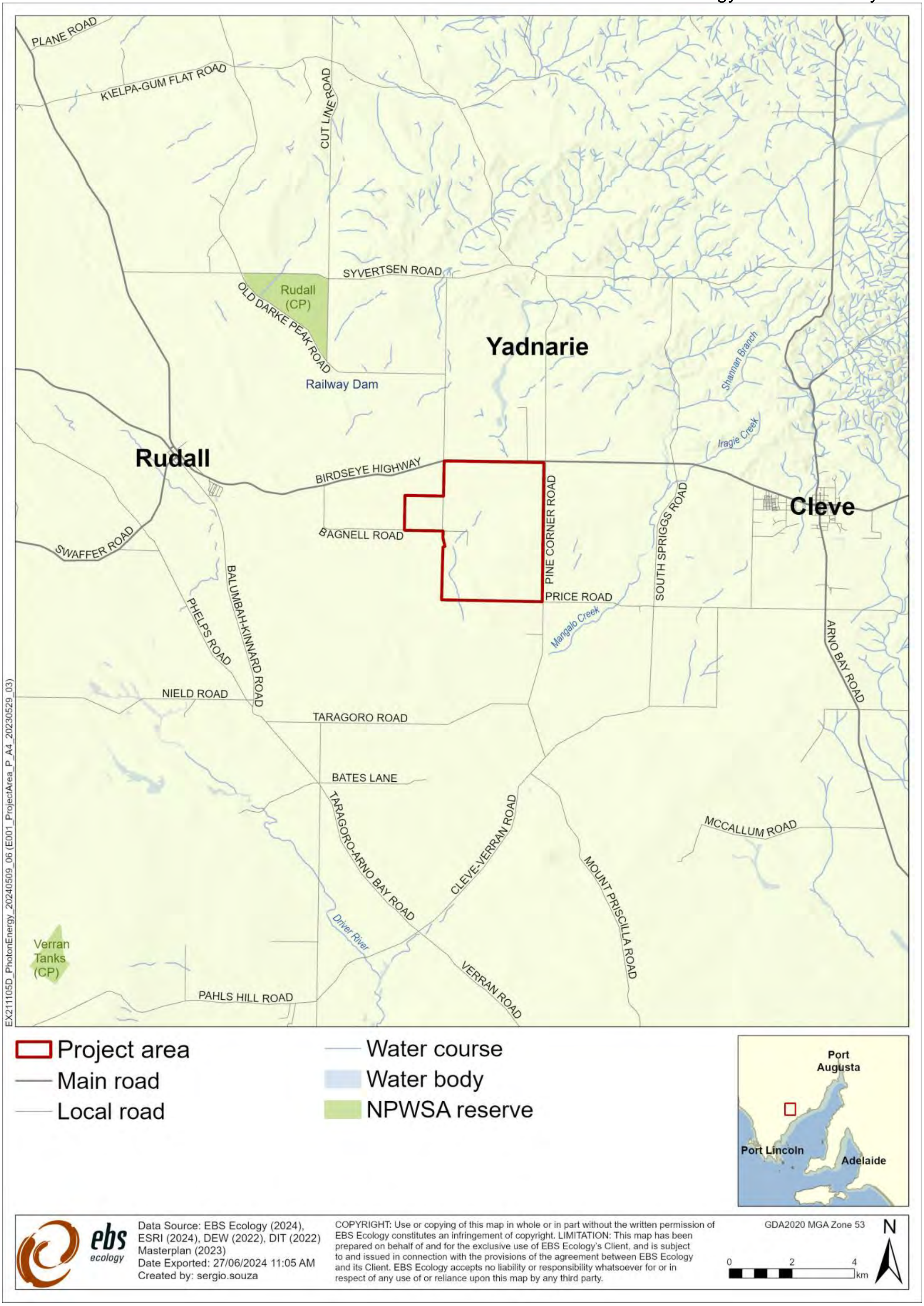


**Figure 1. Location of Project Area.**

# 2 BACKGROUND INFORMATION

## 2.1 Environmental setting

The Project Area is located within the Local Government Area of Cleve, the Eyre Peninsula Landscape Management Region, and the Hundred of Yadnarie. The Project Area is located within the Eyre Yorke Block IBRA Bioregion, the Eyre Hills and Eyre Mallee IBRA Subregions and Cleve and Hambridge IBRA Environmental Associations (EBS Ecology 2024a).

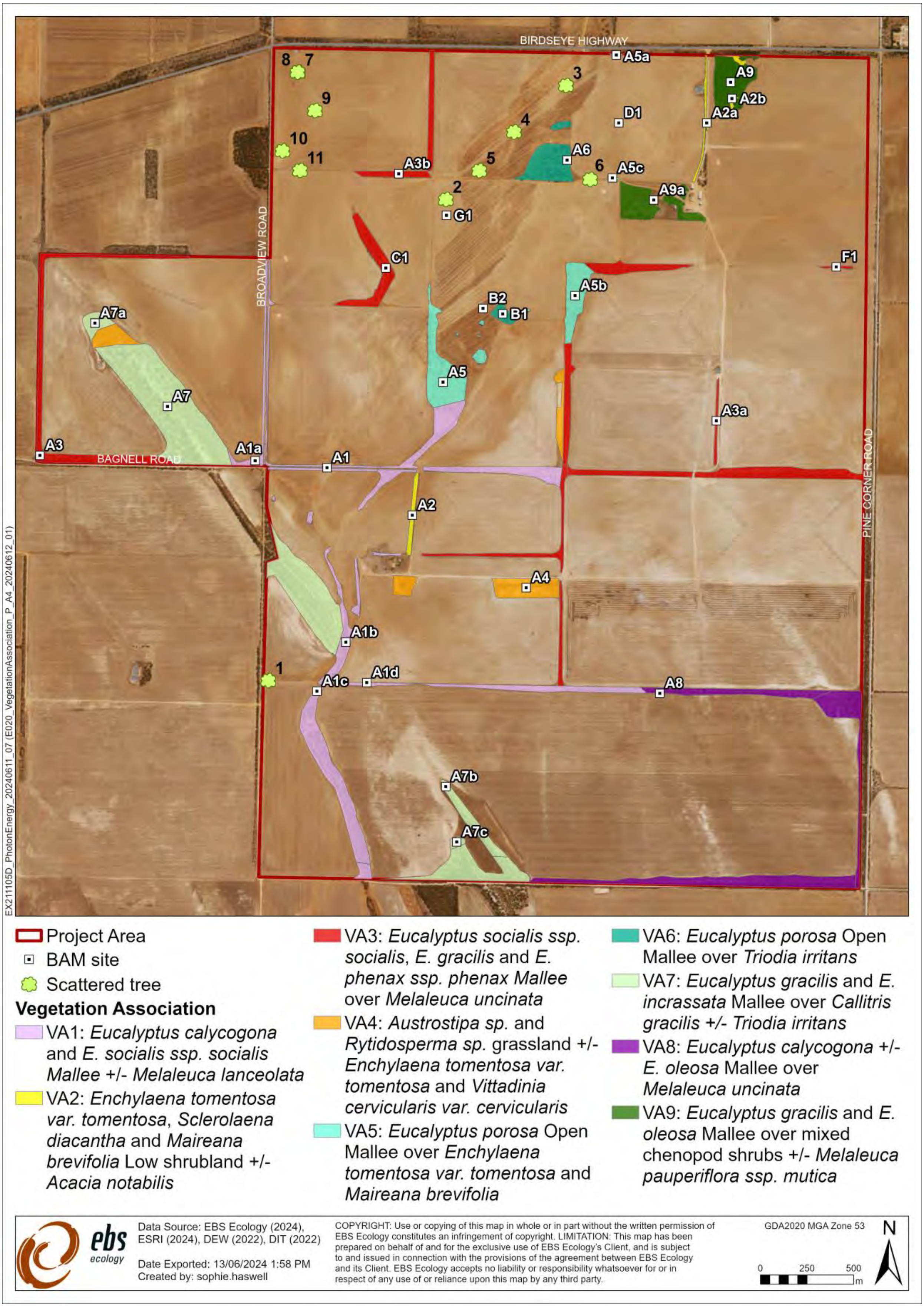
### *2.1.1 Vegetation within the Project Area*

The condition of all remnant native vegetation patches and remnant isolated trees contained within the Project Area was assessed in accordance with the Bushland Assessment Method (BAM) (NVC 2020a) and the Scattered Tree Assessment Manual (STAM) (NVC 2020b). Eleven scattered trees and nine vegetation associations (VAs) totalling 149.813 hectares (ha) were mapped across the Project Area (Figure 2).

Based on the Project designs received on 12/04/2024 (provided to EBS by MasterPlan) 33.425 ha of native vegetation will be impacted as part of the Project (Table 1, Figure 3).

**Table 1. Vegetation associations located within the Project Area.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA1** | *Eucalyptus calycogona* and *E. socialis ssp. socialis* Mallee +/- *Melaleuca lanceolata* | 28.122 | 2.915 |
| **VA2** | *Enchylaena tomentosa* var. *tomentosa, Sclerolaena diacantha* and *Maireana brevifolia* Low shrubland +/- *Acacia notabilis* | 2.144 | 0.577 |
| **VA3** | *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata* | 30.005 | 11.892 |
| **VA4** | *Austrostipa* sp. and *Rytidosperma* sp. Grassland +/- *Enchylaena tomentosa* var. *tomentosa* and *Vittadinia cervicularis* var. *cervicularis* | 8.173 | 1.425 |
| **VA5** | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 |
| **VA6** | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 |
| **VA7** | *Eucalyptus gracilis* and *E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0.00 |
| **VA8** | *Eucalyptus calycogona +/- E. oleosa* Mallee over *Melaleuca uncinata* | 15.034 | 0.132 |
| **VA9** | *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica* | 9.784 | 4.961 |
| | **TOTAL** | **149.816** | **33.425** |



Data Source: EBS Ecology (2024), ESRI (2024), DEW (2022), DIT (2022)

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Created by: sophie.haswell

**Figure 2. Vegetation associations mapped within the Project Area.**

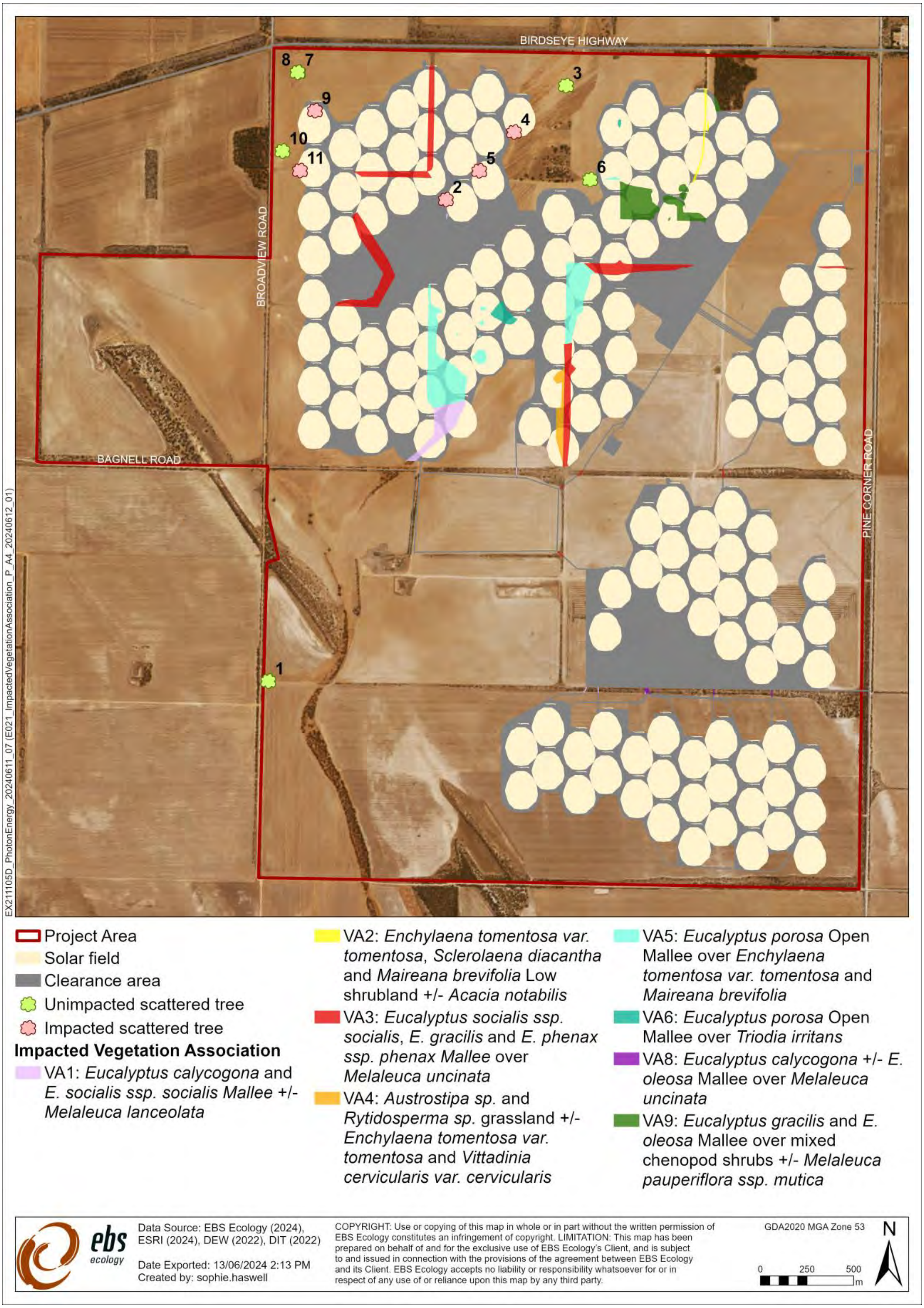


**Figure 3. Vegetation impacted by the proposed infrastructure.**

## 2.2 Limitations

The significant impact assessment is based on the Project design information available at the time of writing. Any change in impact area and/or project designs may require the significance of the potential impact on MNES to be re-assessed and updated.

For three species assessed in this self-assessment the Extent of Occupancy (EOO), Area of Occupancy (AOO) and modelled distribution map were not available within relevant conservation advice or recovery plans. These were: *Caladenia tensa* (Greencomb Spider-orchid), *Pterostylis mirabilis* (Nodding Rufoushood) and Sandhill Dunnart (*Sminthopsis psammophila*). No EOO and AOO calculations were undertaken for these species.

# 3 OVERVIEW OF THE EPBC ACT

The EPBC Act protects the environment in relation to MNES. Under the EPBC Act, if a development proposal involves an action that is likely to result in a significant impact on an MNES, the proposal must be referred to the Commonwealth Department of Climate Change, the Environment, Energy and Water (DCCEEW) (an EPBC Referral). When an EPBC Referral for a development proposal is submitted, DCCEEW provides a determination as to whether the Project is considered a Controlled Action or Not Controlled Action. Controlled Actions require assessment under the EPBC Act in accordance with a formal assessment and approval process (as defined by DCCEEW).

DCCEEW have issued Significant Impact Guidelines (DCCEEW 2013a) to clarify what may constitute a significant impact on MNES. The significant impact criteria are provided by DCCEEW as guidance for proponents in considering whether actions are likely to result in significant impacts to Protected Matters. Definitions of a significant impact are provided in Table 2. The guidelines outline a set of criteria for each MNES and outline the types of actions and impacts that may be considered significant (Table 3). The guidelines consider on-site impacts, such as habitat loss, and indirect impacts, such as the introduction or increased prevalence of invasive species that may threaten the species or its habitat. Supporting the significant impact criteria, definitions of population, important population and critical habitat for threatened species and Threatened Ecological Communities (TECs) have been provided in Table 4.

**Table 2. Definition of a significant impact under the EPBC Act (DCCEEW 2013a).**

| Terms | Definition |
|---|---|
| What is a significant impact? | A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. All of these factors should be considered when determining whether an action is likely to have a significant impact on MNES. |
| When is a significant impact likely? | To be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility. If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment. |

**Table 3. The Significant Impact Criterion for threatened and migratory species under the EPBC Act (DCCEEW 2013a).**

| Critically Endangered and Endangered Ecological Communities | Critically Endangered and Endangered species | Vulnerable Species |
|---|---|---|
| Reduce the extent of an ecological community. | Lead to a long-term decrease in the size of a population. | Lead to a long-term decrease in the size of an *important* population of a species. |
| | Reduce the area of occupancy of the species. | Reduce the area of occupancy of an *important* population. |
| Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species. | Disrupt the breeding cycle of a population. | Disrupt the breeding cycle of an *important* population. |

| Critically Endangered and Endangered Ecological Communities | Critically Endangered and Endangered species | Vulnerable Species |
|---|---|---|
| Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:<br>Assisting invasive species, that are harmful to the listed ecological community, to become established; or<br>Causing regular mobilisation of fertilisers, herbicides, or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community. | Result in invasive species that are harmful to a *critically endangered* or *endangered species* becoming established in the *endangered* or *critically endangered* species' habitat. | Result in invasive species that are harmful to a *vulnerable* species becoming established in the *vulnerable* species' habitat. |
| Fragment or increase fragmentation of an ecological community. | Fragment an existing population in to two or more populations. | Fragment an existing *important* population in to two or more populations. |
| Adversely affect habitat critical to the survival of an ecological community. | Adversely affect habitat critical to the survival of a species. | |
| Modify or destroy abiotic (non-living) factors (Such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns. | Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | |
| | Introduce disease that may cause the species to decline. | |
| Interfere with the recovery of the species. | | |

**Table 4. The definition of key terms referred to in the Significant Impact Criteria for threatened species (DCCEEW 2013a).**

| Terms | Definition |
|---|---|
| Population | A population of a species is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered, or vulnerable threatened species, occurrences include but are not limited to:<br>• A geographically distinct regional population, or collection of local populations, or<br>• A population, or collection of local populations, that occur within a particular bioregion. |
| Important Population | An important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:<br>• A key source population either for breeding or dispersal;<br>• Populations that are necessary for maintaining genetic diversity; and/or<br>• Populations that are near the limit of the species range. |
| Critical Habitat | Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:<br>• for activities such as foraging, breeding, roosting or dispersal;<br>• for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);<br>• to maintain genetic diversity and long-term evolutionary development, or<br>• for the reintroduction of populations or recovery of the species. |

# 4 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE (MNES)

## 4.1 Desktop assessment

### *4.1.1 Previous studies*

The following assessments were undertaken by EBS Ecology, to identify ecological constraints associated with the proposed Project (Table 5).

**Table 5. Summary of previous EBS reports relevant to the Project.**

| Project name | Year | Field dates | Report type | EBS Project Code and reference |
|---|---|---|---|---|
| Photon Energy Solar Storage Project Desktop assessment | 2021 | - | Desktop report outlining ecological constraints for the Project | EX211105 (EBS Ecology 2021) |
| Photon Energy Solar Storage Ecological Assessment | 2022 | 28 February to 3 March & 21 to 25 November | Ecological report highlighting on-ground vegetation condition and outline of constraints | E211105 (EBS Ecology 2022a) |
| Desktop letter for EPBC threatened species | 2022 | - | Letter memo investigating potential threatened species within a new area. | EX211105B (EBS Ecology 2022b) |
| Yadnarie Solar Farm Ecological Assessment | 2024 | 25 August 2023 | Updates to the Ecological Report with a new Project Area | EX240519 (EBS Ecology 2024a) |
| Yadnarie Solar Farm Native Vegetation Clearance Data Report | 2024 | - | Native Vegetation Clearance Data report, with the impact area and Significant Environmental Benefit calculation to Offset the Project. | EX240519 (EBS Ecology 2024b) |

### *4.1.2 Database searches*

To identify recently listed MNES under the EPBC Act relevant to the Project Area, a Protected Matters Search Tool (PMST) report was generated on 3 June 2024 (DCCEEW 2024a). The PMST report identified one Threatened Ecological Community (TECs), 23 threatened species and 9 migratory species as possibly occurring within 5 km of the Project Area. There were no World Heritage Properties, National Heritage Places, Wetlands of International Significance Commonwealth Marine Areas or Great Barrier Reef Marine Park Areas identified in the report. Listed marine species were identified by the report but as this Project is terrestrial based, all marine listed species have been omitted from the EPBC Self-assessment.

### *4.1.3 Relevant MNES*

The EPBC Self-assessment was applied to MNES that were ‘Likely to occur’ or ‘Known to occur’, as per the PMST Report, and that were assessed by EBS as having at least a ‘possible’ probability of occurrence as described within the Yadnarie Solar Farm Ecological Assessment (EBS 2024a). This internal likelihood assessment was predicated on the habitat conditions of the Project Area, the suitability of that habitat for relevant MNES, and the historicity of records within a 5 km radius of the Project Area. Therefore, MNES that returned a 'may occur' by the PMST, or who have habitat requirements inappropriate to that provided by the Project Area, have been excluded from assessment.

Based on these considerations, seven MNES (two flora species and five fauna species) were identified as having the potential of being impacted by the Project (Table 6). These MNES are assessed against the Significant Impact Criteria in Section 5 and 6.

The desktop likelihood assessment for all MNES identified within the PMST is presented in Appendix 1.

**Table 6. Assessment of likelihood of presence of MNES within the Project Area.**

| Scientific name (Common name) | Conservation status | | PMST Presence within 5 km buffer | Likelihood presence in Project Area | Justification of likelihood of occurrence in Project Area |
|---|---|---|---|---|---|
| | EPBC Act | NPW Act | | | |
| **TECs** | | | | | |
| **FLORA** | | | | | |
| *Caladenia tensa* (Greencomb Spider-orchid) | EN | - | Likely | Possible | Widespread species but uncommon, occurring in mallee and woodland vegetation associations such as Cypress Pine and Yellow Gum Woodland (DCCEEW 2016). Suitable habitat is present in several VAs within the Project Area. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur and is assessed further in Section 5.1. |
| *Pterostylis mirabilis* (Nodding Rufoushood) | VU | V | Likely | Possible | Occurs in coastal areas on the Eyre Peninsula, growing on rocky, hilly slopes within Broombush *(Melaleuca uncinata)* scrub. However, it is also found in Callitris and Eucalypt woodlands, typically in stony brown loam soils (DCCEEW 2008). Suitable habitat is present in several VAs within the Project Area. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur and is assessed further in Section 5.2. |
| **FAUNA** | | | | | |
| **Aves** | | | | | |
| *Aphelocephala leucopsis* (Southern Whiteface) | VU | - | Likely | Likely | Occurs in open woodland and shrubland habitat with an understorey of grasses and/or low shrubs. Suitable habitat is usually dominated by *Acacia* spp. or *Eucalyptus* spp. on ranges, foothills, lowlands and plains (DCCEEW 2023a). Suitable habitat is widespread across the Project Area. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered likely to occur and is assessed further in Section 6.1. |
| *Leipoa ocellata* (Malleefowl) | VU | V | Likely | Possible | Inhabits semi-arid regions of southern Australia. Occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine Callitris woodlands, Acacia shrublands, or |

| Scientific name (Common name) | Conservation status | | PMST Presence within 5 km buffer | Likelihood presence in Project Area | Justification of likelihood of occurrence in Project Area |
|---|---|---|---|---|---|
| | EPBC Act | NPW Act | | | |
| | | | | | coastal heathlands (DCCEEW 2010). Suitable habitat is present in several VAs within the Project Area. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur and is assessed further in Section 6.2. |
| *Neophema chrysostoma* (Blue-winged Parrot) | VU | V | Likely | Possible | Prefers grasslands and grassy woodlands but will inhabit a range of habitats from coastal, sub-coastal and inland areas to semi-arid zones (DCCEEW 2023b). Mallee woodlands are widespread throughout the Project Area, however these VAs have minimal grassy understorey. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur and is assessed further in Section 6.3. |
| *Stagonopleura guttata* (Diamond Firetail) | VU | V | Likely | Possible | Resides in a wide range of Eucalypt dominated vegetation communities that have a grassy understorey, including woodland, forest and mallee. Most occur on the inland slopes of the Great Dividing Ranges, with only small pockets near the coast (DCCEEW 2023c). Mallee woodlands are widespread throughout the Project Area, however these VAs have minimal grassy understorey. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur and is assessed further in Section 6.4. |
| **Mammalia** | | | | | |
| *Sminthopsis psammophila* (Sandhill Dunnart) | EN | V | Likely | Possible | Known on the Eyre Peninsula, their specific habitat requirements include sand dunes with presence of mixed age / size spinifex hummocks (*Triodia* spp.) comprising 10 to 70 percent ground cover and preferably low open mallee woodland with diverse shrub layer (DCCEEW 2015). This vegetation community occurs within VA6 and VA7, however these VAs are isolated and fragmented land parcels. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur and is assessed further in Section 6.5. |

**EPBC Act:** (*Environment Protection and Biodiversity Conservation Act 1999*). **NPW Act** (*National Parks and Wildlife Act 1972*).
**Conservation Codes**: **CE**: Critically Endangered. **EN/E**: Endangered. **VU/V**: Vulnerable. **R**: Rare. **Mi (M)**: Migratory marine.

# 5 THREATENED FLORA PROFILES

## 5.1 *Caladenia tensa* (Greencomb Spider-orchid)

### *5.1.1 Conservation status*

Under the EPBC Act, *Caladenia tensa* (Greencomb Spider-orchid) is listed as Endangered. The Greencomb Spider-orchid is not currently listed under the SA *National Parks and Wildlife Act 1972* (NPW Act).

### *5.1.2 Species description*

The Greencomb Spider-orchid is an herbaceous perennial orchid that grows up to 35 centimetres (cm) tall. It has a single narrow leaf that can reach up to 12 cm in length and typically produces one flower, though occasionally there may be two. This orchid dies back annually to a small underground tuber. The erect, hairy flower stem bears a flower that is pale green, white, and maroon. The sepals and petals are pale green with variable thin maroon stripes, each up to 40 mm long. The central petal, or labellum, is broadly triangular, delicately hinged, and features a prominent white median band with a maroon tip. The margins of the labellum are deeply fringed with long, slender teeth (DCCEEW 2016).

**Figure 4.** ***Caladenia tensa*** **(Greencomb Spider-orchid) (Source: ALA 2024b).**

### *5.1.3 Distribution and habitat*

The historical distribution of the Greencomb Spider-orchid included aeolian sand deposits within and surrounding the Little Desert in western Victoria and southeast South Australia**.** It occurs in *Callitris* spp. (Cypress Pine), *Eucalyptus leucoxylon* (Yellow Gum) woodland and *Melaleuca uncinata* (Broombush) mallee on tertiary and quaternary aeolian sandy loams in the Murray-Darling Depression bioregion. Spider-orchids typically reproduce from seeds. Each mature capsule holds tens of thousands of tiny seeds, which are dispersed by the wind once the capsule dries out. Most spider-orchids grow in a complex relationship with mycorrhizal fungi which assimilates some nutrients for the orchid. The long-term presence of a suitable mycorrhiza is crucial for the orchid's growth and development. However, the ecological requirements for the sustained maintenance of the mycorrhizal fungus in soil are not well understood (DCCEEW 2016).

### *5.1.4 Extent of occurrence and area of occupancy*

There is no published population estimate, EOO, AOO or modelled distribution map available for the Greencomb Spider-orchid.

### *5.1.5 Threats*

Threats to the Greencomb Spider-orchid include (DCCEEW 2016):

- *Habitat loss, disturbance and modification:* Habitat fragmentation, trampling by recreational users, road maintenance and vegetation clearance all pose a risk to the survival of the species.
- *Invasive species:* Weed invasion is a risk to orchids because weeds directly out-compete orchids for resources and change the vegetation type and structure of the habitat. They can also alter microhabitats, which may indirectly cause a negative impact on orchid species.
- *Grazing:* Grazing, particularly by rabbits (*Oryctolagus cuniculus*), can have a major impact on orchids.
- *Fire:* The influence of fire on the life history of the Greencomb Spider-orchid is poorly known. Based on related species, fires that occur in autumn, winter and spring, after shoots emerge above ground but before seed is set, may pose a threat. Too frequent fire or aseasonal fires may pose a threat by altering the habitat, removing organic surface materials and negatively impacting pollinators and mycorrhizal agents.

### *5.1.6 Occurrence in the Project Area*

Previous assessment and field surveys undertaken within the Project Area (EBS Ecology 2022a, 2024a) did not detect the species but species-specific targeted orchid surveys were not undertaken. The closest known record is located over 23 kilometres (km) west of the Project Area, with an additional record in Hincks Wilderness Protection Area and another just above the Protection Area (ALA 2024a). However, these records are >20 years old. No BDBSA records were identified in the desktop assessment. Due to the Project Area being located on private property, records of this species within the Project Area are likely to be limited. The Project Area contains remnant old growth Mallee, where some pockets reflect vegetation that is in a Pre-European state and have had little disturbance. As determined by field surveys, three of the nine VA's (VA3, VA7 and VA8) are considered suitable habitat for the Greencomb Spider-orchid, totalling 85.137 ha (Table 7).

**Table 7. Vegetation associations located within the Project Area that are deemed suitable for the Greencomb Spider-orchid.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA3** | *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata* | 30.005 | 11.892 |
| **VA7** | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis* +/- *Triodia irritans* | 40.098 | 0.00 |
| **VA8** | *Eucalyptus calycogona +/- E. oleosa* Mallee over *Melaleuca uncinata* | 15.034 | 0.132 |
| | **TOTAL** | **85.137** | **12.024** |

Critical habitat is not defined in the species' approved conservation advice or recovery plan.

### *5.1.7 Significant impact assessment*

The total proposed clearance of habitat suitable for the Greencomb Spider-orchid is 12.024 ha (Table 7), which is 14.12% of the suitable habitat available within the Project Area. Habitat proposed to be impacted by the Project is not contiguous with a known population of Greencomb Spider-orchid and is therefore not considered critical to the survival of the species. No significant impact is likely to occur to the species as a result of the Project. The assessment of impact significance against the EPBC Act guidelines for Greencomb Spider-orchid is provided in Table 8.

### *5.1.8 Assessment against significant impact guidelines*

**Table 8. Impact to the Greencomb Spider-orchid assessed against the Significant Impact Criteria for an Endangered species (DCCEEW 2013a).**

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Lead to a long-term decrease in the size of a population. | No | No | No populations are known or considered likely to occur within the Project Area. |
| Reduce the area of occupancy of the species. | No | No | The AOO of the species is not published. No populations are known or considered likely to occur within the Project Area. Though habitat is broadly suitable, the distance from nearest known populations (~23 km) and occurrence of known threatening weed species are likely to make the Project Area unsuitable habitat. |
| Fragment an existing population into two or more populations. | No | No | The Project will not fragment an existing population into two or more populations. |
| Adversely affect habitat critical to the survival of a species. | No | No | Critical habitat is not defined in the species' approved conservation advice or recovery plan. However, all existing known populations and contiguous suitable habitat is likely to be considered critical. Habitat proposed to be impacted by the Project is not contiguous with a known population and is therefore not considered critical to the survival of the species. |
| Disrupt the breeding cycle of a population. | No | No | No populations are known or considered likely to occur within the Project Area. |
| Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | No | No | No populations are known or considered likely to occur within the Project Area. Potential habitat is within the Project Area is incurring minimal clearance (~12 ha) which is unlikely to result in the species decline. |
| Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat. | No | No | Weed species known to cause impacts to the species, such as *Asparagus asparagoides* (Bridal Creeper) and *Ehrharta calycina* (Veldtgrass) are already present in the Project Area. The proposed action is unlikely to cause additional invasive species impacts. |
| Introduce disease that may cause the species to decline. | No | No | Dieback and phytophthora are cited as potential impacts to Greencomb Spider-orchid, however as there are no known populations in the Project Area, the risk is negligible. The closest confirmed phytophthora record is ~130 km away, located in Whyalla. Additionally, phytophthora management is considered as part of Department for Infrastructure and Transport (DIT) standard operating procedures - *Phytophthora (Dieback) Control Environmental Instruction* (DIT 2022). |
| Interfere with the recovery of the species. | No | No | Clearance for the Project does not interfere with any proposed recovery actions for the species.<br>Clearance for the Project does not exacerbate the threatening processes below (DCCEEW 2016):<br>• Habitat loss, disturbance and modification.<br>• Invasive species. |

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| | | | - Grazing.<br>- Fire. |
| **Outcome:** | No significant impact. | | |

## 5.2 *Pterostylis mirabilis* (Nodding Rufoushood)

### *5.2.1 Conservation status*

Under the EPBC Act, *Pterostylis mirabilis* (Nodding Rufoushood) is listed as Vulnerable. The Nodding Rufoushood is also currently listed as Vulnerable under the NPW Act.

### *5.2.2 Species description*

Nodding Rufoushood is a small herbaceous orchid with 5–12 overlapping leaves forming a basal rosette. The leaves, measuring 20 millimetres (mm) in length and 4–8 mm in width, are sessile, obscurely veined, and range from narrowly elliptical to obovate with sharp tips. The flowering stem, reaching up to 8 cm in height, is slender and encased in long, scaly sheathing bracts. The plant produces greenish-white flowers, typically 1–7 in number (sometimes up to 10), which grow on pedicels that extend at right angles to the stem (DCCEEW 2008) (Figure 5).

**Figure 5.** ***Pterostylis mirabilis*** **(Nodding Rufoushood) (Source: R. T. Moonabie, n.d.).**

### *5.2.3 Distribution and habitat*

Nodding Rufoushood occurs on the Eyre Peninsula in South Australia, where it is known from about 12 localities, within an estimated area of 190 km$^2$. This species occurs in coastal areas to areas about 100 km inland, 75–200 m above sea level, between Cleve and Kimba, in the 300 mm rainfall zone. *Pterostylis mirabilis* grows on rocky, hilly slopes within Broombush *(Melaleuca uncinata)* scrub. However, it is also found in Callitris and Eucalypt woodlands, typically in stony brown loam soils. The distribution of this species is not known to overlap with any EPBC Act listed TECs (DCCEEW 2008).

### *5.2.4 Extent of occurrence and area of occupancy*

It is estimated that there are approximately 220 individuals in the wild (DCCEEW 2008). There is no published EOO, AOO or modelled distribution map available for the Nodding Rufoushood.

### *5.2.5 Threats*

Threats to the Nodding Rufoushood include (DCCEEW 2008):

- *Habitat fragmentation:* Habitat fragmentation threatens to further reduce population sizes and reduce levels of genetic variability.
- *Weed invasion:* Weed invasion is a risk to orchids because weeds directly out-compete orchids for resources and change the vegetation type and structure of the habitat. They can also alter microhabitats, which may indirectly cause a negative impact on orchid species.
- *Inappropriate fire regimes:* Populations may become locally extinct if fires are too frequent, or conversely if fires are excluded from critical habitat.
- *Drift from agricultural spray:* Agricultural spray drift may also be a threat to the species as well as its insect pollinators.
- *Grazing and trampling:* Grazing and trampling pressure is undetermined; however, known populations occur on private land and may be adversely affected by sheep and rabbits. Trampling may inhibit seed germination due to soil surface disturbance, soil compaction or encouraging weed growth.

### *5.2.6 Occurrence in the Project Area*

Previous assessment and field surveys undertaken within the Project Area did not detect the (EBS Ecology 2022a, 2024a), but species-specific targeted orchid surveys were not undertaken. The closest known record is located approximately 9.5 km east of the Project Area, near the township of Cleve (ALA 2024a). Due to the Project Area being located on private property, field surveys, and therefore records within the Project Area, are likely to be limited. The Project Area contains remnant old growth mallee, where some pockets reflect vegetation that is in a Pre-European state and have had little disturbance. Although no BDBSA records were identified in the desktop assessment, ALA has shown nearby records >10 years old of this species. As determined by field surveys, six of the nine VAs (VA1, VA3, VA5, VA7, VA8 and VA9) are considered suitable habitat for Nodding Rufoushood, totalling 133.742 ha (Table 9).

**Table 9. Vegetation associations located within the Project Area that are deemed suitable for the Nodding Rufoushood.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA1** | *Eucalyptus calycogona* and *E. socialis ssp. socialis* Mallee +/- *Melaleuca lanceolata* | 28.122 | 2.915 |
| **VA3** | *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata* | 30.005 | 11.892 |
| **VA5** | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 |

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA7** | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0.00 |
| **VA8** | *Eucalyptus calycogona +/- E. oleosa* Mallee over *Melaleuca uncinata* | 15.034 | 0.132 |
| **VA9** | *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica* | 9.784 | 4.961 |
| | **TOTAL** | **133.742** | **30.475** |

Critical habitat is not defined in the species' approved conservation advice or recovery plan.

### *5.2.7 Significant impact assessment*

The total proposed clearance of habitat suitable for the Nodding Rufoushood is 30.475 ha (Table 10) which is 22.79% of the suitable habitat available within the Project Area. Habitat proposed to be impacted by the Project is not contiguous with a known population and is therefore not considered critical to the survival of the species. No significant impact is likely to occur to the species as a result of the Project. The assessment of impact significance against the EPBC Act guidelines for Nodding Rufoushood is provided in Table 10.

### 5.2.8 *Assessment against significant impact guidelines*

**Table 10. Impact to the Nodding Rufoushood assessed against the Significant Impact Criteria for a Vulnerable species (DCCEEW 2013a).**

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Lead to a long-term decrease in the size of an *important* population. | No | No | No populations are known or considered likely to occur within the Project Area. Some habitat within the Project Area is broadly suitable for the species, however, with only one small population occurring 9.5 km away (in Cleve), the likelihood of dispersal into the Project Area from other populations is unlikely. The proposed Project is unlikely to lead to a long-term decrease in the size of an important population. |
| Reduce the area of occupancy of an *important* population. | No | No | No populations are known to occur within the Project Area. The known population in Cleve has potential to expand but is unlikely at this stage as only a single individual has been recorded. As habitat within the Project Area is broadly suitable, clearance may reduce some suitable habitat, but this will not reduce the area of occupancy of an important population. |
| Fragment an existing *important* population into two or more populations. | No | No | The Project will not fragment the important population into two or more populations as there is no known population within the Project Area. |
| Adversely affect habitat critical to the survival of a species. | No | No | Critical habitat is not defined in the species' approved conservation advice or recovery plan. However, all existing known populations and contiguous suitable habitat is likely to be considered critical. Habitat proposed to be impacted by the Project is not contiguous with a known population and is therefore not considered critical to the survival of the species. |
| Disrupt the breeding cycle of an *important* population. | No | No | No populations are known or considered likely to occur within the Project Area. |
| Modify, destroy, remove and isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | No | No | No populations are known or considered likely to occur within the Project Area. Potential habitat may be removed or modified but the 30.475 ha area is unlikely to result in the species decline. |
| Result in an invasive species that is harmful to a vulnerable species becoming established in the vulnerable species' habitat. | No | No | Invasive weed species are already present in the Project Area. The proposed action is unlikely to cause additional invasive species impacts to Nodding Rufoushood habitat. |
| Introduce disease that may cause the species to decline. | No | No | Dieback and phytophthora are cited as potential impacts to Nodding Rufoushood, however as there are no known populations in the Project Area, the risk is negligible. The closest confirmed phytophthora record is ~130 km away, located in Whyalla. Additionally, phytophthora management is considered as part of DIT standard operating procedures - *Phytophthora (Dieback) Control Environmental Instruction* (DIT 2022). |
| Interfere with the recovery of the species. | No | No | Clearance for the Project does not interfere with any proposed recovery actions for the species.<br>Clearance for the Project does not exacerbate the threatening processes below (DCCEEW 2008):<br>• Habitat fragmentation |

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| | | | • Weed invasion<br>• Inappropriate fire regimes<br>• Drift from agricultural spray<br>• Grazing<br>• Trampling |
| **Outcome:** | No significant impact. | | |

# 6 THREATENED FAUNA PROFILES

## 6.1 Southern Whiteface (*Aphelocephala leucopsis*)

### *6.1.1 Conservation status*

Under the EPBC Act, the Southern Whiteface (*Aphelocephala leucopsis*) is listed as Vulnerable. The Southern Whiteface is not currently listed under the NPW Act.

### *6.1.2 Species description*

The Southern Whiteface is a small stocky thornbill-like bird with a brown dorsum, white belly, dark brown wings and a black tail with narrow white tip. A grey wash on the belly is sometimes present, along with a grey or rufous tinge to the flanks. The species displays the characteristic facial markings of the genus: a white band across the forehead, with a darker streak along the top edge. Adult birds are approximately 11.5 cm in length with a cream-coloured eye, grey legs and a stubby dark grey bill of finch-like appearance (DCCEEW 2023a).

**Figure 6. Southern Whiteface (*Aphelocephala leucopsis*) (Source: DCCEEW 2023a)**

### *6.1.3 Distribution and habitat*

The Southern Whiteface occurs across most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing Range. There is a broad hybrid zone between the two subspecies extending north from the western edge of the Nullarbor Plain. The northern boundary extends to about Carnarvon in the west, to the southern Northern Territory in central Australia, but is slightly further south in Queensland where the species is largely confined to the south-west of the Mitchell Grass Downs and along the southern state border (DCCEEW 2023a).

The Southern Whiteface occurs in open woodland and shrubland habitat with an understorey of grasses and/or low shrubs. Suitable habitat is usually dominated by *Acacia* spp. or *Eucalyptus* spp. on ranges, foothills, lowlands and plains. The birds forage almost exclusively on the ground, favouring habitats with low tree densities and an herbaceous understorey. The Southern Whiteface is sedentary, although it is thought there may be some movements outside of their normal range during dry periods.

Critical habitat for the Southern Whiteface includes areas of (DCCEEW 2023a):

- Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs or both;
- Habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat; and
- Living and dead trees with hollows and crevices which are essential for roosting and nesting.

### *6.1.4 Extent of Occurrence and Area of Occupancy*

It is estimated that there are approximately 47,7000 (range 236,000–954,000) mature individuals in the wild (DCCEEW 2023b). The EOO, AOO and impact of the proposed Project on the Southern Whiteface is presented in Table 11. The modelled distribution of the species is presented in Figure 7.

**Table 11. The Extent of Occurrence, Area of Occupancy and impact of the Project on the Southern Whiteface.**

| Extent of Occurrence (km$^2$) | Area of Occupancy (km$^2$) | Impacted Habitat (km$^2$) | Percent of AOO Impacted (%) |
|---:|---:|---:|---:|
| 4,910,000 | 80,000 | 0.32000 | 0.00040 |

### *6.1.5 Threats*

Threats to the Southern Whiteface include:

- *Habitat loss and fragmentation*: Habitat loss caused by clearing for agriculture is likely the cause of the species decline, especially in the parts of the species' range where there has been complete removal of habitat for intensive agriculture (Ehmke *et al.* 2021).
- *Habitat degradation*: Habitat degradation caused by domestic livestock grazing impacts on native tree and shrub seedlings and grassy woodland groundcover species, as well as changes in soil structure and damage to native plants by trampling. Livestock grazing can exacerbate the spread of weeds through seed dispersal, soil and vegetation disturbance, and nutrient enrichment.
- *Increased frequency or length of droughts*: Droughts impact food resources for a range of woodland birds in Australia, which, in turn, decreases bird abundance. It is not known how the increased frequency or length of droughts affect Southern Whiteface survival and reproduction and its habitat. Further studies are needed to better understand the impact of drought on the species.
- *Increased likelihood of extreme events (i.e., wildfire, drought and heatwaves)*: It is not known how wildfire, drought and heatwaves weather events, or the cumulative effect of these weather events,

affect Southern Whiteface survival and reproduction and its habitat. Further studies are needed to better understand the impact increased likelihood of extreme events on the species.

### *6.1.6 Occurrence in the Project Area*

Previous assessment and field surveys undertaken within the Project Area did not detect the species (EBS Ecology 2022a, 2024a). The closest known record is located approximately 9.5 km east of the Project Area, near the township of Cleve, and an additional record occurs at the southern boundary of Hincks Wilderness Protection Area (ALA 2024a). Majority of the vegetation associations recorded in the Project Area are considered suitable habitat for the Southern Whiteface. Although no BDBSA records were identified in the desktop assessment, Atlas of Living Australia (ALA) has shown nearby records of Southern Whiteface. The Southern Whiteface is considered to be sedentary; however, ALA records indicate that individuals may move into wetter areas outside of their normal range during drought years (DCCEEW 2023a). Therefore, the species is considered likely to occur within the Project Area. As determined by field surveys, eight of the nine VA's (VA1-VA3, VA5-VA8) are considered suitable habitat for the Southern Whiteface, totalling 141.644 ha (Table 12).

**Table 12. Vegetation associations located within the Project Area that are deemed suitable for the Southern Whiteface.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA1** | *Eucalyptus calycogona* and *E. socialis ssp. socialis* Mallee +/- *Melaleuca lanceolata* | 28.122 | 2.915 |
| **VA2** | *Enchylaena tomentosa* var. *tomentosa, Sclerolaena diacantha* and *Maireana brevifolia* Low shrubland +/- *Acacia notabilis* | 2.144 | 0.577 |
| **VA3** | *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata* | 30.005 | 11.892 |
| **VA5** | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 |
| **VA6** | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 |
| **VA7** | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0.00 |
| **VA8** | *Eucalyptus calycogona +/- E. oleosa* Mallee over *Melaleuca uncinata* | 15.034 | 0.132 |
| **VA9** | *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica* | 9.784 | 4.961 |
| | **TOTAL** | **141.644** | **32.001** |

### *6.1.7 Significant impact assessment*

The current project design will impact 32 ha (22.59%) (Table 12) of suitable habitat within the Project Area, which is 0.00040% of 80,000 km$^2$ AOO for the Southern Whiteface (Table 11). Given that suitable habitat is widespread surrounding the impact area and no records of the Southern Whiteface were observed within 5 km of the Project Area, the clearance of suitable habitat is unlikely to have a significant impact on this species. The assessment of impact significance against the EPBC Act guidelines for Southern Whiteface is provided in Table 13.

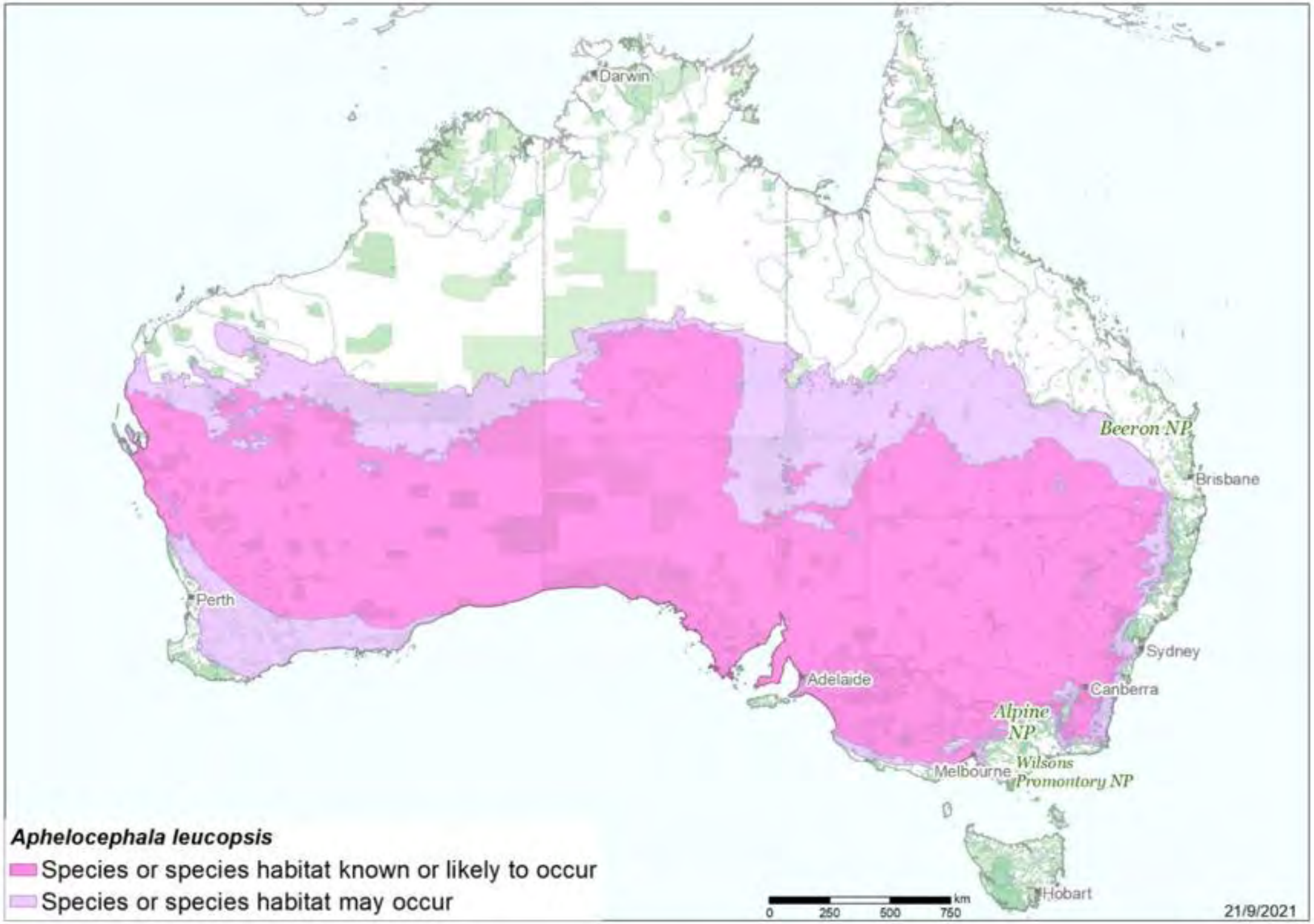


**Figure 7. Modelled distribution of Southern Whiteface (DCCEEW 2023a).**

### *6.1.8 Assessment against significant impact guidelines*

**Table 13. Impact to the Southern Whiteface assessed against the Significant Impact Criteria for a Vulnerable species (DCCEEW 2013a).**

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Lead to a long-term decrease in the size of an *important* population. | No | No | There are no important populations defined under the EPBC Act for the Southern Whiteface and the species has a continuous distribution throughout its range. A lack of BDBSA database records indicate that no population currently persists within proximity of the Project Area. Although there is habitat available to this species within the Project Area, the extent of habitat affected is considered small (<0.001%) and would not lead to a long-term decrease in the size of the population. |
| Reduce the area of occupancy of an *important* population. | No | No | No Southern Whiteface populations are known from within the Project Area. The Southern Whiteface is widespread throughout semi-arid southern Australia with an AOO of 80,000 km$^2$. The habitat clearance that will occur within the Project Area represents 0.00040% of this. The Project is therefore not likely to reduce the AOO of an important population of the Southern Whiteface. |
| Fragment an existing *important* population into two or more populations. | No | No | There are no recent record of Southern Whiteface within 5 km of the Project Area and the species was not detected during field assessments. The proposed Project does not fragment an existing important population into two or more populations. |
| Adversely affect habitat critical to the survival of a species. | No | No | The Project will reduce 32 ha of habitat for this species. As the species has an EOO of up to 4,910,000 km$^2$, it is not likely that this amount of habitat clearance would cause the species to decline. The species is sedentary so lack of observations within the Project Area indicate that habitat within the Project Area is not critical to the species. |
| Disrupt the breeding cycle of an *important* population. | No | No | If clearance occurs during the species' breeding season, disturbance from construction activities may disrupt the breeding cycle of local birds in the Project Area. However, given the species extensive AOO, and no individuals being observed within the Project Area within the last decade, it is unlikely to disrupt the breeding cycle at a population level. |
| Modify, destroy, remove and isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | No | No | Suitable habitat exists outside of the Project Area. The removal of <0.001% of suitable habitat in the Project Area is unlikely to cause a decrease in the availability or quality of habitat to the extent that the species is likely to decline. |
| Result in an invasive species that is harmful to a vulnerable species becoming established in the vulnerable species' habitat. | No | No | Habitat loss and degradation caused by land clearing and grazing by livestock and feral herbivores is thought to be a contributing factor in the decline of the species (DCCEEW 2023a). As invasive species are already established within the Project Area it is unlikely that the Project will result in in an invasive species that are harmful to Southern Whiteface becoming established in their habitat. Management of pest species may be required to account for any residual impacts associated with the proposed works. |
| Introduce disease that may cause the species to decline. | No | No | There are no known diseases or pathogens that may impact Southern Whiteface. |
| Interfere with the recovery of the species. | No | No | Clearance for the Project does not interfere with any proposed recovery actions for the species. |

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| | | | Clearance for the Project does not exacerbate the threatening processes below (DCCEEW 2023a):<br>• Habitat loss caused by clearance for agriculture.<br>• Habitat degradation caused by domestic livestock grazing.<br>• Increased frequency or length of droughts caused by climate change.<br>• Increased likelihood of extreme events caused by climate change. |
| **Outcome:** | No significant impact. | | |

## 6.2 Malleefowl (*Leipoa ocellata*)

### *6.2.1 Conservation status*

Under the EPBC Act, the Malleefowl (*Leipoa ocellata*) is listed as Vulnerable. The Malleefowl is also currently listed as Vulnerable under the NPW Act.

### *6.2.2 Species description*

Malleefowl are large ground birds that can grow up to 60 cm in length and weigh up to 2.5 kilograms. Due to their size, they are unlikely to be confused with any other bird in the Project Area. Their wings and back are mottled and barred with grey, black, brown, and white. The head and neck are grey, featuring a distinctive black stripe down the fore-neck. They have a short dark bill and large, strong legs and feet. Both sexes appear similar, but male Malleefowl are slightly larger than females. Juveniles can be identified by their smaller size and paler colouring on the head and neck, as well as the dull brown and cream patterning on the upper surfaces of their wings and tail, which lack the white patches seen in adults. Immature Malleefowl resemble adults in appearance (DCCEEW 2010).

**Figure 8. Malleefowl (*Leipoa ocellata*) (Source: J. Skewes (EBS Ecology 2022c)).**

### *6.2.3 Distribution and habitat*

The Malleefowl is distributed in the semi-arid to arid zone in shrublands and low woodlands dominated by mallee and associated habitats such as Broombush (*Melaleuca uncinata*) and Scrub Pine (*Callitris verrucosa*). In the south of South Australia and Victoria, Malleefowl also occur in Brown Stringybark (*Eucalyptus baxteri*) woodland. Sandy substrates and abundance of leaf litter are clear requirements for the development of the birds' incubator-nests. Densities of the birds are generally greatest in areas of higher rainfall and on more fertile soils and where there is a higher shrub diversity. However, the floristic and structural requirements of the species are not well understood. Chenopod mallee, which typically forms on heavy soils, and heath-dominated habitat are among the least preferred mallee habitats for Malleefowl (Benshemesh 2007).

### *6.2.4 Extent of occurrence and area of occupancy*

It is estimated that there are approximately 25,000 mature individuals in the wild (IUCN 2022b). The EOO, AOO and impact of the proposed Project on the Malleefowl is presented in Table 14. The modelled distribution of the species is presented in Figure 7.

**Table 14. The Extent of Occurrence, Area of Occupancy and impact of the Project for the Malleefowl.**

| Extent of Occurrence ($km^2$) | Area of Occupancy ($km^2$) | Impacted Habitat ($km^2$) | Percent of AOO Impacted (%) |
|---:|---:|---:|---:|
| 2,640,000 | 50,000 | 0.31424 | 0.00063 |

### *6.2.5 Threats*

Threats to the Malleefowl include (Benshemesh 2007):

- *Clearing*: Clearing of the mallee for wheat and sheep production has been the major factor in the decline of Malleefowl in SA. The best habitats for Malleefowl tend to occur on fertile soils which receive relatively high rainfall, but these have been almost entirely cleared. This clearing also threatens remaining habitat due to fragmentation and dryland salinity.
- *Fragmentation and isolation*: clearing for agriculture has resulted in fragmentation of the remnant population into small populations with little opportunity for dispersal between them.
- *Grazing*: In areas grazed by sheep, Malleefowl breeding densities are reduced by 85-90% compared to similar ungrazed habitats. Other herbivores may also compete with Malleefowl for herbaceous foods and damage shrubs that are important as seed sources for the birds.
- *Predation*: Predation by the introduced fox, and to a lesser extent by cats and raptors, is a major cause of mortality of Malleefowl. Predation on Malleefowl chicks is severe but difficult to measure in wild populations.
- *Fire (wildfire and intentional burns)*: Large fires are a major threat to the conservation of Malleefowl and many other threatened mallee birds. Populations of Malleefowl may suddenly be eliminated from vast areas that are burnt, and recovery in the burnt area to densities that occurred before the fire appears to be very slow, requiring 30 to 60 years.
- *Climate change*: Current predictions of climate change for Australia provide considerable cause for concern and the projected changes in rainfall and temperatures, and concomitant changes in biota, are likely to threaten Malleefowl over their entire range.

### *6.2.6 Occurrence in the Project Area*

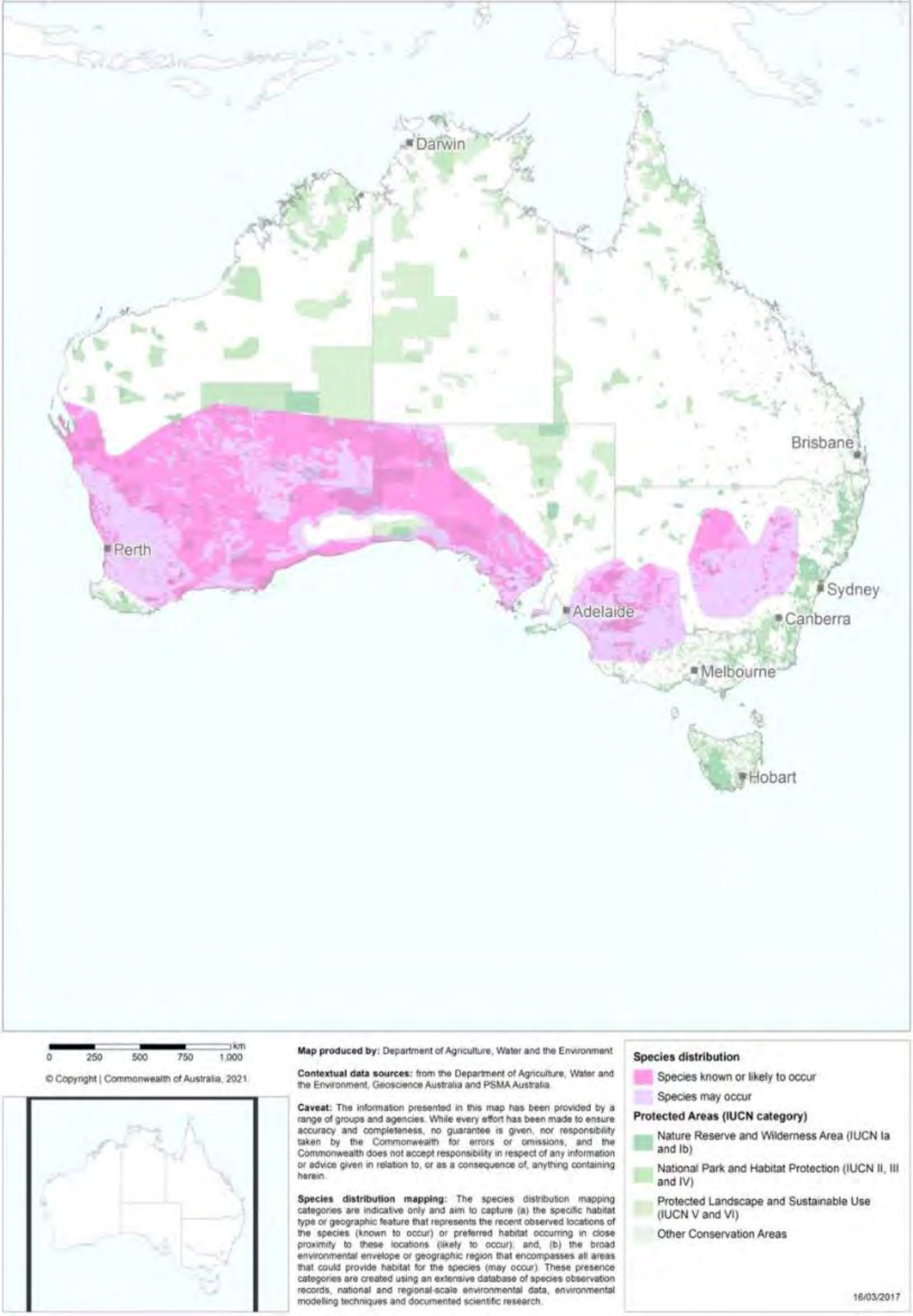
Previous assessment and field surveys undertaken within the Project Area did not detect the species (EBS Ecology 2022a, 2024a), but species-specific targeted surveys were not undertaken. The closest known records are located approximately 8 km south of the Project Area (ALA 2024a). No BDBSA records were identified in the desktop assessment. Majority of the vegetation associations recorded in the Project Area are considered suitable habitat for the Malleefowl. As determined by field surveys, seven of the nine VA's (VA1, VA3, VA5, VA6- VA9) are considered suitable habitat for Malleefowl, totalling 139.50 ha (Table 15).

**Table 15. Vegetation associations located within the Project Area that are deemed suitable for Malleefowl.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA1** | *Eucalyptus calycogona* and *E. socialis ssp. socialis* Mallee +/- *Melaleuca lanceolata* | 28.122 | 2.915 |
| **VA3** | *Eucalyptus socialis* ssp. *socialis, E. gracilis* and *E. phenax* ssp. *phenax* Mallee over *Melaleuca uncinata* | 30.005 | 11.892 |
| **VA5** | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 |
| **VA6** | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 |
| **VA7** | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0.00 |
| **VA8** | *Eucalyptus calycogona +/- E. oleosa* Mallee over *Melaleuca uncinata* | 15.034 | 0.132 |
| **VA9** | *Eucalyptus gracilis* and *E. oleosa* Mallee over mixed chenopod shrubs +/- *Melaleuca pauperiflora* ssp. *mutica* | 9.784 | 4.961 |
| | **TOTAL** | **139.5** | **31.424** |

### *6.2.7 Significant impact assessment*

Currently, the Impact Area covers 31.42 ha (22.53%) (Table 15) of suitable habitat within the Project Area, which is 0.00063% of the 50,000 km² AOO for the Malleefowl (Table 14). There is abundant suitable habitat adjacent to the impact area with no Malleefowl sightings within 5 km of the Project Area, the vegetation clearance is unlikely to significantly affect this species. The assessment of impact significance against the EPBC Act guidelines for Malleefowl is provided in Table 16.



**Map produced by:** Department of Agriculture, Water and the Environment

**Contextual data sources:** from the Department of Agriculture, Water and the Environment, Geoscience Australia and PSMA Australia

**Caveat:** The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.

**Species distribution mapping:** The species distribution mapping categories are indicative only and aim to capture (a) the specific habitat type or geographic feature that represents the recent observed locations of the species (known to occur) or preferred habitat occurring in close proximity to these locations (likely to occur); and, (b) the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species (may occur). These presence categories are created using an extensive database of species observation records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research.

**Figure 9. Modelled distribution of Malleefowl (DCCEEW 2010).**

### *6.2.8 Assessment against significant impact guidelines*

**Table 16. Impact to the Malleefowl assessed against the Significant Impact Criteria for a Vulnerable species (DCCEEW 2013a).**

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Lead to a long-term decrease in the size of an *important* population. | No | No | The closest known records are located approximately 8 km south of the Project Area. Malleefowl are widespread but uncommon. No populations or general areas have been described as of greater importance for the long-term survival of Malleefowl. There are no important populations of Malleefowl occurring within the Project Area. As such the proposed Project does not lead to a long-term decrease in the size of an important population. |
| Reduce the area of occupancy of an *important* population. | No | No | No Malleefowl populations are known from within the Project Area. The proposed clearance of <0.01% of suitable Malleefowl habitat will not result in a reduction the area of occupancy of an important population. |
| Fragment an existing *important* population into two or more populations. | No | No | There are no recent record of Malleefowl within 5 km of the Project Area and the species was not detected during field assessments. The existing potential suitable habitat within the Project Area is already fragmented and is not contiguous with any known Malleefowl records. The proposed Project will not fragment an existing important population of Malleefowl into two or more populations. |
| Adversely affect habitat critical to the survival of a species. | No | No | Habitat critical to the survival of Malleefowl is known only in broad terms and may include presence of a sandy substrate, abundance of leaf litter and long unburnt mallee vegetation. The Project Area is highly degraded and the suitable habitat within the Project Area is unlikely to adequately support the needs of a population of Malleefowl. The Project Area is not considered habitat critical to the survival of the species. |
| Disrupt the breeding cycle of an *important* population. | No | No | The closest known records are located approximately 8 km south of the Project Area. No known nest locations occur within the Project Area or immediate surrounds. The proposed Project does not impact on the breeding cycle of Malleefowl. |
| Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | No | No | As no known populations of Malleefowl occur within the Project Area, the proposed Project is not likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to cause the species to decline. |
| Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat. | No | No | Increased areas of disturbance may be beneficial to pest plants and animals. As invasive species (including introduced predators, foxes and cats) are already established within the Project Area it is unlikely that the Project will increase populations of these species. Management of pest species may be required to account for any residual impacts associated with the proposed works. |
| Introduce disease that may cause the species to decline. | No | No | There are no known diseases or pathogens that may impact Malleefowl. |
| Interfere with the recovery of the species. | No | No | Clearance for the Project does not interfere with any proposed recovery actions for the species. |

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| | | | Clearance for the Project does not exacerbate the threatening processes below (DCCEEW 2023a):<br>• Clearing<br>• Fragmentation and isolation<br>• Grazing<br>• Predation<br>• Fire (wildfire and intentional burns)<br>• Climate change |
| **Outcome:** | No significant impact. | | |

## 6.3 Blue-winged Parrot (*Neophema chrysostoma*)

### *6.3.1 Conservation status*

Under the EPBC Act, the Blue-winged Parrot (*Neophema chrysostoma*) is listed as Vulnerable. The Blue-winged Parrot is also currently listed as Vulnerable under the NPW Act.

### *6.3.2 Species description*

The Blue-winged Parrot is a slender bird with an olive-green head and upper body, transitioning to light green on the fore-neck. Its upper tail is green-blue with yellow sides and underparts, and it may have an orange belly. A yellow facial patch extends to the eye, and a dark narrow blue band runs across the forehead from eye to eye. This species is named for the distinctive dark blue patch on its wings. Females resemble males but have slightly duller colours (DCCEEW 2023b).

**Figure 10. Blue-winged Parrot (*Neophema chrysostoma*) (Source: DCCEEW 2023b).**

### *6.3.3 Distribution and habitat*

As a partial migrant, a number of Blue-winged Parrots migrate across the Bass Strait in winter. During the non-breeding period, from autumn to early spring, they are recorded in northern Victoria, eastern South Australia (SA), south-western Queensland, and western New South Wales (NSW). Some birds even reach south-eastern NSW and eastern Victoria (DCCEEW 2023b).

The Blue-winged Parrot inhabits a range of coastal, sub-coastal, and inland areas, extending to semi-arid zones. They favour grasslands and grassy woodlands and are often found near wetlands, both near the coast and in semi-arid zones, including chenopod shrubland with native and introduced grasses, herbs, and forbs. Their breeding range includes eucalypt forests and woodlands in Tasmania, coastal south-eastern SA, and southern Victoria. These habitats are critical to the survival of the Blue-winged Parrot (DCCEEW 2023b).

### 6.3.4 *Extent of occurrence and area of occupancy*

It is estimated that there are approximately 10,000 mature individuals in the wild (IUCN 2022c). The EOO, AOO and impact of the proposed Project on the Blue-winged Parrot is presented in Table 17. The modelled distribution of the species is presented in Figure 11.

**Table 17. The Extent of Occurrence, Area of Occupancy and impact of the Project for the Blue-winged Parrot.**

| Extent of Occurrence (km$^2$) | Area of Occupancy (km$^2$) | Impacted Habitat (km$^2$) | Percent of AOO Impacted (%) |
|---:|---:|---:|---:|
| 170,000 | 11,000 | 0.12948 | 0.00118 |

### 6.3.5 *Threats*

Threats to the Blue-winged Parrot include (DCCEEW 2023b):

- *Clearing*: The main threat to bird survival in agricultural areas is habitat loss caused by over-clearing of native vegetation, and subsequent degradation of the remnants of vegetation
- *Grazing*: Native grassy woodland groundcover species are highly susceptible to domestic livestock grazing. A reduction or removal of understorey habitat (e.g., native herbs and grasses) can reduce foraging sites, reduce shelter, and consequently increase the risk of predation.
- *Invasive weeds*: Invasive weeds have the ability to change the floristic and structural characteristics of habitat, thereby changing resource availability. Some weeds may also increase the flammability of the habitat, amplifying bushfire risks.
- *Fire*: Inappropriate fire regimes are the greatest threat to Australia's birds after direct human destruction and alteration of habitats. Fires destroy key nesting habitat and remaining trees may be deemed unsafe by fire authorities and removed, causing further decline of old large/mature trees. Frequent fires can deplete the soil seed bank and reduce soil seed viability.
- *Climate change*: Increased likelihood of extreme events (i.e., wildfire, heatwave and drought) which can have detrimental impacts on blue-winged parrots and their habitats. Blue-winged parrots are also vulnerable to any rise in sea level where they rely on coastal saltmarsh.
- *Predation*: Predation by feral cats and foxes may pose a threat to Blue-winged Parrots foraging on the ground.
- *Competition for tree hollows*: A large proportion of Australian bird species use tree hollows as nesting sites and almost all arboreal marsupials use tree hollows for breeding and shelter.
- *Psittacine Beak and Feather Disease:* Psittacine Beak and Feather Disease is a widespread, lethal parrot disease, typically transferring between adults, nestlings and contaminated nest hollows. Although Blue-winged Parrots are susceptible to this disease, the threat level is relatively low.

### *6.3.6 Occurrence in the Project Area*

Previous assessment and field surveys undertaken within the Project Area did not detect the species (EBS Ecology 2022a, 2024a). The closest known records are located over 44 km south-east of the Project Area, in Franklin Harbor Conservation Park (ALA 2024a). No BDBSA records were identified in the desktop assessment. As determined by field surveys, four of the nine VA's (VA4, VA5, VA6 and VA7) are considered suitable habitat for the Blue-winged Parrot (Table 18).

**Table 18. Vegetation associations located within the Project Area that are deemed suitable for the Blue-winged Parrot.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA4** | *Austrostipa* sp. and *Rytidosperma* sp. Grassland +/- *Enchylaena tomentosa* var. *tomentosa* and *Vittadinia cervicularis* var. *cervicularis* | 8.173 | 1.425 |
| **VA5** | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 |
| **VA6** | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 |
| **VA7** | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0.00 |
| | **TOTAL** | **64.728** | **12.949** |

### *6.3.7 Significant impact assessment*

As the Impact Area covers 12.95 ha (Table 18), which is 20% of the suitable habitat available within the Project Area and 0.00118% of the 11,000 km² of the AOO for the Blue-winged Parrot (Table 17), and there is abundant suitable habitat around the Impact Area with no Blue-winged Parrot sightings within 5 km of the Project Area, the vegetation clearance is unlikely to significantly affect this species. The assessment of impact significance against the EPBC Act guidelines for Blue-winged Parrot is provided in Table 19.

Figure 11. Modelled distribution of the Blue-winged Parrot (DCCEEW 2022b).

### *6.3.8 Assessment against significant impact guidelines*

**Table 19. Impact to the Blue-winged Parrot assessed against the Significant Impact Criteria for a Vulnerable species (DCCEEW 2013a).**

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Lead to a long-term decrease in the size of an *important* population. | No | No | No observations and previous records have been recorded within the Project Area or within 5 km from the Project Area. Although habitat within the Project Area may be suitable for this species, the extent of habitat affected is considered small (<0.01%) and would not lead to a long-term decrease in the size of an important population. |
| Reduce the area of occupancy of an *important* population. | No | No | The AOO is 11,000 km$^2$. The clearance of 12.95 ha, or <0.01%, of this area is not likely to reduce the AOO of an important population. |
| Fragment an existing *important* population into two or more populations. | No | No | No Blue-winged Parrot populations are known from within the Project Area. No individuals were observed on site and no records have been observed within 5 km of the Project Area. The proposed Project does not fragment an existing important population into two or more populations. |
| Adversely affect habitat critical to the survival of a species. | No | No | Critical habitat is not defined in the species' approved conservation advice or recovery plan. However, all existing known populations and contiguous suitable habitat is likely to be considered critical. As the species has an EOO of up to 170,000 km$^2$ and the 0.129 km$^2$ of habitat proposed for clearance for the Project is not contiguous with a known population, it is therefore not considered critical to the survival of the species. |
| Disrupt the breeding cycle of an *important* population. | No | No | Blue-winged Parrots breed in Tasmania, coastal south-eastern South Australia and Southern Victoria. Therefore, clearance in the Project Area is unlikely to disrupt the breeding cycle of this species. |
| Modify, destroy, remove and isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | No | No | Suitable habitat exists outside of the Project Area. The removal of <0.01% of suitable habitat in the Project Area is unlikely to decrease the availability or quality of habitat to the extent that causes the population of Blue-winged Parrot to decline. |
| Result in an invasive species that is harmful to a vulnerable species becoming established in the vulnerable species' habitat. | No | No | Increased areas of disturbance may be beneficial to pest plants and animals (Florentine and Westbrooke 2005). As invasive species are already established within the Project Area it is unlikely that the Project will result in in an invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. Management of pest species may be required to account for any residual impacts on pest animal numbers associated with the proposed works. |
| Introduce disease that may cause the species to decline. | No | No | Psittacine Beak and Feather Disease is a widespread and lethal parrot disease. Blue-winged Parrots are susceptible to Psittacine Beak and Feather Disease, which is spread by food sharing through the bird's crop, fresh or dried excrement and feather and skin particles. A reduction in suitable nesting hollows and increased competition due to removal of suitable breeding habitat is likely to increase the threat in the future.<br>As the Project Area is not located within a suitable breeding habitat for this species it is unlikely that disease will be introduced by the proposed Project. |

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Interfere with the recovery of the species. | No | No | Clearance for the Project does not interfere with any proposed recovery actions for the species.<br>Clearance for the Project does not exacerbate the threatening processes below:<br>• Inappropriate fire regimes<br>• Habitat degradation caused by domestic livestock grazing<br>• Increased frequency or length of droughts caused by climate change<br>• Sea level rise<br>• Competition for tree hollows<br>• Increased likelihood of extreme events.<br>Clearance of the Project *may* exacerbate the threatening processes below:<br>• Habitat loss caused by land clearing<br>• Invasive weeds<br>• Predation by cats and foxes<br>• Psittacine Beak and Feather Disease. |
| **Outcome:** | No significant impact. | | |

## 6.4 Diamond Firetail (*Stagonopleura guttata*)

### *6.4.1 Conservation status*

Under the EPBC Act, the Diamond Firetail (*Stagonopleura guttata*) is listed as Vulnerable. The Diamond Firetail is also currently listed as Vulnerable under the SA *National Parks and Wildlife Act 1972* (NPW Act).

### *6.4.2 Species description*

The Diamond Firetail is a large finch, growing 10-12 cm long and weighing 17 grams. The species has a bright red bill, eyes and rump, with a white throat and lower breast which are separated by a broad black breast-band with white-spotted flanks (Figure 12). Females are similar to the males, although sometimes smaller. The juvenile diamond firetail has a black bill and is duller in colour (DCCEEW 2023c).

**Figure 12. Diamond Firetail (*Stagonopleura guttata*) (Source: DCCEEW 2023c).**

### *6.4.3 Distribution and habitat*

Diamond Firetails occur on the south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia, and about 300 km inland from the sea. Birds in South Australia appear to have been separated into three isolated subpopulations (Eyre Peninsula, Mt Lofty to Southern Flinders Ranges, and the south-east), with few records from a fourth (Yorke Peninsula) in the last decade (DCCEEW 2023c).

Diamond Firetails occur in Eucalypt, Acacia or Casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees, preferring areas with relatively low tree density, few large logs, and little litter cover but high grass cover (DCCEEW 2023c). The species appears to be sedentary, though some populations move locally. Birds roost in dense shrubs or in smaller nests built especially for roosting. The nests are bottle shaped and are made of green grass and feathers and are often built into the base of the large stick-nest of a bird of prey, or among shrubs with prickly foliage

(DCCEEW 2023c). Diamond firetails feed predominantly at ground level, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects

Habitat critical to the survival of the Diamond Firetail includes areas of (DCCEEW 2023c):

- Eucalypt, Acacia or Casuarina woodlands, open forests and other lightly timbered habitats with low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding; and
- Drooping she-oak (*Allocasuarina verticillata*) within the Mt Lofty Ranges.

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

### *6.4.4 Extent of Occurrence and Area of Occupancy*

It is estimated that there are approximately 136,000 mature individuals in the wild (IUCN 2022c). The EOO, AOO and impact of the proposed Project on the Diamond Firetail is presented in Table 20. The modelled distribution of the species is presented in Figure 13.

**Table 20. The Extent of Occurrence, Area of Occupancy and impact of the Project for the Diamond Firetail.**

| Extent of Occurrence (km$^2$) | Area of Occupancy (km$^2$) | Impacted Habitat (km$^2$) | Percent of AOO Impacted (%) |
|---|---|---|---|
| 1,500,000 | 25,000 | 0.11523 | 0.00046 |

### *6.4.5 Threats*

Threats to the Diamond Firetail include (DCCEEW 2023c):

- *Clearing*: The main threats to bird survival in agricultural areas is habitat loss caused by over-clearing of native vegetation and subsequent degradation of remnant habitat patches.
- *Weeds, particularly exotic annual grasses, altering habitat*: Invasive weeds have the ability to change the floristic and structural characteristics of habitat, thereby changing resource availability for native birds. The replacement of native perennial grasses with exotic annual grasses has resulted in food shortages during periods when exotic annual grass seed germinates. Some weeds may also increase the flammability of habitat, amplifying bushfire risk.
- *Grazing*: Native tree and shrub seedlings and grassy woodland groundcover species are highly susceptible to domestic livestock grazing. The reduction or removal of understorey habitat can reduce foraging and nesting site availability, reduce shelter, and subsequently increase the risk of predation.
- *Increase in frequency, scale, or intensity of fire*: Too frequent fire may contribute to Diamond Firetail decline through changes in composition and/or structure of vegetation, increased weed invasion following fire, loss of woody debris and decline in invertebrate abundance.
- *Climate change*: Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought) may have detrimental impacts on Diamond Firetails, though it is not fully known how these weather events, or the cumulative effect of these weather events, affect diamond firetail survival and reproduction and its habitat.

- *Noisy Miner territorial competition*: The Noisy Miner (*Manorina melanocephala*) often aggressively excludes other small woodland birds from mutual habitat.

### *6.4.6 Occurrence in the Project Area*

Previous assessment and field surveys undertaken within the Project Area did not detect the species (EBS Ecology 2022a, 2024a). The closest known records are located only 2.37 km south of the Project Area (ALA 2024a). However, as ALA records are often denatured and these records do not have a date or institute who undertook the survey, these records are considered insufficient in justifying the presence of the species. No BDBSA records were identified in the desktop assessment. As determined by field surveys, three of the nine VA's (VA5, VA6 and VA7) are considered suitable habitat for the Diamond Firetail, totalling 56.555 ha (Table 21).

**Table 21. Vegetation associations located within the Project Area that are deemed suitable for the Diamond Firetail.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA5** | *Eucalyptus porosa* Open Mallee over *Enchylaena tomentosa* var. *tomentosa* and *Maireana brevifolia* | 10.699 | 10.575 |
| **VA6** | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 |
| **VA7** | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0.00 |
| | **TOTAL** | **56.555** | **11.524** |

### *6.4.7 Significant impact assessment*

The proposed Impact Area covers 11.52 ha (Table 21), which is 20.38% of the suitable habitat available within the Project Area and 0.00046% of the 25,000 km² AOO for the Diamond Firetail (Table 20). As there is abundant suitable habitat beyond the Project Area with no BDBSA records within 5 km of the Project Area, the vegetation clearance associated with the Project is unlikely to significantly affect this species. Suitable habitat within the Project Area is highly fragmented, suggesting if the species does occur within the area, it would likely be as a vagrant visitor and not a stable population. Therefore, significant impact is unlikely to affect this species. The assessment of impact significance against the EPBC Act guidelines for Diamond Firetail is provided in Table 22.

**Figure 13. Modelled distribution of Diamond Firetail (DCCEEW 2023c).**

### 6.4.8 *Assessment against significant impact guidelines*

**Table 22. Impact to the Diamond Firetail assessed against the Significant Impact Criteria for a Vulnerable species (DCCEEW 2013a).**

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Lead to a long-term decrease in the size of an *important* population. | No | No | No observations and previous records have been recorded within the Project Area or within 5 km from the Project Area. The Diamond Firetail has three isolated populations in SA. Most BDBSA records on the Eyre Peninsula occur south of Cummings. The lack of BDBSA records within 5 km of the Project Area indicate that there is not a population persisting within Project Area. Although there is habitat within the Project Area that may be suitable for this species, the extent of habitat affected is considered small (<0.001%) and would not lead to a long-term decrease in the size of an important population. |
| Reduce the area of occupancy of an *important* population. | No | No | The proposed habitat clearance within the Project Area represents 0.000141% of the species' 25,000 km$^2$ AOO. Additionally, the Diamond Firetail is known to move locally, suggesting that individuals potentially occurring within the Project Area may be vagrant. The Project is therefore not likely to reduce the AOO of the Diamond Firetail. |
| Fragment an existing *important* population into two or more populations. | No | No | No Diamond Firetail populations are known from within the Project Area. No individuals were observed on site and no records have been observed within 5 km of the Project Area. The proposed Project does not fragment an existing *important* population into two or more populations. |
| Adversely affect habitat critical to the survival of a species. | No | No | Critical habitat, as defined in the approved conservation advice, occurs in three VAs within the Project Area. The species has an EOO of up to 1,500,000 km$^2$ and the 11.52 ha of habitat proposed for clearance. However, as the habitat proposed for clearance is already fragmented, and is not contiguous with habitat affiliated with existing records, the Project Area is not considered critical to the survival of the species. |
| Disrupt the breeding cycle of an *important* population. | No | No | No observations and previous records have been recorded within the Project Area or within 5 km from the Project Area. As the species is likely a vagrant to the area, the species large AOO, and no individuals being observed within the Project Area within the last decade, it is unlikely to disrupt the breeding cycle at a population level. |
| Modify, destroy, remove and isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | No | No | The removal of <0.001% of suitable habitat in the Project Area is unlikely to decrease the availability or quality of habitat to the extent to cause a species decline. Suitable habitat exists outside of the Project Area. |
| Result in an invasive species that is harmful to a vulnerable species becoming established in the vulnerable species' habitat. | No | No | Habitat loss and degradation caused by land clearing and grazing by livestock and feral herbivores is thought to be a contributing factor in the decline of the species (DCCEEW 2023c). As invasive species are already established within the Project Area it is unlikely that the Project will result in in an invasive species that are harmful Diamond Firetail becoming established in their habitat. Management of pest species may be required to account for any residual impacts on pest animal numbers associated with the proposed works. |

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Introduce disease that may cause the species to decline. | No | No | There are no known diseases or pathogens that may impact Diamond Firetail. |
| Interfere with the recovery of the species. | No | No | Clearance for the Project does not interfere with any proposed recovery actions for the species.<br>Clearance for the Project does not exacerbate the threatening processes below:<br>• Habitat loss caused by clearance for agriculture.<br>• Invasive weed introduction.<br>• Habitat degradation caused by domestic livestock grazing.<br>• Increased frequency or length of fire caused by climate change.<br>• Increased likelihood of extreme events caused by climate change.<br>• Territorial competition from the Noisy Miner. |
| **Outcome:** | No significant impact. | | |

## 6.5 Sandhill Dunnart (*Sminthopsis psammophila*)

### *6.5.1 Conservation status*

Under the EPBC Act, the Sandhill Dunnart (*Sminthopsis psammophila*) is listed as Endangered. The Sandhill Dunnart is also currently listed as Vulnerable under the NPW Act.

### *6.5.2 Species description*

The Sandhill Dunnart (*Sminthopsis psammophila*) is a small carnivorous marsupial with a head and body length of approximately 8-12 cm and a tail length of approximately 10-12 cm. The Sandhill Dunnart is pale grey with thin black markings extending from the shoulders to between the eyes, which bear a black ring. The underside and feet are white and their ears are large. The tail is grey above and dark grey below, tapering at the tip (Pearson and Churchill 2008).

**Figure 14. Sandhill Dunnart (*Sminthopsis psammophila*) (Source: Kris 2024)**

### *6.5.3 Distribution and habitat*

Between 1969 and 2001 the species was recorded from only five sites within three isolated localities; the Middleback Range, Eyre Peninsula, the Ooldea region in South Australia and Mulga Rock and Queen Victoria Spring regions of the Great Victoria Desert in Western Australia (DEW 2019).

Sandhill Dunnarts occupy sandy, semi-arid and arid areas of southern central Australia, especially where sand dunes occur with *Triodia* ssp. (Spinifex) hummocks. The preferred overstorey vegetation for this species varies and has been identified as *Allocasuarina decaisneana* (Desert Oak) groves, along with low, open *Eucalyptus* and *Callitris* Woodlands. The species has a preference for areas with at least 10-70% *Triodia* cover (DEW 2019). *Triodia* clumps are generally over 40 cm high and between 70 cm and 100 cm in diameter (DEW 2019). The post fire age of the *Triodia* appears to be a strong habitat indicator due to its influence on the cover and structure of the *Triodia* (DEW 2019). Recently burnt tussocks are too small and old senescing plants don't provide enough cover. Therefore, areas 10-50 years post-fire appear to provide the most suitable habitat.

Habitat critical to the survival of the Sandhill Dunnart includes areas of (DCCEEW 2001):

- Large hummocks of Spinifex (*Triodia* spp) grasses in areas approximately 8 to 20 years post-fire.

#### *6.5.4 Extent of Occurrence and Area of Occupancy*

There is no published population estimate, EOO, AOO or modelled distribution map available for the Sandhill Dunnart.

#### *6.5.5 Threats*

The main threats identified for the Sandhill Dunnart are (DCCEEW 2001):

- *Predation:* Predation by feral cats (*Felis catus*) and Red Foxes (*Vulpes vulpes*) is likely to have had a severe impact on the species over its entire range. On the Australian mainland, predation by feral cats on native mammals has impacted most heavily on smaller species weighing less than 220g, and the sandhill dunnart weighs 25-55g, indicating that it there is an increased likelihood of extinction or significant decline.
- *Fire*: Inappropriate fire regimes are likely to have had a severe consequence for the species over its entire range. Extensive hot fires in summer are now common in the spinifex deserts, and these destroy habitat over very large areas, limiting recolonisation as the vegetation recovers. Frequent fire is also a threat, as the sandhill dunnart requires old, well-established spinifex hummocks as shelter.
- *Habitat loss and fragmentation*: By 2001, 57% of land on the Eyre Peninsula had been cleared for agriculture, and the remaining vegetation was heavily fragmented, with 88% in areas of less than 20 hectares. This has led to major reduction in suitable habitat in this region. Increased patchiness of suitable habitat leads to further vulnerability to large fires.

Potential threats to the sandhill dunnart include (DCCEEW 2001):

- *Introduced herbivores*: These impact on the survival of native species by reducing the available food supply and cover for herbivorous native mammals, changing the species composition of vegetation, and causing erosion of waterholes.
- *Invasive weeds*: Invasion by Buffel Grass (*Cenchrus ciliaris)* has replaced native grasslands and has invaded areas occupied by the Sandhill Dunnart. Increases in fuel load are correlated with Buffel Grass invasion, leading to more frequent and more intense fires.

#### *6.5.6 Occurrence in the Project Area*

Previous assessment and field surveys undertaken within the Project Area did not detect the species (EBS Ecology 2022a, 2024a), but species-specific targeted surveys were not undertaken. The closest known records are located over 21 km east of the Project Area, in the Hincks Wilderness Protection Area (ALA

2024a). These records are 20 years old and occur outside of the currently known distribution of the species. No BDBSA records were identified in the desktop assessment. As determined by field surveys, two of the nine VA's (VA6 and VA) are considered suitable habitat for the Sandhill Dunnart, totalling 45.856 ha Table 23).

**Table 23. Vegetation associations located within the Project Area that are deemed suitable for the Sandhill Dunnart.**

| VA | Description | Area (ha) across the Project Area | Area (ha) impacted |
|---|---|---|---|
| **VA6** | *Eucalyptus porosa* Open Mallee over *Triodia irritans* | 5.758 | 0.949 |
| **VA7** | *Eucalyptus gracilis and E. incrassata* Mallee over *Callitris gracilis +/- Triodia irritans* | 40.098 | 0.00 |
| | **TOTAL** | **45.856** | **0.949** |

### *6.5.7 Significant impact assessment*

The proposed Impact Area covers 0.949 ha (Table 23) which is 2.07% of the suitable habitat available within the Project Area. However, these areas are small and isolated from any other large areas of remnant mallee or woodlands. This species is unlikely to inhabit these areas or use these vegetated pockets as wildlife corridors and is therefore unlikely to be impacted by the proposed works. The assessment of impact significance against the EPBC Act guidelines for Sandhill Dunnart is provided in Table 24.

### *6.5.8 Assessment against significant impact guidelines*

**Table 24. Impact to the Sandhill Dunnart assessed against the Significant Impact Criteria for an Endangered species (DCCEEW 2013a).**

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| Lead to a long-term decrease in the size of a population. | No | No | No observations and previous records have been recorded within the Project Area or within 5 km from the Project Area. A lack of BDBSA records indicate that there is not a population persisting within proximity of the Project Area currently. Although there is habitat within the Project Area that may be suitable for this species, the extent of habitat affected is considered small (0.009 km$^2$) and would not lead to a long-term decrease in the size of the population. |
| Reduce the area of occupancy of the species. | No | No | The AOO of the species is not published. No populations are known or considered likely to occur within the Project Area. Though habitat is broadly suitable, the distance from nearest known populations (~21 km) make the Project unlikely to reduce the AOO of the Sandhill Dunnart. |
| Fragment an existing population into two or more populations. | No | No | No Sandhill Dunnart populations are known from within the Project Area. No individuals were observed on site and no records have been observed within 5 km of the Project Area. The Project will not fragment the population into two or more populations. |
| Adversely affect habitat critical to the survival of a species. | No | No | The habitat proposed for clearance is already fragmented, and habitat is not contiguous with habitat affiliated with existing records. As such habitat within the Project Area is not considered critical to the survival of the species. |
| Disrupt the breeding cycle of a population. | No | No | No populations are known or considered likely to occur within the Project Area. Therefore, clearance in the Project Area is unlikely to disrupt the breeding cycle of this species. |
| Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. | No | No | No populations are known or considered likely to occur within the Project Area. Potential habitat is within the Project Area is incurring minimal clearance (0.009 km$^2$) which is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline. |
| Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat. | No | No | Invasion by Buffel Grass (*Cenchrus ciliaris*), which has replaced native grasslands and has invaded areas occupied by the Sandhill Dunnart (DCCEEW 2015). Buffel Grass was not observed during field surveys. However, the Project Area is located within Zone 3 – Destroy Infestations of the *South Australia Buffel Grass Strategic Plan 2019-2024* and any new infestations should be destroyed immediately (Biosecurity 2019). |
| Introduce disease that may cause the species to decline. | No | No | No diseases are cited as a threat to the Sandhill Dunnart. |
| Interfere with the recovery of the species. | No | No | Clearance for the Project does not interfere with any proposed recovery actions for the species.<br>Clearance for the Project does not exacerbate the threatening processes below:<br>• Predation<br>• Fire<br>• Habitat loss and fragmentation |

| Significant Impact Criterion | Directly Impacted (Yes or No) | Indirectly impacted (Yes or No) | Justification of impact outcome |
|---|---|---|---|
| | | | • Introduced herbivores<br>• Invasive weeds |
| **Outcome:** | No significant impact. | | |

# 7 EPBC SELF-ASSESSMENT CONCLUSION

## 7.1 Significant impact outcome

This assessment finds that construction and operation of the proposed Project:

- Will not have significant impact on the EPBC Act Endangered Greencomb Spider Orchid as there are no known populations within the Project Area.
- Will not have significant impact on the EPBC Act Endangered Nodding Rufoushood as there are no known populations within the Project Area.
- Will not have significant impact on the EPBC Act Vulnerable Southern Whiteface.
- Will not have significant impact on the EPBC Act Vulnerable Malleefowl.
- Will not have significant impact on the EPBC Act Vulnerable Blue-winged Parrot.
- Will not have significant impact on the EPBC Act Vulnerable Diamond Firetail.
- Will not have significant impact on the EPBC Act Vulnerable Sandhill Dunnart.

## 7.2 Referral advice

It is considered that an EPBC referral to the Minister for the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for the Proposed Yadnarie PV Ultra (Solar Cogeneration) and Thermal Hydro Facility For Photon Energy AUS SPV 4 Pty Ltd, in its current form.

# 8 REFERENCES

Atlas of Living Australia (2024a). Spatial analysis (Spatial Portal). Available at: https://spatial.ala.org.au/ [Accessed 19/06/2024].

Atlas of Living Australia (2024b). *Caladenia tensa G.W.Carr.* Available at: https://bie.ala.org.au/species/https://id.biodiversity.org.au/taxon/apni/51399400#gallery [Accessed 18/06/2024].

Benshemesh, J. (2007). *National Recovery Plan for Malleefowl Leipoa ocellata.* Adelaide: Department for Environment and Heritage, South Australia.

Biosecurity SA (2019*). South Australia Buffel Grass Strategic Plan 2019–2024: A plan to reduce the weed threat of buffel grass in South Australia*. Government of South Australia.

BirdsSA (2024). *Malleefowl Leipoa ocellata.* Available at: https://birdssa.asn.au/birddirectory/bd-malleefowl/ [Accessed 18/06/20234.

Department for Environment and Water (2019). National Recovery Plan for the Sandhill Dunnart (*Sminthopsis psammophila*). Department for Environment and Water, South Australia.

Department for Environment and Water (DEW) (2019). Eyre Peninsula Blue Gum Woodlands. Natural Resources Eyre Peninsula. Available at: https://cdn.environment.sa.gov.au/landscape/docs/ep/2019-ep-blue-gum-woodland-facts.pdf [Accessed 18/06/2024].

Department for Environment and Water (DEW) (2024). *NatureMaps.* Available at: http://data.environment.as.gov.au/NatureMaps/Pages/default.aspx [Accessed 07/06/2024].

Department for Infrastructure and Transport (DIT) (2022). *Phytophthora (Dieback) Control Environmental Instruction.* Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.dit.sa.gov.au/standards?a=921168 [Accessed 03/06/2024].

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2008). *Approved Conservation Advice for Pterostylis sp. Eyre Peninsula (R. Bates 19474).* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2009). *Approved Conservation Advice for Acacia praemorsa (Senna Wattle).* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2010). *National Recovery Plan for Leipoa ocellata Malleefowl.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2013a*). Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. Available from:

http://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2013b). *Approved Conservation Advice for the Eyre Peninsula Blue Gum (Eucalyptus petiolaris) Woodland*. Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2013c). *Approved Conservation Advice for Acacia rhetinocarpa (neat wattle).* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2013d). *Approved Conservation Advice for Olearia pannosa ssp. pannosa Silver Daisy-bush.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2013e). *Approved Conservation Advice for Rostratula australis Australian Painted Snipe.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2015). *Approved Conservation Advice for Sminthopsis psammophila Sandhill Dunnart.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2016). *Approved Conservation Advice for Caladenia tensa, Greencomb Spider-orchid.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (2023a). *Conservation Advice for Aphelocephala leucopsis (Southern Whiteface).* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (2023b). *Conservation Advice for Neophema chrysostoma Blue-winged Parrot.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (2023c). *Conservation Advice for Stagonopleura guttata Diamond Firetail.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024a). *Protected Matters Search Tool.* Available at: https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl [Accessed 03/06/2024].

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024b). *Species Profile and Threats Database.* Available at: https://www.environment.gov.au/epbc/protected-matters-search-tool [Accessed 03/06/2024].

EBS Ecology (2021) Photon Energy Solar Storage Project Desktop Assessment. Report to Photon Energy Engineering Australia. EBS Ecology, Adelaide.

EBS Ecology (2022a) Photon Energy Solar Storage Ecological Assessment. Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2022b) Photon Energy Solar Storage Letter Memo (in draft). Report to Masterplan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2022c) EPBC Self-Assessment Mallee Highway. Report to WSP Australia Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2024a) Yadnarie Solar Farm Ecological Assessment (in draft). Report to MasterPlan Pty Ltd. EBS Ecology, Adelaide.

EBS Ecology (2024b) Yadnarie Solar Farm Native Vegetation Clearance Data Report. Report to RayGen Resources Pty Ltd. EBS Ecology, Adelaide.

Ehmke G., Antos M.J., Bennett A.F., Ford H.A., Barnes M.D., Tulloch A.I.T., Lyon R.H., Garnett S.T. (2021). South-west Southern Whiteface *Aphelocephala leucopsis castaneiventris* and South-east Southern Whiteface *A. l. leucopsis*. In Garnett S.T., Baker G.B. (eds.) *The Action Plan for Australian Birds 2020*. CSIRO Publishing, Melbourne, Australia.

Florentine S.K. and Westbrooke M.E. (2005). Invasion of the noxious weed *Nicotiana glauca* R. Graham after an episodic flooding event in the arid zone of Australia. *Journal of Arid Environments*, Volume 60, Issue 4, pp 531-545. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0140196304001569 [Accessed 13/06/2024].

International Union for Conservation of Nature (IUCN) (2016). *Sandhill Dunnart*. The IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/species/20293/21947794 [Accessed 13/06/2024].

International Union for Conservation of Nature (IUCN) (2022a). *Malleefowl*. The IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/species/22678646/212766400 [Accessed 03/06/2024].

International Union for Conservation of Nature (IUCN) (2022b). *Southern Whiteface*. The IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/species/22704748/211249958 [Accessed 03/06/2024].

International Union for Conservation of Nature (IUCN) (2022c). *Blue-winged Parrot*. The IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/species/22685194/210989456 [Accessed 03/06/2024].

Kris (2024). *Portrait of a wild, threatened sandhill dunnart (Sminthopsis psammophila) from South Australia.* Available at: https://stock.adobe.com/au/images/portrait-of-a-wild-threatened-sandhill-dunnart-sminthopsis-psammophila-from-south-australia/494657097 [Accessed 14/06/2024].

Lilleyman A., Pascoe J., Robinson, C. J., Legge S. M., Woinarski J. C. Z. and Stephen T. Garnett (2024). Imperilled birds and First Peoples' land and sea Country in Australia, *Emu - Austral Ornithology*, **124** (1): 108-122, DOI: 10.1080/01584197.2023.2290008. https://doi.org/10.1080/01584197.2023.2290008.

Native Vegetation Council (NVC) (2020). Bushland Assessment Manual July 2020. Native Vegetation Council, Adelaide. Available at: https://www.environment.sa.gov.au/topics/native-vegetation/clearing/vegetation-assessments.

Pizzey, G and Knight, F (2003). The Field Guide to the Birds of Australia. 7th edition.

Pizzey, G. and Knight, F. (2014). Birds of Australia. Gibbon Multimedia Pty Ltd. Victoria, Australia.

R. T. Moonabie (n.d.) *Pterostylis mirabilis*. Plants of South Australia. Available at: https://syzygium.xyz/saplants/Orchidaceae/Pterostylis/Pterostylis_mirabilis.html [Accessed 07/06/2024].

Threatened Species Scientific Committee (TSSC) (2000). Guidelines for assessing the conservation status of native species according to the *Environment Protection and Biodiversity Conservation Act 1999* and *Environment Protection and Biodiversity Conservation Regulations 2000*. Available at: https://www.dcceew.gov.au/sites/default/files/env/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2021.pdf [Accessed 12/06/2024].

# 9 APPENDICES

## 9.1 Appendix 1 - Database records of EPBC listed threatened and Migratory species and TECs potentially occurring within 5 km of the Project Area

| Scientific name (Common name) | Conservation status | | PMST Presence within 5 km buffer | Likelihood presence in Project Area | Justification of likelihood of occurrence in Project Area |
|---|---|---|---|---|---|
| | EPBC Act | NPW Act | | | |
| **TECs** | | | | | |
| Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland | EN | - | Likely | Unlikely | The overstorey of this TEC is dominated or co-dominated by *Eucalyptus petiolaris* (blue gum) and the tree canopy cover is 10% or more (DCCEEW 2013b). This species only occurs in the Project Area as scattered trees. |
| **FLORA** | | | | | |
| *Acacia enterocarpa* (Jumping-jack Wattle) | EN | E | May | Unlikely | Although associated Eucalyptus vegetation communities are present in Project Area, there are no recent records, and the species was not identified during the field surveys (DCCEEW 2024b). |
| *Acacia praemorsa* (Senna Wattle) | VU | E | Likely | Unlikely | The species is confined to the Eyre Peninsula where it occurs in seven localised populations in the ranges north-east of Cleve (DCCEEW 2009). No recent records occur within the Project Area and the species was not observed during sufficient survey efforts. |
| *Acacia rhetinocarpa* (Neat Wattle) | VU | V | Likely | Unlikely | Located in disjunct locations on the EP where it is confined in scattered areas around Kimba, Cleve and Lock (DCCEEW 2013c). No recent records occur within the Project Area and the species was not observed during sufficient survey efforts. |
| *Caladenia brumalis* (Winter Spider-orchid) | VU | V | May | Unlikely | Found in vegetation associations dominated by *Melaleuca uncinata*, *Allocasuarina verticillata* and *Eucalyptus diversifolia* (DCCEEW 2024b). Although appropriate vegetation associations were present, there are no recent records, and the species was not identified during the field surveys. |
| *Caladenia tensa* (Greencomb Spider-orchid) | EN | - | Likely | Possible | Widespread species but uncommon, occurring in mallee and woodland vegetation associations such as Cypress Pine and Yellow Gum Woodland (DCCEEW 2016). Suitable habitat is present in several VAs within the Project Area. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur. |

| **Scientific name (Common name)** | **Conservation status** | | **PMST Presence within 5 km buffer** | **Likelihood presence in Project Area** | **Justification of likelihood of occurrence in Project Area** |
|---|---|---|---|---|---|
| | **EPBC Act** | **NPW Act** | | | |
| *Limosella granitica* | VU | V | May | Unlikely | This species is confined to seasonally wet rock-pools (DCCEEW 2024b). These habitat features were absent from the Project Area, and the field surveys failed to encounter this species. |
| *Olearia pannosa* ssp. *pannosa* (Silver Daisy-bush) | VU | V | Likely | Unlikely | Widespread but rare species occurring on the Fleurieu Peninsula, Yorke Peninsula and in two main subpopulations on the Eyre Peninsula. Found in association with *Eucalyptus* spp. such as *Eucalyptus phenax* ssp. *phenax* (DCCEEW 2013d). Recent records present within the Project Area but the species was not observed during sufficient survey efforts. |
| *Pterostylis mirabilis* (Nodding Rufoushood) | VU | V | Likely | Possible | Occurs in coastal areas on the Eyre Peninsula, growing on rocky, hilly slopes within Broombush (*Melaleuca uncinata*) scrub. However, it is also found in Callitris and Eucalypt woodlands, typically in stony brown loam soils (DCCEEW 2008). Suitable habitat is present in several VAs within the Project Area. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur. |
| *Pterostylis* sp. *Hale* (R. Bates 21725) | EN | V | May | Unlikely | Grows in mallee vegetation communities (DCCEEW 2024b). Although suitable habitat is present within the Project Area, there are no recent records, and the field surveys failed to encounter this species. |
| *Pterostylis xerophila* (Desert Greenhood) | VU | V | May | Unlikely | Grows in generally remote locations in semi-desert environments in rocky outcrops under low shrubland (DCCEEW 2024b). There are no recent records, and the Project Area lacked suitable rocky outcroppings. |
| *Swainsona pyrophila* (Yellow Swainson-pea) | VU | R | May | Unlikely | Grows in association with *Eucalyptus oleosa* over *Melaleuca uncinata* tall shrubland (DCCEEW 2024b). Although suitable habitat is present within the Project Area, there are no recent records, and the field surveys failed to encounter this species. |
| **FAUNA** | | | | | |
| **Aves** | | | | | |
| *Actitis hypoleucos* (Common Sandpiper) | Mi (W) | R | May | Unlikely | Uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats (DCCEEW 2024b). There are no recent records, and no suitable habitat was available for this species. |
| *Aphelocephala leucopsis* (Southern Whiteface) | VU | - | Likely | Likely | Occurs in open woodland and shrubland habitat with an understorey of grasses and/or low shrubs. Suitable habitat is usually dominated by *Acacia* spp. or *Eucalyptus* spp. on ranges, foothills, lowlands and plains (DCCEEW 2023a). Suitable habitat is widespread across the Project Area. Although |

| Scientific name (Common name) | Conservation status | | PMST Presence within 5 km buffer | Likelihood presence in Project Area | Justification of likelihood of occurrence in Project Area |
|---|---|---|---|---|---|
| | EPBC Act | NPW Act | | | |
| | | | | | no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered likely to occur. |
| *Apus pacificus* (Fork-tailed Swift) | Mi (M) | - | Likely | Unlikely | Widespread but almost exclusively aerial. Mostly occurs over inland plains, over cliffs and beaches and sometimes well out to sea or in dry or open habitats (DCCEEW 2024b). No recent records, no suitable wetland or tidal habitat available in Project Area and the species was not observed during sufficient survey efforts. |
| *Calidris acuminata* (Sharp-tailed Sandpiper) | VU, Mi (W) | - | May | Unlikely | In migration, they forage and roost on rocky and sandy beaches, freshwater habitats and inland saltwater habitats (DCCEEW 2024b). There are no recent records, and the Project Area did not contain suitable habitat for this species. |
| *Calidris ferruginea* (Curlew Sandpiper) | CE, Mi (W) | E | May | Unlikely | Migratory species which prefers tidal mudflats, saltmarsh, salt fields and fresh, brackish or saline wetlands (Pizzey and Knight 2014). There are no recent records, and the Project Area did not contain suitable habitat for this species. |
| *Calidris melanotos* (Pectoral Sandpiper) | Mi (W) | R | May | Unlikely | Shallow fresh to saline wetlands. Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DCCEEW 2024b). There are no recent records, and the Project Area did not contain suitable habitat for this species. |
| *Charadrius veredus* (Oriental Plover, Oriental Dotterel) | Mi (W) | - | May | Unlikely | Shallow fresh to saline wetlands. Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Pizzey and Knight 2014). There are no recent records of this species. |
| *Falco hypoleucos* (Grey Falcon) | VU | R | May | Unlikely | Preferred habitat includes lightly treed inland plains, sand ridges and pastoral plains (Pizzey and Knight 2014). Although the Project Area contained suitable habitat for this species, there are no recent records. |
| *Gallinago hardwickii* (Latham's Snipe) | VU, Mi (W) | R | May | Unlikely | Preferred habitat includes open, freshwater wetlands with low, dense vegetation. Saline or brackish water modified or artificial habitats, and in habitats located close to humans or human activity (DCCEEW 2024b). There are no recent records, and the Project Area did not contain suitable habitat for this species. |
| *Grantiella picta* (Painted Honeyeater) | VU | R | May | Unlikely | Inhabits woodland, dry scrub with abundant mistletoe (Pizzey & Knight 2013). There are no recent records, and the Project Area lacked mistletoe of the *Amyema* genus, an important food source for this species. |

| Scientific name (Common name) | Conservation status | | PMST Presence within 5 km buffer | Likelihood presence in Project Area | Justification of likelihood of occurrence in Project Area |
|---|---|---|---|---|---|
| | EPBC Act | NPW Act | | | |
| *Leipoa ocellata* (Malleefowl) | VU | V | Likely | Possible | Inhabits semi-arid regions of southern Australia. Occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine Callitris woodlands, Acacia shrublands, or coastal heathlands (DCCEEW 2010). Suitable habitat is present in several VAs within the Project Area. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur. |
| *Motacilla cinerea* (Grey Wagtail) | Mi (T) | - | May | Unlikely | European and Asian species. Migrates south in winter, usually to Indonesia and NG. Rarely reaches Australia, but when it does, favours habitat near freshwater streams. There are no recent records. |
| *Motacilla flava* (Yellow Wagtail). | Mi (T) | - | May | Unlikely | Open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground. There are no recent records. |
| *Neophema chrysostoma* (Blue-winged Parrot) | VU | V | Likely | Possible | Prefers grasslands and grassy woodlands but will inhabit a range of habitats from coastal, sub-coastal and inland areas to semi-arid zones (DCCEEW 2023b). Mallee woodlands are widespread throughout the Project Area, however these VAs have minimal grassy understorey. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur. |
| *Pedionomus torquatus* (Plains-wanderer) | CE | E | May | Unlikely | Present in very small numbers in SE South Australia occurring in sparse, treeless native grasslands and/or low shrubland (Pizzey and Knight 2014). There are no recent records. |
| *Rostratula australis* (Australian Painted Snipe) | EN | E | Likely | Unlikely | Most common in eastern Australia and has been recorded in south-eastern SA. It generally inhabits shallow terrestrial freshwater and wetlands including temporary and permanent lakes, swamps and claypans (DCCEEW 2013e). No recent records, no suitable wetland or tidal habitat available in Project Area and the species was not observed during sufficient survey efforts. |
| *Stagonopleura guttata* (Diamond Firetail) | VU | V | Likely | Possible | Resides in a wide range of Eucalypt dominated vegetation communities that have a grassy understorey, including woodland, forest and mallee. Most occur on the inland slopes of the Great Dividing Ranges, with only small pockets near the coast (DCCEEW 2023c). Mallee woodlands are widespread throughout the Project Area, however these VAs have minimal grassy understorey. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur. |

| **Scientific name (Common name)** | **Conservation status** | | **PMST Presence within 5 km buffer** | **Likelihood presence in Project Area** | **Justification of likelihood of occurrence in Project Area** |
|---|---|---|---|---|---|
| | **EPBC Act** | **NPW Act** | | | |
| **Mammalia** | | | | | |
| *Sminthopsis psammophila*<br>(Sandhill Dunnart) | EN | V | Likely | Possible | Known on the Eyre Peninsula, their specific habitat requirements include sand dunes with presence of mixed age / size spinifex hummocks (*Triodia* spp.) comprising 10 to 70 percent ground cover and preferably low open mallee woodland with diverse shrub layer (DCCEEW 2015). This vegetation community occurs within VA6 and VA7, however these VAs are isolated and fragmented land parcels. Although no recent records occur within the Project Area and the species was not observed during the field surveys, this species is considered possible to occur. |

**EPBC Act:** (*Environment Protection and Biodiversity Conservation Act 1999*). **NPW Act** (*National Parks and Wildlife Act 1972*).

**Conservation Codes**: **CE**: Critically Endangered. **EN/E**: Endangered. **VU/V**: Vulnerable. **R**: Rare. **Mi**: Migratory Status (**M**: Marine, **T**: Terrestrial, **W**: Wetland).

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# 4

# LANDSCAPE CHARACTER AND PROBABLE VISUAL EFFECT ASSESSMENT

# Landscape Character and Probable Visual Effect Assessment

## Yadnarie Energy Project

Photon Energy and RayGen Australia Pty Ltd

**5 September 2024**

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| REVISION | DATE | AUTHOR(s) | REVIEWER |
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| B | 26/06/2024 | WK | WK/CS |
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| **DESIGN REFERENCE** | RayGen_Yadnarie_Site Layout_20240416_Polygon |

# Contents

# Contents

Appendices (please refer to Appendices report)

## Figures & Tables

## Figures & Tables

# 01 Scope of Assessment

## 1.1 Introduction

This report has been prepared by Warwick Keates of WAX Design in association with Dr Brett Grimm of Brett Grimm Landscape Architect (BGLA) for Photon Energy AUS SPV 4 Pty Ltd (Photon Energy) and RayGen Resources Pty Ltd (RayGen).

Photon Energy, a global project developer, has developed a strategic partnership with RayGen Resources Pty Ltd (RayGen), with the objective of developing global renewable energy projects suitable for the roll-out of RayGen's unique solar power and electricity storage technology.

Photon Energy proposes to utilise RayGen's technology for the generation of solar power and energy storage at Yadnarie, west of Cleve on the Eyre Peninsula. The technology proposed and scale of electricity storage is new to the South Australian renewable energy sector and comprises RayGen's proprietary PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) technologies.

The purpose of the report is to assess the potential visual impact of the proposed solar power and energy storage renewable energy facility (the project), which includes a 150MWac solar generation, 90MW grid connection/ 720 Megawatt hours of storage (and 24 hours of dispatchable energy), with connection to the Yadnarie substation or 132kV overhead transmission line and ancillary infrastructure. In addition, this report provides an evaluation of the existing landscape character and the degree of visual change that is likely to result from the proposed development within the regional locality.

The Landscape and Visual Impact Assessment (LVIA) comprises two separate assessments, a landscape character assessment and a visual impact assessment; these are interrelated processes as described in the Guidelines for Landscape and Visual Impact Assessment[1]. The landscape character assessment described in this report considers the existing character of the landscape within a 10 kilometre radius of the project site. The visual impact assessment evaluates and describes the likely effect of the proposed development on the physical landscape, with consideration of changes in its character and the resultant effects on visual amenity.

The potential visual impact will be assessed using the Grimke matrix methodology that involves onsite assessments, GIS modelling, consultation with relevant stakeholders and interested parties, the preparation of photomontages and a detailed visual impact assessment to illustrate the predicted visual effect of the project within the defined locality. The visual impact assessment forms the second stage of the LVIA process.

## 1.2 Project Description

RayGen and Photon propose to develop the project in South Australia. The project is approximately 8.5 kilometres west of Cleve on the Eyre Peninsula.

The project will consist of the following components:

- The subject land is approximately 1,530 hectares.
- 150 fields of rotational mirrors (heliostats) orientated north. Each field comprises approximately 273 individual heliostats. Each heliostat is approximately between 5.4 and 5.6 metres above the ground and mounted on steel posts. Heliostat heights will depend on site-specific factors.
- One receiver is 40-45 metres high, with one receiver per field of 273 heliostats. The receiver faces the field of mirror and a southward direction. Each receiver has electrical switchgear and water pumping infrastructure at its base. One inverter is a 6.6 metre container shipping container-sized electrical device that converts DC

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[1] *Swanwick, C. (2013). Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment.*

power from the receivers to AC power for use. One inverter is required per two receivers for a total of 75 inverters.

- Three (3) thermal hydro pits units comprising:
    - *three cold pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity*
    - *three hot pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity*

- Three Thermal Hydro plants, each comprising:
    - *An Organic Rankine Cycle (ORC) engine, each with a net capacity of 30MW*
    - *Heat Exchangers*
    - *Tanks*
    - *Various pumps*
    - *Large Chiller and Heat Pump units*
    - *Connecting pipework.*
    - *Electrical infrastructure, including switch rooms and transformers*
- Underground electrical cable reticulation on site
- Connection via overhead transmission connection to the Yadnarie substation; or to the existing 132kV overhead electricity line
- Operations and maintenance building and compound.
- Temporary construction compound.
- Security fencing around the site.
- Internal access roads.

RayGen's solar-plus-storage technology has been developed in a commercial demonstration facility at Carwarp, near Mildura in Victoria. The Carwarp site comprises 4MW of solar generation and 2.8MW of thermal storage capable of running for about 17 hours (50MWh). The following images provide a visual reference to the scale and configuration of the project used for the visual impact assessment.

Figure 1: Receivers towers at the Carwarp Facility, Victoria

Figure 2: Heliostats at the Carwarp Facility, Victoria

*Figure 3: Typical power block at the Carwarp Facility, Victoria*

## 1.3 Visual Effect Review – Carwarp Site Case Study

The following descriptive assessment is based on site observations made during a visit to RayGen's Carwarp project site in Victoria. The description provides a reference to a precedent development representative of the visual experience upon receptors.

The Carwarp site (The Site) has four heliostat fields, four receivers and a power block.

The layout and arrangement are similar to the arrangement of the solar arrays, receivers, and power blocks that are proposed for the Yadnarie Solar project. The site visit enabled an assessment to be made of the potential visual effects of the Yadnarie Solar Project (The project).

### Heliostats

The development form of the site is created by the heliostat fields, which create a fragmented visual effect with numerous individual panels facing towards the receivers. The varied orientation of the panels and the underlying topography create a fragmented and somewhat pixelated visual character.

While visually recognisable as infrastructure elements in the landscape, the visual effect has a non-rectilinear representation due to the way the panels respond to the underlying topography. The irregularity of the development form reduces the overall visual effect associated with the site.

The reflected dark blue and pale blue sky colours associated with the front surface of the solar panels are complementary to the dark vegetation colours of the existing landscape character.

During the summer months, it is anticipated that the contrast in visual character between the heliostats and the surrounding landscape will increase as the heliostats remain a deep blue colour and the landscape turns a lighter brown.

During the winter, the blue hues will complement the green arable landscape character of the rural land use, reducing the visual contrast.

The recessive light grey colour of the back of the heliostats will remain consistent all year round.

### Receivers

The towers associated with the receivers form notable visual elements within the landscape due to their height and level of brightness produced by the receivers.

The degree of visibility varies depending on the viewpoint and the orientation of the view relative to the development, noting that the towers are located north of the heliostats and that the receivers face south.

Immediately north, there is very little reflected light or glare, and the visibility is focused on the lattice tower and the power block infrastructure, which is similar to a transmission tower or telephone tower. From locations to the northeast and northwest of the development, the visual impact is produced by low levels of glare, which spills from the receiver's shields.

The visibility and associated visual impact of the receivers increase to the east and west due to the level of glare and the light spill from the sides of the receivers.

From locations south of the development, the visibility of the lattice tower relative to the receiver reduces, and the glare and brightness reflected from the receivers within the wider landscape increases.

Looking south towards the development, the glare and degree of brightness are experienced relative to the prevailing weather conditions. The brightness of the receiver is reciprocal to the sun's intensity and the sunlight being reflected.

In this regard, the brightness is experienced as part of the broader visual context that is generated by different weather conditions during the day and throughout the year.

While the receivers appear as bright points of light low in the sky, the brightness and intensity are relative to the sun, sun angle, weather, time of day and the location of the viewpoint.

### Power Blocks

The power block is a collection of industrial infrastructure elements consisting of storage tanks, sheds, chiller units, and elevated pipe runs that contribute to the visibility of the site.

The dams and water holding areas have limited visual impacts due to the earth bunding associated with the water collection areas.

### Visual Assessment Discussion

At distances of 1.5 km from the development site, particularly from the south, east and west, the visual effect is predominantly caused by the receivers, which form brightly lit reflective objects within the landscape. These elements appear like bright lights, similar to sports field lights.

The mirrors of the heliostats appear as a fragmented collection of infrastructure elements that follow the underlying topography. The fragmentation creates a visual effect where, although perceived as infrastructure, the variations in the arrangement and form provide a level of mitigation. That is to say, the heliostats and solar arrays do not appear as a single large object.

The scale of development on site means that belts of vegetation and trees back-screen the development and mitigate both the overall visual effect and the potential for sky lining within the locality.

At distances of 5 km, the visibility of the site is reduced. The power blocks and heliostats are screened by roadside vegetation adjacent to the viewpoint, and the receivers appear as bright, visible elements in the landscape. The lattice towers form recessive infrastructure elements.

The visual experience of the Carwarp project raises a number of preliminary considerations for the visual impact of the Yadnarie project, including the contrasting scale and frequency of the receivers (150 receivers), which are likely to create a defined visual effect within the locality. The question is whether the frequency and intensity of the receivers constitute a significant visual effect.

## 1.4 Defined Project Assessment Area

Based on the site investigation from the Carwarp visit, a 10 kilometre site locality around the project has been defined for assessment purposes. This locality is based on research and previous experience in defining thresholds for the degree and qualification of visual effects. Most notably, the Thomas Matrix[2] and Bishop (2002)[3] has provided guidance on this matter. Also, the extent of the project locality has been reviewed against the ZTVI mapping. This mapping provides a reference of the extent to which the project is likely to be visible in the landscape and defines the visual envelope and viewshed resulting from the local topography (excluding vegetation and built form screening).

The landscape character assessment of the proposed development consists of a written description and photographic survey of the surrounding locality to articulate the character of the existing landscape that surrounds the project site in relation to the local (zero to three kilometres), sub-regional (three to 10 kilometres) and regional (greater than 10 kilometres) landscapes. This is followed by a discussion of the probable visual effect that is anticipated to occur across the regional landscape. The landscape character and visual assessment provide the basis on which to assess the suitability of the development in relation to the visual impact within the regional locality (10 kilometres).

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[2] *Sinclair, G. (2001). The Potential Visual Impact of Wind Turbines in relation to distance: An approach to the environmental assessment of planning proposals. E.I.Services*

[3] *Bishop, I. (2003). Determination of thresholds of visual impact: the case of the wind turbines: Environment and Planning B: Planning and Design: 707-718*

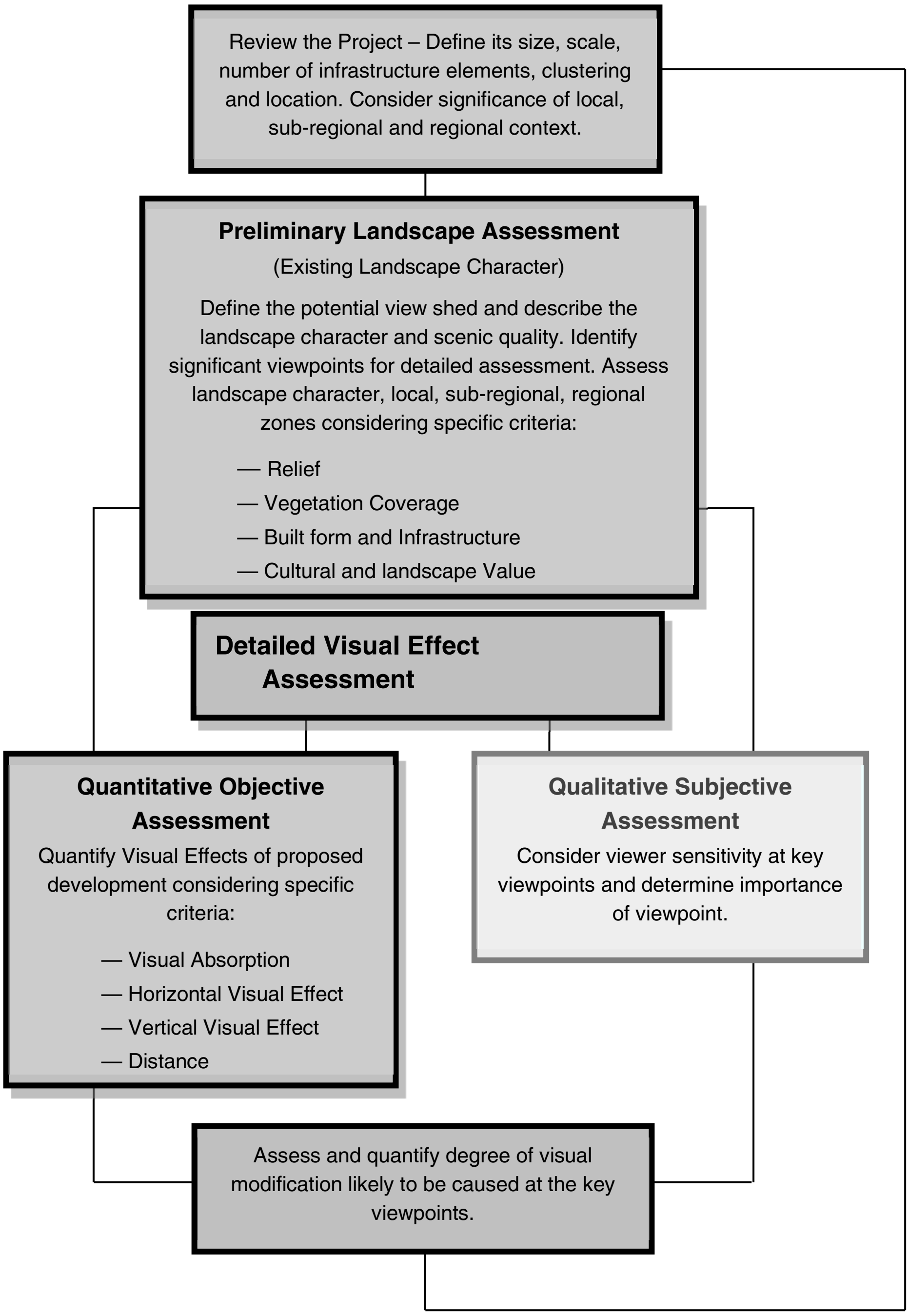
# 02 Introduction

# 02 Approach and Methodology

## 2.1 Visual Assessment Approach

*The aim of the LVIA methodology is to provide an objective, reliable, credible, replicable and measurable analysis of the potential visual impact when considered against the existing landscape character.*

*The process for the visual assessment is based on the recommendations of John Ginivan and Planning SA (2002)*[4]



Review the Project – Define its size, scale, number of infrastructure elements, clustering and location. Consider significance of local, sub-regional and regional context.

**Preliminary Landscape Assessment**

(Existing Landscape Character)

Define the potential view shed and describe the landscape character and scenic quality. Identify significant viewpoints for detailed assessment. Assess landscape character, local, sub-regional, regional zones considering specific criteria:

- Relief
- Vegetation Coverage
- Built form and Infrastructure
- Cultural and landscape Value

**Detailed Visual Effect Assessment**

**Quantitative Objective Assessment**

Quantify Visual Effects of proposed development considering specific criteria:

- Visual Absorption
- Horizontal Visual Effect
- Vertical Visual Effect
- Distance

**Qualitative Subjective Assessment**

Consider viewer sensitivity at key viewpoints and determine importance of viewpoint.

Assess and quantify degree of visual modification likely to be caused at the key viewpoints.

*Figure 4: Detailed Visual Assessment Process*

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[4] *Planning South Australia (2002). Advisory Notice Planning- Draft for Consultation 21 Wind Farms. S.A Adelaide*

## 2.2 Guidance and Best Practice

Currently, there is no formalised standard visual assessment methodology at local, state or federal government levels. While various guidelines and frameworks have been produced, they do not provide a definitive methodology or technique to be applied. A best practice methodology has been developed for the LVIA with reference to the following documents:

- Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (Department of Environment, Land, Water and Planning, November (2021)
- Solar Energy Facilities Design and Development Guidelines (Department of Environment, Land, Water and Planning, August 2019)
- Environment Protection and Heritage Council (2010) National Wind Farm Development Guidelines;
- Guidelines for Landscape and Visual Impact Assessment (Third edition) (2013), Landscape Institute;
- Grimm, B (2009). Quantifying the Visual Effects of Wind Farms; A Theoretical Process in an Evolving Australian Visual Landscape. PhD Thesis Adelaide University;
- Australian Wind Energy Association and Australian Council of National Trusts (2007) Wind Farms and Landscape Values: National Assessment Framework;
- Visual Landscape Planning in Western Australia. (2007). A manual for evaluation, assessment, siting and design, Western Australian Planning Commission;
- Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia (2006);
- Lothian, A. (2008). Scenic perceptions of the visual effects of wind farms on South Australian landscapes. Geographical Research, 46:2, 196 – 207;
- Swanwick, C. (2013). Guidelines for Landscape and Visual Impact Assessment. 3rd ed. United Kingdom: Landscape Institute and Institute of Environmental Management and Assessment;
- South Australian Wind Farms Planning Bulletin (2002);

## 2.3 Methodology

The LVIA is based on two assessment stages with reference to the Guidelines for Landscape and Visual Impact Assessment and set out in Figure 2.

- Stage 1: Landscape Character Assessment identifies and assesses the importance of landscape characteristics and the existing landscape quality.
- Stage 2: The Visual Assessment aims to quantify the extent to which the development is visible and define the degree of visual change and the associated visual impacts using the photomontages, site observations and the Grimke Matrix.

The completed Landscape Character Assessment and Visual Impact Assessment are used to draw several observations and conclusions about the likely visual effects of the proposed development on the locality.

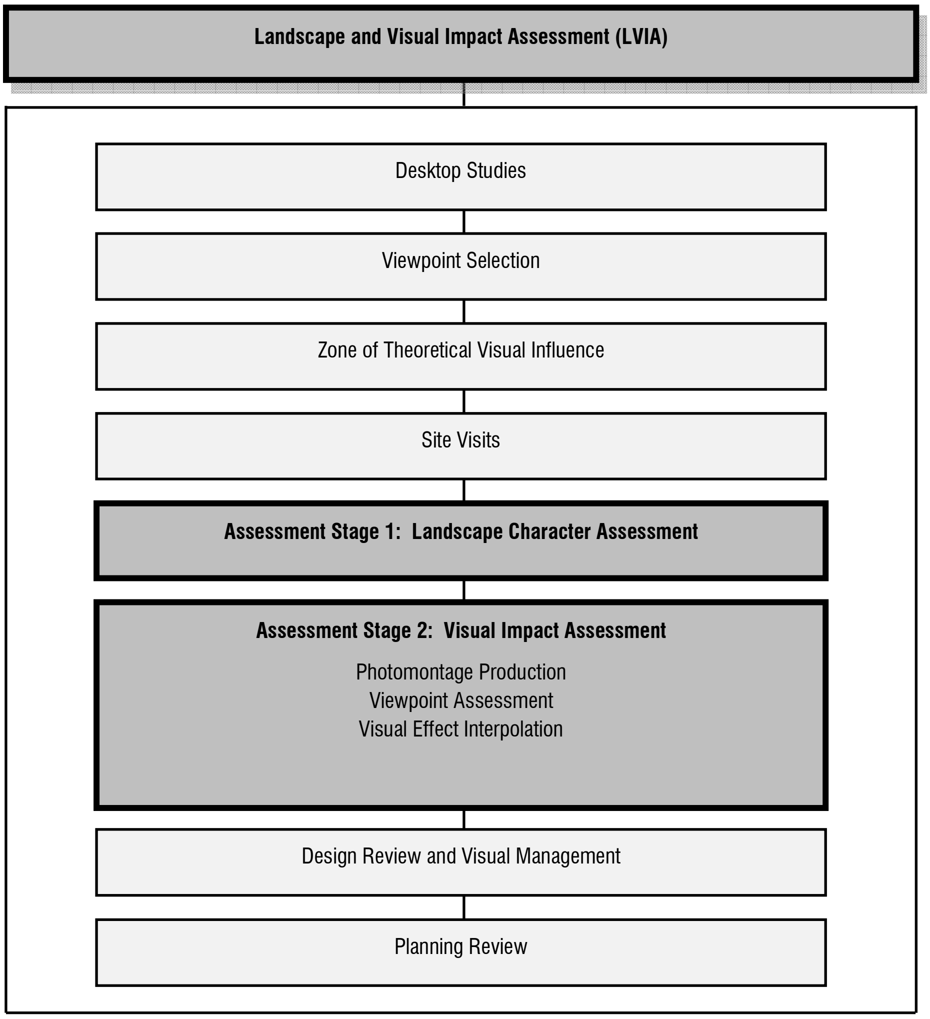

*Figure 5: LVIA – Two Assessment Stages and Associated Tasks.*

### Desktop Studies

The Landscape Character Assessment for the project includes reviews of the project documentation, the proposed development location and the infrastructure associated with the proposed development. Analysis of GIS maps, site photography, aerial photographs and supporting literature was reviewed to establish a broad comprehension of the scope of the project and the existing landscape character.

### Viewpoint Selection

Viewpoint selection was conducted by WAX Design and BGLA as part of an initial site visit on the 6 and 7 July 2023 and interrogation of GIS desktop analysis mapping of topography, geographic features and public accessibility. The selection of the viewpoints provides locations from which a detailed visual assessment of the potential visual effect can be made as part of the Stage 2 assessment. The viewpoints are also selected based on being representative of the locality, publicly accessible, adjacent to areas of private land ownership and where a large proportion of the project and associated infrastructure is visible.

A total of five (5) viewpoints were selected during this site visit to understand the likely visual effect.

Viewpoint locations were identified using a preliminary Zone of Theoretical Visual Influence (ZTVI) map, which illustrates the likely degree of visibility according to the underlying topography.

Each viewpoint represents a typical location where the most significant probable degree of visual change will be experienced due to the proposed development within the existing landscape.

**Zone of Theoretical Visual Influence**

In order to gain an appreciation of where the project will be visible, ZTVI maps have been produced. The mapping provides an illustrative depiction of where the development may be seen within the landscape. The maps quantify the extent to which the project receivers are likely to be seen, considering a tower height of 45m.

The analysis uses a digital terrain model and computer-generated models of the towers to illustrate how many individual towers would be visible from any location around the project within the regional landscape assessment area.  It should be noted that the ZTVI does not consider the impact of local vegetation and buildings or localised landforms as it is based on a 10 metre contour data set.  This means that, theoretically, the visual impact of the project is evaluated within a landscape devoid of any screening vegetation or other features and represents a 'worst case' scenario.

The site assessment confirmed and qualified the ZTVI mapping with reference to vegetation screening and local landforms not depicted by the ZTVI.

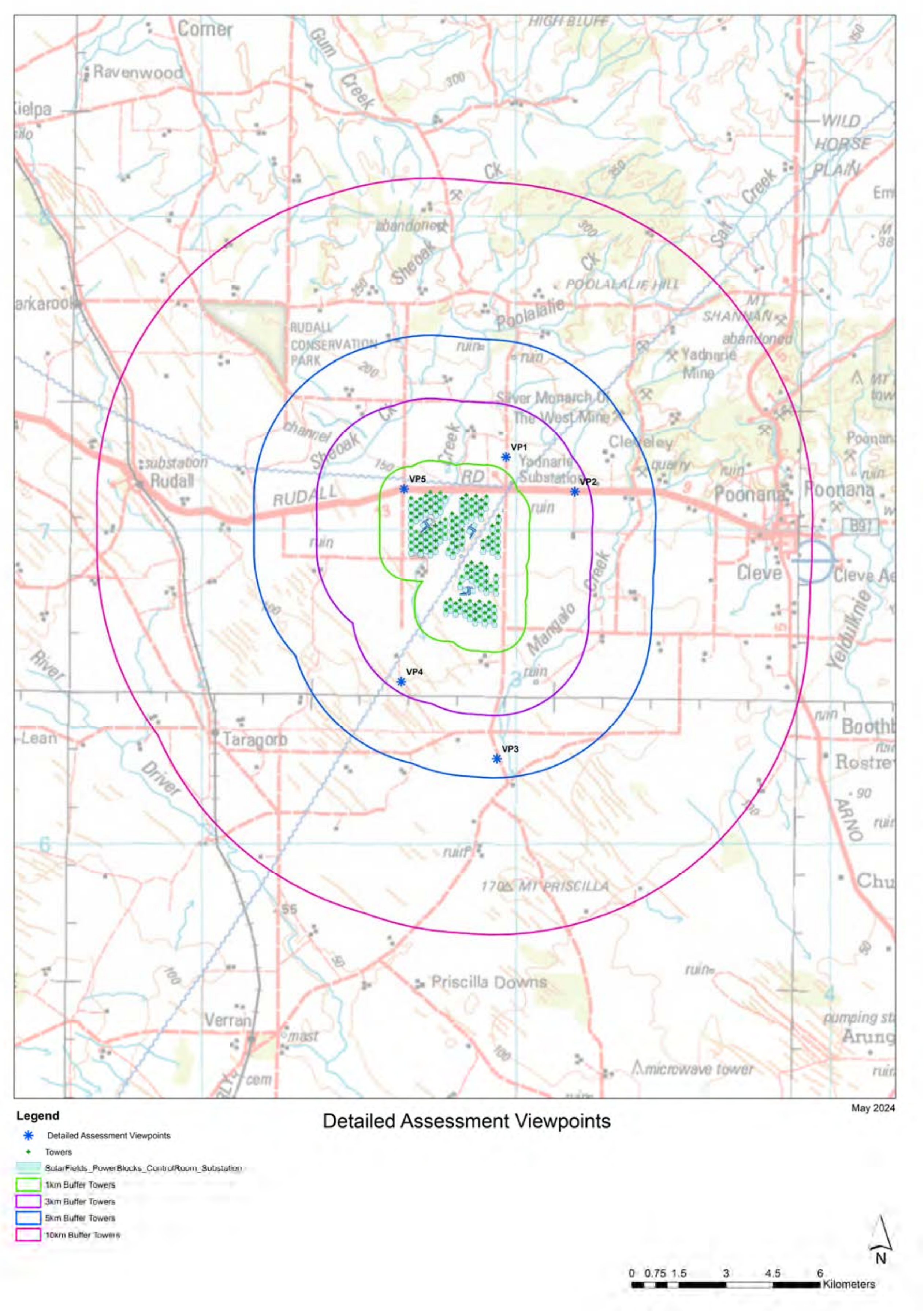

*Figure 6: Viewpoint Locations*

### Assessment Stage 1: Landscape Character Assessment

The assessment includes identification and description of the existing landscape character (considering areas of defined landscape quality determined by topographic form, land use, and vegetation associations, including patterning, colouration and textural relief). In addition, special landscape features and settlements are identified. Mapping and photographic surveys are undertaken, and written commentary is used to describe the locality and existing landscape character of the site locality.

As part of the Landscape Character Assessment, the viewpoint selections were confirmed, and the base photography was taken to support the photomontage production.

The assessment was undertaken on 6 and 7 July 2023 to enable the project team to develop a comprehensive understanding of the existing landscape character. A preliminary landscape character assessment was provided to the consultant team to support the design development of the project site. Stage 2 of the detailed visual assessment commenced once the project design layout was further developed.

### Assessment Stage 2: Photomontage Production

Photomontages of the proposed development from each viewpoint were produced. The photomontages represent a 120-degree horizontal field of view with a 50mm lens digital equivalent photo capture. This has been proven to represent the human binocular field of view. Details of the methodology used to produce the photomontages are described in Appendix B and represent a best practice approach with reference to 'Photography and photomontage in landscape and visual impact assessment' (2011) Landscape Institute (advice note 01/11).

As part of the photomontage compositing process in Photoshop ™, adjustments were made to the contrast and luminosity levels of the digital renders to increase the visibility of the proposed development within photomontage. It is important to note that the adjustments made to the photomontages do not alter the assessment process, as all findings are validated by onsite observations and measurements.

WAX Design and BGLA confirmed the accuracy of the photomontages during a second site visit on 31 May and 1 June 2024. The combined photomontage assessment and on-site review ensures that issues typically associated with photographic simulations, such as image compression and distortion, are mitigated by assessing and measuring the visual effect in the existing landscape using GPS and a bearing compass. This enables the photomontages to be ground-truthed for positional correctness and scale. Any minor distortion to the edge of the 120 degrees provided by the horizontal field extent and 2-dimensional image representations are reflected relatively in the simulated modelling overlay.

The photomontage images were used to inform the detailed viewpoint assessment.

### Assessment Stage 2: Visual Impact Assessment

The assessment of the visual impact includes the production of photomontages to assist in the quantification and qualification of the potential visual effect. The viewpoints identified as part of the preliminary assessment stages were measured using a series of landscape and visual criteria. The assessment results were then mapped and interpolated to demonstrate the likely visual impact of the project across the regional landscape.

### Assessment Stage 2: Viewpoint Impact Assessment

The viewpoint assessment of the project uses a combination of visual assessment measurements and descriptive text. This comprises site observations with reference to prepared photomontages and a detailed assessment of the baseline landscape character and resulting visual impact.

Initially, the baseline landscape character for each viewpoint was assessed considering the following:

- Relief (the complexity of the land that exists as part of the underlying landscape character);
- Vegetation Cover (the extent to which vegetation is present and the potential to screen and filter views);
- Infrastructure and Built Form (the impact of development on landscape and visual character); and
- Cultural Sensitivity (existing cultural overlays, planning designations and any identified listing of heritage items and local sensitivities to landscape, such as scenic drives and viewpoints).

A numerical value was generated for the existing landscape relative to each viewpoint. This value formed the baseline assessment value. This baseline value is modified by the impact of the development on the landscape, which in turn informs the degree of visual effect.

Following the landscape character assessment, each viewpoint was then assessed against the following visual effects:

- Percentage of landscape absorption (the landscape's ability to absorb and screen the development form);
- Horizontal visual effect (percentage spread of the development in the field of view);
- Vertical visual effect (vertical scale of the development as a percentage of the existing landscape scale within the field of view); and
- Distance of visual effect (distance between viewpoint and development).

The landscape character and visual effect measurements were combined to produce a quantified value for the degree of visual change that resulted from the project at each viewpoint (refer to Appendix D for detailed assessment criteria and matrix methodology).

### Assessment Stage 2: Visual Effect Interpolation

The findings of the visual impact assessment for each viewpoint were used to provide a percentage value to describe the degree of visual change. Each viewpoint was cartographically mapped in GIS, and the values were used in a distance-weighted interpolation. The ZTVI was overlayed onto the visual effect interpolation map to define the extent of visibility. The combination of visual effect interpolation and ZTVI produces a map of the likely visual impact experienced in the regional locality as a result of the project. The map provides relativity to the possible experience of visual effect.

### Design Review and Visual Management

Interrogation of the visual effect interpolation and likely areas with sensitivity provides further insight into the likely visual effect of the project.

### Planning Review

A review of the landscape and visual impacts of the development from a planning context was also undertaken. The planning review included a review of the relevant frameworks and provisions of the PDI Code.

In particular, the potential visual impact of the development has been reviewed and discussed against the relevant desired character statements with specific reference to landscape and visual considerations resulting from the development of the project.

# 03 Landscape Character Assessment

## 3.1 Landscape Character

The following assessment considers the underlying landscape character surrounding the project site. Consideration is given to the landscape and visual character to the north, east, south and west, as well as a description of prominent landscape features and settlements.

### 3.1.1 Northern Regional Landscape

The north edge of the regional landscape is defined by the undulating escarpment and foothills of the Poolalalie Hill Range. The range is formed by Poolalalie Hill, Mount Nield and Mount Shannan, which extend in an east-west direction, forming the northern edge of Cleve and the regional locality. The undulating landscape character of the range extends south across to the lower-lying landscape of the coastal plain and Dutton Bay further to the south.

The land cover of the range and the northern regional landscape consists of remnant vegetation with grazing and cropping land uses to the lower slopes. The rural landscape of the foothills is punctuated by dense belts of vegetation that follow creek lines and other overland drainage patterns that extend south from the escarpment of the ranges. The combination of landform and vegetation forms a complex landscape and visual character.

*Figure 7: View looking north towards Poolalalie Hill, Mount Nield and Mount Shannan*

*Figure 8: Locality Plan*

# 03 Landscape Character Assessment

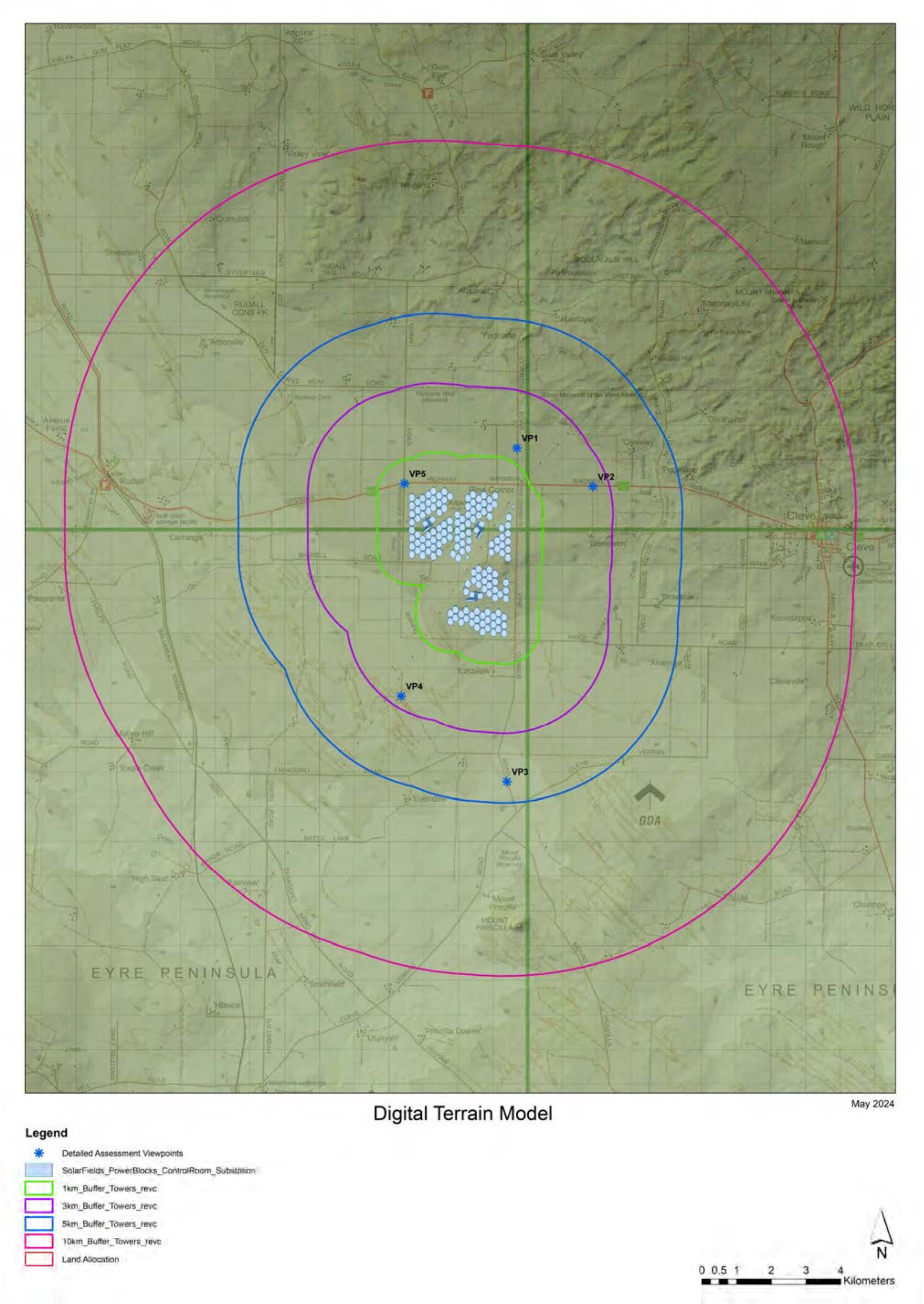

*Figure 9: Topographic digital terrain model (10m contours)*

*Figure 10: Undulating rural landscape of the northeastern regional landscape*

Throughout the northern and northeastern regional landscape, low-lying ridgelines and belts of trees provide localised screens. This screening is demonstrated by the fragmented visibility of the existing transmission towers, which appear partially screened behind the local topographic and landscape features.

Several floodways and creek lines extend across the northern regional landscape, including Mangalo Creek and Yadnarie Creek. These creeks form natural features that traverse the rural landscape north-south towards Twelve Mile Plain and Dutton Bay to the south.

The Birdseye Highway runs east-west along the northern boundary of the project site. The visual character of the highway is defined by extensive roadside vegetation. The height and density of the vegetation form an almost continuous 10 metre high screen on either side of the road.

The vegetated character of the road corridor limits views north and south out of the corridor. While the alignment of the road reinforces the corridor effect, with views extending east and west along the highway, glimpsed views occur through breaks in the vegetation to the project site.

The field pattern and management of the rural landscape results in large-scale paddocks and fields with narrow belts of vegetation along cadastral boundaries. The large-scale land management of the rural landscape creates an open visual character across the regional landscape to the north, east and south and the project site itself.

To the northwest is Rudall Conservation Park. The conservation park represents a large area of native vegetation. Extending north from Rudall Conservation Park is a remnant inland dunal system. The dunal system extends northwest-southeast across the locality.

## 03 Landscape Character Assessment

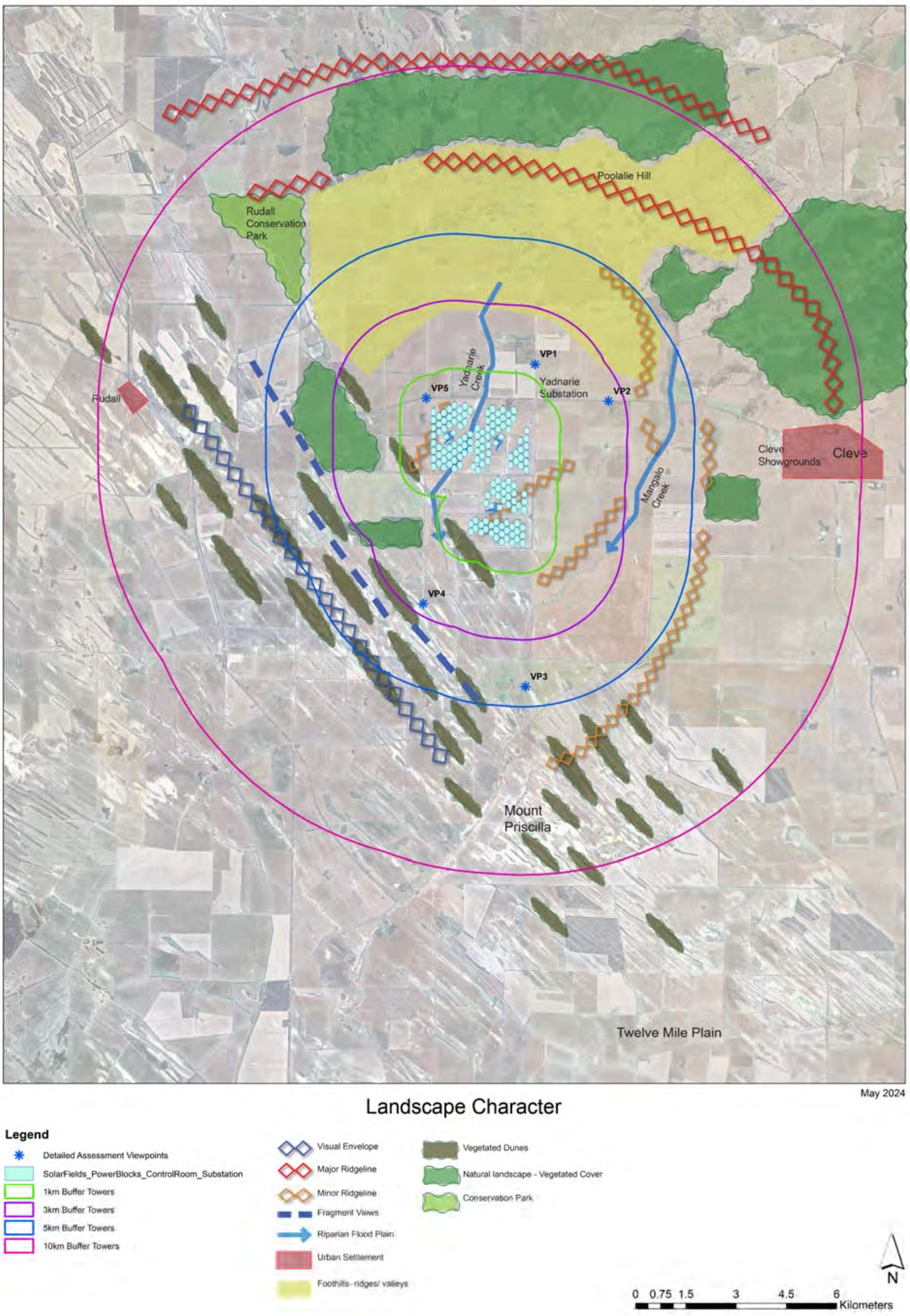

*Figure 11: Landscape character mapping*

### 3.1.2 Eastern Regional Landscape

The eastern landscape character is defined by widely separated northeast-southwest ridgelines that extend across the low-lying landscape. In between the ridgelines are creeks with scattered trees and other belts of vegetation.

The large fields and a lack of vegetation reduce the potential for screening. The resulting rural landscape is open, with views extending over several kilometres in all directions.

Extending south from the foothills of the range is a prominent ridgeline that connects the Poolalalie Hill Range with Mount Priscilla. The ridgeline forms a visual envelope to the eastern edge of the regional landscape locality.

Further to the south east, the topography of the Poolalalie Hill range reduces, creating a rolling rural landscape. The land cover consists of cropping and agricultural activities with isolated dwellings and buildings. Small belts of vegetation form localised screening.

Another local ridgeline runs northeast-southwest through the eastern regional landscape, defining the edge of the project site. This feature creates a visual envelope limiting views across the site to the west and the proposed development site.

*Figure 12 View looking east across open agricultural landscape with Mount Priscilla and prominent ridgeline*

### 3.1.3 Southern Regional Landscape

The southern regional landscape character is defined by the coastal plain of Dutton Bay and the sand hills of a large inland dunal system that runs from Minnipa in the north, to the coast in a southeasterly direction.

The southern regional landscape character is punctuated by the volcanic landform of Mount Priscilla. The topography and elevation form a notable geological element within the regional landscape, rising to a height of 170m above sea level.

The agricultural landscape is punctuated by belts of vegetation following the cadastral boundaries interspersed with arable cropping. Throughout the locality are large agricultural buildings.

The field boundary pattern of the southern regional landscape enables views to extend over several kilometres to rising ridgelines to the east and local ridges within the low-lying landscape character to the south.

Further to the south, and along the southern boundary of the proposed development site, are pronounced vegetation belts that follow the orientation of the remnant inland dunal system. The frequency of the dunes reduces the rural context of the landscape, replacing it with a more natural landscape character.

Southwest is the broad low-lying basin of Twelve Mile Plain, which creates a visually open landscape character. Views further south across the plain towards the Dutton Bay coastline are evident from elevated positions within the regional landscape.

Throughout the southern landscape are local ridgelines and wide low-lying basins that form an undulating plain with floodways, creeks and belts of vegetation.

*Figure 13: Looking south towards Mount Priscilla across the southern regional landscape and Twelve Mile Plain*

*Figure 14: Looking south along Pine Corner Road*

*Figure 15: Looking east across the southwestern regional landscape and the dunal sand hills*

### 3.1.4 Western Regional Landscape

To the west, the landscape is defined by numerous low ridges formed by an extensive inland dunal system. The combination of vegetation and ridges forms a layered landscape character to the west.

The undulating form of the sand hills combined with remnant and revegetated belts of vegetation fragment the visual character. Views typically extend over a few hundred metres to the local ridge.

To the northwest, the remnant inland dunal system continues forming localised visual screens, which are traversed by local roads and the alignment of the Birdseye Highway. The orientation of the dunes and the highway produces filtered views.

To the southwest, the parallel ridges of the dunes increase in frequency, and the associated vegetation creates a layered landscape character. The increased tree and vegetation cover disrupts the typical field pattern and creates an irregular patchwork of paddocks broken up by sand hills and dense belts of vegetation.

Further to the southwest is the elevated landforms of Blue Range and the Hinck Wilderness Area.

*Figure 16: Vegetated ridgeline associated with the southwestern regional landscape*

The dunes typically reach an elevation of 5-6 metres above the surrounding landscape. The visual character of the sand hills and vegetation is enclosed, contrasting the open visual character associated with the southern and eastern landscape characters.

Further southwest, the landscape character becomes flat and rural, punctuated with low-lying vegetated sand hills.

Running northeast-southwest across the project site and to the western regional landscape is a transmission line. The uniformity and frequency of the transmission lines create a defined infrastructure corridor that extends across the regional landscape character. The transmission line is visible above the vegetation in the locality.

*Figure 17: View showing vegetated dunal ridges*

### 3.1.5 Towns and Settlements

Within the regional landscape character units are two towns that form locations of increased visitation or occupation by community members, visitors and individuals. These include;

- Cleve
- Rudall

**Cleve**

Cleve is located to the northeast of the project site. Cleve is a small agricultural town on the Eyre Peninsula. It is 226 km southwest of Port Augusta and 143 km north of Port Lincoln. Cleve is approximately 8.5m to the east of the project site.

The western outskirts of Cleve face towards the project site. The landscape character is dominated by industrial and light industrial land uses with associated sheds, hardstand areas and ancillary infrastructure. The western residential outskirts have significant areas of vegetation, particularly along Bamman Road, which create filtered screens to the southern and western edge of the town.

The Field Day showgrounds are an important community location and are used periodically throughout the year. The site is surrounded by local ridgelines, which provide an enclosed visual character with limited views to the north, west and east.

To the south of Cleve, is a wide undulating agricultural landscape. Existing topographic features such as Mount Priscilla and the Poolalalie Hill range form prominent landscape elements. Further south are distant views of the low-lying land of Twelve Mile Plain.

Poornamookinnie Creek provides a north/south vegetated corridor to the edge of Cleve and Poolalalie Hill. The landscape and vegetation character of the creek provide a degree of visual screening to the western edge of the town.

Similar landscape characters exist for many of the open space and residential areas to the south and southwest of Cleve.

*Figure 18: Mainstreet of Cleve*

### Rudall

Rudall is a small settlement primarily used for grain storage. The township is a collection of single-story buildings with numerous tree groups and screening vegetation set between the buildings. Adjacent to the township is a grain silo and transfer station with rail and road connections. The township is located approximately 8 kilometres to the west of the project site.

To the north of Rudall is an established community club and sports precinct with netball and tennis courts, an oval, sports lighting and club rooms. The sports precinct, similar to the township, is surrounded by extensive belts of vegetation and undulating dunal systems that form localised visual screens to the township and recreational area.

The combination of landforms and vegetation creates a defined visual enclosure with views from both the oval and township, extending over several hundred metres. In this regard, there are no significant views of the project site from the township or oval.

*Figure 19: View from Rudall looking along Birdseye Highway*

*Figure 20: View of clubroom at Rudall Sport Precinct*

## 3.2 The Project Site

The project area is located 8.5 kilometres from Cleve and is situated adjacent to the Birdseye Highway, which runs to the north.

The site covers approximately 1,530 hectares and is used for agricultural cropping. An existing transmission line runs northeast to southwest across the site. The 65 metres height of the transmission line towers provides a relative infrastructural reference.

Pine Corner Road forms the eastern edge of the site and follows the underlying topography of the area.

The western edge of the project site is defined by Broadview Road and the tree screening that exists along the road corridor. The landscape character of Broadview Road forms a defined vegetative edge to the project site. Taragoro Road forms the southern boundary.

The project site is bisected centrally by a ridge that extends from the foothills of Poolalalie Hill Range through the eastern regional landscape and across the project site. The ridge creates a visual envelope that separates the project site to the northwest and southeast.

Across the southwestern section of the project site is a large prominent sand hill that runs northwest-southeast and fragments the site further.

Both topographic features rise to a height of between 20 and 30 metres in elevation. The form and height of the ridge and sandhill generate additional visual envelopes and visual fragmentation across the project site boundary as well as the broader locality.

The existing transmission line is evident within the field of view, as well as the infrastructure associated with the substation located on Birdseye Highway.

*Figure 21: Looking southwest across the project site*

*Figure 22: View of existing infrastructure associated with substation*

# 04 Zone of Theoretical Visual Influence (ZTVI)

## 4.1 Methodology

The Zone of Theoretical Visual Influence (ZTVI) mapping illustrates where the project may be seen within the landscape. The mapping quantifies the visibility of the proposed development in the broader landscape.

The ZTVI mapping is developed in GIS using 10 metre contour data that has been provided around the project site. The ZTVI represents a ‘worst case’ scenario as it does not incorporate vegetation, built form or localised screening effects, which are assessed onsite.

The ZTVI indicates that the project will be visible in the broader regional landscape, with local ridgelines creating visual envelopes to the southwest and northeast.

An onsite assessment of the existing landscape and vegetation cover indicates a substantial amount of vegetation to the northwest and west. This vegetation will limit and, in some cases, screen the visibility of the proposed development, mitigating the potential visual impacts. The degree of visual absorption is discussed in Section 5.

*Figure 23: North western landscape area comprising of dense vegetation which fragments views.*

# 04 Zone of Theoretical Visual Influence

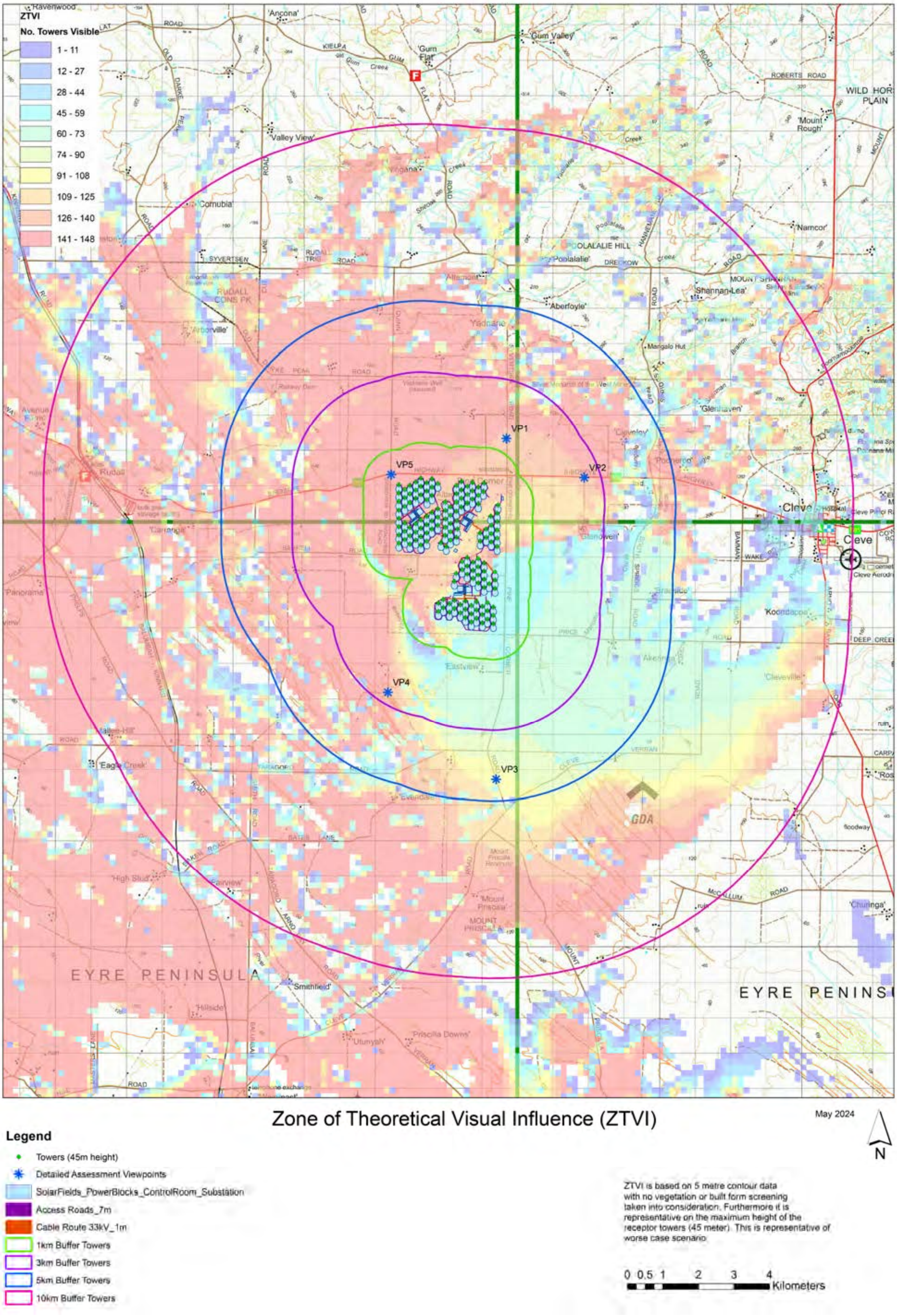

*Figure 24: ZTVI map for the Project based on a standard tower height of 45 metres*

## 4.2 ZTVI Assessment

The ZTVI mapping, shown in Figure 24, illustrates three distinct visual characteristics in relation to the visibility of the receivers within the broader locality. These characteristics vary in relation to the underlying topographic features that result from the DTM survey. Using a typical height of 45 m, the ZTVI mapping demonstrates the number of receivers that will be visible within the locality in relation to local, sub-regional and regional landscape character areas.

To the north, the visibility of the project is defined by the elevated foothills of Poolalalie Hill. Across the local and sub-regional areas, the majority of receivers will be visible. This visibility decreases in regional areas to the north as a result of the local landforms and screening provided by the underlying topography of the Poolalalie Hill range. Similar visual characteristics extend to the northeast, particularly around Mount Shannan and the western edge of the Cleve Township.

To the south and southeast, the visibility of the project is defined by the local ridge line that runs along Pine Corner Road. This topographic feature screens many of the receivers to the northwest. The ridgeline creates a visual envelope along the eastern edge of the project area, reducing the visibility of the receivers across the low lying basin formed by Mangalo Creek. Across the regional landscape character areas, the visibility of the project increases as a result of the elevated ridge that extends northeast-southwest between Cleve and Mount Priscilla.

To the west and southwest, a complex visual character is created as a result of the localised topographic features of the inland dunal system that extends across the sub-regional and regional locality. The frequency and orientation of these dunal landforms fragment the visual character, creating varying degrees of visibility to the receivers. From elevated sections of the dunal system, the visibility of the project increases. Conversely, from low lying areas, the dunal landforms screen the visibility of the project significantly.

While the ZTVI demonstrates a worst-case scenario, the extent of visibility of the project is mitigated by existing vegetation. Tree belts along existing cadastral boundaries and remnant vegetation across the dunal system increase mitigating the likely visual effects associated with the project.

# 05 Visual Impact Assessment

## 5.1 Visual Assessment Scope

The preliminary visual impact assessment considers the effects of the proposed layout and development form of the project within the locality as described in the Landscape Character Assessment.

The Visual Impact Assessment considered key aspects of the existing landscape, such as relief, vegetation, built form and infrastructure, and cultural and scenic landscape values from a series of selected viewpoints.

## 5.3 Viewpoint Selection

The viewpoints selected for the visual impact assessment are listed below:

1. VP01 Syvertsen Road (north – regional)
2. VP02 Birdseye Highway (northeast – sub-regional)
3. VP03 Pine Corner Road (south – local)
4. VP04 Broadview Road (southwest – sub-regional)
5. VP05 Intersection of Birdseye Highway, Quinn Road and Broadview Road (northwest – local)

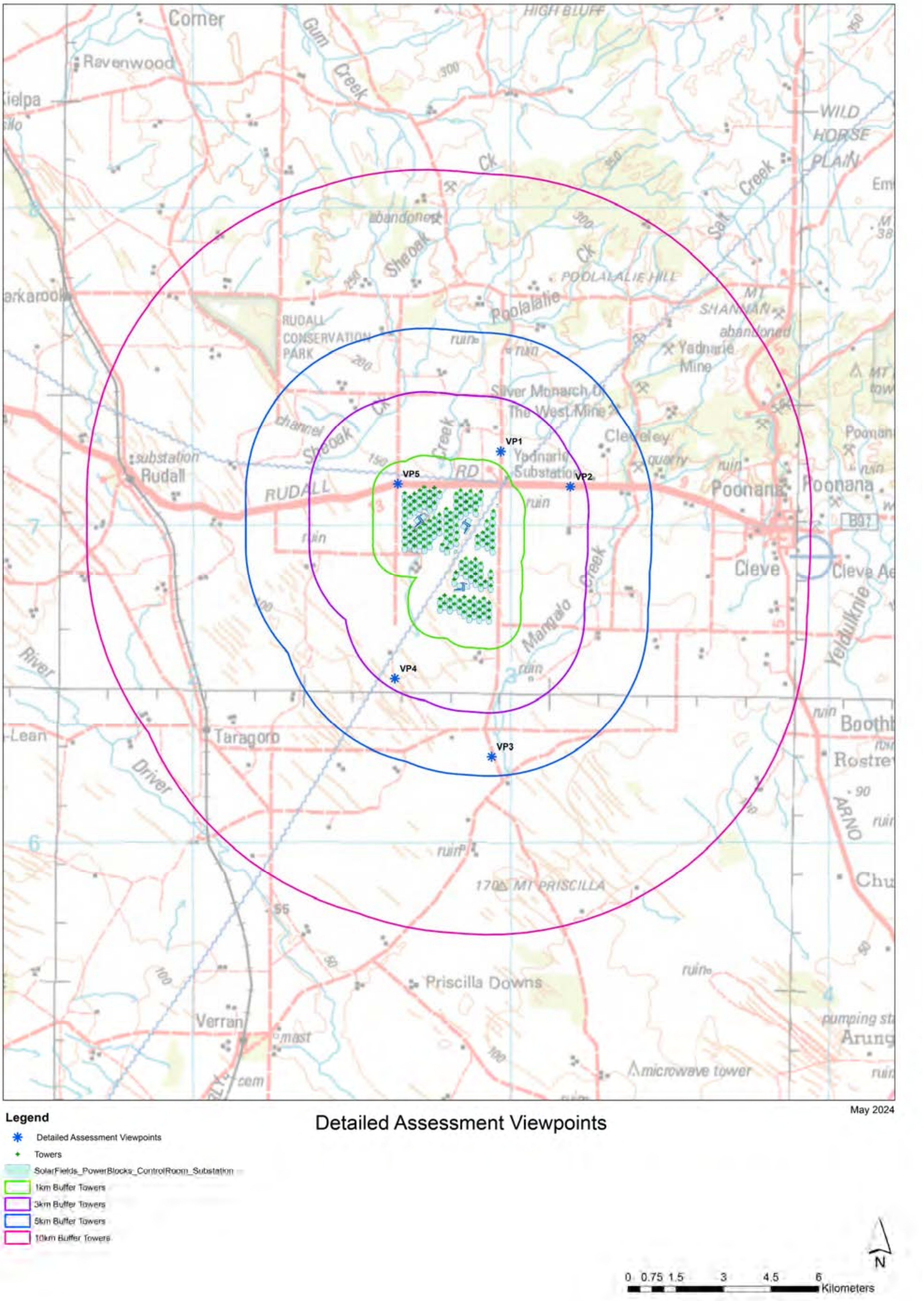

*Figure 25: Assessment Viewpoints*

## 5.3 Viewpoint 1: Syvertsen Road (north – regional)

Viewpoint Context

Viewpoint 1 is located to the north of the project on Syvertsen Road. The viewpoint illustrates the visual effect that will be experienced from the northern regional landscape. The visibility of the project is contained in a narrow field of view and visible.

The potential visual impact associated with the project is likely to result from an alteration of the grazing land use and the development of receivers and heliostat fields across the existing landscape character.

*Figure 26: Existing: Viewpoint 1*

*Figure 27: Photomontage: Viewpoint 1*

*Figure 28: Digital Overlay showing development: Viewpoint 1*

*Figure 29: Absorption Capacity Calculations: Viewpoint 1*

Viewpoint Assessment

| Assessment | Value | Description |
|---|---|---|
| Relief | **2** | Negligible local foreground variation with limited subregional and regional background topographic form |
| Vegetation Coverage | **2** | Limited road corridor boundary vegetation to the foreground with expansive views across pastoral fields. Moderate vegetation pattern the western side of the proposed development provides variance in colouration and pattern to the midground. |
| Infrastructure and Built Form | **3** | Transmission lines and substation to the foreground are prominent, overlaid with road corridors traversing the landscape. For this viewpoint the landscape still maintains an agricultural character. |
| Cultural and Landscape Value | **1** | On the fringe of the visual catchment to the north of the proposed development, this viewpoint has low frequency of visitation and no known culturally significant sensitivities. |
| **Baseline Landscape** | **8** | |
| Landscape Absorption | **5** | No or minor absorption due to the elevated viewpoint with views across the lower lying valley and flood plain with minimal vegetation canopy screening. The absorption capacity of the landscape is recorded as 11%. |
| Horizontal | **3** | The horizontal visual effect is created by referenced tower receivers 147 and 22 which equates to 63 degrees or 53% of the field of view |
| Vertical | **5** | The vertical visual effect is created by tower receiver 148 which has the greatest elevation from this perspective. The existing landscape topographic variation is recorded as 27m at a distance of 5233m. The variance in elevation created by tower receiver is 72m at a distance of 5333m. Hence the towers will create a substantial proportional increase greater than 100% of the exiting landscape scale. |
| Distance | **5** | The closest tower receiver is 1.4km to the south |
| **Visual Effect** | **18** | |
| **Coefficient** | **0.9** | |
| **Degree of Visual Change** | **36%** | 8x0.9= 7.2 Landscape visual effect<br>7.2/20= Degree of visual change |

Description of Potential Visual Impact

From Viewpoint 1, two defined visual effects are created by the project. To the southwest, the potential visual effect of the heliostat fields is fragmented by existing belts of vegetation that run along the Birdseye Highway and associated field boundaries. The heliostats are seen as a distinct collection of infrastructure elements located behind belts of existing vegetation. The vegetation fragments the visual effect. Across this area to the southeast, the receivers are likely to be seen as prominent vertical elements within the landscape.

The frequency and number of vertical elements mean that the receivers will likely have greater visual prominence than the existing transmission towers running northeast - southeast across the project area.

The likely visual effect is produced by the arrangement of heliostats across the underlying topography and the prominent ridgeline that runs to the east of the site. The ridgeline is likely to elevate heliostat fields and receivers, increasing the visibility of the infrastructure.

The visual effect of the receivers adjacent to the northern boundary will be back-screened by the distant ridgeline of the Blue Range and Hinck Wilderness Area to the southwest. This reduces the potential visibility of the receivers and heliostats. Contrasting the towers to the eastern boundary, which appear elevated and sky-lined above the local ridgelines.

The existing visual effect of the transmission line is likely to be reduced by the introduction of the tower receivers. While the project is likely to create a moderate visual effect, the additional infrastructure elements punctuating the existing landscape character reduces the visual prominence of the transmission line.

## 5.4 Viewpoint 2: Birdseye Highway (northeast – sub-regional)

Viewpoint Context

Viewpoint 2 is located on the Birdseye Highway at the entrance to a private property referred to as Glenowen. The viewpoint is representative of the eastern regional landscape and the visual effect associated with the northeastern and eastern locality. This viewpoint is also representative of the potential visual effects that will be experienced from the western edge of Cleve

The landscape character associated with the viewpoint is defined by the low-lying undulating rural landscape of the eastern regional landscape.

Views extend west and south over the low-lying landscape character ridgelines of Mangallo Creek. To the north, the rising landforms of the Poolalalie Hill range create a defined visual envelope and backdrop to the viewpoint.

Similar to viewpoint 1, the project is likely to produce a change in the rural landscape. The agricultural land use of the project site will be replaced with infrastructure elements spread over the underlying topography of the site.

*Figure 30: Existing: Viewpoint 2*

*Figure 31: Photomontage: Viewpoint 2*

Figure 32: Digital Overlay showing development: Viewpoint 2

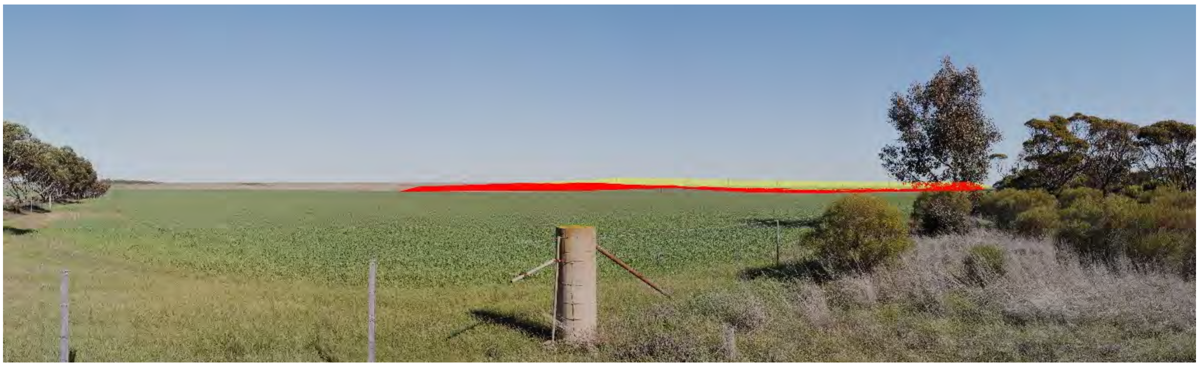

Figure 33: Absorption Capacity Calculations: Viewpoint 2

Viewpoint Assessment

| Assessment | Value | Description |
|---|---|---|
| Relief | **1** | Negligible foreground variation with limited subregional and negligible regional background topographic form. |
| Vegetation Coverage | **2** | Limited road side corridor vegetation to the foreground with limited to moderate subregional vegetation canopy adjacent the development site. |
| Infrastructure and Built Form | **4** | Recessive transmission line present across the subregional ridgeline and low voltage lines. Road corridor provides limited presence within the field of view. Localised farming utility buildings and equipment. |
| Cultural and Landscape Value | **2** | Relative high frequency of views on the Birdseye Highway between Cleve and Rudall. No known culturally significant sensitivities. |
| **Baseline Landscape** | **9** | |
| Landscape Absorption | **3** | Moderate absorption due to the vegetation screening adjacent to the road corridor and topographic form to the |

| | | |
|---|---|---|
| | | south west screening the majority of the heliostats. The absorption capacity of the landscape is recorded as 50%. |
| Horizontal | **3** | The horizontal visual effect is created by referenced tower receivers 147 and 28 which equates to 58 degrees or 48% of the field of view |
| Vertical | **5** | The vertical visual effect is created by tower receiver 148 which has the greatest elevation from this perspective. The existing landscape topographic variation is recorded as 14m at a distance of 3120m. The variance in elevation created by tower receiver is 42.7m at a distance of 3115m. Hence the towers will create a substantial proportional increase greater than 100% of the exiting landscape scale. |
| Distance | **5** | The closest tower receiver is 2.53km to the west |
| **Visual Effect** | **16** | |
| **Coefficient** | **0.8** | |
| **Degree of Visual Change** | **36%** | 9x0.8= 7.2 Landscape visual effect<br>7.2/20= Degree of visual change |

Description of Potential Visual Impact

The proposed infrastructure associated with the project creates a distinct visual effect to the northwest. The visual effects are created by the band of infrastructure elements formed by the horizontal spread of the heliostats across the landscape and the verticality of the receivers.

The project will be situated within the lower lying basin of the Yadnarie Creek corridor. The local topography is likely to result in the receivers being seen as a collection of vertical elements extending across the existing rural landscape character. The potential visual impact created by the receivers is offset by the back screening provided by the more distant topography of the Blue Range to the northwest. While receivers are back-screened, they are likely to appear as prominent visual elements in the landscape.

The transmission line corridor forms a distinct separation within the infrastructure footprint across the site. This is accentuated by the underlying topography, which rises to the east.

The arrangement of the infrastructure and the location of the main eastern ridgeline is likely to provide significant screening to the eastern boundary, reducing the potential visual effect of proposed power blocks and heliostats. The screening provided by the ridgeline and associated vegetation reduces and, in some instances, removes the visibility of the heliostats. Due to their height, the receivers are likely to remain visible across the local ridgeline to the southeast.

Heliostats and receivers to the southeast are likely to be completely screened, reducing the potential visual impact that occurs from viewpoint 2 and, more broadly, from locations east of the project.

The introduction of the project is likely to alter the existing character of the landscape. Altering the visual character and land use from a productive rural landscape to a renewable energy infrastructure, with horizontal and vertical elements visible in the agricultural landscape. While there is likely to be a distinct change in the visual character of the landscape, this change is concentrated, and the moderate vertical form of the infrastructure elements reduces the potential visual effect of the project as demonstrated by the zone of theoretical visual influence (ZTVI) mapping.

In terms of the visual effect, it is important to note that the visual prominence of the project to the north is likely to result from a band of infrastructure associated with the heliostats. The receivers by nature of the lattice frame construction, become recessive at distance. This observation in terms of the prominence of the visual impact elements associated with the infrastructure changes to the south, where a band of infrastructure elements associated with the heliostats is likely to be recessive, and the receivers, due to the reflective quality of the receiver panels, become prominent.

## 5.5 Viewpoint 3: Pine Corner Road (south – local)

Viewpoint Context

Viewpoint 3 is located to the south of the project site on Pine Corner Road. The viewpoint is representative of the landscape character and visual effects that will be experienced from the south.

The visual character of the viewpoint is visually open, and views extend over several kilometres to the east, south and north. To the west are local ridges formed by the inland sand hill system, which enclose the visual character of the rural landscape.

To the south is the low-lying landscape of Twelve Mile Plain, punctuated by belts of vegetation that run along the creek lines and cadastral boundaries of the locality.

Within the field of view, the existing transmission line forms a defined infrastructure corridor, with the transmission towers forming vertical infrastructure elements.

*Figure 34: Existing: Viewpoint 3*

*Figure 35: Photomontage: Viewpoint 3*

*Figure 36: Digital Overlay showing development: Viewpoint 3*

*Figure 37: Absorption Capacity Calculations: Viewpoint 3*

Viewpoint Assessment

| Assessment | Value | Description |
|---|---|---|
| Relief | **3** | Negligible foreground topographic variation with moderate subregional to regional. |
| Vegetation Coverage | **2** | Limited vegetation to the foreground with views across pastoral fields. Moderate canopy structure in the distance that overlays with the proposed development site. Layered dunal vegetation pattern associated the south west of the development site provides visual relief |
| Infrastructure and Built Form | **5** | Limited presence of infrastructure within the field of view. Transmission lines are relatively recessive in the distance. |
| Cultural and Landscape Value | **1** | Typical of the visual catchment to the south of the proposed development, this viewpoint has low frequency of visitation and no known culturally significant sensitivities. |
| **Baseline Landscape** | **11** | |

| | | |
|---|---|---|
| Landscape Absorption | **3** | Moderate absorption due to the vegetation screening adjacent to the road corridor and topographic form to the subregional landscape, screening a proportion of the heliostats. The absorption capacity of the landscape is recorded as 40%. |
| Horizontal | **1** | The horizontal visual effect is created by referenced tower receivers 67 and 97 which equates to 23 degrees or 19% of the field of view |
| Vertical | **3** | The vertical visual effect is created by tower receiver 148 which has the greatest elevation from this perspective. The existing landscape topographic variation is recorded as 93m at a distance of 6360m. The variance in elevation created by tower receiver is 135m at a distance of 6594m. Hence the towers will create a 40% proportional increase which is classified as moderate. |
| Distance | **4** | The closest tower receiver is 4.41km to the north |
| **Visual Effect** | **11** | |
| **Coefficient** | **0.55** | |
| **Degree of Visual Change** | **30%** | 11x0.55= Landscape visual effect<br>6.05/20= Degree of visual change |

Description of Potential Visual Impact

The visual impact to the southeast is defined by the visibility of the heliostats and receivers that are likely to be visible along the Pine Corner Road ridgeline. The ridgeline creates separated topographic orientations to the northwest and southeast, creating a defined view shed that potentially screens a significant proportion of the heliostats and power blocks.

The development of the project site is likely to visually alter the ridgeline due to the introduction of receivers across the underlying topography.

While the lattice tower construction of the proposed receivers is likely to result in a series of recessive visual elements, the glare from the reflective surface of the receiver is likely to be highly visible during daylight hours, creating bright points of light within the landscape with a similar visual effect to when football oval floodlighting is used during the daytime. This specific visual effect likely increase the project's visibility to the south.

When considering the visual impact on the panoramic character of the landscape to the south and east, the visual effects are likely to be concentrated within a narrow field of view and primarily screened by the existing topography. The visibility of the project concentrated on the heliostat, lattice tower and the reflectivity of the receiver panels. However, this particular effect is limited to periods of sunlight and specific periods during the day according to the angle of view from the south.

## 5.6 Viewpoint 4: Broadview Road (southwest – sub-regional)

Viewpoint Context

Viewpoint 4 represents the visual impact that will be experienced from the southwest. The viewpoint is located on Broadview Road and illustrates the visual impacts associated with the existing transmission line and the degree of visual change that will occur in the landscape as a result of the project. The viewpoint also illustrates the visual character of local landforms and vegetation that transects across the project site.

Within the foreground of Viewpoint 4 is a low-lying rural landscape typical of the south and southwestern regional landscape. The elevated landforms and ridges provide a visual envelope to the east and northeast.

The existing transmission line forms a defined infrastructure element that runs west to northwest.

Further to the north are distant ridgelines associated with the Poolalalie Hill ranges. Local sand hills running northwest-southeast to the edge of the viewpoint create a defined visual envelope, reducing the potential of visual impacts to the south and southwest.

*Figure 38: Existing: Viewpoint 4*

*Figure 39: Photomontage: Viewpoint 4*

Figure 40: Digital Overlay showing development: Viewpoint 4

Figure 41: Absorption Capacity Calculations: Viewpoint 4

Viewpoint Assessment

| Assessment | Value | Description |
|---|---|---|
| Relief | **3** | Negligible foreground topographic variation with moderate subregional to regional. |
| Vegetation Coverage | **2** | Limited vegetation to the foreground with views across pastoral fields and road corridors. Moderate canopy structure pattern in the distance that overlays with the proposed development site provides visual relief |
| Infrastructure and Built Form | **4** | Local road infrastructure dissects the field of view. The presence of transmission lines traversing the ridgelines provide elements of vertical scale and modification to the landscape |
| Cultural and Landscape Value | **1** | This viewpoint has low frequency of visitation and no known culturally significant sensitivities. The viewpoint is typical of local residential / farming properties to the south within the local to subregional locality. |
| **Baseline Landscape** | **10** | |

| | | |
|---|---|---|
| Landscape Absorption | **2** | Increasing absorption due to the vegetation ant topographic screening to the local and subregional locality. The absorption capacity of the landscape is recorded as 67%. |
| Horizontal | **3** | The horizontal visual effect is created by referenced tower receivers 147 and 22 which equates to 54 degrees or 45% of the field of view |
| Vertical | **4** | The vertical visual effect is created by tower receiver 127 which has the greatest elevation from this perspective. The existing landscape topographic variation is recorded as 30m at a distance of 2096m. The variance in elevation created by tower receiver is 68m at a distance of 2837m. Hence the towers will create a 67% proportional increase which is classified as an increasing visual effect. |
| Distance | **5** | The closest tower receiver is 2.69km to the north |
| **Visual Effect** | **14** | |
| **Coefficient** | **0.7** | |
| **Degree of Visual Change** | **35%** | 10x0.7= Landscape visual effect<br>7/20= Degree of visual change |

Description of Potential Visual Impact

The visual effect is created by the vertical form of the receivers positioned across the project site and visible from the wider locality.

The local topography and ridgelines that occur to the south are likely to provide localised screening, reducing and, in many instances, removing the potential visual effects of the heliostats and receivers as well as the infrastructure associated with the power blocks.

The lattice towers of the receivers form vertical elements within the landscape. The scale of the infrastructure appears similar to the transmission towers. However, the frequency of the receivers increases the visual prominence within the landscape. In addition, the reflectivity of the receivers produces distinct points of light at each receiver.

The number of towers visible creates a prominent visual effect in terms of the reflectivity and point-light sources in the landscape. This is a unique visual character that will be experienced from locations south of the project area.

From the south, the existing transmission line continues to form a prominent visual impact within the landscape. The project, while complex in its visual character, is recessive, acknowledging the individual points of light that will be emitted from each receiver.

### 5.7 Viewpoint 5: Intersection of Birdseye Highway, Quinn Road and Broadview Road (northwest – local)

Viewpoint Context

Viewpoint 5 is located on the intersection of Quinn Road, Broadview Road and Birdseye Highway. The viewpoint provides a direct view of the project within the western local landscape, particularly when travelling from the west towards Cleve.

The visual character associated with viewpoint 5 is an open rural landscape and from large breaks in the existing roadside vegetation associated with the Birdseye Highway. These breaks provide open vistas towards the project and associated infrastructure.

*Figure 42: Existing: Viewpoint 5*

*Figure 43: Photomontage: Viewpoint 5*

*Figure 44: Digital Overlay showing development: Viewpoint 5*

*Figure 45: Absorption Capacity Calculations: Viewpoint 5*

Viewpoint Assessment

| Assessment | Value | Description |
|---|---|---|
| Relief | **1** | Negligible foreground and subregional topographic variation with limited regional. |
| Vegetation Coverage | **2** | Limited vegetation shelter belts to property boundaries and road corridors |
| Infrastructure and Built Form | **3** | Transmission lines traverse the landscape upon the ridgelines providing an existing vertical scale, coupled with underlying farming utility equipment and road corridor. |
| Cultural and Landscape Value | **2** | Relative high frequency of views on the Birdseye Highway between Cleve and Rudall. No known culturally significant sensitivities. |
| **Baseline Landscape** | **8** | |
| Landscape Absorption | **5** | Minor absorption due to the proximity of the viewpoint to the development with limited to no vegetation or topographic screening. The absorption capacity of the landscape is recorded as 2%. |
| Horizontal | **4** | The horizontal visual effect is created by referenced tower receivers 37 and 67 which equates to 78 degrees or 65% of the field of view |
| Vertical | **5** | The vertical visual effect is created by tower receiver 22 which has the greatest elevation from this perspective. The existing landscape topographic variation is recorded as 30m at a distance of 3312m. The variance in elevation created by tower receiver is 37m at a distance of 361m. Hence the towers will create a substantial proportional increase greater than 100% of the exiting landscape scale. |

| | | |
|---|---|---|
| Distance | **5** | The closest tower receiver is 361km to the east |
| **Visual Effect** | **19** | |
| **Coefficient** | **0.95** | |
| **Degree of Visual Change** | **38%** | 8x0.95= Landscape visual effect<br>7.6/20= Degree of visual change |

Description of Potential Visual Impact

The visual impact associated with the project will be created by the heliostat fields located across the ground plain of the site, the numerous receivers that form vertical visual elements and the infrastructure form of the three power blocks.

The frequency and number of receivers in the landscape produce a distinct vertical visual effect. The height and frequency of the infrastructure elements contrast with the existing rural character, increasing the degree of visual change to the rural landscape.

The extent and frequency of the heliostat fields are likely to create a defined band of visual impact across the agricultural land use of the site, screening the rural character of the landscape.

Although the visual impact is likely to be moderate increasing to substantial from the viewpoint, a degree of visual relief is provided by the elevated typography of the ridgeline to the east. This variation in the local landform offsets the vertical nature and disrupts the linear array of the receivers.

The existing visual impact produced by the transmission tower, while visible, is likely to be dominated by the introduction of the heliostats and receivers.

The potential to provide supplementary revegetation to the project boundaries with local mallee species will provide significant mitigation of the visual effect. Over a period of time, the visual impact associated with the heliostats could be screened, and the visual effects of the receivers are likely to become fragmented as the tree canopy develops. Effectively, the scale of the receivers is likely to be similar to that of the existing transmission tower infrastructure. However, the visual effect will result from the number and frequency of receivers and their position across the landscape.

It is important to note that the frequency and concentration of infrastructure elements is contained within a defined visual envelope, as illustrated by the ZTVI mapping.

Across the project site are several pockets of vegetation. To the east, the existing vegetation of Pine Corner Road is screened by the project infrastructure. However, isolated vegetation groups near to the Birdseye Highway further fragment and disrupt the visual effect of the receivers and heliostats.

While the project is likely to result in a moderate increasing to substantial degree of visual change, the visual character of the locality has already been impacted by the upgrade of the substation and the recent development of the substation site, including new cut-in towers, transmission connections as well as communication towers. The concentration of infrastructure elements provides a visual reference to the degree of impact that will occur at the northern corner of the site.

## 5.8 Summary of Visual Impacts

| | Relief | Vegetation Coverage | Infrastructure | Cultural/Landscape Value | **Landscape Character** | Landscape Absorption | Horizontal | Vertical | Distance | **Visual Assessment** | **Degree of Visual Change** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Viewpoint 1** | 2 | 2 | 3 | 1 | **8** | 5 | 3 | 5 | 5 | **18** | **36%** |
| **Viewpoint 2** | 1 | 2 | 4 | 2 | **9** | 3 | 3 | 5 | 5 | **16** | **36%** |
| **Viewpoint 3** | 3 | 3 | 5 | 1 | **12** | 3 | 1 | 3 | 4 | **11** | **30%** |
| **Viewpoint 4** | 3 | 2 | 4 | 1 | **10** | 2 | 3 | 4 | 5 | **14** | **35%** |
| **Viewpoint 5** | 1 | 2 | 3 | 2 | **8** | 5 | 4 | 5 | 5 | **19** | **38%** |

*Table 1: Summary of Visual Impacts*

Table 2 is a summary of the classifications described in the GrimKe matrix, which provides additional information on the potential visual impact used to describe each viewpoint.

The table summarises the classification of visual effects provided in the report and shows a series of defined percentage ranges that relate to the degree of visual change. These percentage ranges are then categorised using various verbal descriptions of the visual impact from ‘slight’ to ‘extreme’.

The visual impact assessment undertaken for the viewpoints, shown in Table 1, quantifies the degree of visual change. These values are then defined against the classification of visual effects to enable the visual impact to be comparatively described.

In situations where the degree of visual change approaches the boundaries of the percentage ranges, the description of the visual impact is modified to demonstrate a sliding scale that recognises the increasing or decreasing qualities of the visual impact. For example, a percentage of 38% is described as ‘moderate increasing to substantial’, while a percentage of 22% is described as ‘moderate decreasing to slight’.

| Percentage of Visual Change | Description of Visual Impact | Descriptors – appearance in the central vision field | Comments |
|---|---|---|---|
| 80-100% | **Extreme** | *Commanding, controlling the view* | *Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of the landscape and view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity. The sensitivity of the underlying landscape character to change is unable to accommodate or mitigate the introduction of development, and the visual effect is highly adverse.* |
| 60-80% | **Severe** | *Standing out, striking, sharp, unmistakable, easily seen* | *Severe change in view involving the obstruction of existing views or alteration to underlying landscape visual character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting or a severe change in the context of the existing landscape character.* |
| 40-60% | **Substantial** | *Noticeable, distinct, catching the eye or attention, clearly visible, well defined* | *Substantial change in view: which may involve partial obstruction of existing view or alteration of underlying landscape visual character and composition through the introduction of new elements. Composition of the view will alter however the sensitivity of the underlying landscape character to change is low, and the landscape has the capacity to mitigate and absorb the visual effects.* |
| 20-40% | **Moderate** | *Visible, evident, obvious* | *Moderate change in view: change will be distinguishable from the surroundings while the composition and underlying landscape visual character will be retained. The sensitivity of the existing landscape to change is low.* |
| 0-20% | **Slight** | *Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite* | *Slight change in view: change barely distinguishable from the surroundings. Composition and character of view is substantially unaltered.* |

*Table 2: Classification of Visual Effects*

## 5.2 Visual Impact Assessment

The visual effects resulting from the project are likely to be experienced at distances of 3 kilometres from the project site boundary. From locations 1 to 3 kilometres from the project, the visual effect has the potential to be pronounced as a result of the frequency, scale and visibility of the proposed infrastructure within the landscape, particularly with reference to the verticality of the receivers and the bands of infrastructure elements created by the heliostats arrays. The visual effect is described as moderate, increasing to substantial, with a percentage of visual change ranging from 30% to 38%.

The visual impact assessment demonstrates that the interpolated visual effect is consistent across the locality with similar degrees of visual change to the north, east, south and west. While the visual effect is described as moderate and visually prominent, existing landscape features, such as ridgelines, local landforms and belts of vegetation, mitigate the visual impacts.

To the northwest and southeast, the visual effects are reduced slightly, and the ridgeline along Pine Corner Road and vegetation screening to the west mitigate potential visual effects. However, the sensitivity of the underlying landscape to change is low due to the agricultural character.

Along the Birdseye Highway the heliostats and the lattice towers of the receiver appear as noticeable infrastructure elements due to their frequency and height. Across the local and sub-regional areas, the receivers are likely to remain visible.

South and east, the ridgeline associated with Pine Corner Road, screens a significant proportion of the project. The visibility of the project and the accompanying visual impacts are associated with the receivers. The ridgeline creates a visual envelope to the project area, limiting the number of visible receivers. Across the regional landscape character areas, the number of visible receivers increases due to the ridge that extends northeast-southwest between Cleve and Mount Priscilla.

To the west and southwest, the inland dunal system creates a complex visual character. The frequency and orientation of these dunal landforms fragment views of the project, reducing the number of receivers and heliostat fields that are visible.

At distances between 5 and 10 kilometres, the potential visibility of the project increases to the south and west. To the north and east, the visual effect is reduced by the broader landscape context, major ridgelines and back screening by existing landform and vegetation cover of Poolalalie Hill, and the project is likely to become a recessive visual element within the broader rural landscape of the locality.

The potential visual impact at distances greater than 10 kilometres from the project is likely to be slight to negligible. The project is likely to be seen as a distant visual effect created by the number of towers visible and glare within the broader southern landscape context.

Given the unique infrastructure character of the project, the visibility of the receivers and heliostat fields will vary depending on the relative viewpoint location and the time of day. At distances of between 1 and 3 kilometres, particularly from the south, east and west, the visual effect is likely to be caused by the receivers, forming brightly lit reflective infrastructure elements, creating glare in the landscape. The extent of this glare is illustrated in Figure 47.

The heliostat fields are likely to be visible as an infrastructure overlay across the rural landscape. The overlay of the heliostats will be punctuated by the receivers, creating a potential visual mass due to the frequency and concentration of the infrastructure elements across the project site.

The mirror panels of the heliostats are likely to be visible as a band of infrastructure that follows the underlying topography. The low profile of the heliostats means that local landforms and existing trees will screen and fragment the potential visual effect.

From locations to the north, the visual prominence of the heliostats will increase due to their colouration and orientation. The visual impact continues to increase with the elevation and topography of the ridge on the eastern edge of the site. While limiting the visual effect of the power blocks, the elevation and orientation of the ridgeline increase the visibility of the heliostats and receivers to the west and southwest.

Although the project is likely to result in a prominent degree of visual change, the defined visual character of the locality, the rural land use, and existing visual impacts from the substation upgrade mean that the Yadnarie Energy Project can be accommodated within the existing regional landscape character with moderate impacts on the immediate locality.

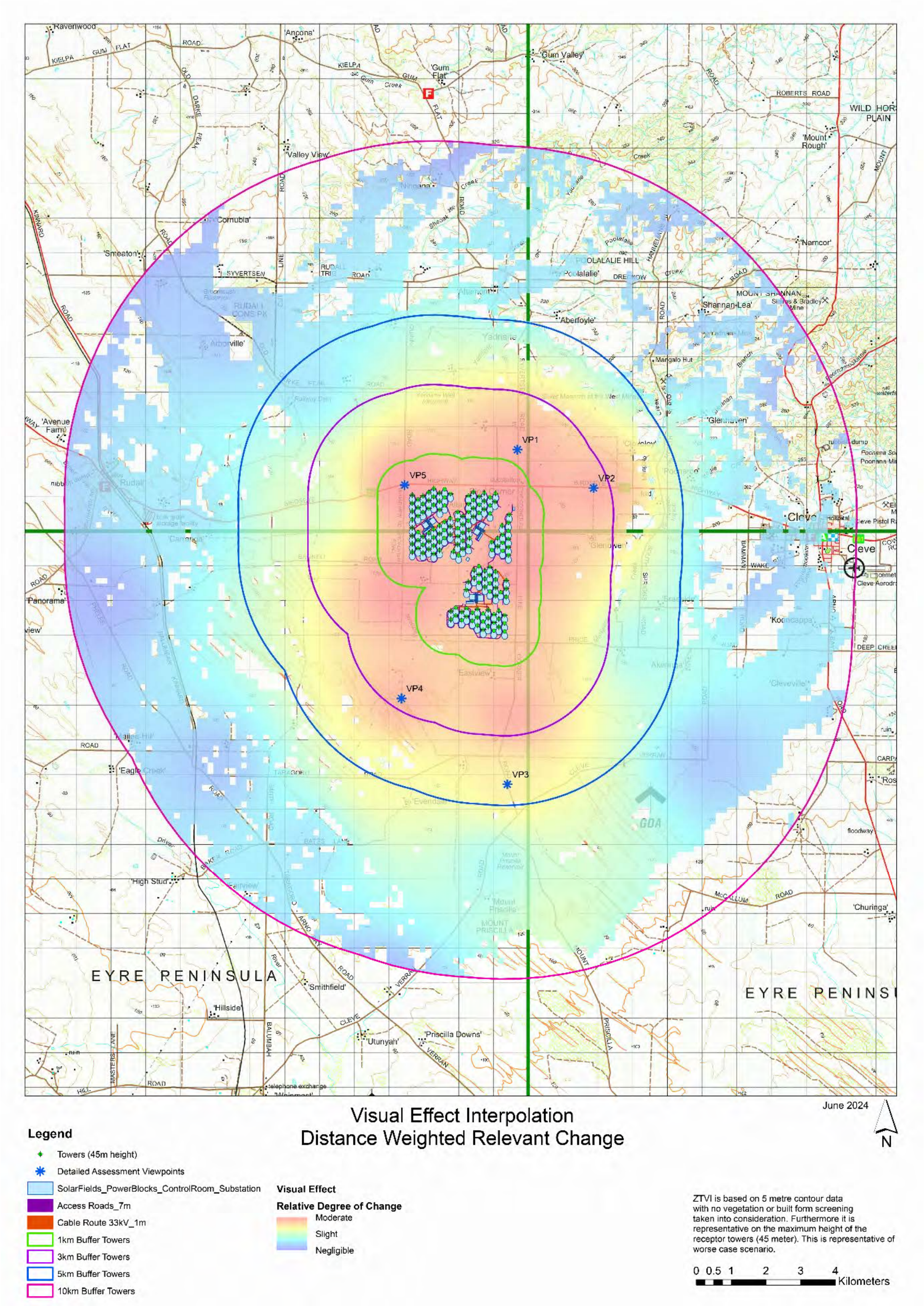

Figure 46: Summary of viewpoint visual effect

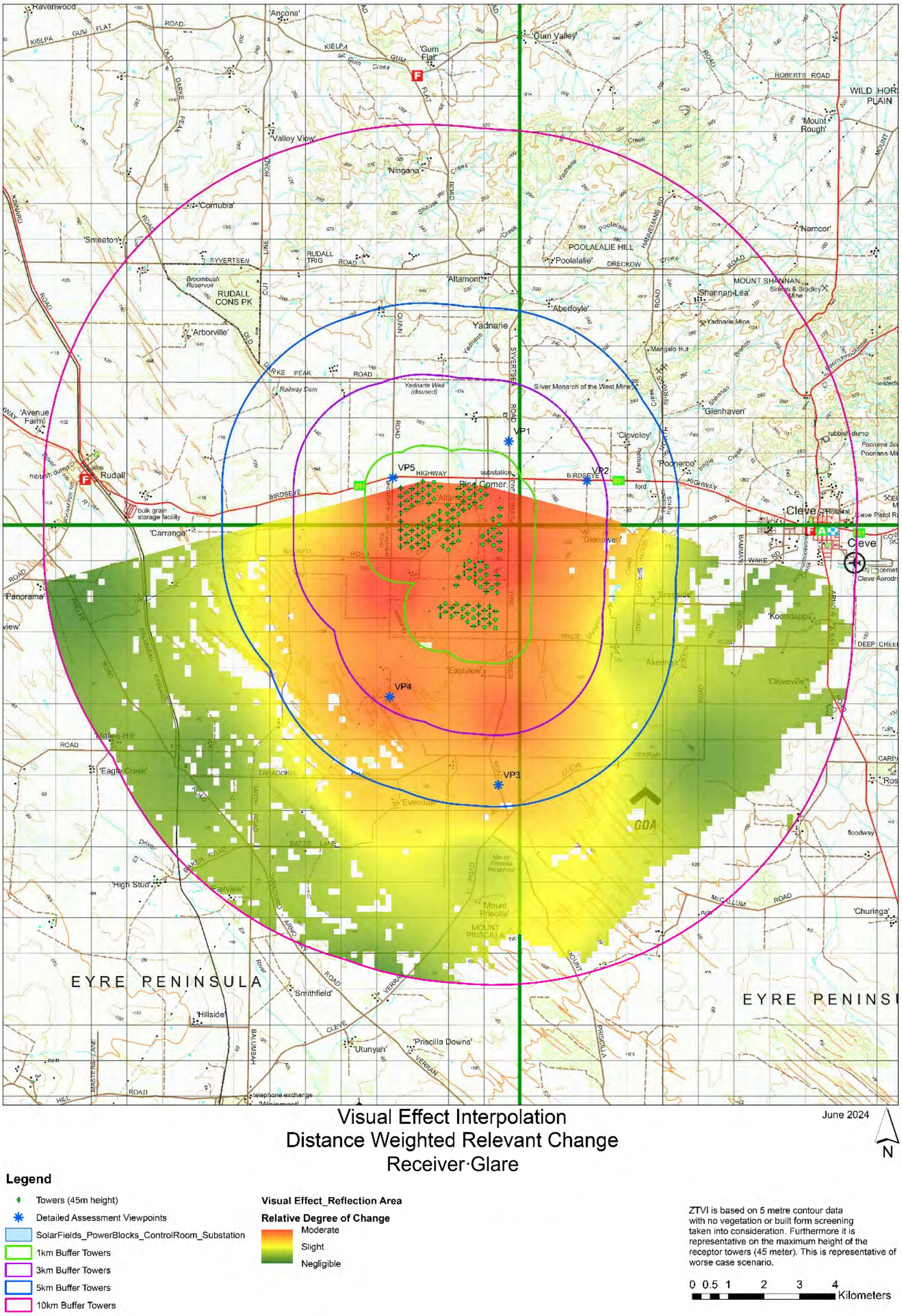

*Figure 47: Interpolated visual effect of receiver glare*

## 5.10 Visual Effect Assessment for Ancillary Infrastructure

In addition to the visual effect associated with heliostats and receivers, an assessment was undertaken to understand the anticipated visual effect of ancillary infrastructure, including power blocks, substation connections and access tracks.

## 5.11 Power Blocks, Control Buildings and Operational Maintenance Compound

The visual effect associated with the three power blocks is likely to be seen as a collection of industrial elements within the renewable energy infrastructure context of the project site.

The power block will consist of storage tanks, sheds, chiller units, and elevated pipe runs. The arrangement, form and visual mass of the power blocks will be visually different from the heliostats and receivers. The hot and cold water storage pits are likely to have limited visual impacts as they are covered and have associated earth bunding, which provides screening.

In this regard, the power blocks are likely to form noticeable visual elements that punctuate the modified landscape character and land use of the project from local viewpoints. However, as the power blocks are sited within the development and is set back from the boundary of the project site, it is limited in contribution to the scale and context of the visual effect.

## 5.12 Substation and Connection to Existing 132kV Line

The substation connection is anticipated to be relatively small, with a cut-in tower similar in scale and development form to the existing transmission towers in the locality. The location of an existing substation on the northern side of the Birdseye Highway ensures that the substation connection will be seen within the context of the existing infrastructure within the locality.

The vertical scale of the substation gantries (approximately 14 metres) is likely to produce a small increase in the degree of visibility within the locality of the substation. Further, the visual effect of the substation in relation to the overall effect of the receivers and heliostat is minimal, and its location in the centre of the site.

Views of the substation from the immediate locality adjacent to the project will be viewed in the context of the other infrastructure on the site, including the receivers, heliostats, and power blocks, limiting potential visual effects. In addition, the existing vegetation belts along Pine Corner Road and Birdseye Highway will provide additional screening.

Generally, from more distant views, the lattice tower construction of the gantries will become recessive, limiting the visual presence of the infrastructure. The recessive nature of the gantries will also be seen within the context of the existing transmission line infrastructure. The existing belts of vegetation to the north along the existing road corridor will reduce the visibility of this infrastructure.

## 5.13 Access Tracks

As part of the proposed development, compacted gravel tracks will be required across the site to access the power blocks, heliostats and receivers. It is anticipated that these access tracks will be extensive connecting the heliostats and power blocks. The form, materiality and colour of the new tracks will be in keeping with other tracks and roads in the area.

While the proposed tracks will appear as new forms of development post-construction, they will not appear out of character within the wider rural landscape. The track surface will be crushed rock sourced from a local supplier. Over time, the surface material is likely to weather and will be subject to the natural revegetation on the track edges, which will further reduce the associated visual effect.

To support the visual integration of the access tracks it is proposed supplementary revegetation be incorporated in a layered pattern adjacent to the site boundaries will support screening and depth of field. A vegetation plan that extends the landscape dunal pattern of northwest to southeast planting would be a consistent response to the site.

Finally, the visibility of the tracks needs to be assessed relative to the other development forms associated with the solar farm proposal. The potential visual effects of the tracks will always be secondary or partial when considered against the degree of visual change produced by the power blocks, heliostats and receivers. In this regard, the visual effect of the tracks is described as limited and will progressively diminish over time.

## 5.14 Design Mitigation

The management of the project's visual effects can be considered in relation to the site selection, the existing landscape characteristics and opportunities to supplement screening and landscape treatments to the boundary of the site and associated site entries and interspersed ridgelines.

The project site consists of low lying areas to the northwest and a ridgeline to the southeast. The low lying areas of the project site reduce the visual prominence of the associated infrastructure, particularly the visual impacts of the heliostats. The ridgeline to the east reduces the potential visual effects to the southeast while affording significant screening to the south.

The retention of the established vegetation across the project site will aid in visually fragmenting the infrastructure elements of the project, reducing the potential visual effect, particularly when viewed from the north, east and west. The retention of other areas of vegetation across the project site further fragments the potential visual effect.

Opportunities exist to increase tree planting along the property boundary to establish a second band of vegetation 5-10 metres in width within the site boundary. Furthermore, opportunities to provide revegetation to local ridgelines in a southeast to north-westerly direction would supplement the dunal system landscape pattern and relief, enhancing visual integration of the development form. These landscape treatments can establish a layered vegetation buffer, which will provide a denser screen of vegetation, reducing potential visual impact.

The existing vegetation within the locality demonstrates that a screening height of 8-10 metres can be achieved with the local Mallee species. The establishment of screening vegetation to this height, along with appropriate development buffers, would significantly reduce the visibility of the project, in particular from Viewpoint 5.

It is suggested that the following recommendations and new landscape treatments are implemented to the site boundaries, and other locations to increase the visual management. These include;

- Establish landscape buffers, particularly along the Birdseye Highway. This will fragment the visual mass and bulk of the development.
- Use local plant species. Established trees in the locality suggest that screening trees could reach a height of approximately 10 metres over 10-20 years.
- Consider mounding with swale combination to increase passive irrigation and plant establishment whilst increasing the height of the vegetation to increase potential visual screening. The planting will then create a layered vegetation screen.
- Landscape proposals immediately surrounding the development should be consistent with bushfire risk mitigation requirements.

Material selection and finishes, such as a galvanised or neutral grey finish should be considered for service buildings and other infrastructure to provide a contextual reference within the agricultural building with the rural landscape. Materiality and colour finishes should be selected that are consistent with the surrounding agricultural landscape character to provide additional visual management and enhancement and integration of the proposed development.

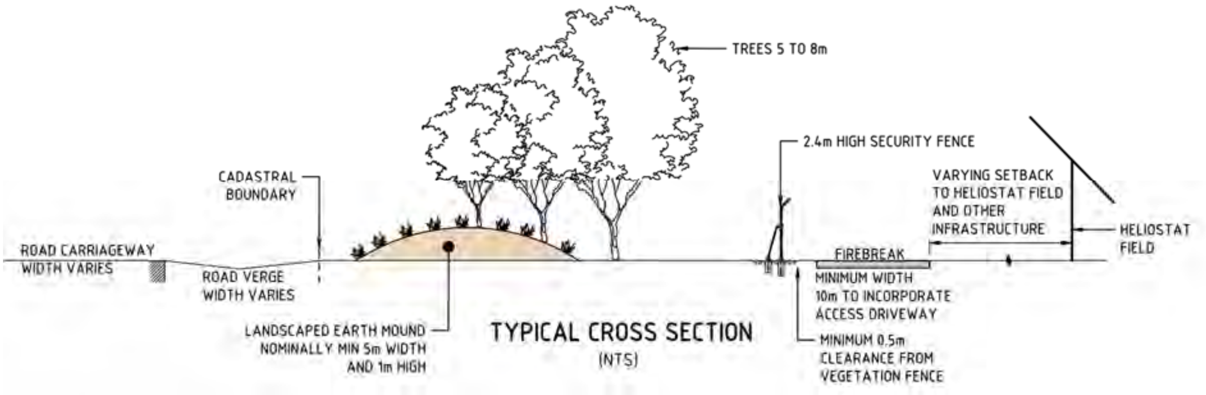

*Figure 48: Typical planting buffer detail (not to scale)*

# 06 Planning Assessment

# 06 Review of Planning and Design Code

## 6.1 Introduction

The following section details the relevant planning provisions under the Planning and Design Code (Code), version-2024.7 (dated 18 April 2024), that have been considered in relation to the potential visual effect of the project and associated infrastructure.

The intent of the review is to provide clarity as to the relevance and consistency with particular outcomes of the Code in relation to the development of renewable energy facilities and associated infrastructure, visual impacts, and the effects on the landscape character and amenity.

Following a review of the Code, consideration has been given to the following that directly relate to the project and the visual and landscape matters.

## 6.2 Planning and Design Code Review

| **Overview** | |
|---|---|
| **Property:** | • Section 39, Hundred of Yadnarie, in the area named Cleve in Certificate of Title Volume 6205 Folio 513;<br>• Section 44 Hundred of Yadnarie in the area named Rudall and Sections 46, 55, 56, 394 and 395 Hundred of Yadnarie in the area named Cleve, in Certificate of Title Volume 5940 Folio 707; and<br>• Section 28, Hundred of Yadnarie, in the area named Cleve, in Certificate of Title Volume 6274 Folio 890 |
| **Zone:** | Rural Zone |
| **Overlays:** | • Environment and Food Production Area<br>• Hazards (Bushfire - General)<br>• Hazards (Flooding - Evidence Required)<br>• Native Vegetation<br>• Traffic Generating Development<br>• Urban Transport Routes<br>• Water Resources |
| **Proposed Development:** | A solar power and energy storage renewable energy facility, incorporating 150MWac solar generation, 90MW grid connection/ 720 Megawatt hours of storage (and 12 hours of dispatchable energy), with connection to the Yadnarie substation or 132kV overhead transmission line and ancillary infrastructure. |
| **Assessment Pathway** | Code Assessed – Performance Assessed |
| **Planning Authority** | District Council of Cleve |

| Land Use Definition | | Includes |
|---|---|---|
| **Renewable Energy Facility** | Means land and/or water used to generate electricity from a renewable source such as wind, solar, tidal, hydropower, biomass and/or geothermal. This use may also include:<br>a) any associated facility for the storage and/or transmission of the generated electricity;<br>b) any building or structure used in connection with the generation of electricity. | Battery storage facility;<br>Hydropower or pumped hydropower facility;<br>Solar power facility;<br>Wave power generator;<br>Wind farm |

ASSESSMENT CONSIDERATIONS

| Zone - Rural | | Assessment Response |
|---|---|---|
| **DO 1** | A zone supporting the economic prosperity of South Australia primarily through the production, processing, storage and distribution of primary produce, forestry and the generation of energy from renewable sources. | The project is aligned with the desired outcomes of the Rural Zone. The primary function of the project is energy storage which includes energy produced by renewable sources. |
| **PO 1.1** | The productive value of rural land for a range of primary production activities and associated value adding, processing, warehousing and distribution is supported, protected and maintained.<br>DTS/DPF 1.1 Development comprises one or more of the following:<br>(s) Renewable energy facility | The project is associated with the production and storage of energy from renewable sources. |
| **PO 2.2** | Buildings are generally located on flat land to minimise cut and fill and the associated visual impacts. | The development of the land will include balanced cut and fill areas across the project site. The extent of the earthworks will create minor landform variations within the topographic context of the locality. The cut and fill also offers the potential for mounding and screening of the project, which will reduce some visual impacts. |

| Zone - Rural | | Assessment Response |
|---|---|---|
| **PO 9.1** | Renewable energy facilities and ancillary development minimises significant fragmentation or displacement of existing primary production. | The project is likely to result in changes to the visual character of the locality, especially within the local and sub-regional locality around the project. The project is located adjacent to an existing substation, and a transmission line runs through the site.<br>The proposed location consolidates infrastructure-related land use in the locality. The location also reduces the extent and spread of potential visual effects across the broader rural landscape due to the visual mitigation provided by local ridgelines and belts of vegetation.<br>In addition to the potential visual mitigation offered by existing landscape features, the infrastructure layout and development footprint does not exclude agricultural land uses such as grazing on the project site. |
| **PO 10.1** | Large buildings are designed and sited to reduce impacts on scenic and rural vistas by:<br>a) having substantial setbacks from boundaries and adjacent public roads<br>b) using low-reflective materials and finishes that blend with the surrounding landscape<br>c) being located below ridgelines. | The scale and form of the project will include large buildings associated with the power blocks however the scale and siting design limits the visual impact from local and subregional receptors.<br>It is suggested the project will use grey tones and a low reflective finish to increase the recessive visual character of the infrastructure elements.<br>The earthworks across the site will provide opportunities for mounding and embankments that can be planted. This combination of landscape and landform reduces the visual impacts. |

The Planning Overlays associated with the site have been reviewed with specific reference to the landscape character and visual impact. The project proposes to retain large stands of native vegetation which dissect the site creating visual buffers and fragmented screens, these areas also support areas of landscape amenity.

| Overlays | | |
|---|---|---|
| **Environment and Food Production Area** | **DO 1** | Protection of valuable rural, landscape, environmental and food production areas from urban encroachment. |
| **Hazards (Bushfire - General)** | **PO 1.1** | Buildings and structures are located away from areas that pose an unacceptable bushfire risk as a result of vegetation cover and type, and terrain. |
| | **PO 2.1** | Buildings and structures are designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against or underneath the building or structure, or between the ground and building floor level in the case of transportable buildings and buildings on stilts. |

| Overlays | | |
|---|---|---|
| **Hazards (Flooding – Evidence Required)** | **DO 1** | Development adopts a precautionary approach to mitigate potential impacts on people, property, infrastructure and the environment from potential flood risk through the appropriate siting and design of development. |
| **Native Vegetation** | **DO 1** | Areas of native vegetation are protected, retained and restored in order to sustain biodiversity, threatened species and vegetation communities, fauna habitat, ecosystem services, carbon storage and amenity values. |
| | **PO 1.1** | Development avoids, or where it cannot be practically avoided, minimises the clearance of native vegetation taking into account the siting of buildings, access points, bushfire protection measures and building maintenance. |
| | **PO 1.4** | Development restores and enhances biodiversity and habitat values through revegetation using locally indigenous plant species. |
| **Water Resources** | **DO 1** | Protection of the quality of surface waters considering adverse water quality impacts associated with projected reductions in rainfall and warmer air temperatures as a result of climate change |
| | **PO 1.5** | Development that increases surface water run-off includes a suitably sized strip of vegetated land on each side of a watercourse to filter runoff to:<br>reduce the impacts on native aquatic ecosystems minimise soil loss eroding into the watercourse. |
| **Traffic Generating Development** | **DO 2** | Provision of safe and efficient access to and from urban transport routes and major urban transport routes. |
| **Urban Transport Routes** | **DO 1** | Safe and efficient operation of Urban Transport Routes for all road users. |
| **Key Outback and Rural Routes Overlay** | **DO 1** | Safe and efficient movement of vehicle and freight traffic on Key Outback and Rural Routes |

| **General Provisions – Infrastructure and Renewable Energy Facilities** | | **Assessment Response** |
|---|---|---|
| **DO 1** | Efficient provision of infrastructure networks and services, renewable energy facilities and ancillary development in a manner that minimises hazard, is environmentally and culturally sensitive and manages adverse visual impacts on natural and rural landscapes and residential amenity. | The project is located within a rural landscape adjacent to an existing substation. Potential visual effects are contained within a defined locality with increased visual impacts to the southeast and south of the project.<br>The visual impacts are likely to be contained within a defined locality, and are described as moderate increasing towards substantial. At distances greater than 5 kilometres, the visual effects of the project are reduced, and existing landforms and vegetation mitigate the visual effect. The potential for supplementary landscape treatments to the project boundary further reduces potential visual effects. |

| General Provisions – Infrastructure and Renewable Energy Facilities | | Assessment Response |
|---|---|---|
| | | The location, land use, existing infrastructure and proposed landscape treatments mean that significant adverse visual impacts on rural character are managed. |
| **PO 2.1** | The visual impact of above-ground infrastructure networks and services (excluding high voltage transmission lines), renewable energy facilities (excluding wind farms), energy storage facilities and ancillary development is minimised from townships, scenic routes and public roads by:<br>c) utilising features of the natural landscape to obscure views where practicable<br>d) siting development below ridgelines where practicable<br>e) avoiding visually sensitive and significant landscapes<br>f) using materials and finishes with low-reflectivity and colours that complement the surroundings<br>g) using existing vegetation to screen buildings<br>h) incorporating landscaping or landscaped mounding around the perimeter of a site and between adjacent allotments accommodating or zoned to primarily accommodate sensitive receivers. | The LVIA illustrates that the project is located in a defined locality, including;<br>• Additional landscape planting to the boundary of the project<br>• Balanced cut and fill that sets the eastern boundary below the local ridgeline, screening the project to the east<br>• Potential mounding and supplementary planting to the western boundary to screen the project from sensitive receivers (dwelling) further west. |
| **PO 2.2** | Pumping stations, battery storage facilities, maintenance sheds and other ancillary structures incorporate vegetation buffers to reduce adverse visual impacts on adjacent land. | Recommendations have been made as part of the LVIA to meet the performance outcomes and demonstrate the potential mitigation that can be achieved by supplementary landscape treatments and mounding to the perimeter of the site in localities identified as being more sensitive to visual change. |
| **PO 2.3** | Surfaces exposed by earthworks associated with the installation of storage facilities, pipework, penstock, substations and other ancillary plant are reinstated and revegetated to reduce adverse visual impacts on adjacent land. | Areas of proposed hardstanding will not be vegetated to allow the ongoing operation of the site. However, significant areas of landscaping using native plants are recommended as part of the LVIA. |
| **PO 5.1** | Electricity infrastructure is located to minimise visual impacts through techniques including:<br>a) siting utilities and services:<br>i. on areas already cleared of native vegetation | The performance objectives associated with PO5.1 are met through the following outcomes:<br>• The subject land has been cleared of native vegetation and is currently used for cropping |

| General Provisions – Infrastructure and Renewable Energy Facilities | Assessment Response |
|---|---|
| ii. where there is minimal interference or disturbance to existing<br>iii. native vegetation or biodiversity<br>b) grouping utility buildings and structures with non-residential development, where practicable. | • The agricultural land use means that there is no impact on any native vegetation.<br>• The project is located adjacent to the existing substation, reducing potential visual impacts in the broader locality.<br>• Visual effects will be minimised through recommendations in the LVIA for supplementary landscape treatments and mounding. |

## 07 Viewer Sensitivity

The preceding assessment considers the visual effect of the project from various locations having regard to the existing landscape quality and the degree of visual change on the existing environment. It does not measure the extent to which a viewer’s response or sensitivity to landscape changes and how this influences the perception of visual effect.

Fundamental to the viewer’s sensitivity is the degree to which visual change is perceived or experienced and whether this is seen as a positive or negative visual effect.

Whether the change is perceived as positive or negative will depend on the viewer’s opinion of renewable energy and what the project represents in terms of sustainability.

The truth may be that within all user groups, be they locals, tourists, walkers or weekenders, a spectrum of opinions can be expected based on differing views on the receiving landscape, the visibility of the project and renewable energy itself. The final level of viewer sensitivity becomes the viewer's personal preference as to whether the visual change is positive or negative, as an assessment of social or demographic groups can only be subjective; it does not form part of this discussion.

## 08 Conclusion

## 08 Conclusion

The landscape and visual impact assessment indicates that the Yadnarie Energy Project will be developed in a modified rural landscape with a defined visual character. The topography of the Poolalalie Hill, Mount Priscilla and the local ridge line along Pine Corner Road create a visual envelope to the north, east and southeast of the project. To the west and southwest, the inland dunal system and the associated remnant vegetation create a distinct visual and landscape character that fragments the visibility of the project.

The landscape character of the locality, coupled with woodland areas and pockets of vegetation, creates a defined visual character. At distances greater than 5 kilometres, the visibility of the project is reduced, and the visual impacts across the broader rural effects become limited.

The potential visual effects are likely to be most notable from the northeast and southwest within the local to sub-regional locality. The number and spread of receivers and heliostats are likely to produce a moderate visual effect within the sub-regional locality with notable areas within the local 1-3 km distance, increasing to a substantial visual effect. The infrastructure associated with the project has the potential to appear in the landscape as prominent visual elements spread across the undulating landform of the project site.

To the northwest and southeast, the visual effects are reduced slightly, and the ridgeline along Pine Corner Road and vegetation screening to the west mitigate potential visual effects. However, the sensitivity of the underlying landscape to change is low due to the agricultural character.

Across the sub-regional landscape, local ridgelines, inland dunal systems and tree belts create defined visual screens that reduce and remove the visual effects of the project. The combination of topography and vegetation provides additional visual mitigation, and the degree of visual change is reduced, described as slight.

At distances of over ten kilometres within the regional locality, the degree of visual change reduces significantly and is described as negligible.

The associated infrastructure, power blocks, substations, and transmission lines will provide localised impacts to their immediate site localities. These visual effects will be limited to shorter distances (contained viewsheds). There will be no visual effect on the townships of Cleve and Rudall. Transient visual impacts will be experienced along the Birdseye Highway.

The visual assessment and visual effect interpolation mapping illustrate the relationship between distance and visual effect, the contained locality and the effect of local ridgelines and vegetation in reducing the visibility of the project in the wider locality. The visual effect is represented as bands of visual change radiating from the project. The existing landscape character means that topography and distance are the dominant variables in mitigating the visual effect.

Although the visual impact is likely to be moderate, the visual effects are contained within a defined locality. Consequently, the LVIA concludes that the Yadnarie Energy Project can be accommodated within the existing regional landscape character with moderate impacts on the immediate locality.

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PhD, BLarch, BDest, AILA Registered Landscape Architect

# Landscape Character and Probable Visual Effect Assessment: Appendices

## Yadnarie Energy Project

Photon Energy and RayGen Australia Pty Ltd

## 5 September 2024

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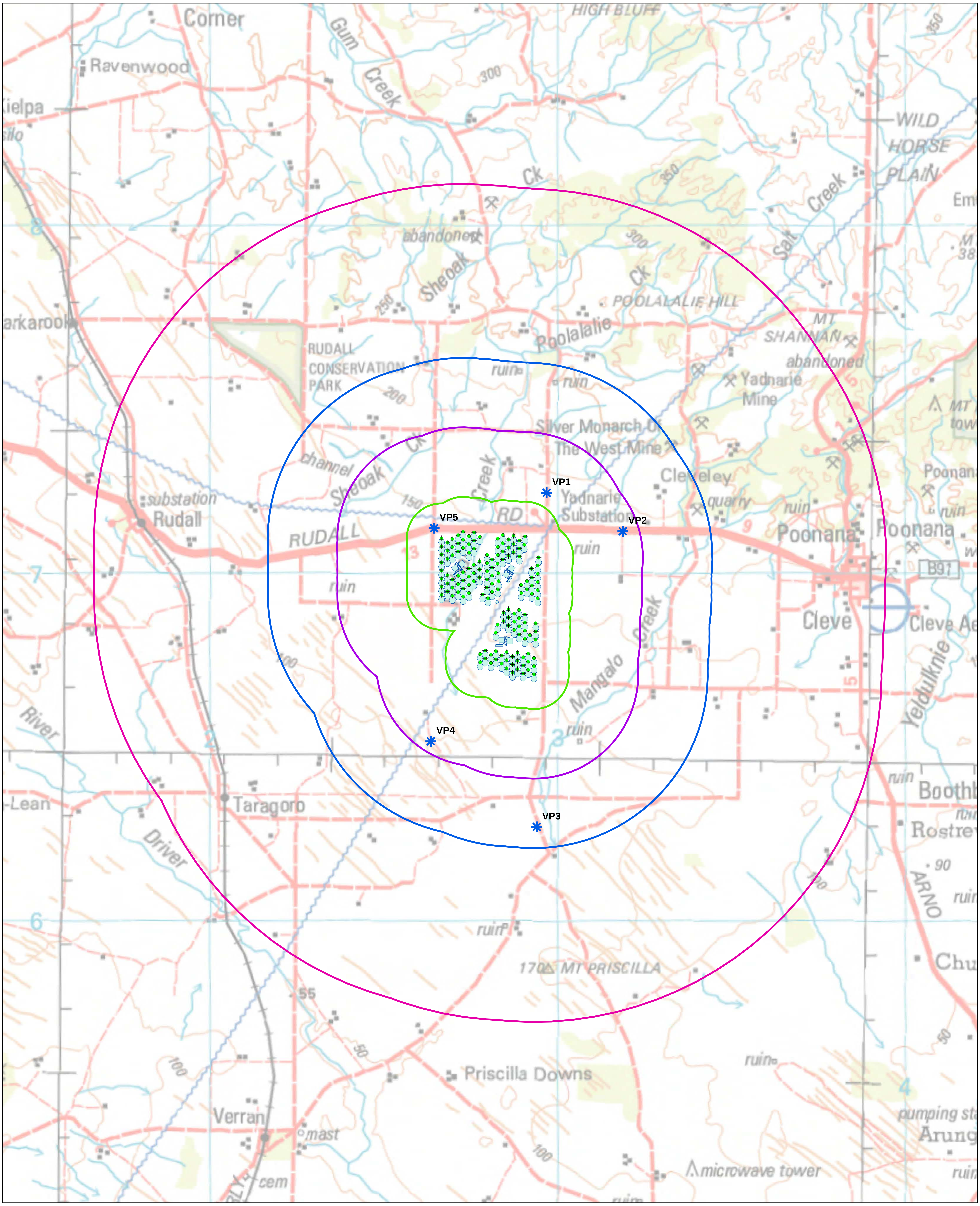
# Appendix A
## Assessment Mapping



May 2024

## Detailed Assessment Viewpoints

**Legend**

- ✱ Detailed Assessment Viewpoints
- ◆ Towers
- ▨ SolarFields_PowerBlocks_ControlRoom_Substation
- 🟩 1km Buffer Towers
- ▢ 3km Buffer Towers
- ▢ 5km Buffer Towers
- ▢ 10km Buffer Towers

N

0 0.75 1.5 3 4.5 6 Kilometers

May 2024

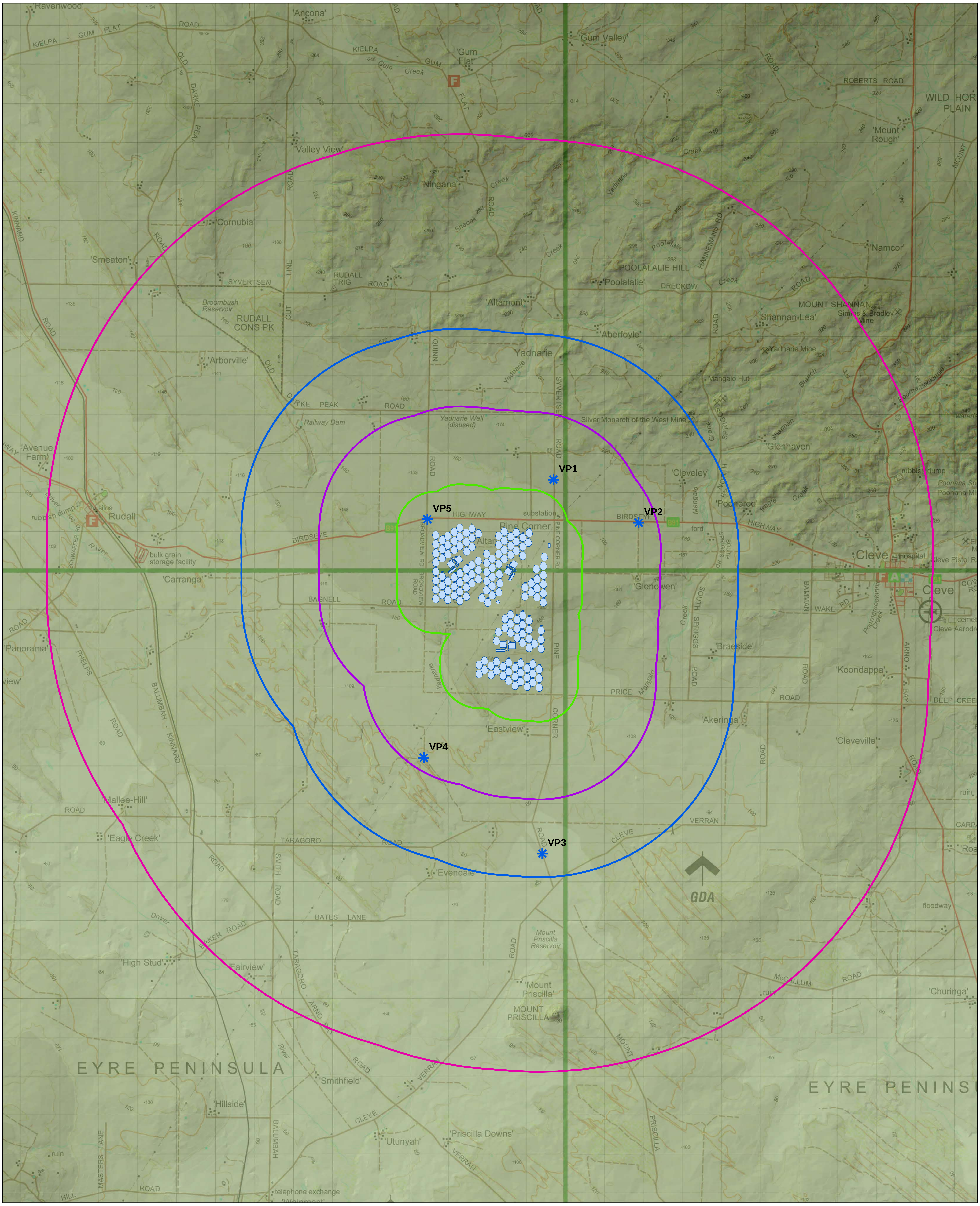
## Site Context

**Legend**

- ✱ Detailed Assessment Viewpoints
- 🟩 1km Buffer
- 🟪 3km Buffer
- 🟦 1km Buffer
- 🟥 10km Buffer
- 🟩 SolarFields_PowerBlocks_ControlRoom_Substation
- 🟧 Access_Roads_7m
- 🟦 Cable_Route_33kV_1m
- ▨ DC_Inverter_Cables_1m
- 🟦 Main_Roads_10m
- 🟩 Water_Corridor_7_5m

N

0 0.5 1 2 3 4 Kilometers

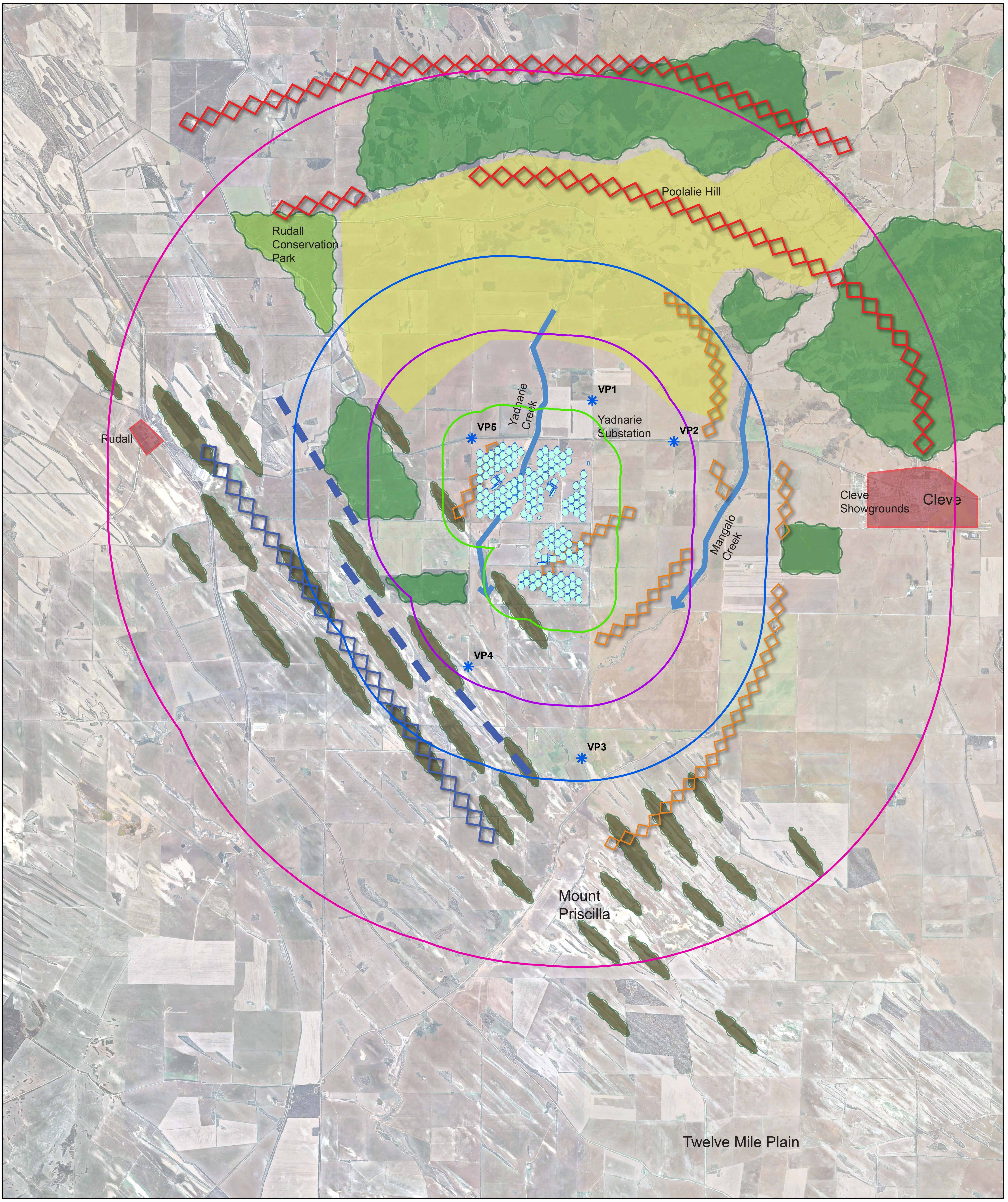


May 2024

# Digital Terrain Model

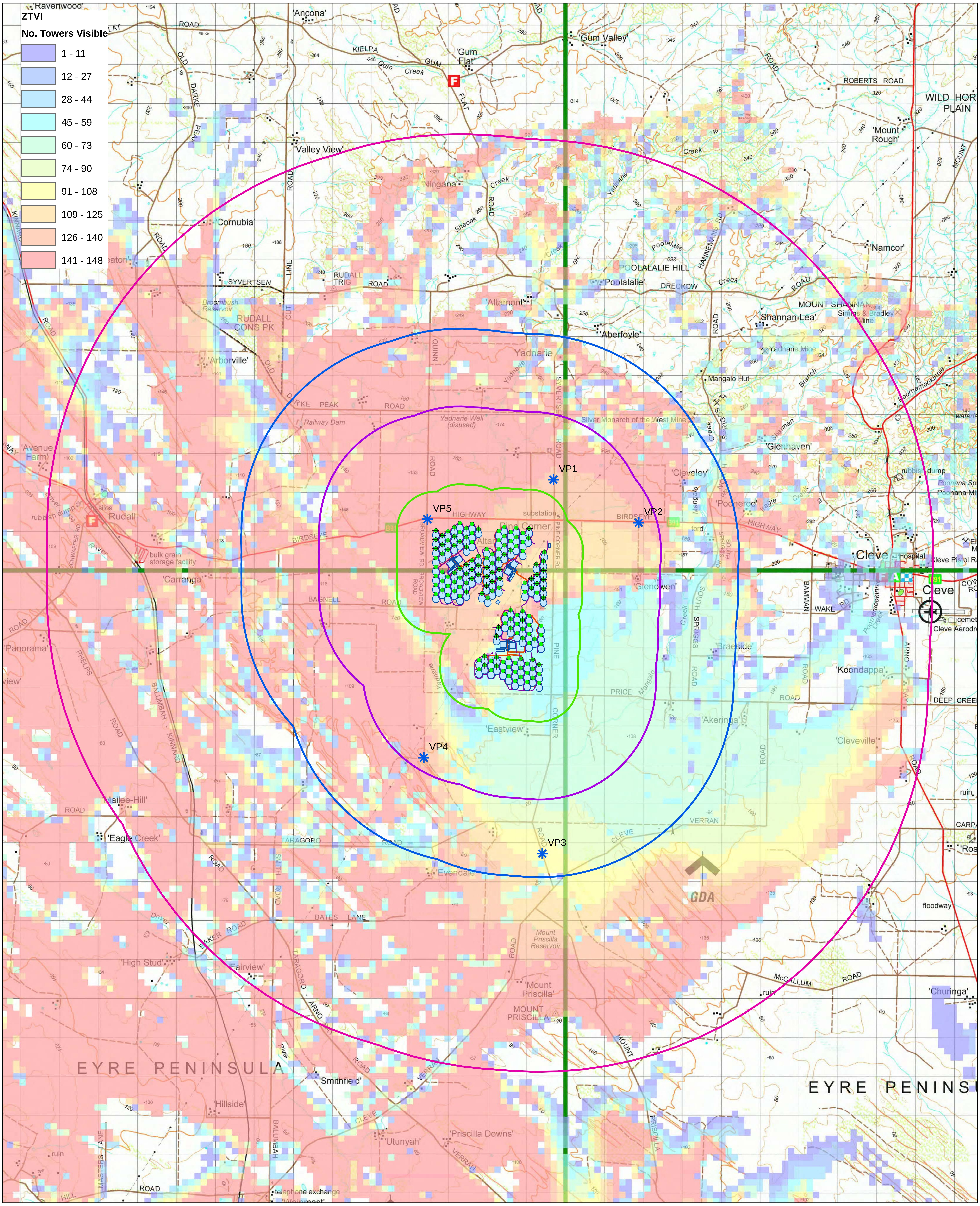
## Legend

| | |
|---|---|
| ✱ | Detailed Assessment Viewpoints |
| 🟦 | SolarFields_PowerBlocks_ControlRoom_Substation |
| 🟩 | 1km_Buffer_Towers_revc |
| 🟪 | 3km_Buffer_Towers_revc |
| 🟦 | 5km_Buffer_Towers_revc |
| 🟪 | 10km_Buffer_Towers_revc |
| 🟥 | Land Allocation |



May 2024

# Landscape Character



# Zone of Theoretical Visual Influence (ZTVI)

May 2024

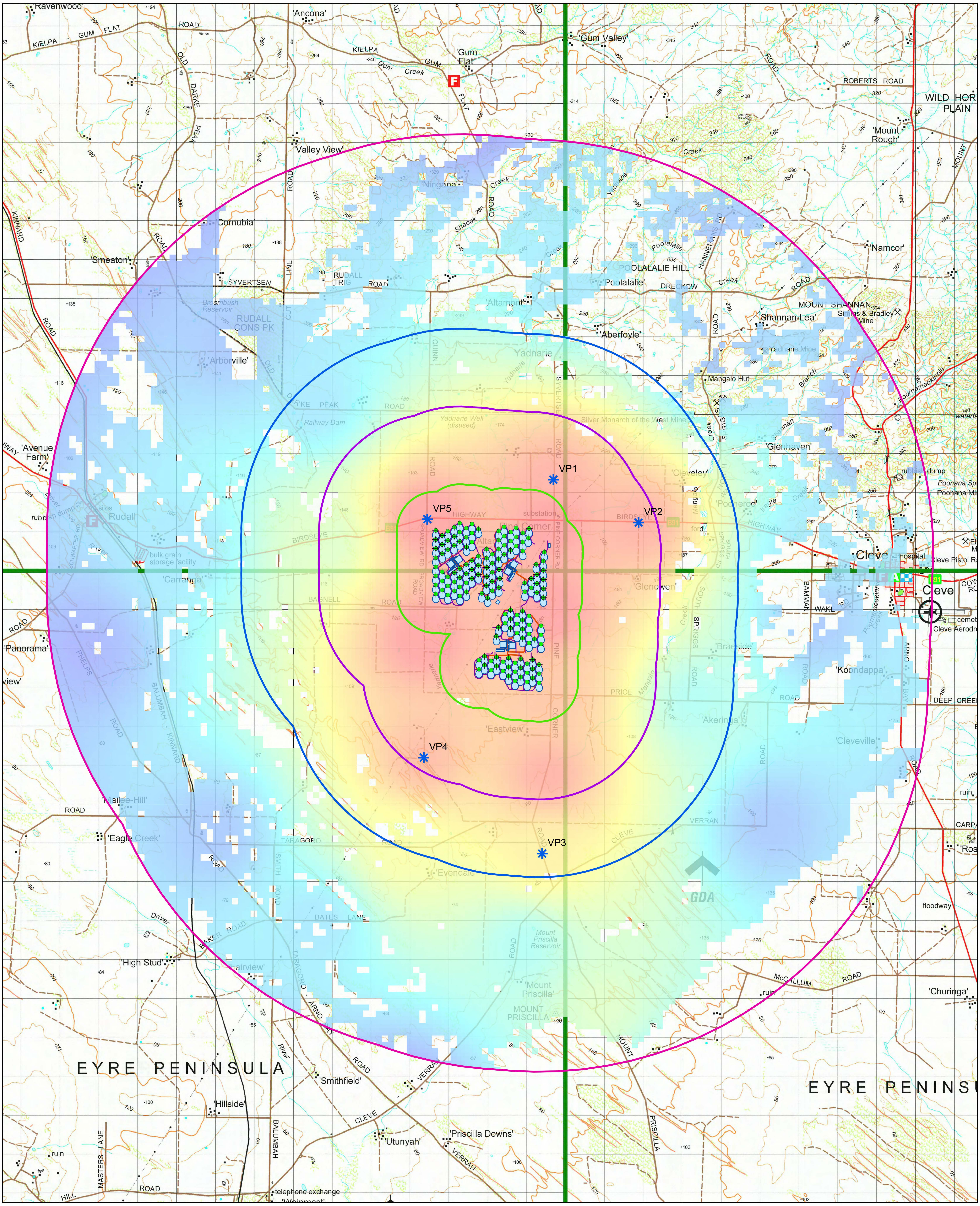
N

## Legend

- • Towers (45m height)
- ✱ Detailed Assessment Viewpoints
- 🟦 SolarFields_PowerBlocks_ControlRoom_Substation
- 🟪 Access Roads_7m
- 🟧 Cable Route 33kV_1m
- ☐ 1km Buffer Towers
- ☐ 3km Buffer Towers
- ☐ 5km Buffer Towers
- ☐ 10km Buffer Towers

ZTVI is based on 5 metre contour data with no vegetation or built form screening taken into consideration. Furthermore it is representative on the maximum height of the receptor towers (45 meter). This is representative of worse case scenario.

0 0.5 1 2 3 4 Kilometers



June 2024

# Visual Effect Interpolation
# Distance Weighted Relevant Change

N

**Legend**

- ✱ Towers (45m height)
- ✱ Detailed Assessment Viewpoints
- 🟦 SolarFields_PowerBlocks_ControlRoom_Substation
- 🟪 Access Roads_7m
- 🟧 Cable Route 33kV_1m
- ☐ 1km Buffer Towers
- ☐ 3km Buffer Towers
- ☐ 5km Buffer Towers
- ☐ 10km Buffer Towers

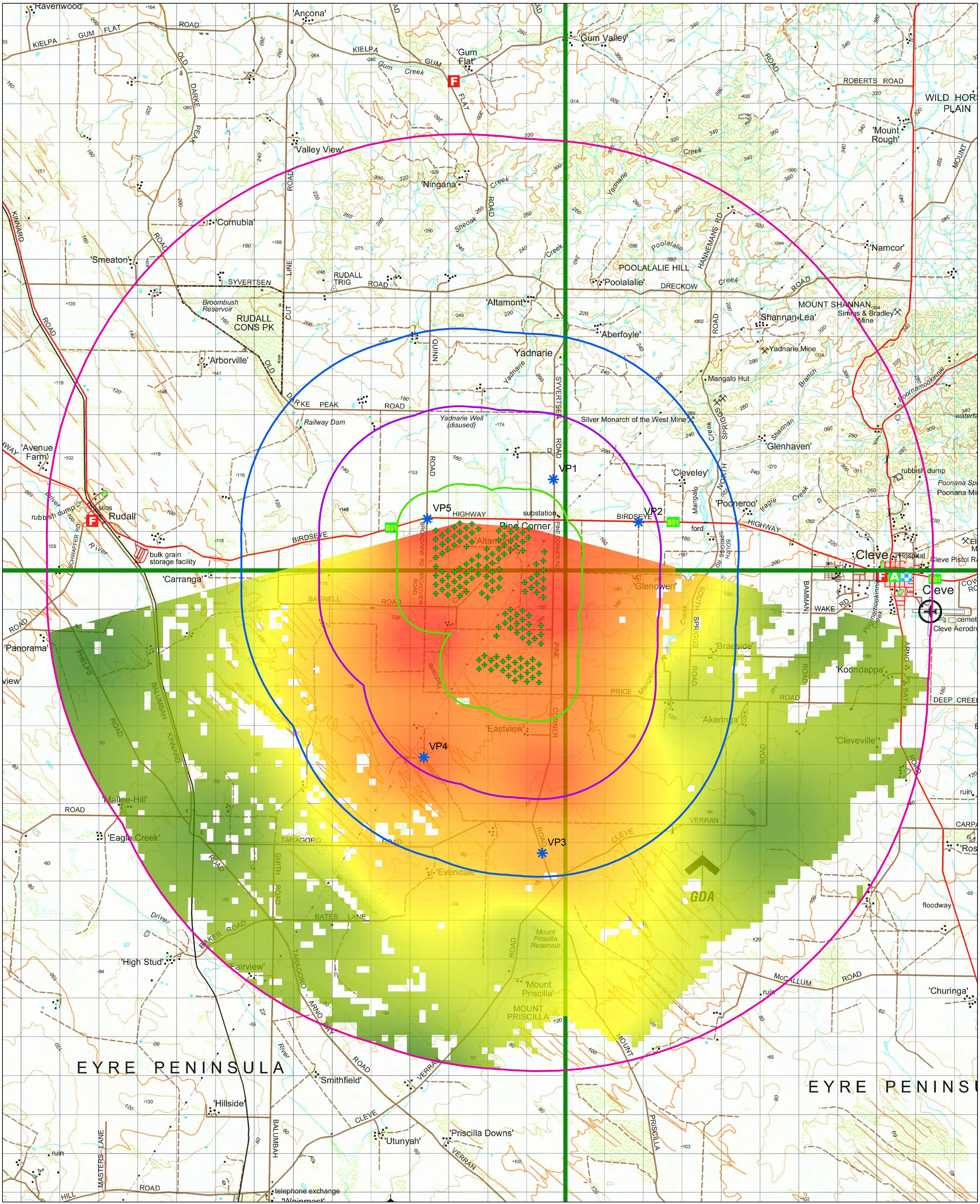
**Visual Effect**

**Relative Degree of Change**

- Moderate
- Slight
- Negligible

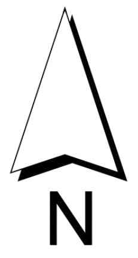
ZTVI is based on 5 metre contour data with no vegetation or built form screening taken into consideration. Furthermore it is representative on the maximum height of the receptor towers (45 meter). This is representative of worse case scenario.

0 0.5 1 2 3 4 Kilometers



# Visual Effect Interpolation
# Distance Weighted Relevant Change
# Receiver Glare

June 2024



**Legend**

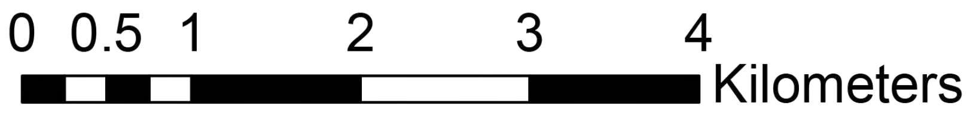
- ✦ Towers (45m height)
- ✱ Detailed Assessment Viewpoints
- ▭ SolarFields_PowerBlocks_ControlRoom_Substation
- ▭ 1km Buffer Towers
- ▭ 3km Buffer Towers
- ▭ 5km Buffer Towers
- ▭ 10km Buffer Towers

**Visual Effect_Reflection Area**

**Relative Degree of Change**

- Moderate
- Slight
- Negligible

ZTVI is based on 5 metre contour data with no vegetation or built form screening taken into consideration. Furthermore it is representative on the maximum height of the receptor towers (45 meter). This is representative of worse case scenario.



# Appendix B

Photographic Methodology (produced by Convergen)

**The method consists of 6 stages. The following summarises the stages;**

1. Viewpoints are identified using a Zone of Theoretical Visibility map, site assessment and in consultation with the client and residents in the area. The viewpoints are selected to represent the worse case scenario i.e. the maximum number of turbines visible within the field of view. The locations of viewpoints are typically representative of the regional landscape character units or identified by residents. The locations represent a diverse range of views from around the wind farm at a variety of directions and distances.

2. Photos are taken onsite using a 32mm lens digital SLR camera (50mm equivalent analogue). Numerous research papers have concluded that this is most representative of the human eye for depth of field. Photos are taken on a mounted tripod and the height recorded to eye level. In addition the elevation of the viewpoint is recorded Above Sea Level (ASL) using the barometric measure on a handheld GPS device. The weather and time of day are also recorded to enable computer model rectification in stage 4 and 6 of the process.

3. The centre of the field of view is equated onsite using a bearing compass and GPS to the projected centre of the development. A field of view of 60 degrees to either side of centre is established onsite to provide the full 120 degrees. The extent of the field of view is recorded and evaluated onsite using the GPS and bearing compass. 6 photos are taken for each viewpoint with 1/3 overlap of each to enable photo stitching. The bearing to centre of each photo is recorded to enable cross reference to the next phase of developing a computer model. During the site photography numerous fixed known visual markers are recorded with a GPS location and bearing from the viewpoint. These markers provide reference points within the computer modelling for due diligence.

4. To generate the panoramic photographs the individual photographs are stitched together using PTGui software.

5. The next stage of the process involves the computer generation of a wire frame perspective view of the wind farm, which incorporates the topography from each viewpoint. Using the Wind Farmer™ software the wire frame is produced using a digital terrain model with 10 metre contour intervals. This creates the topography and positions the turbines at the correct coordinates and elevation within the wire frame. The correct field of view is established by matching the viewing centre of the view angle to the camera and lens used for the photography with the wire frame. This ensures that the image size and angle of view of the wire line matches the photos taken. The wire line is then superimposed on the stitched panoramic photograph and matched in accordance to reference markers and landscape features.

6. A second site visit is conducted with the preliminary wire lines to certify the correct locations of the turbines using a GPS and bearing compass. Minor alterations are marked up on the drafts to mitigate the effects of photographic warping to the periphery of the stitched panorama. Ground truthing the turbine locations, provides rigour to the process. Typically if any amendments are required they are within 1-5 degrees.

7. Once the wire frame and photograph have been lined up the rendered image of the turbines are created. The rendered model is created in Wind Farmer™ using the correct sun angle for the date and time of the day that the photograph was taken. The rendered model is exported to Photoshop™ for final matching with the photograph. The rendered image is edited, masking turbines or parts their off that are screened by vegetation and other elements to the foreground. Additional visual effects are applied to match the lighting effects of shadow imposed by vegetation etc.

**Viewing of Photomontages**

Given that the objectives of photography and photomontage are to produce printed images of a size and resolution sufficient for use in assessment work in the field, the exact dimensions of these images will depend on the characteristics of the field of view.

All photographs, whether printed or digitally displayed, have a unique, correct viewing distance - that is, the distance at which the perspective in the photograph correctly reconstructs the perspective seen from the point at which the photograph was taken. The correct viewing distance is stated for all printed or digitally displayed photographs and photomontages, together with the size at which they should be printed.

The viewing distance and the horizontal field of view together determine the overall printed image size.
Photographs and photomontages should be printed or published digitally at an appropriate scale for comfortable viewing at the correct distance, noting the limitations of the printing process particularly with regards to colour and resolution. Guidance is provided on viewing the image in order to best represent how the proposal would appear if constructed, such as the required viewing distance between the eye and the printed image. Panoramic images should be curved so that peripheral parts of the image are viewed at the same intended viewing distance. The ‘before’ photograph and the ‘after’ photomontage should be presented on the same page and/or at the same scale to allow comparison if practicable.

## References

Landscape Institute Photography and photomontage in landscape and visual impact assessment (March 2011)

Landscape Institute and IEMA (2002) Guidelines for landscape and visual impact assessment (2nd ed). London: Spon.

Scottish Natural Heritage (2006) Visual representation of windfarms: good practice guidance. Inverness: Scottish Natural Heritage. SNH report no. FO3 AA 308/2

# Appendix C

## Photomontages

Used in the GrimKe visual assessment and referred to in sections 5.3 – 5.7 of the Landscape Character and Probable Visual Effect Report

## VIEWPOINT 1: SYVERTSEN ROAD

BASE PHOTOGRAPHY

WIRE LINE

VIEWPOINT 1: SYVERTSEN ROAD

PHOTOMONTAGE

## VIEWPOINT 2: BIRDSEYE HIGHWAY

BASE PHOTOGRAPHY

WIRE LINE

VIEWPOINT 2: BIRDSEYE HIGHWAY

PHOTOMONTAGE

# VIEWPOINT 3: PINE CORNER ROAD

BASE PHOTOGRAPHY

WIRE LINE

## VIEWPOINT 3: PINE CORNER ROAD

PHOTOMONTAGE

## VIEWPOINT 4: BROADVIEW ROAD

BASE PHOTOGRAPHY

WIRE LINE

## VIEWPOINT 4: BROADVIEW ROAD

PHOTOMONTAGE

VIEWPOINT 5: INTERSECTION OF BIRDSEYE HIGHWAY, QUINN ROAD AND BROADVIEW ROAD

BASE PHOTOGRAPHY

WIRE LINE

VIEWPOINT 5: INTERSECTION OF BIRDSEYE HIGHWAY, QUINN ROAD AND BROADVIEW ROAD

PHOTOMONTAGE

# Appendix D
## GrimKe Assessment Matrix

The GRIMKE Matrix has been based on the WAX (2006) and HASSELL Matrix (2005), and with reference to The Visual Management System (VMS) produced by Litton (1968) primarily used for the U.S. Forest Service (1973) and the US Bureau of Land Management (1980). These models are based on a professional consultant (Landscape Architect) quantifying potential changes to landscape composition through “forms, lines, colours and textures and their interrelationships”1. Other factors such as compositional qualities, dominance, variety, animation and sensitivity to potential receptors are also considered.

The extent of visual impact was identified on site, using a GPS with a Wide Area Augmentation System (WAAS) that provides positional accuracy to within 3 metres.i Using the GPS, the location and extent of the development was plotted as 'waypoints', using longitude and latitude, elevation and distances to provide geographic referenced data. The surrounding area was then surveyed with the GPS and a SILVAii bearing compass to calculate the bearing and distance between the viewpoint and the subject area. This methodology was used to assess where the development is in the landscape and whether it is visible.

The GrimKe Matrix considers two key aspects in terms of understanding visual impact and the resulting visual assessment. The initial assessment is a quasi-objective measurement, where a landscape architect considers the landscape character of the site and particularly in relation of this landscape to the viewpoints that have been selected as part of the assessment criteria. Each viewpoint is then assessed in terms of:

- Relief (the complexity of the land that exists as part of the underlying landscape character)
- Vegetation Cover (the extent to which vegetation is present and its potential to screen and filter views)
- Infrastructure and Built Form (the impact of development on landscape and visual character)
- Cultural and Landscape Value (quantification of recognised planning overlays)

Assessing each viewpoint and the regional context (cultural and landscape value) a quantified value is generated for landscape character. This value then forms the baseline assessment value, which will be modified by the impact of the development within the landscape, which in turn will be measured as part of the visual assessment.

This two-tiered assessment methodology ensures the degree of visual impact is assessed against a quantified landscape character value enabling, the GrimKe Matrix to accurately quantify the degree of visual impact that is experienced as a result of implementing the development.

The assessment considers the landscape as three distinct zones based on the distance from the proposed development. The three zones were defined as; local (0-1km), sub-regional (1-5km) and regional (5-30km). (Planning South Australia, 2002). Specific landscape characters are also identified to provide a complete assessment of the landscape context.

---

[1] *Daniel, T C & Vining, J (1980) p49*

## 1. Landscape Character Assessment

### 1.1 Relief

This is an assessment of the landscape complexity in terms of the underlying topography. The relationship of relief assists in defining the landscape and the visual character of an area. This is relevant in terms of the position and elevation of a proposed development within the landscape and the viewpoint.

The topography is assessed both on site (from each viewpoint) and as part of a desktop review (topography mapping). The assessment considers the topographical complexity in terms of local, sub-regional and regional. Within each zone an assessment is made of the topography and the complexity of landscape features.

The assessment is concerned with landscape complexity and how it impacts on the visual character. The assessment considers landform patterns, dominant elements and other distinguishing topographical features that will impact on the visual context.

| **Relief (expressed as percentage)** | **Value** | **Description of Landscape Relief** |
|---|---|---|
| 80-100% | 5 | Substantial landscape relief. The landscape possesses significant topographic variations, features and prominent elements creating a dynamic landscape context. |
| 60-79% | 4 | Increasing relief. Due to the scale of the topography and frequency of features. |
| 40-59% | 3 | Moderate relief. Medium level of change to the landscape. Occasional landscape features and topographic variation. |
| 20-39% | 2 | Limited relief. Small amount of topographic variation in the landscape. |
| 0-19% | 1 | No or minor relief within the landscape. The landscape is considered feature less, without noticeable elements or patterns. |

### 1.2 Vegetation Coverage

Vegetation coverage is a measurement of the extent, character and frequency of vegetation that exists at each viewpoint and within the local, sub-regional and regional zones. The extent of vegetation provides the potential for screening and to reduce the visual effect of development. Conversely, a lack of vegetation results in an increase in the visual significance of a development.

This measurement responds to the potential visual absorption of the landscape as measured by the visual matrix. Again, this assessment considers the dominant vegetation patterns within each zone and in relation to each viewpoint.

| **Vegetation Coverage (expressed as percentage)** | **Value** | **Description of Vegetation Coverage** |
|---|---|---|
| 80-100% | 5 | Natural or non-harvested commercial forests. Significant areas of treed vegetation creating an arboreal landscape. |
| 60-79% | 4 | Bushland or woodlands. Major areas of |

| | | |
|---|---|---|
| | | vegetation that define the landscape character of an area |
| 40-59% | 3 | Tree groups, copse, screens, shelter belts. Defined areas of vegetation creating a layered landscape character. |
| 20-39% | 2 | Sporadic trees producing a punctuated vegetation character. |
| 0-19% | 1 | No trees scrub or low ground cover. Limited vegetation cover. |

### 1.3 Infrastructure and Built Form

This assessment considers the interrelationship of landscape character and human development. The assessment considers how development and infrastructure can create a counterpoint to the existing landscape character (vegetation and topography). Alternatively, development within the landscape may assist with the assimilation of development.

| Infrastructure and Built Form (expressed as percentage) | Value | Description of Infrastructure and Built Form |
|---|---|---|
| 0-19% | 5 | No objects within the landscape. The landscape has a high natural or remote rural character. |
| 20-39% | 4 | Isolated objects in the landscape. Single elements with limited visual impact on the landscape. Small farm building, telephone towers or houses. |
| 40-59% | 3 | Small clusters of development. Increasing presence of development within the landscape. |
| 60-79% | 2 | Medium scale linear infrastructure or development. More significant development within the landscape. Minor roads, culverts, warehouses, transmission lines and residential areas. |
| 80-100% | 1 | Large scale infrastructure. The landscape is significantly affected by development. Freeways, power stations and opencast mining |

### 1.4 Cultural Sensitivity Value

The cultural and landscape value assessment is a survey of the regional area around the development up to 20 kilometres. The measurement considers the recognised cultural, heritage, natural and social overlays that exist within the landscape. This assessment is predominantly a desktop survey and only measures recognised designations.

The measurement is then represented as a percentage based of the area of designation compare to the area occupied by the regional zone.

The landscape value is the aggregate value from each of the assessment criteria. Either, as a value for each viewpoint or as a baseline value for the landscape surrounding the development. This Landscape Value in then used to assess the percentage of visual change created by the introduction of development within the landscape.

| Cultural and Landscape (expressed as percentage) | Value | Description of Cultural and Landscape Value |
|---|---|---|
| 80-100% | 5 | Majority of regional zone is affected by planning designations or overlays.  Highly valued culture, natural and social landscape. |
| 60-79% | 4 | Planning designations impacts a significant area of the regional zone. Valued culture, natural and social landscape |
| 40-59% | 3 | Moderate impact from planning designations. Valued community or social landscape |
| 20-39% | 2 | Limited effect |
| 0-19% | 1 | None to negligible effect of planning designations |

### 1.5 Landscape Character Assessment

The aggregate of relief, vegetation, infrastructure and cultural sensitivity values determines the base line landscape character value. The following table summarises the definition of Landscape Character Values

| Landscape Character Value | Value | Description of Landscape Relief |
|---|---|---|
| 16-20 | High | Landscape quality is of high value with significant areas of scenic quality provided by varied topography, large areas of natural beauty and obvious presence of cultural sensitivity to change. |
| 12-16 | Moderate to increasing | Moderate to increasing landscape character value experienced through a layered landscape of natural qualities, scenic beauty and cultural sensitivity. |
| 8-12 | Moderate | Moderate landscape character value experienced by small clusters of natural landscape and cultural sensitivity. |
| 4-8 | Limited | Limited landscape character value experienced. The landscape is monotonous with little visual interest through topography or vegetation and heavily modified. |

## 2. Visual Assessment

Each viewpoint was then assessed with respect to the following aspects of visual effect

— Percent of landscape absorption (the landscape’s ability to absorb and screen the development form).

- Horizontal visual effect (percentage spread of the development in the field of view).
- Vertical visual effect (height of the development as a percentage of the field of view).
- Distance of visual effect (distance between viewpoint and development).

Using the following GRIMKE matrix formula, the development was quantified and aggregated to provide an assessment of the visual effect for each viewpoint.

### 2.1 Percent of Visual Absorption (PVA)

This is an assessment of the landscape's ability to absorb or screen the visual effect. Due to the comprehension of the landscape and wind farm development being holistic, the area that is visually affected includes the space between the turbines.

Using photomontages of the proposed development and Adobe Photoshop™ the amount to which the landscape screens the development is described as a percent of pixel absorption. Foreground contrasting pixels are selected within the vertical and horizontal extents of the development (area A), figure 6. This area is divided by the total area occupied by the development within the active field of view (area B) and expressed as a percentage of visual absorption. The assessment takes into consideration, visual sky lining and screening from existing vegetation and other physical forms.

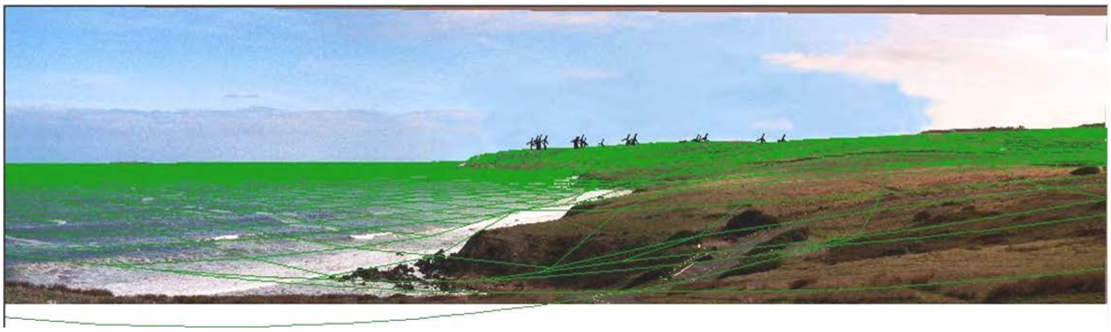


Figure 1 Photo with wire line model draped on top. Courtesy Wind Farm Developments (2004)

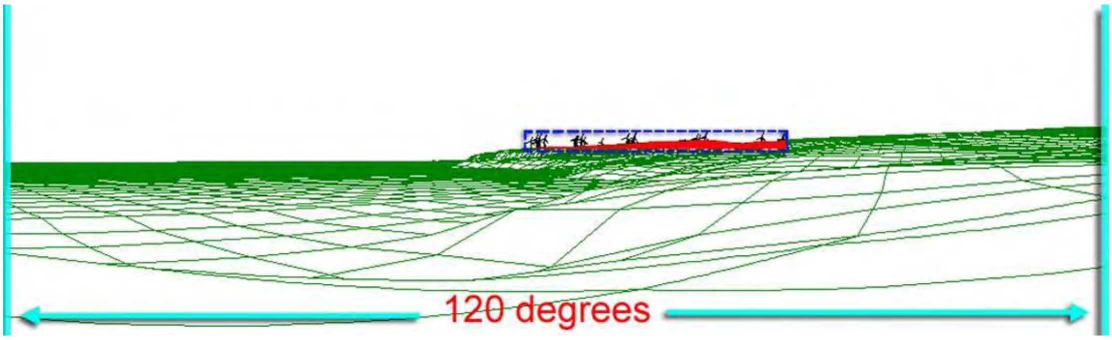


Figure 2 Wire line of showing extent of photomontage. Adapted from Wind Farm Development (2004)

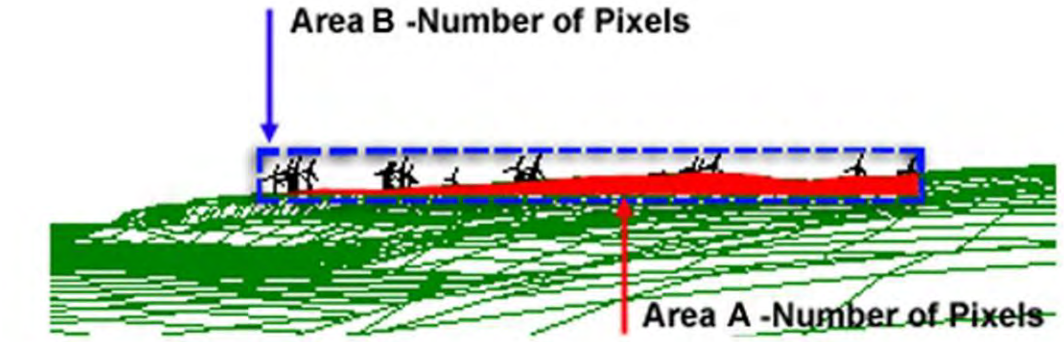


Figure 3 Detailed view of the landscape absorption (area A) and development extents (area B).

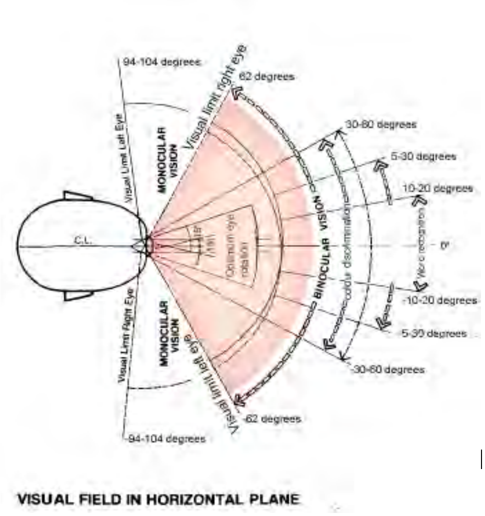
Adapted from Wind Farm Development (2004)

| **Percent of Visual Absorption (expressed as percentage of change)** | **Value** | **Description of Visual Absorption** |
|---|---|---|
| 80-100% | 1 | Substantial landscape absorption capacity. The landscape possesses sufficient vegetation and topography to screen any effect of the development, maintaining the visual character. |
| 60-79% | 2 | Increasing absorption capacity. Due to the scale of the topography and density of vegetation the landscape is able to screen the development. |
| 40-59% | 3 | Moderate absorption capacity. Medium level of change to the landscape. The landscape is less able to absorb change due to the scale, distance and extent of the development. |
| 20-39% | 4 | Limited absorption. The development is noticeable within the landscape; however through vegetation and topography the landscape fragments and filters views of the development. |
| 0-19% | 5 | No or minor absorption within the landscape. The development is considered to be prominent within the visual landscape. |

### 2.3 Horizontal Visual Effect (HVE)

The field of vision (FOV) experienced by the human eye is described as an angle of 200-208 degrees horizontallyiii. This field of view includes the peripheral (monocular) vision, which is described as 40 degrees to each eye; within this zone colour and depth of field are not registered. For the purposes of the assessment the angle of peripheral vision has been subtracted from the field of view producing a binocular, ‘active field of view’ of 120 degrees.

Using this fixed visual reference, an assessment of the possible impact of development within this measurable area is undertaken. The centre of the development is established and an angle of 60 degrees each side is defined. The overall assessment is made of the entire development, rather than of the individual objects that may form the proposal. The angle is measured using a GPS and a bearing compass with known waypoints (geographic coordinates). Using GPS the extent of the horizontal visual field is calculated by the difference in bearing between the widest waypoints from a particular viewpoint. This measurement of effect is then described as a percentage of the 120 degrees active field of view



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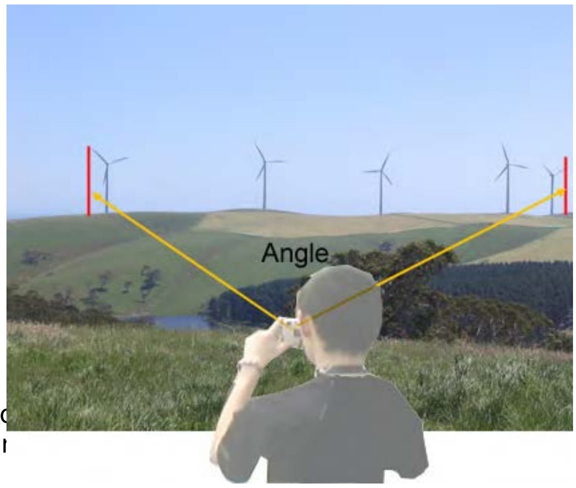

| Degree of Horizontal Visual Impact (expressed as an angle of impact and percentage of change) | Value | Description of Visual Modification |
|---|---|---|
| 80-100% of the panorama measure at 120˚FOV) | 5 | Substantial horizontal visual impact. Visual impact throughout the entire active field of view. |
| 60-80% of the panorama measure at 120˚FOV) | 4 | Increasing visual effect. A large proportion of the active field of view is affected. |
| 40-60% of the panorama<br>Measure at 120˚FOV | 3 | Moderate visual effect. |
| 20-40% of the panorama measure at 120˚FOV) | 2 | Limited effect. The visual impact is a small part of the active field of view. |
| 0-20% of the panorama measure at 120˚FOV) | 1 | No or minor visual effect. |

### 2.4 Vertical Visual Effect (VVE)

The vertical visual effect evaluates the proportional scale of the development with reference to the vertical character of the existing landscape, as seen within the field of view of the assessed viewpoints.

The process of assessment is undertaken in 3 stages:

*Stage 1:*

The first stage of the process is to determine the vertical scale of the existing landscape. The baseline landscape scale is calculated using the photomontage viewpoint elevation (A) as a known reference height. The elevation of the viewpoint is recorded using a GPS. Using contour data, a second value (B) is recorded representing the highest topographic elevation within the field of view. Finally, the horizontal distance (C) between the viewpoint and the highest topographic feature is recorded. The vertical angle of view $\alpha_1$ is then given as:

$\alpha_1 = \tan^{-1}((B-A)/C)$

as shown in Figure 6 below.

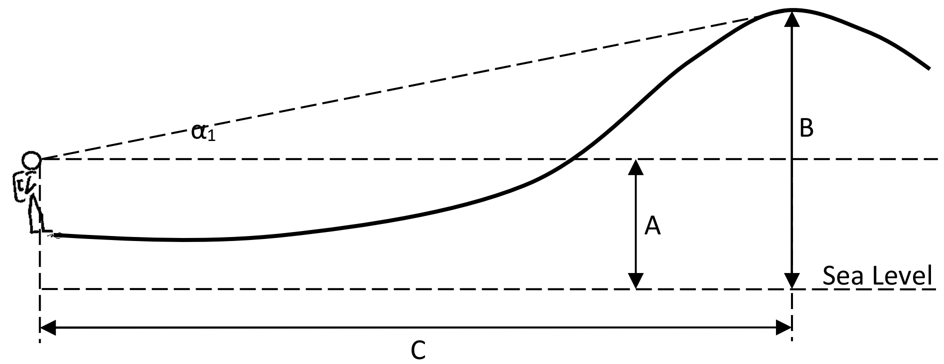

Figure 6: Vertical Scale of Existing Landscape

*Stage 2:*

The second stage of the process is to determine the vertical scale of the landscape modification, namely that of the apparent maximum turbine tip height as viewed from the viewpoint. Using the known turbine height (E), ground elevation (F) and its distance from the viewpoint (G), the vertical angle of view $\alpha_2$ is then given by:

$\alpha_2 = \tan^{-1}((E+F - A)/G)$

as shown in Figure 7 below.

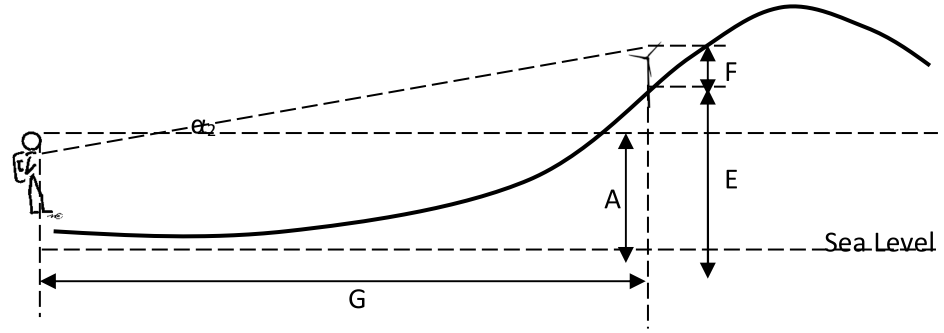

Figure 7: Vertical Scale of Landscape Modification

*Stage 3:*

The final stage of the process is to determine the overall proportion of the vertical scale of the development with reference to the existing landscape scale by taking the ratio of the two angles $\alpha_2$ and $\alpha_1$. Depending on the relative size of the vertical angles of view occupied by the existing and modified landscapes respectively, the ratio $\alpha_2 / \alpha_1$ will determine the nature and scale of the visual impact.

Depending on the relative scale of the angle of view occupied by the landscape and/or the development, the two vertical angles will depict whether there will be an increase in vertical visual impact created by the development ($\alpha_2 / \alpha_1 > 1$) or conversely the visual effect will be experienced as a vertical visual effect relative to the existing landscape scale ($\alpha_2 / \alpha_1 < 1$).

The vertical visual effect assessment will result in one of the following conditions:

- an increase in the overall vertical visual effect experienced from the viewpoint as a result of the combined vertical visual effect of the existing landscape character and the proposed development, or;
- a limited vertical visual effect as a result of the scale of the development being less than the existing landscape vertical scale when assessed from a viewpoint. This may be created by backdrop landforms or large ravines, valleys depicting a scale that within the field of view is greater than the development.

Either, the turbines or parts of the turbines are seen above ridgelines or landforms within the field of view and the effect will result in an increase in vertical visual effect, or the viewpoint contains large escarpments or deep valleys within the field of view and the vertical scale of the proposed wind turbines are likely to be seen as a proportion of the existing landscape scale resulting in a limited vertical visual effect.

In the first case (i.e. where $\alpha_2 / \alpha_1 > 1$), the proportional vertical visual impact should be assessed using Table 1 below. In the second case, the proportional vertical visual impact is considered minor and is assigned a value of 1.

*Table 1 Proportional Vertical Visual Effect in existing landscape scale* ($\alpha_2 / \alpha_1 > 1$)

| Vertical Visual Impact (expressed as percentage increase ($\alpha_2 / \alpha_1 - 1$) x 100) | Value | Description of Visual Modification |
|---|---|---|
| 80-100% | 5 | Substantial visual impact. |
| 60-80% | 4 | Increasing visual impact |
| 40-60% | 3 | Moderate visual impact. |
| 20-40% | 2 | Limited impact |
| 0-20% | 1 | No or minor visual impact within the landscape. |

### 2.5 Distance of Visual Effect

This is a measurement of how visual impact is modified by distance. The effect of scale, topography, vegetation and weather, changes with distance, and in turn changes the degree of visual effect. The distance to the development from each viewpoint is recorded using the GPS. Standing onsite at each viewpoint the exact distance can be calculated by selecting the closest waypoint function (all the turbine locations are stored as waypoints in the GPS).

The distance categories outlined in the table below have been based on empirical research University of Newcastle (2002), Sinclair (2001), Bishop (2002).

| Location of Development (from viewpoint)v | Value | Description |
|---|---|---|
| 0 to 4 km (80-100%) | 5 | Adjacent: Dominant impact due to large scale, movement, proximity and number |
| 4 to 8 km (60-80%) | 4 | Foreground: Major impact due to proximity:<br>capable of dominating landscape |
| 8 to 13 km (40-60%) | 3 | Middle ground: Clearly visible with moderate impact:<br>potentially intrusive |
| 13 to 18 km (20-40%) | 2 | Distant middle ground: Clearly visible with moderate impact becoming less distinct |
| 18 km and greater (0-20%) | 1 | Background: Less distinct: size much reduced |

### 2.6 Landscape Absorption Assessment

The aggregate of landscape absorption, horizontal and vertical effects and distance values determines the base visual impact value form the viewpoint. The following table summarises the definition of Visual Impact values

| Visual Impact Value | Value | Description of Landscape Relief |
|---|---|---|
| 16-20 | High | High visual impact within the field of view |
| 12-16 | Moderate to increasing | Moderate to increasing visual impact within the field of view |
| 8-12 | Moderate | Moderate visual impact within the field of view |
| 5-8 | Limited | Limited visual impact within the field of view |

## 3. Degree of Visual Impact (Percentage of Visual Change)

*Degree of Visual Impact*

The degree of Visual Impact is expressed as a coefficient of visual change to the baseline Landscape Value (general or viewpoint specific). This calculation directly expresses the effect of the development on the landscape, the change to the visual character and the reciprocal visual impact.

— Baseline Landscape Character : express as a value between 4 and 20)

— Coefficient of Visual Impact : calculated as the 20 divided by visual assessment value

*Calculation of degree of Visual Impact*

Coefficient x landscape character value expressed as a percentage = Visual Impact on Landscape Character

*Example:*

*(a) Visual Impact Assessment*

| | |
|---|---|
| Horizontal visual effect | 3 |
| Vertical visual effect | 1 |
| Absorption capacity | 3 |
| Distance | 2 |
| Total visual effect | **9 (0.45)** |

*9/20 equated to a coefficient of **0.45***

*(b) Landscape Character Assessment*

| | |
|---|---|
| Relief | 3 |
| Vegetation coverage | 3 |
| Infrastructure built form | 2 |
| Cultural landscape overlays | 2 |
| Total landscape character | **10** |

*(c) 10 x 0.45 = 4.5*

*(d) 4.5/20 = 0.225*

*(e) 0.225 x 100 = 22.5% Visual Change to the Landscape*

### **3.1** Final Aggregated Visual Effect

| **Percentage Value of Visual Change** | **Descriptive Qualification of Visual Effect** | **Comments** |
|---|---|---|
| 80-100% | Extreme | Extreme change in view: change very prominent involving total obstruction of existing view or change in character and composition of view through loss of key elements or addition of new or uncharacteristic elements which significantly alter underlying landscape visual character and amenity |

| | | |
|---|---|---|
| 60-80% | Severe | Severe change in view involving the obstruction of existing views or alteration to character through the introduction of new elements. Change may be different in scale and character from the surroundings and the wider setting. Resulting in a perceived increase in proportional change to the underlying landscape visual character. |
| 40-60% | Substantial | Substantial change in view: which may involve partial obstruction of existing view or alteration of character and composition through the introduction of new elements. Composition of the view will alter. View character may be partially changed through the introduction of features. |
| 20-40% | Moderate | Moderate change in view: change will be distinguishable from the surroundings whilst composition and underlying landscape visual character will be retained. |
| 0-20% | Slight | Very slight change in view: change barely distinguishable from the surroundings. Composition and character of view substantially unaltered. |

# Appendix E

## Glossary[2]

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[2] *Visual Analysis of Windfarms Good Practice Guidance, Scottish Natural Heritage (2005)*

| | |
|---|---|
| **Active Field of View:** | The field of view excluding peripheral vision, which is described as 40° to each eye, within this zone colour, shapes and forms are not registered. The active field of view removes the angle of peripheral vision from the field of view producing an angle of 120 - 160° |
| **Assessment (landscape):** | An umbrella term for description, classification and analysis of landscape. |
| **Depth of Field:** | The distance between the nearest point (viewpoint) and farthest objects (visual envelope) which is visible within the field of view. |
| **Element:** | A component part of the landscape or visual composition. |
| **Effect (landscape or visual):** | These occur as a broad culmination of one or more impacts, incorporating professional judgement to extrapolate and/or generalise on the nature of these. |
| **Horizontal Visual Effect:** | This term is used to describe the field of view occupied by the visible part of a wind farm. |
| **Impact (landscape or visual):** | Impacts occur to a particular element of the environment and they can be described factually by the nature and degree of change. |
| **Landscape:** | Human perception of the land conditioned by knowledge and identity with a place. |
| **Landscape character:** | The distinct and recognizable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape. |
| **Landscape feature:** | A prominent eye-catching element, for example, wooded hilltop, isolated trees or grain silo. |
| **Mitigation:** | Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual impacts of a development project. |
| **Panorama:** | A view, covering a wide field of view. |
| **Photomontage:** | A visualisation based on the superimposition of an image onto a photograph for the purpose of creating a realistic representation of proposed or potential changes to a view. These are now mainly generated using computer software. |
| **Sensitivity**: | The extent to which a landscape or visual composition can accommodate of a particular type and scale without adverse effects on its character or value. |
| **Visual Amenity:** | The value of a particular area or view in terms of what is seen. |
| **Visual Envelope:** | Extent of potential visibility to or from a specific area, viewpoint or feature. |

# Appendix F
## Endnotes

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[i] The GPS used was a Garmin X12 which differential-ready 12 parallel channel receiver continuously tracks and uses up to twelve satellites to compute and update a position

[ii] The SILVA precision M80 with a parallax free prismatic magnification-bearing compass. A magnetic bearing compass with a ± 0.5˚ from true magnetic course.

[iii] Pirenne, M.H. (1967). Vision and the Eye. London: Chapman and Hall

[iv] Panero, J. & Zelnik, M. (1979) Human Dimension & Interior Space- A source Book of Design Reference Standards. The Architectural Press Ltd. London.

[v] The distance zones have been developed Sinclair Thomas Matrix, which has cited field observations of the visual extents. The classification zones have been based on projected 90-100m high turbines.

# 5

# ENVIRONMENTAL NOISE ASSESSMENT

Resonate

# Yadnarie Renewable Energy Facility

## Environmental Noise Assessment

A220230RP1C Revision 2
Tuesday, 1 October 2024

**Document Information**

| | |
|---|---|
| **Project** | Yadnarie Renewable Energy Facility |
| **Client** | MasterPlan SA Pty Ltd |
| **Report title** | Environmental Noise Assessment |
| **Project Number** | A220230 |

**Revision Table**

| Report revision | Date | Description | Author | Reviewer |
|---|---|---|---|---|
| 0 | 25/08/2023 | First Issue | Lachlan Newitt | Nick Henrys |
| 1 | 12/07/2024 | Second Issue | Laura Lopez | Darren Jurevicius |
| 2 | 01/10/2024 | Third Issue | Laura Lopez | Darren Jurevicius |
| | | | | |
| | | | | |
| | | | | |

# Glossary

| | |
|---|---|
| A-weighting | A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies. |
| Characteristic | Associated with a noise source, means a tonal, impulsive, low frequency or modulating characteristic of the noise that is determined in accordance with the Guidelines for the use of the Environment Protection (Noise) Policy (Noise Policy) to be fundamental to the nature and impact of the noise. |
| Continuous noise level | A-weighted noise level of a continuous steady sound that, for the period over which the measurement is taken using fast time weighting, has the same mean square sound pressure as the noise level which varies over time when measured in relation to a noise source and noise-affected premises in accordance with the Noise Policy |
| Day | Between 7 am and 10 pm as defined in the Noise Policy |
| dB | Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of loudness. |
| dB(A) | Units of the A-weighted sound level. |
| Frequency (Hz) | The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second. |
| Indicative noise level | Indicative noise level determined under clause 5 of the Noise Policy. |
| $L_{90}$ | Noise level exceeded for 90 % of the measurement time. The $L_{90}$ level is commonly referred to as the background noise level. |
| $L_{eq}$ | Equivalent Noise Level—Energy averaged noise level over the measurement time. |
| $L_{max}$ | The maximum instantaneous noise level. |
| Night | Between 10.00 p.m. on one day and 7.00 a.m. on the following day as defined in the Noise Policy |
| Noise source | Premises or a place at which an activity is undertaken, or a machine or device is operated, resulting in the emission of noise |
| Quiet locality | A locality is a quiet locality if the Planning & Design Code provisions that make land use rules for the locality principally promote land uses that all fall within either or both of the following land use categories: (a) Residential; (b) Rural Living; |

# Table of Contents

# 1 Introduction

## 1.1 Context

Photon Energy NV (Photon Energy), a global project developer, has developed a strategic partnership with RayGen Resources Pty Ltd (RayGen), with the objective of developing global renewable energy projects suitable for the roll-out of RayGen's unique solar power and electricity storage technology.

Photon Energy propose to utilise RayGen's technology for generation of solar power and energy storage at Yadnarie, west of Cleve on the Eyre Peninsula. The technology proposed and scale of electricity storage is new to the South Australian renewable energy sector and comprises RayGen's proprietary PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) technologies.

## 1.2 Scope

This report outlines the environmental noise assessment for the proposed Yadnarie Renewable Energy Facility, a solar-thermal power plant located near Yadnarie, South Australia.

The development proposed by Photon Energy is a facility with 150MW of solar generation, 90MW grid connection and 720 Megawatt hours of storage, equivalent to 8 hours of dispatchable energy. Electricity will be supplied to the national electricity grid via a connection to the existing Yadnarie substation (opposite the subject land) or 132Kv transmission line.

The Renewable Energy Facility consists of fields of ground-mounted heliostats, directed to a receiver tower, where solar energy and thermal energy are captured. Power is stored in 'hot store' and 'cold store' water ponds, where it can then be dispatched on demand via an organic Rankine Cycle (ORC) turbine generator.

Noise sources associated with the development include chillers, condensing units, pumps, turbines, turboexpander generators and electrical equipment such as, transformers and inverters.

A total of 24 noise sensitive receptors are considered in this assessment. This includes non-involved landowner dwellings within a 5-kilometre buffer area around the subject land, and representative dwellings from the Cleve and Rudall townships.

The potential noise emissions from the development have been assessed against the requirements of the Planning & Design Code and the South Australian environmental noise policy.

The assessment has been based on the layout drawings, plant specifications and noise source data supplied by Raygen on 17 June 2024.

# 2 Proposed development

## 2.1 Location

The subject land spans several land parcels south of the Birdseye Highway near Yadnarie, South Australia, and is intercepted by the Eyre Peninsula (EP) Link high voltage transmission line. The proposed layout of heliostat fields, receiver towers and power blocks are shown in Figure 1, with respect to the Birdseye Highway and baseline noise monitoring locations.

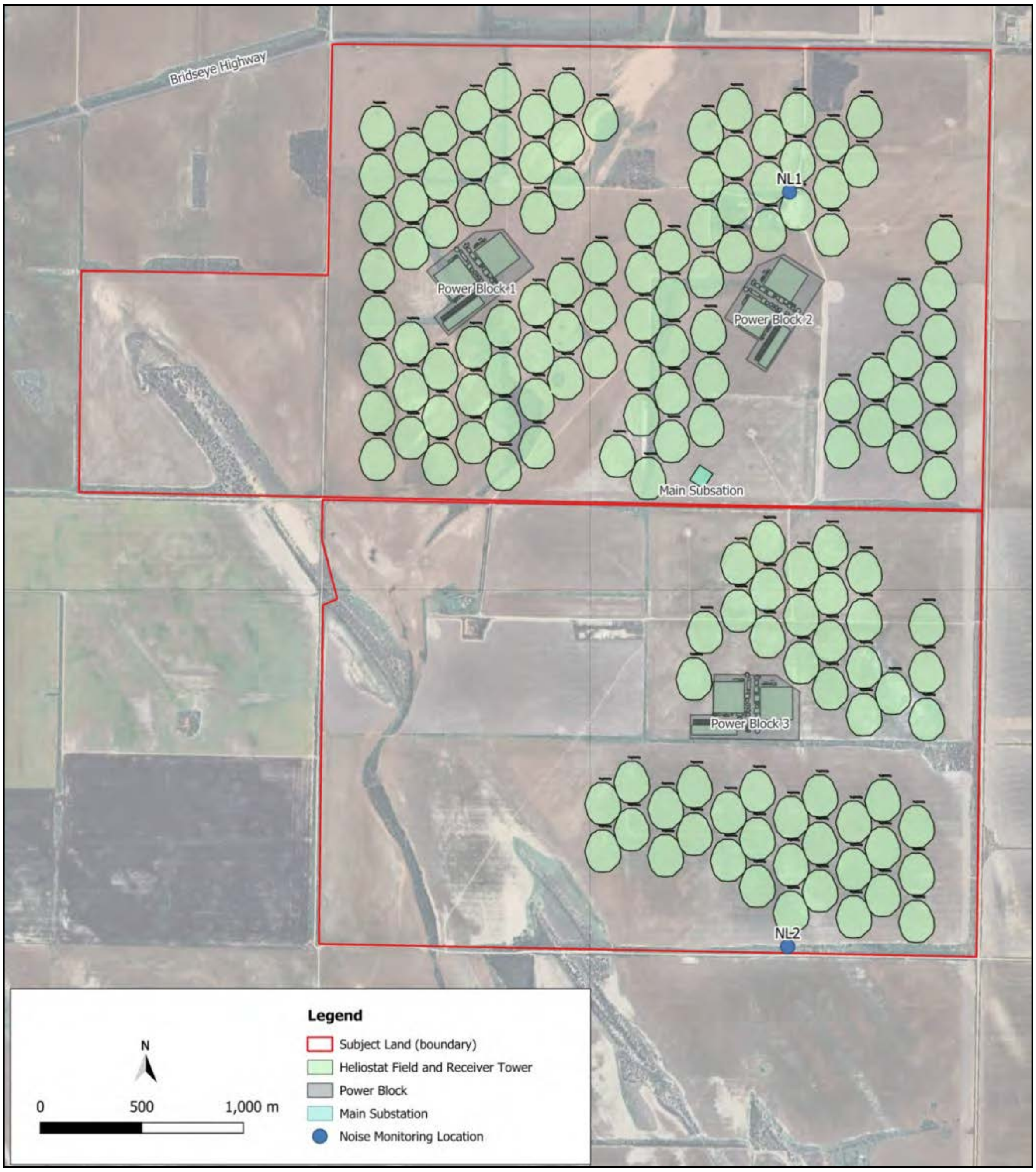


**Figure 1 Proposed site layout with respect to the Birdseye Highway and baseline monitoring locations**

## 2.2 Zoning

The relevant Planning & Design Code zones, and noise sensitive receptors are shown with respect to the subject land on Figure 2 overleaf.

### 2.2.1 Subject land

The subject land is located within a Rural zone in the District Council of Cleve. The relevant Desired Outcome is outlined in Table 1.

**Table 1 Relevant Desired Outcome—Rural zone**

| Desired Outcome | |
|---|---|
| DO 1 | A zone supporting the economic prosperity of South Australia primarily through the production, processing, storage and distribution of primary produce, forestry and the generation of energy from renewable sources. |
| DO 2 | A zone supporting diversification of existing businesses that promote value-adding such as industry, storage and warehousing activities, the sale and consumption of primary produce, tourist development and accommodation. |

### 2.2.2 Adjacent land

A total of 24 noise sensitive receptors are considered in this assessment. This includes non-involved landowner dwellings within a 5-kilometre buffer area around the subject land, and representative dwellings in the Cleve and Rudall townships, which are located further away than 5 kilometres. Involved landholders are not considered in this assessment. The dwellings occupy land uses according to the following:

- NSR1 – NSR21, NSR24: Rural zone
- NSR22: Representative dwelling within the Township zone
- NSR23: Representative dwelling within the Rural Neighbourhood zone

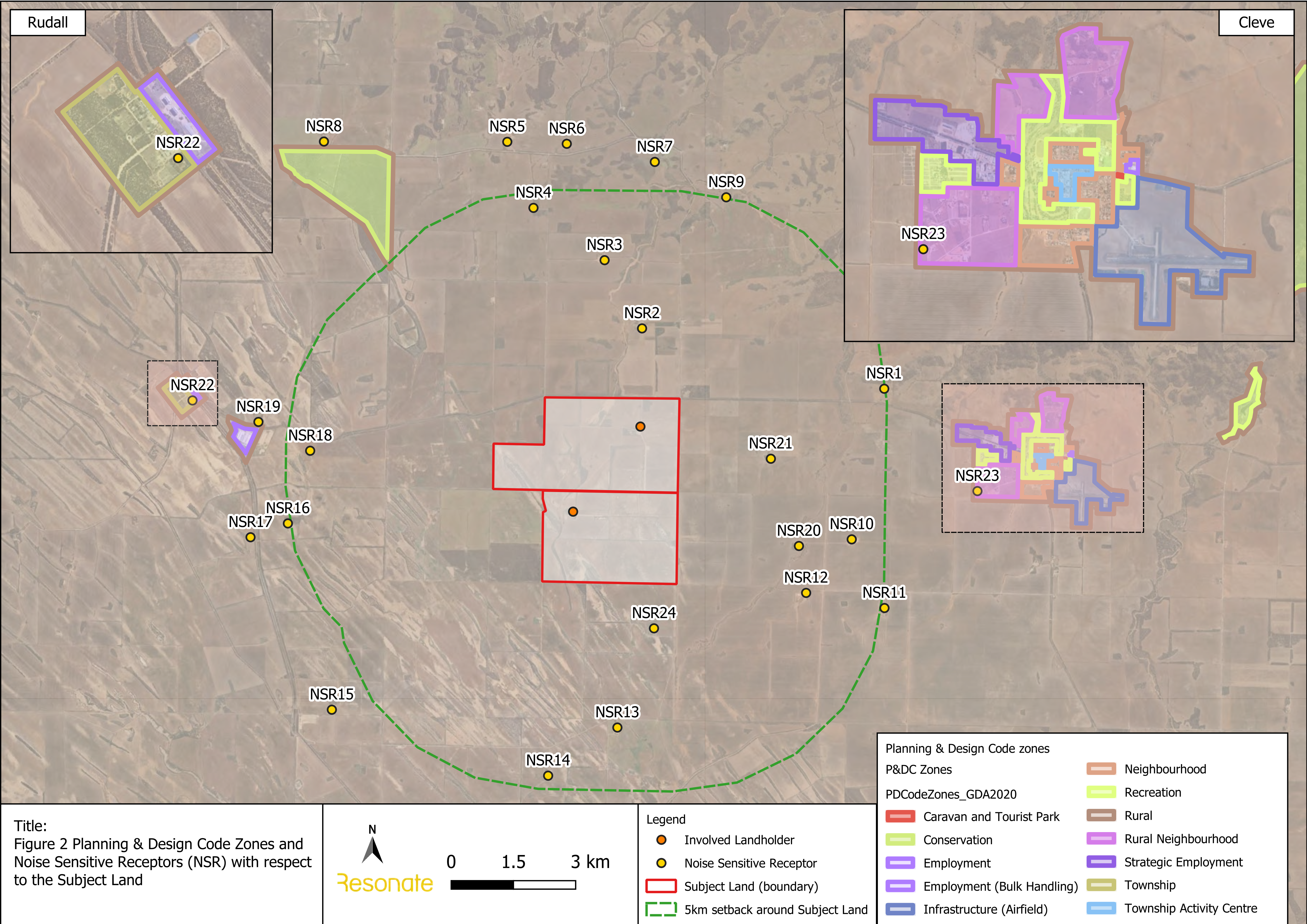
The relevant Desired Outcomes for the Township and Rural Neighbourhood zones are outlined in Table 2 and Table 3 respectively.

**Table 2 Relevant Desired Outcome —Township zone**

| Desired Outcome | |
|---|---|
| DO 1 | A township supporting a range of residential, community, retail, business, commercial and light industry uses and facilities. |
| DO 2 | Development contributes to and enhances streetscapes and the settlement patterns comprising the township. |

**Table 3 Relevant Desired Outcome —Rural neighbourhood zone**

| Desired Outcome | |
|---|---|
| DO 1 | Housing on large allotments in a spacious rural setting, often together with large outbuildings. Easy access and parking for cars. Considerable space for trees and other vegetation around buildings, as well as on-site wastewater treatment where necessary. Limited goods, services and facilities that enhance rather than compromise rural residential amenity. |



Title:
Figure 2 Planning & Design Code Zones and Noise Sensitive Receptors (NSR) with respect to the Subject Land

## 2.3 Interface between land uses

Interface between Land Uses is a General Development Policy that is relevant to the subject land. The relevant Assessment Provisions relating to noise are outlined in Table 4.

**Table 4 Relevant Assessment Provisions—Activities generating noise or vibration**

| **Relevant Assessment Provisions** | |
|---|---|
| **Desired Outcome** | |
| DO1 | Development is located and designed to mitigate adverse effects on or from neighbouring and proximate land uses. |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| PO 4.1<br>Development that emits noise (other than music) does not unreasonably impact the amenity of sensitive receivers (or lawfully approved sensitive receivers). | DTS/DPF 4.1<br>Noise that affects sensitive receivers achieves the relevant Environment Protection (Noise) Policy criteria. |

# 3 Noise criteria

## 3.1 Environmental noise policy

As noted in DTS/DPF 4.1, environmental noise emissions from the subject land should comply with the *Environment Protection (Noise) Policy* 2007 (Noise Policy).

The noise goals in the Noise Policy are based on the zoning of the development and the closest noise affected premises. The land uses primarily promoted by the zones are used to determine the environmental noise criteria with the indicative noise factors shown in Table 5.

**Table 5 Excerpt from Noise Policy—Table 2(subclause(1)(b))**

| Land use category | Indicative noise factor dB(A) | |
|---|---|---|
| | Day (7 am to 10 pm) | Night (10 pm to 7 am) |
| Rural living | 47 | 40 |
| Residential | 52 | 45 |
| Rural industry | 57 | 50 |
| Light industry | 57 | 50 |
| Commercial | 62 | 55 |
| General industry | 65 | 55 |
| Special industry | 70 | 60 |

Based on the zoning and the relevant Desired Outcomes for the zones of the subject land and the adjacent receptors, the primarily promoted land uses and the relevant criteria for the receptors in each zone are outlined in Table 6. In accordance with Part 5 of the Noise Policy, the relevant criteria are the average of the relevant indicative noise factors less 5 dB(A).

**Table 6 Summary of zones, land uses, and Noise Policy criteria**

| Location | Zone | Land use(s) | Criteria | |
|---|---|---|---|---|
| | | | Day (7 am to 10 pm) | Night (10 pm to 7 am) |
| Subject land | Rural | Rural Industry | N/A | N/A |
| NSR1 – NSR21, NSR24 | Rural | Rural Industry | 52 | 45 |
| NSR22 | Township | Residential, Light Industry, Commercial | 52 | 45 |
| NSR23 | Rural Neighbourhood | Rural Living | 47 | 40 |

Additionally, as the noise affected premises in the Rural Neighbourhood zone (NSR23) is situated in a 'quiet locality', being a Residential zone, a maximum noise criterion of $L_{max}$ 60 dB(A) at night, 10 pm to 7 am, is applicable.

Penalties can also be applied to a noise source for a variety of characteristics, such as impulsive, low frequency, modulating or tonal characters. For a characteristic penalty to be applied to a noise source it must be fundamental to the impact of the noise and dominate the overall noise impact. Application of the characteristic penalty is discussed in the noise emission assessment.

We note that under Part 5, Clause 20(6) of the Noise Policy, exceedance of the recommended criterion does not necessarily mean action is required under the Noise Policy. Some of the following matters should be considered when considering action:

- the amount by which the criterion is exceeded (in dB(A))
- the frequency and duration for which the criterion is exceeded
- the ambient noise that has a noise level similar to the predicted noise level
- the times of occurrence of the noise source
- the number of persons likely to be adversely affected by the noise source and whether there is any special need for quiet.

# 4 Existing noise environment

## 4.1 Details

Baseline noise monitoring was undertaken at two locations within the subject land from Monday, 17 July to Tuesday, 1 August 2023.

## 4.2 Instrumentation

The noise measurements were taken with calibrated Rion NL-42 sound level meters, which are a Class 2 instrument suitable for field and laboratory use. The sound level meter was calibrated both before and after the measurements using a Class 1 Brüel & Kjær 4231 sound level calibrator, and the calibration was found to have not drifted. Both the sound level meter and calibrator carry current calibration certificates from a NATA accredited laboratory. Copies of the calibration certificates are available on request.

## 4.3 Procedure

The noise monitors were configured and installed according to the following:

- Microphone installed at a height of 1.5m above local ground level.
- Microphone fitted with a manufacturer specified windshield for all measurements, for which the appropriate correction was applied.
- Sound Level Meter set to record noise data continuously in 15-minute intervals, using the ‘A’ auditory weighting function and Fast (F) time weighting.

It is usual practice to exclude noise logging data that correlates with periods of bad weather from the results prior to the calculation of summary values. Weather data was obtained from the Bureau of Meteorology (BOM) weather station: *Cleve Airport*. Measured noise levels were excluded from the overall measured noise levels where average wind speed exceeded 5 m/s, when adjusted from 10m above ground level to 1.5m, or where rainfall exceeded 0.2 mm/hour. The exclusions are visualised on the daily measured noise level plots in Appendix C.

## 4.4 Results

A summary of the baseline noise measurement results is presented in Table 7.  Plots of the daily measured noise levels are available in Appendix C.

**Table 7 Summary of existing noise environment**

| ID | Location (Lat/Lon) | SLM Type/Serial Number | Average Measured Noise Level, dB | | | |
|---|---|---|---|---|---|---|
| | | | Day $L_{Aeq(15\text{-}hour)}$ | Night $L_{Aeq(9\text{-}hour)}$ | Day $L_{A90,\ Day}$ | Night $L_{A90,\ Night}$ |
| NL1 | -33.69687613,<br>136.38862501 | NL-42<br>00946975 | 55.7 | 42.2 | 32.4 | 27.0 |
| NL2 | -33.7304288,<br>136.3890628 | NL-42A<br>00322763 | 37.4 | 31.7 | 21.1 | 18.0 |

The results indicate noise levels representative of a generally quiet rural environment. Existing background noise levels are particularly low at NL2.

# 5 Assessment

## 5.1 Noise modelling

### 5.1.1 Modelling parameters

Noise emissions from Renewable Energy Facility have been modelled in SoundPLAN Environmental Software v9 program, using the Conservation of Clean Air and Water in Europe (CONCAWE) algorithms. The model takes into consideration:

- attenuation of noise source due to distance
- barrier effects from buildings, topography and the like
- air absorption
- ground effects
- weather conditions (wind speed, wind direction, time of day, and cloud cover)

CONCAWE has six difference meteorological categories—CONCAWE meteorological category 1 represents weather conditions that are least conducive to noise propagation (best case situation with the lowest predicted noise levels), CONCAWE meteorological category 4 represents neutral weather conditions, and CONCAWE meteorological category 6 represents weather conditions that are the most conducive to noise propagation (the worst-case situation with the highest predicted noise levels).

The worst-case CONCAWE meteorological category 6 has been used for night time emissions to conservatively assess noise emissions in conditions that are most conducive to noise propagation.

We note that noise sources associated with power storage and generation may operate at any time, while heliostat field pumps would operate during daylight hours only. During summer months, sunrise could occur before 7am, which is within ‘night time’ hours in the Noise Policy. On this basis, and for brevity, we have only assessed night time scenarios, which are subject to lower noise criteria.

### 5.1.2 Modelling scenarios

The noise assessment considers the two worst-case operational noise scenarios which are associated with the energy storage and power generation states of the plant. As discussed above, field pumps may operate during the ‘night time’ (i.e. before 7am) in summer months and are therefore assumed to be operating in both scenarios. The proposed transformers and inverter are also conservatively assumed to operate in the two worst-case scenarios considered. These are as follows:

**Scenario 1** – *PV + SYNC-GEN*

- ORC feed pumps
- ORC turbine
- Generator
- PV field pumps
- Transformers and inverter

**Scenario 2** – *PV + LOADS + SYNC-CON*

- Chiller
- Heat pump
- ACC
- Generator (in synchronous condenser mode)
- PV field pumps
- Transformers and inverter

## 5.2 Sound levels

The modelled sound levels have been sourced from measurements undertaken by Resonate Consultants at RayGen’s pilot plant in Carwarp, Victoria, manufacturer’s data provided by Raygen and estimates based on the design power and duty of proposed plant as provided by Raygen. The modelled sound power levels are presented for reference in Appendix B.

## 5.3 Results

The highest predicted operational noise level at each receptor is presented in Table 8 with respect to the relevant noise criteria. Table 8 also indicates the distance from the closest subject land boundary to the noise sensitive receivers.

The assessment demonstrates that operation of the Yadnarie Renewable Energy Facility is predicted to comply with the continuous noise requirements of the Noise EPP at all noise sensitive receptors surrounding the development.

**Table 8 Predicted operational noise levels and applicable Noise Policy criteria**

| **Prediction location** | **Distance (km)** | **Predicted noise level – $L_{Aeq}$ (dB)** | | **Noise Policy Criteria – $L_{Aeq}$ (dB)** | |
|---|---|---|---|---|---|
| **Noise Sensitive Receptor** | **Closest distance to Subject land** | **Scenario 1** | **Scenario 2** | **Day (7 am to 10 pm)** | **Night (10 pm to 7 am)** |
| NSR1 | 4.9 | 19 | 26 | 52 | 45 |
| NSR2 | 1.7 | 33 | 39 | 52 | 45 |
| NSR3 | 3.3 | 26 | 32 | 52 | 45 |
| NSR4 | 4.6 | 20 | 27 | 52 | 45 |
| NSR5 | 6.2 | 14 | 23 | 52 | 45 |
| NSR6 | 6.1 | 15 | 23 | 52 | 45 |
| NSR7 | 5.7 | 16 | 24 | 52 | 45 |
| NSR8 | 8.1 | 6 | 15 | 52 | 45 |
| NSR9 | 5.0 | 18 | 25 | 52 | 45 |
| NSR10 | 4.2 | 22 | 29 | 52 | 45 |
| NSR11 | 5.0 | 18 | 25 | 52 | 45 |
| NSR12 | 3.1 | 25 | 31 | 52 | 45 |
| NSR13 | 3.5 | 23 | 30 | 52 | 45 |
| NSR14 | 4.7 | 18 | 25 | 52 | 45 |
| NSR15 | 5.9 | 12 | 21 | 52 | 45 |
| NSR16 | 5.0 | 15 | 23 | 52 | 45 |
| NSR17 | 6.0 | 12 | 21 | 52 | 45 |
| NSR18 | 4.4 | 17 | 24 | 52 | 45 |

| | | | | | |
|---|---|---|---|---|---|
| NSR19 | 5.7 | 13 | 22 | 52 | 45 |
| NSR20 | 2.9 | 27 | 33 | 52 | 45 |
| NSR21 | 2.2 | 31 | 37 | 52 | 45 |
| NSR22 – Representative receptor in Township Zone (Rudall) | 7.3 | 6 | 16 | 52 | 45 |
| NSR23 - Representative receptor in Rural Neighbourhood Zone (Cleve) | 7.2 | 13 | 21 | 47 | 40 |
| NSR24 - Most affected receptor in Rural Zone | 1.1 | 35 | 40 | 52 | 45 |

Predicted noise level contours at 1.5m above ground level for Scenario 2, are presented in Appendix A, with indication of the noise sensitive receptors. Scenario 2 represents the worst-case in comparison with Scenario 1.

The maximum noise level criterion, applicable to the premises in the Rural Neighbourhood Zone for a 'quiet locality' (NSR 23), is expected to be a result of the ORC blowdown and relief valves and is predicted to be below the quiet locality criterion of $L_{Amax}$ 60 dB at NSR23.

A character penalty has not been applied to the predicted noise levels, based on observations of operational noise at the pilot plant in Carwarp, Victoria in both the near and far field. Operational noise was observed to be continuous in nature, with the only notable tonal noise near the chiller compressor unit dissipating within 50 metres of the plant. Transformers and generators, exhibit tonal characteristics, however, these are contained within the boundaries of the site and attenuated to not noticeable at the locations of the closest receptors (i.e. NSR24 located at approximately 1.1 km distance from the Subject land boundary).

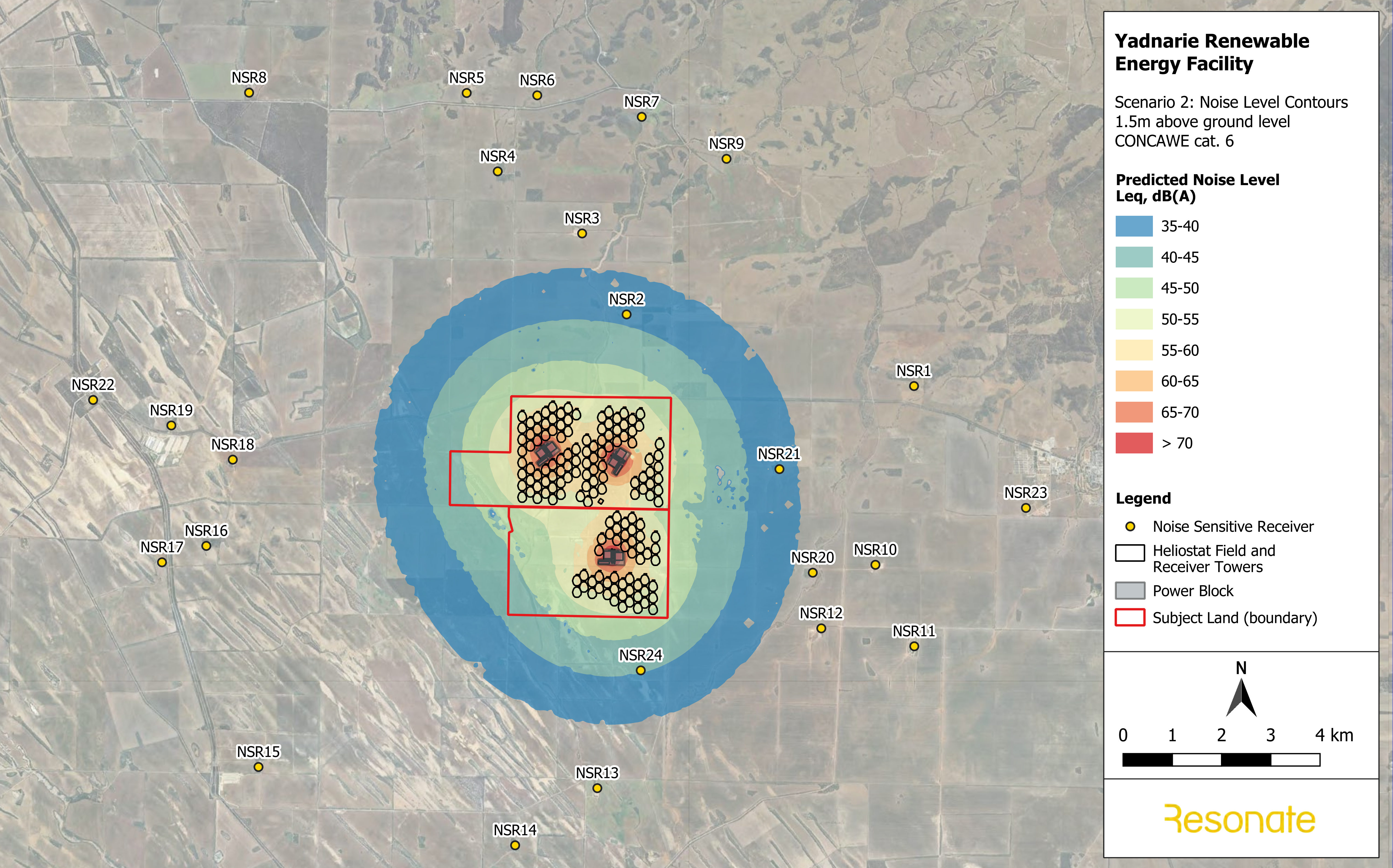
# 6 Conclusion

An environmental noise impact assessment has been undertaken for the proposed Yadnarie Renewable Energy Facility, located near Yadnarie, South Australia.

This assessment has demonstrated that the noise emissions from the operation of the proposed development will be able to comply with the relevant environmental noise criteria at the nearest noise sensitive receptors to the subject land.

On this basis the proposed Yadnarie Renewable Energy Facility will be able to operate within the relevant noise provisions in the Planning & Design Code and Environmental Protection (Noise) Policy.

# Appendix A – Predicted noise level contours



**Yadnarie Renewable Energy Facility**

Scenario 2: Noise Level Contours
1.5m above ground level
CONCAWE cat. 6

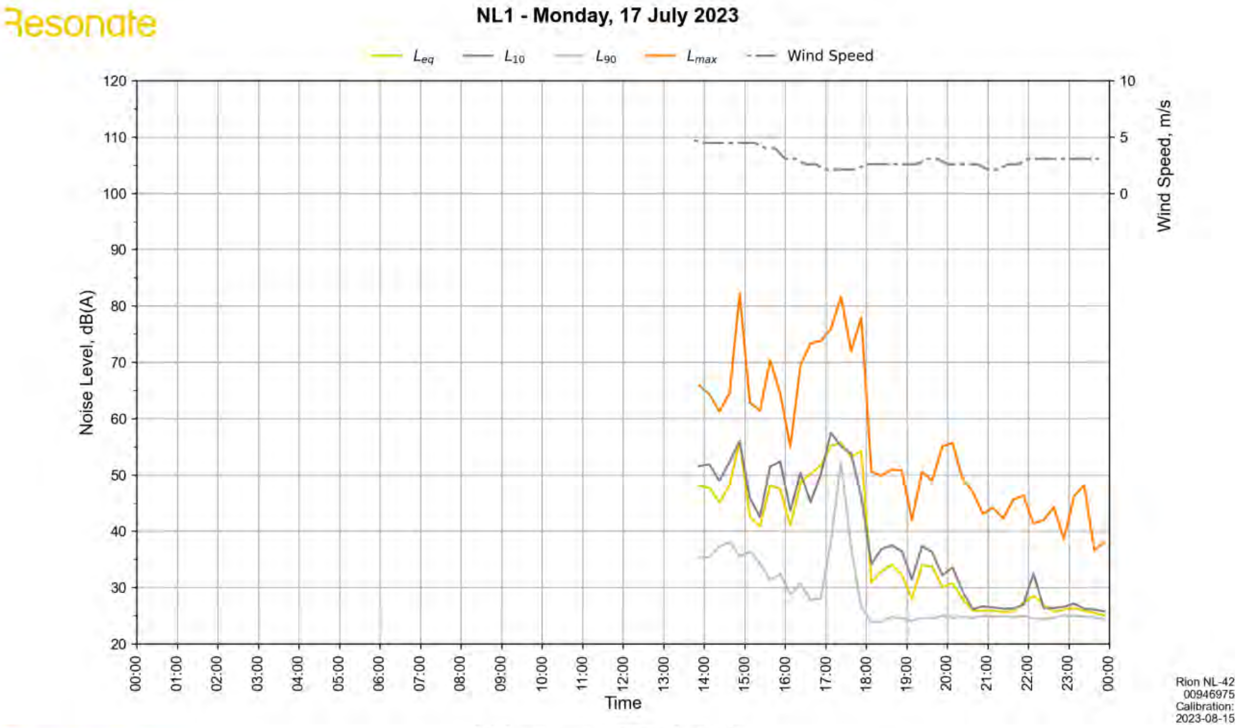
# Appendix B – Modelled sound levels

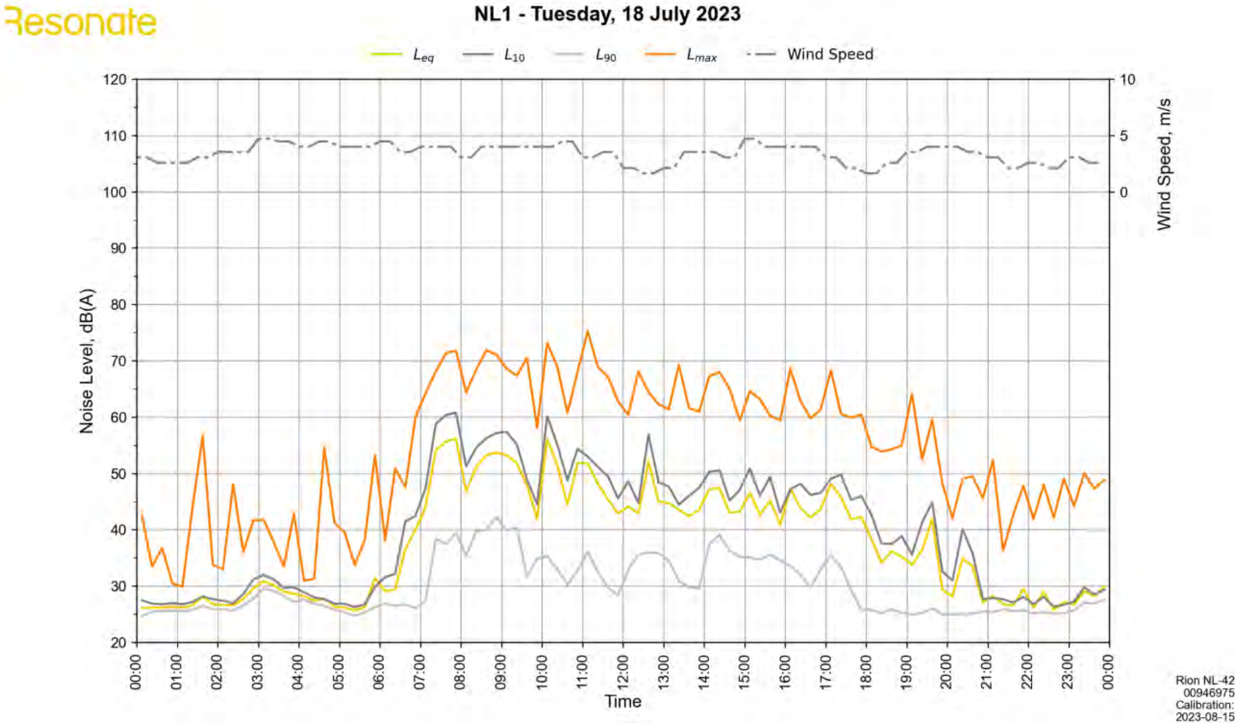
| Noise source | Octave band sound power level, dBZ | | | | | | | (Single Unit) Overall dBA | Qty | Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | | | |
| Turbo expander / generator | 93 | 95 | 98 | 99 | 101 | 104 | 71 | **107** | 2 (Nozzles) | *G-000190270_Estimated Sound Pressure Levels_BL* |
| ORC blowdown and relief valves | 79 | 81 | 87 | 94 | 103 | 106 | 101 | **110** | 1 | *Email from Worley TM 16 Feb / Measurements at Carwarp* |
| Chiller Compressor | 112 | 116 | 117 | 111 | 115 | 116 | 114 | **121** | 1 | *Atlas Copco Calculations #14741* |
| Heat Pump Compressor | 106 | 109 | 111 | 108 | 109 | 110 | 113 | **117** | 1 | *Atlas Copco Calculations #14742* |
| Air cooled heat exchanger fans | 101 | 100 | 97 | 92 | 90 | 84 | 78 | **95** | 68 | *API 661 Air-Cooled Heat Exchanger - Specification Sheet - Jord* |
| ORC pump 1 | 94 | 95 | 97 | 97 | 100 | 97 | 93 | **104** | 1 | *Preliminary Pump Selection Summary Rev A - June 2024 Qty Updates* |
| PV Pump 1 | 92 | 93 | 95 | 95 | 98 | 95 | 91 | **102** | 10 | |
| Heat Pump | 91 | 92 | 94 | 94 | 97 | 94 | 90 | **101** | 1 | |
| ORC Pump 2 | 91 | 92 | 94 | 94 | 97 | 94 | 90 | **101** | 3 | |
| ORC Pump 3 | 88 | 89 | 91 | 91 | 94 | 91 | 87 | **98** | 1 | |
| Chiller Pump 1 | 84 | 85 | 87 | 87 | 90 | 87 | 83 | **94** | 1 | |
| Large Water Pump | 67 | 68 | 70 | 70 | 73 | 70 | 66 | **77** | 1 | |
| ORC Pump 4 | 91 | 92 | 94 | 94 | 97 | 94 | 90 | **101** | 3 | |
| Chiller Pump 2 | 91 | 92 | 94 | 94 | 97 | 94 | 90 | **101** | 2 | |
| Chiller Pump 3 | 91 | 92 | 94 | 94 | 97 | 94 | 90 | **101** | 3 | |
| PV Pump 1 | 83 | 84 | 86 | 86 | 89 | 86 | 82 | **93** | 1 per tower | *200KQW280-16-18.5-4 - PV Primary Main Pump* |

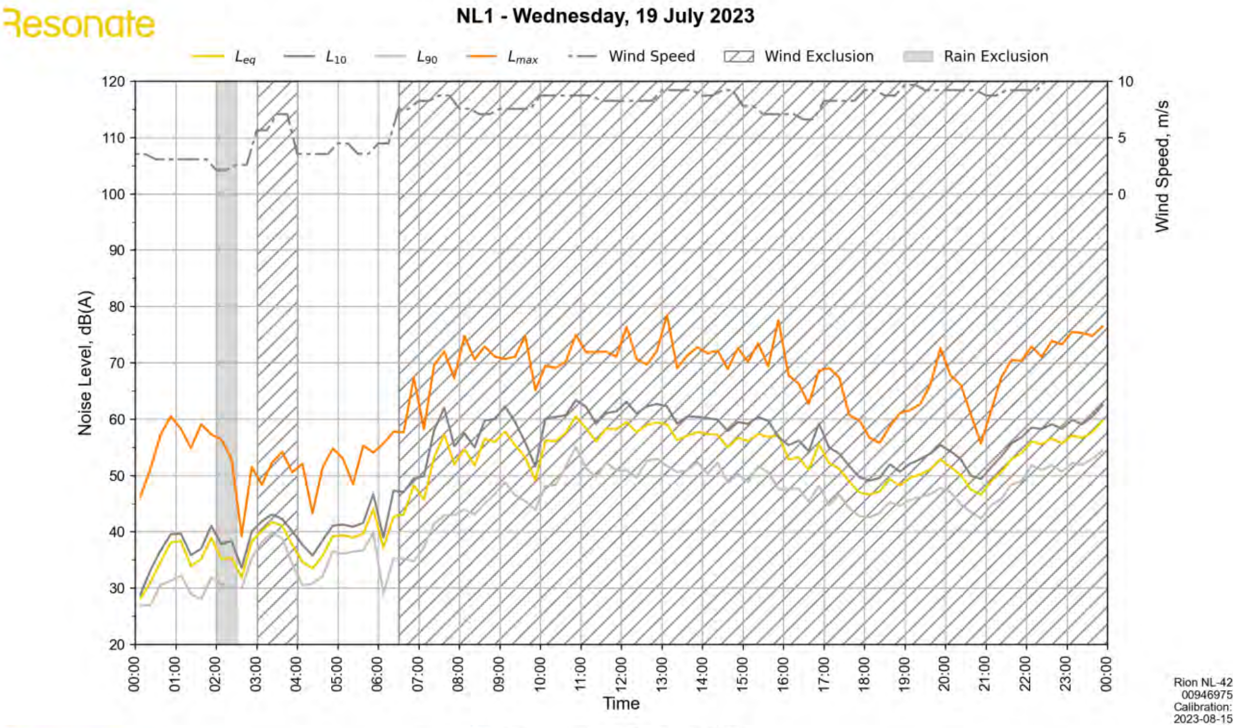
| Noise source | Octave band sound power level, dBZ | | | | | | | (Single Unit) Overall dBA | Qty | Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | | | |
| PV Pump 3 | 75 | 76 | 78 | 78 | 81 | 78 | 74 | **85** | 1 per tower | *KQDP40-8-57 - PV Primary Top Up Pump* |
| Inverter | 35 | 50 | 64 | 67 | 69 | 78 | 86 | **87** | 1 per 2 towers | *SC4xxxUP-DS-en-30 SMA Sunny Central UP Inverter Datasheet* |
| Inverter's transformer | 78 | 80 | 75 | 75 | 69 | 64 | 59 | **76** | 1 per 2 towers | *SC4xxxUP-DS-en-30 SMA Sunny Central UP Inverter Datasheet* |
| Substation transformer | 100 | 102 | 97 | 97 | 91 | 86 | 81 | **97** | 1 for site | *Transformers & Rectifiers (India) Ltd datasheet* |
| Power block transformer (40 MVA) | 98 | 100 | 95 | 95 | 89 | 84 | 79 | **95** | 1 | *Transformer Specification 40MVA datasheet available..*<br>*Calculated sound level data based on transformer's power rating and dimensions. The same dimensions as a 40MVA assumed for all transformers (conservative).* |
| Power block transformer 1 | 97 | 99 | 94 | 94 | 88 | 83 | 78 | **94** | 2 | |
| Power block transformer 2 | 91 | 93 | 88 | 88 | 82 | 77 | 72 | **88** | 3 | |
| Power block transformer 3 | 79 | 81 | 76 | 76 | 70 | 65 | 60 | **76** | 3 | |

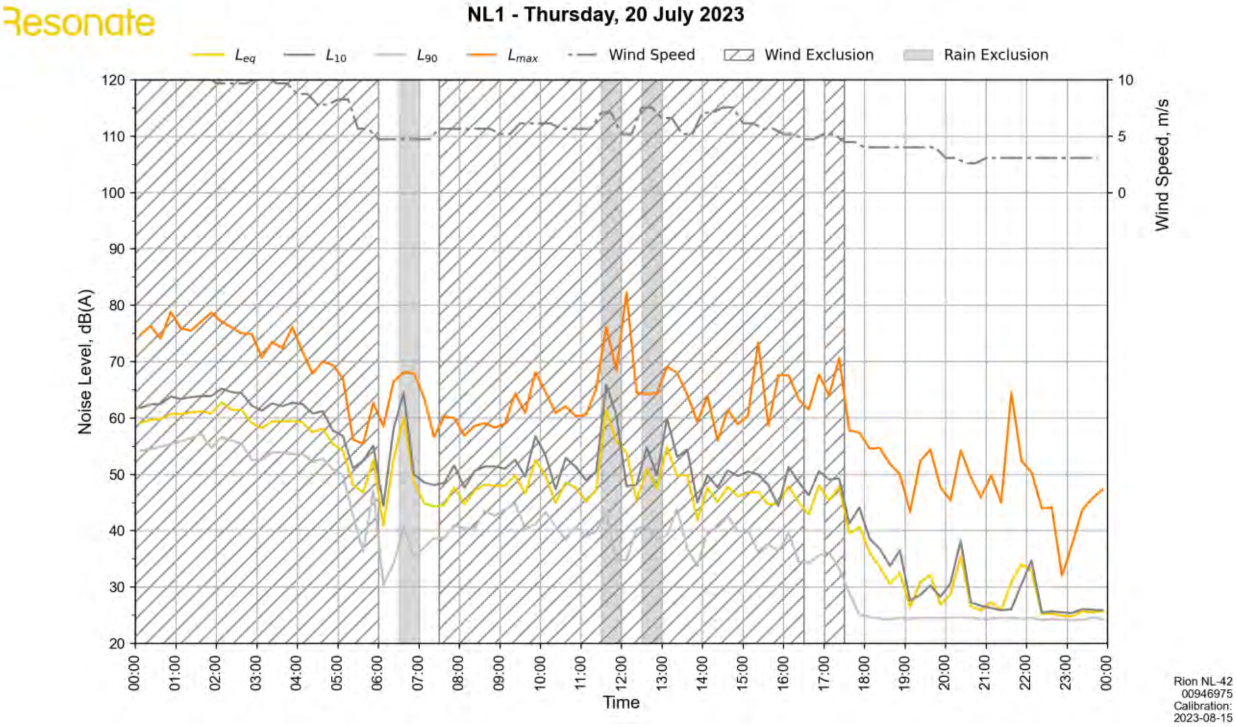
# Appendix C – Daily measured noise levels

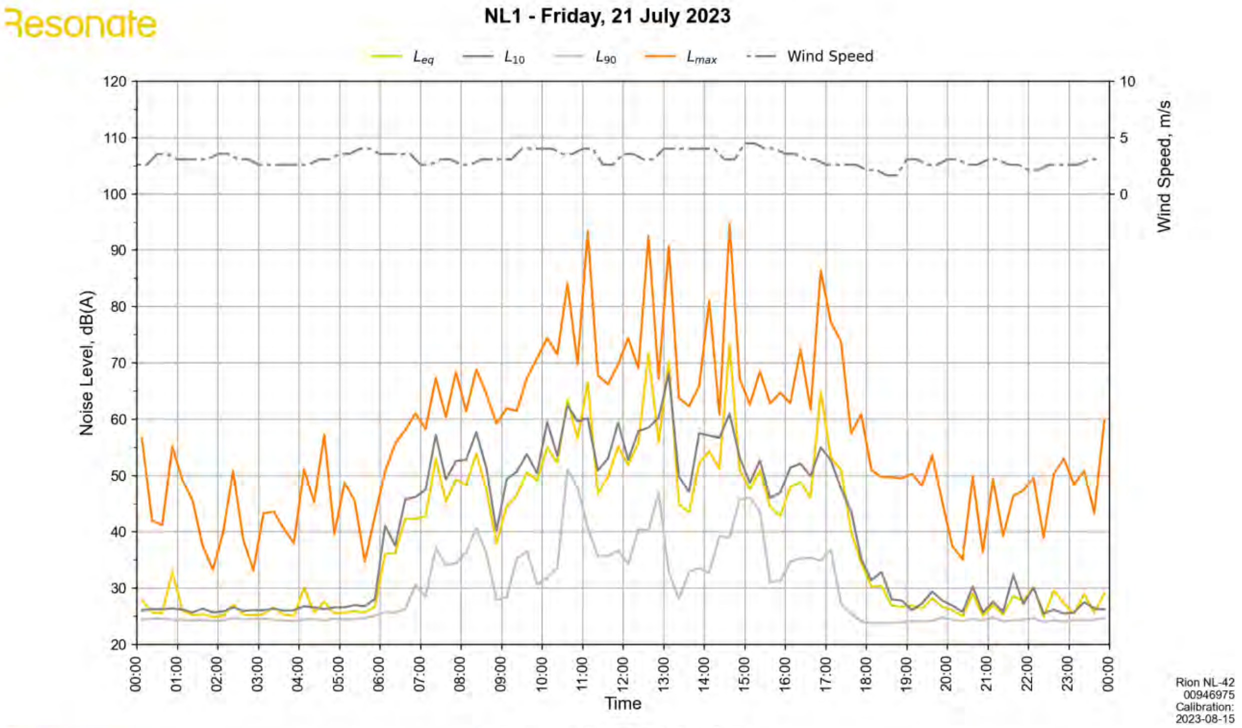
**NL1**

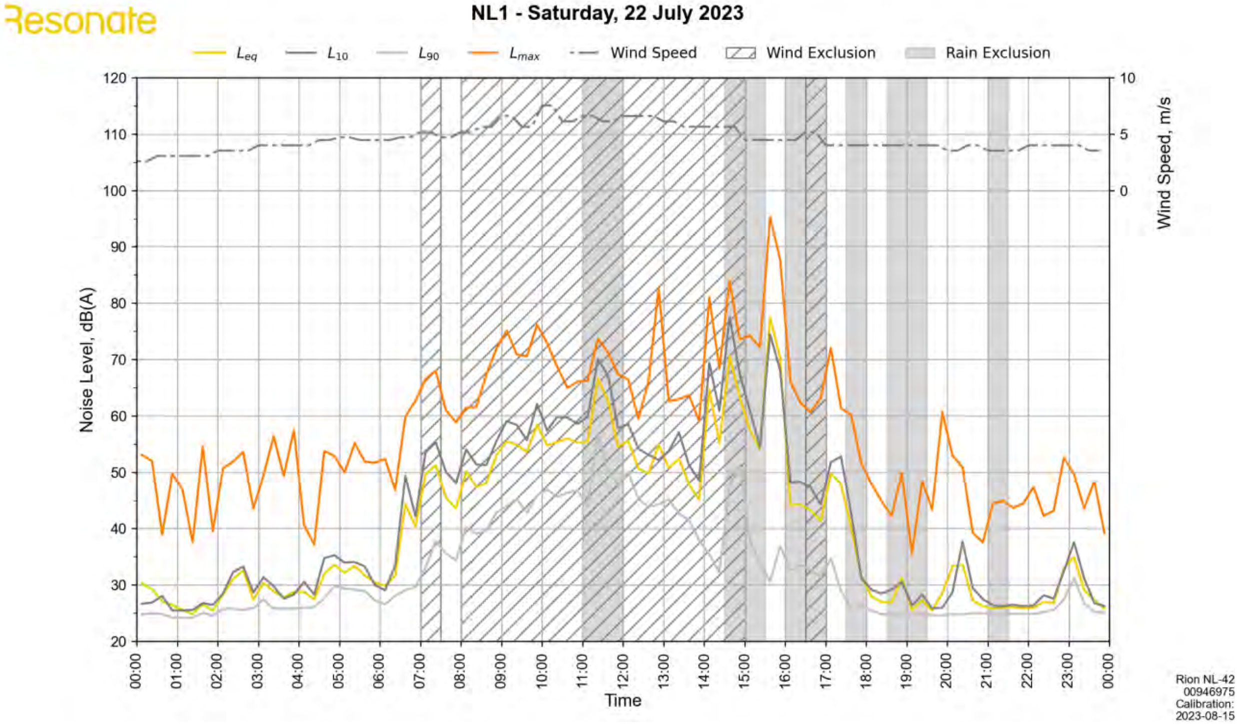


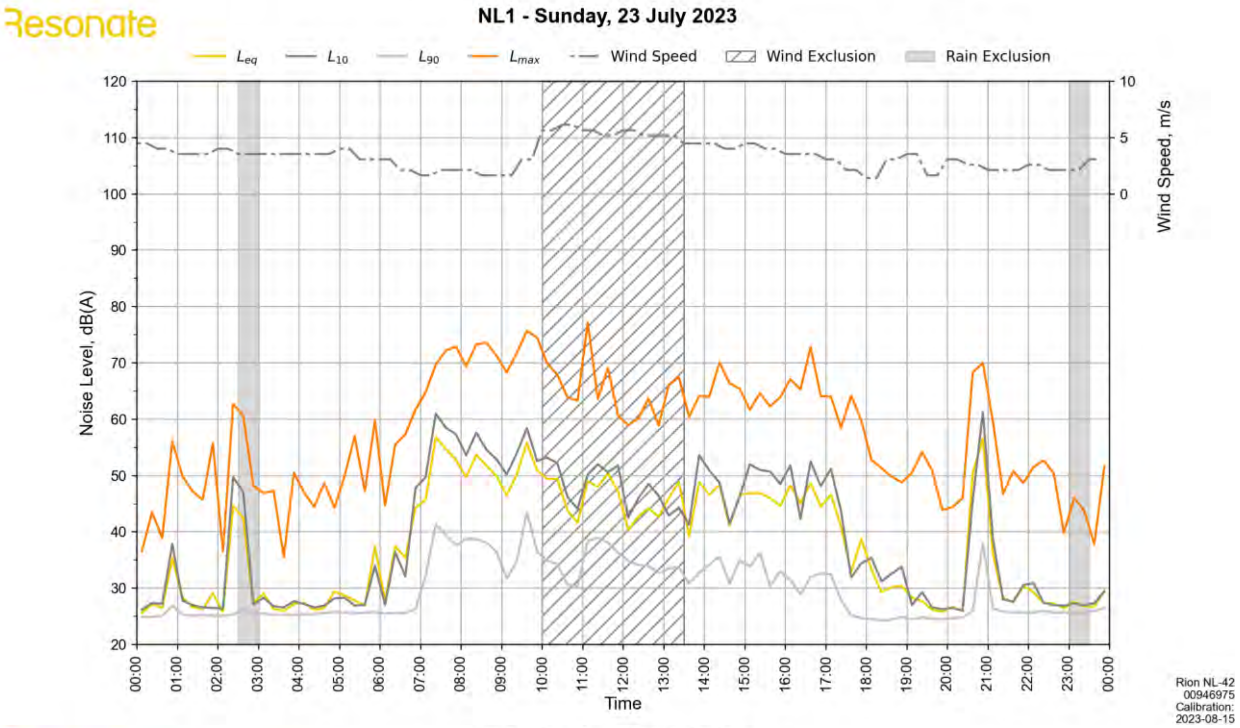



Resonate
NL1 - Wednesday, 19 July 2023
Leq
L10
L90
Lmax
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946975
Calibration:
2023-08-15


Resonate
NL1 - Thursday, 20 July 2023
Leq
L10
L90
Lmax
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946975
Calibration:
2023-08-15


Resonate
NL1 - Friday, 21 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15


Resonate
NL1 - Saturday, 22 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15


Resonate
NL1 - Sunday, 23 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
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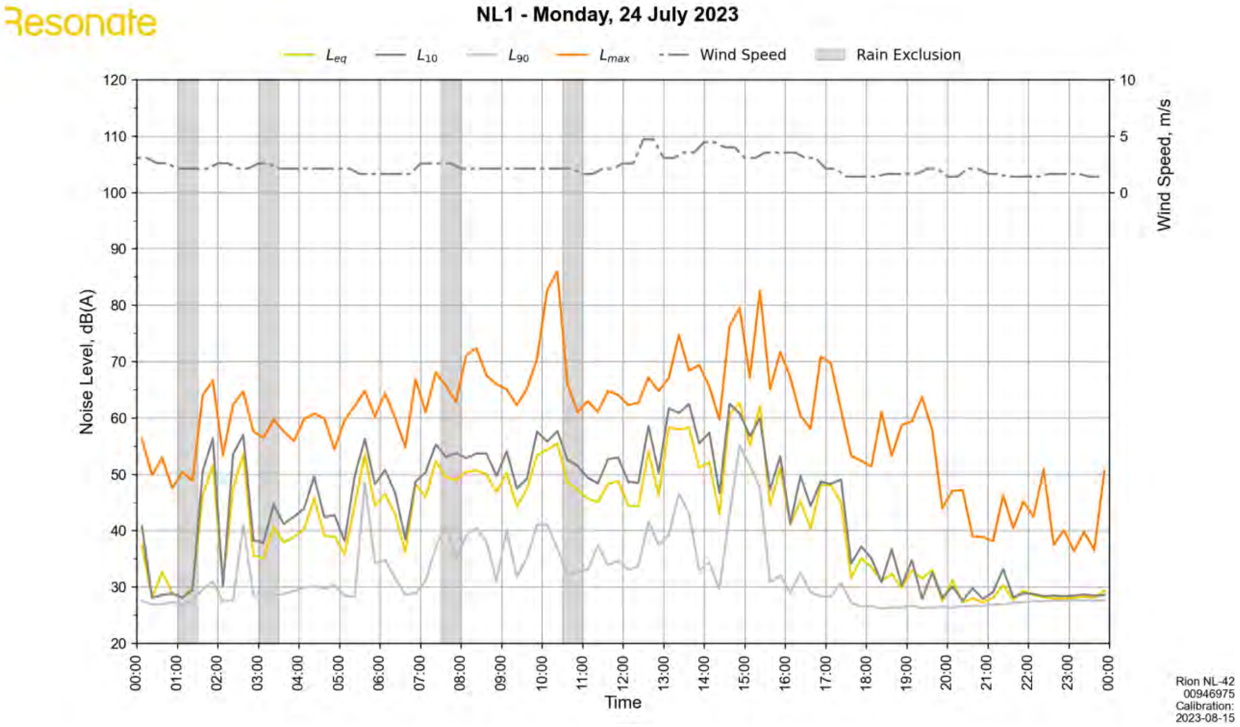
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15


Resonate
NL1 - Monday, 24 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
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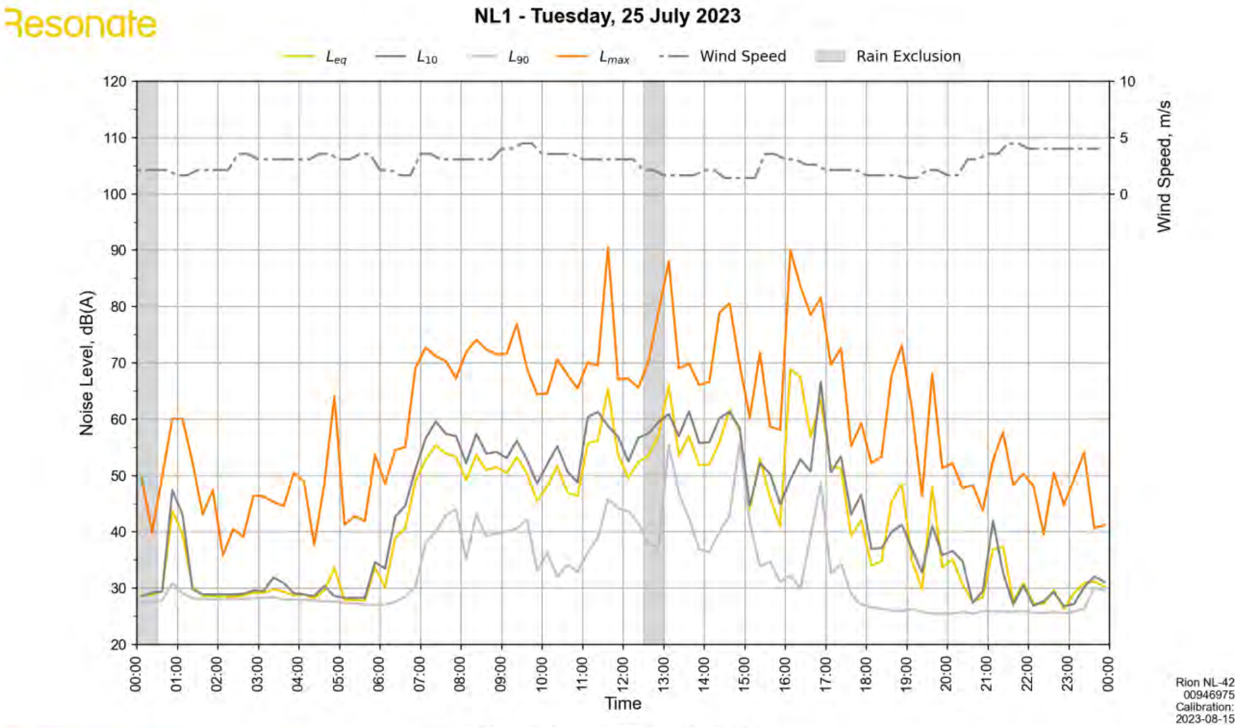
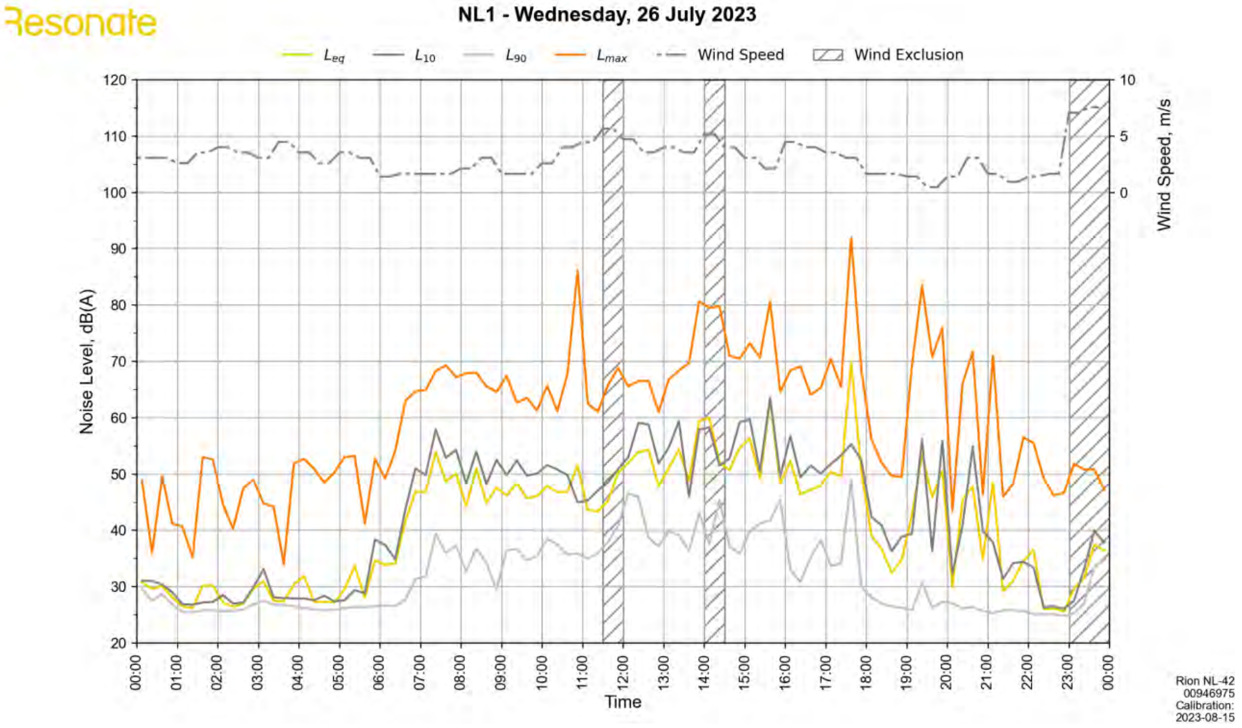
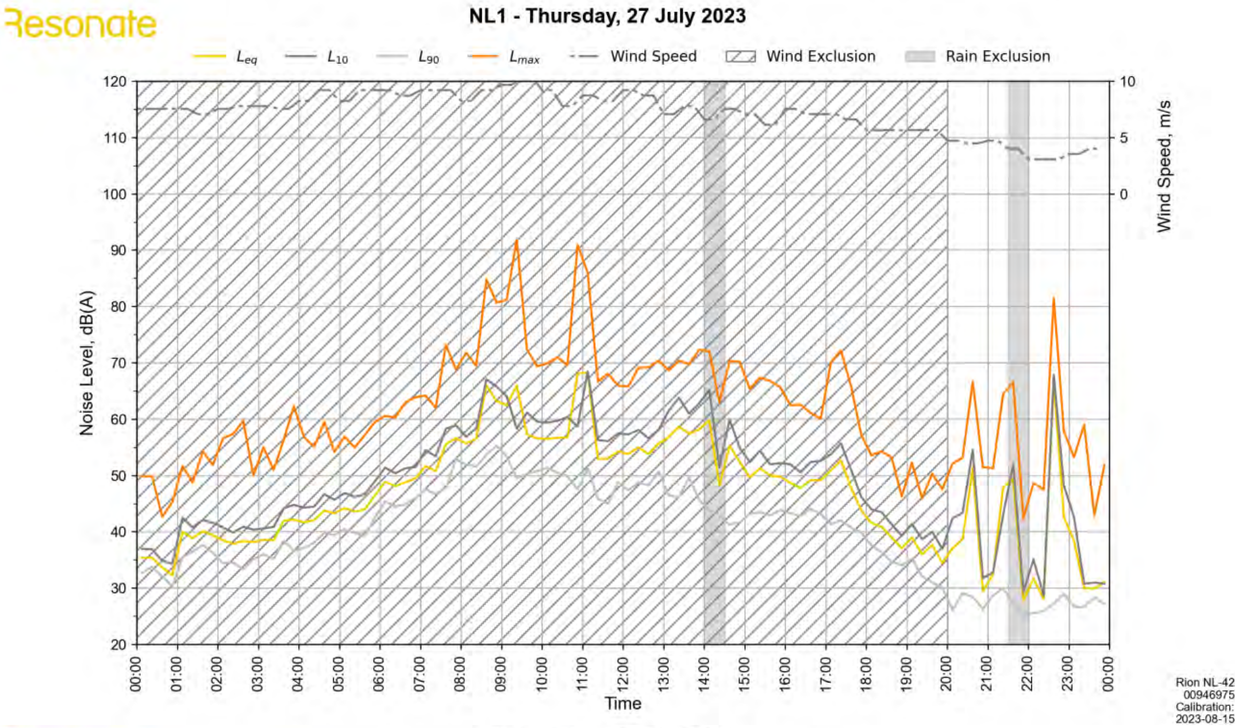
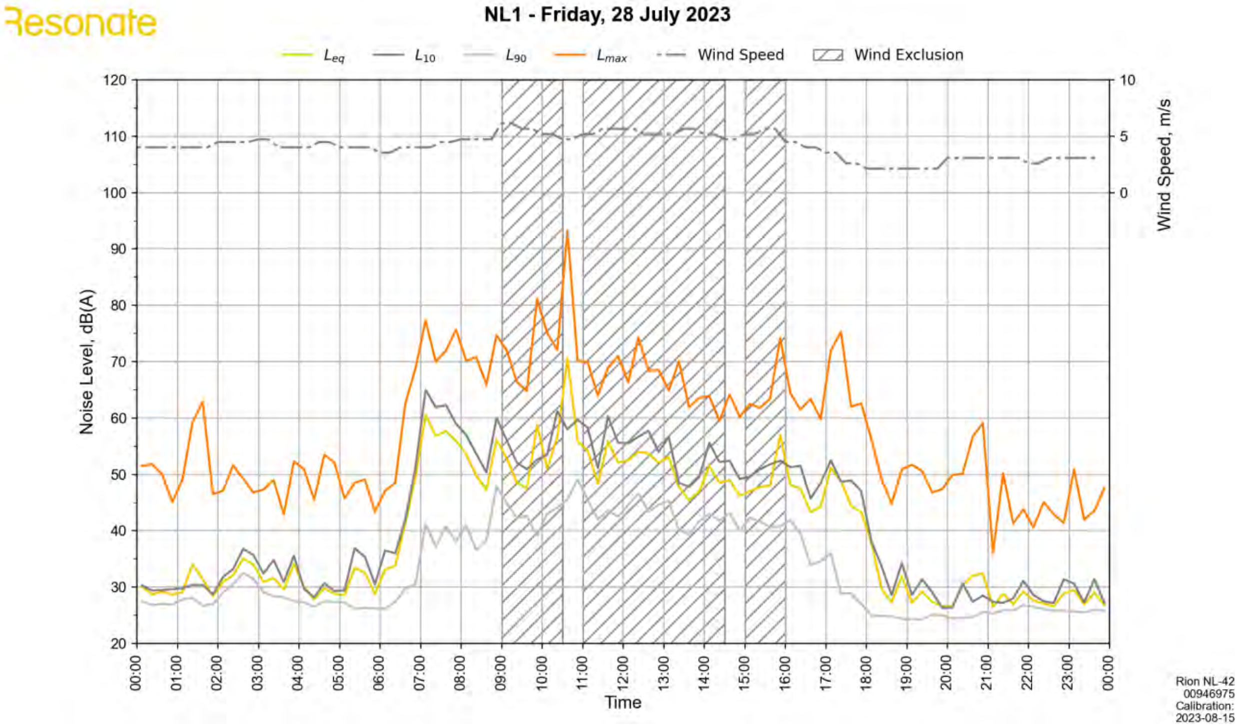
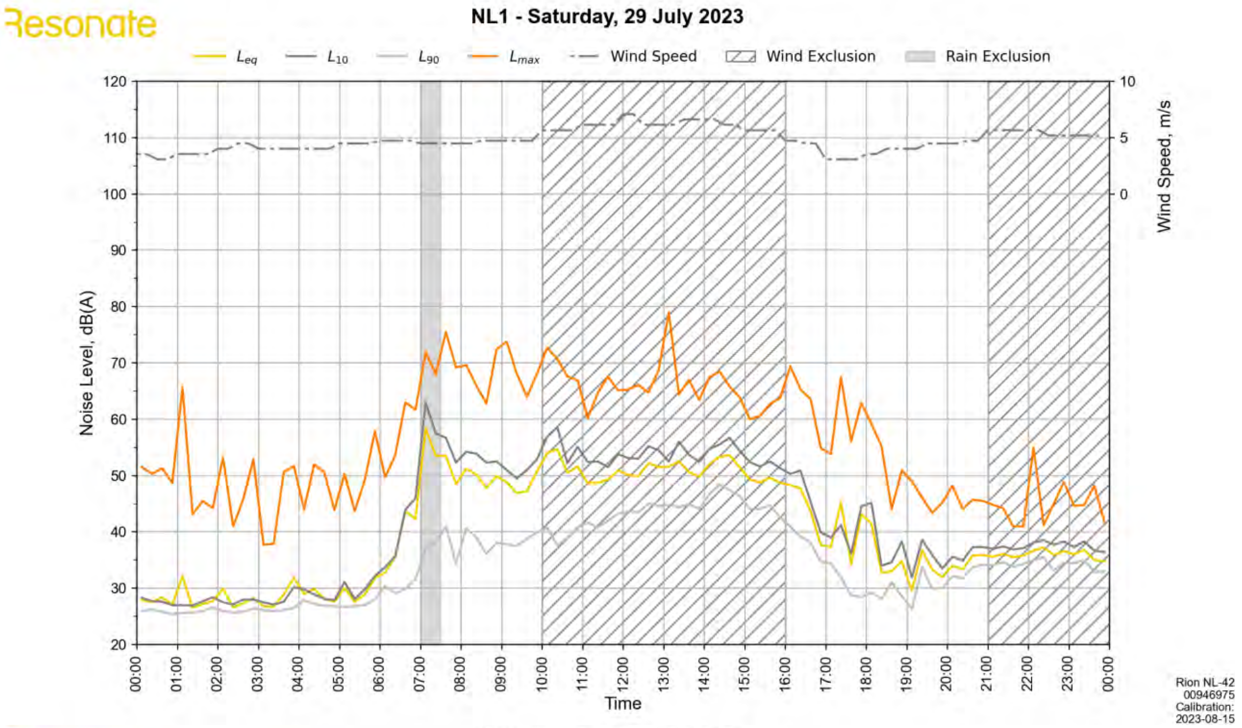
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15

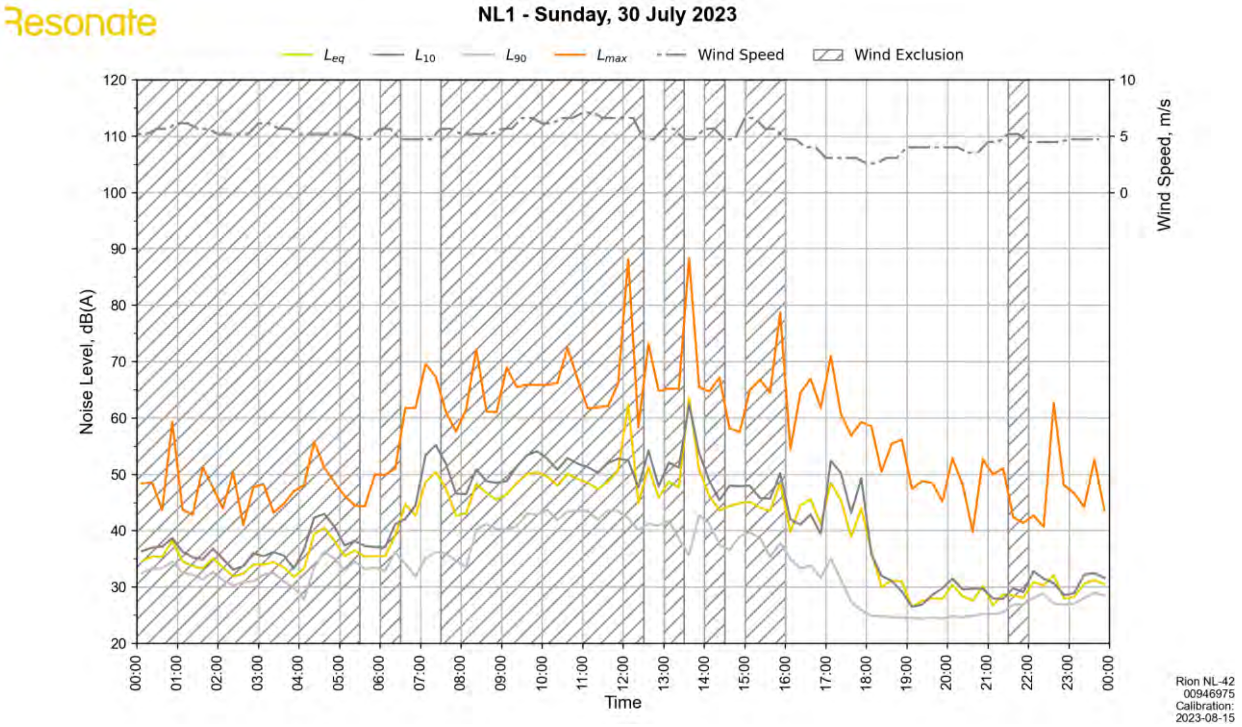

Resonate
NL1 - Tuesday, 25 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Rain Exclusion
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
Time
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15

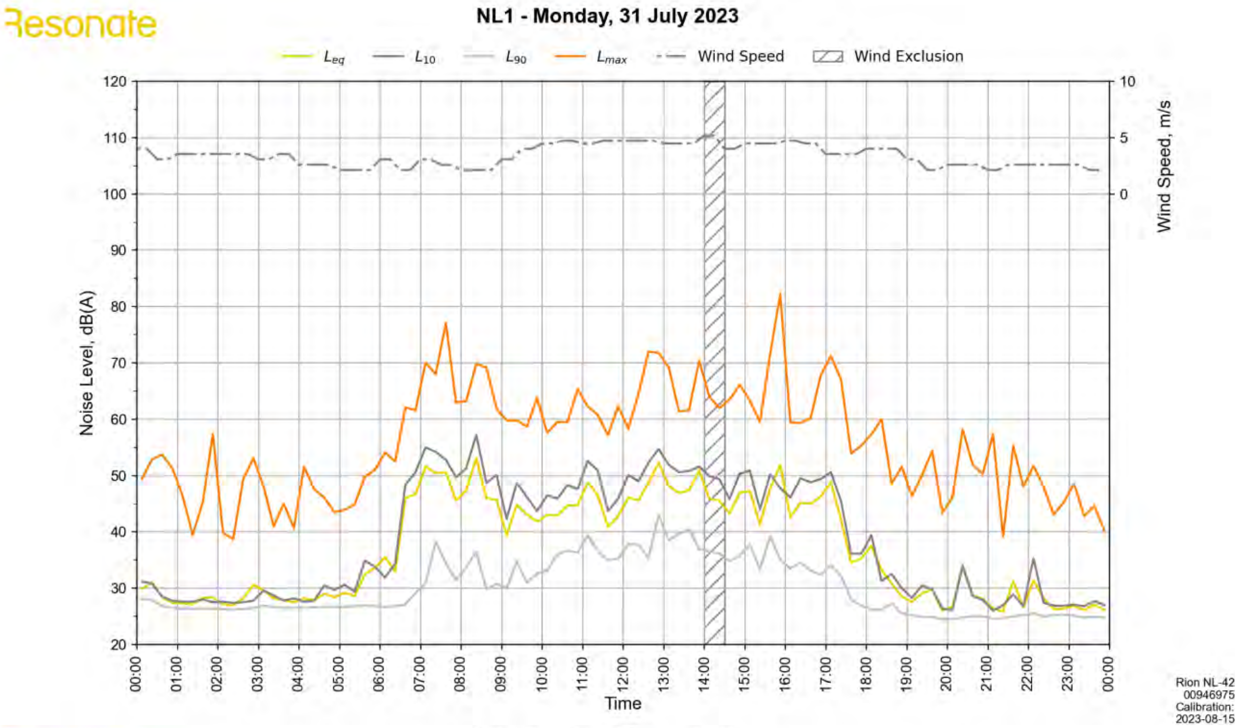

Resonate
NL1 - Wednesday, 26 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
Time
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15

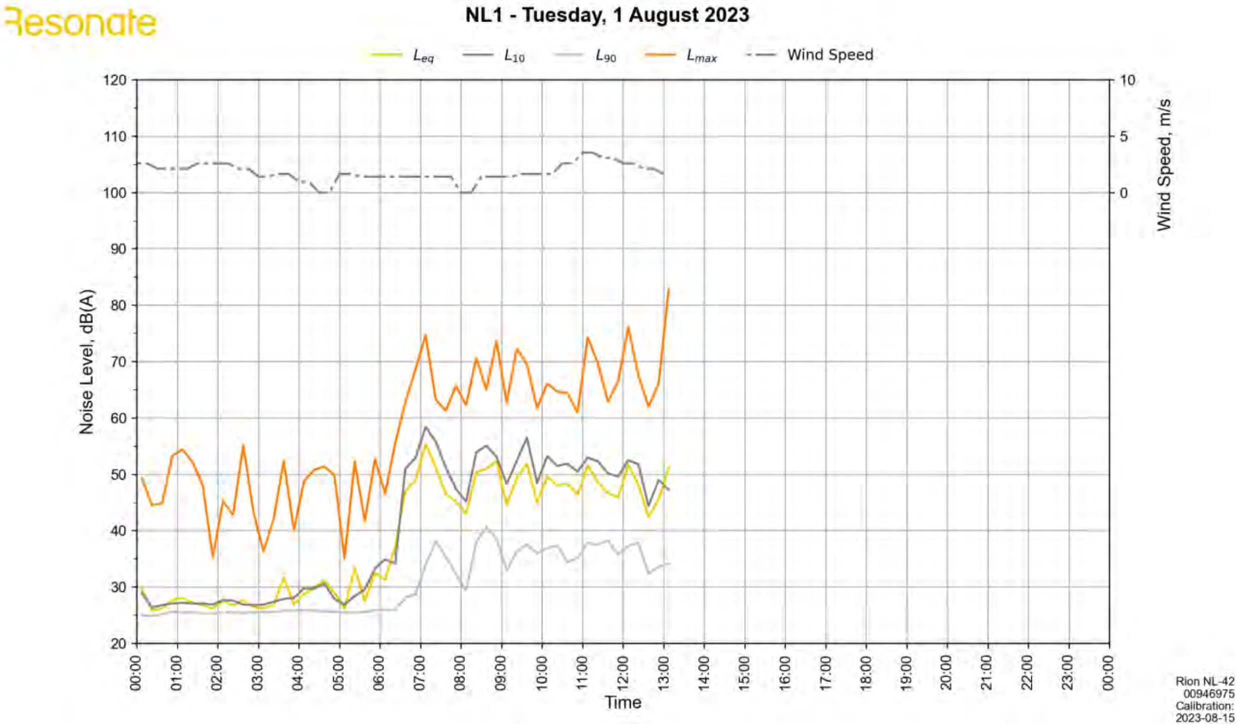

Resonate
NL1 - Thursday, 27 July 2023
Leq
L10
L90
Lmax
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15


Resonate
NL1 - Friday, 28 July 2023
Leq
L10
L90
Lmax
Wind Speed
Wind Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15

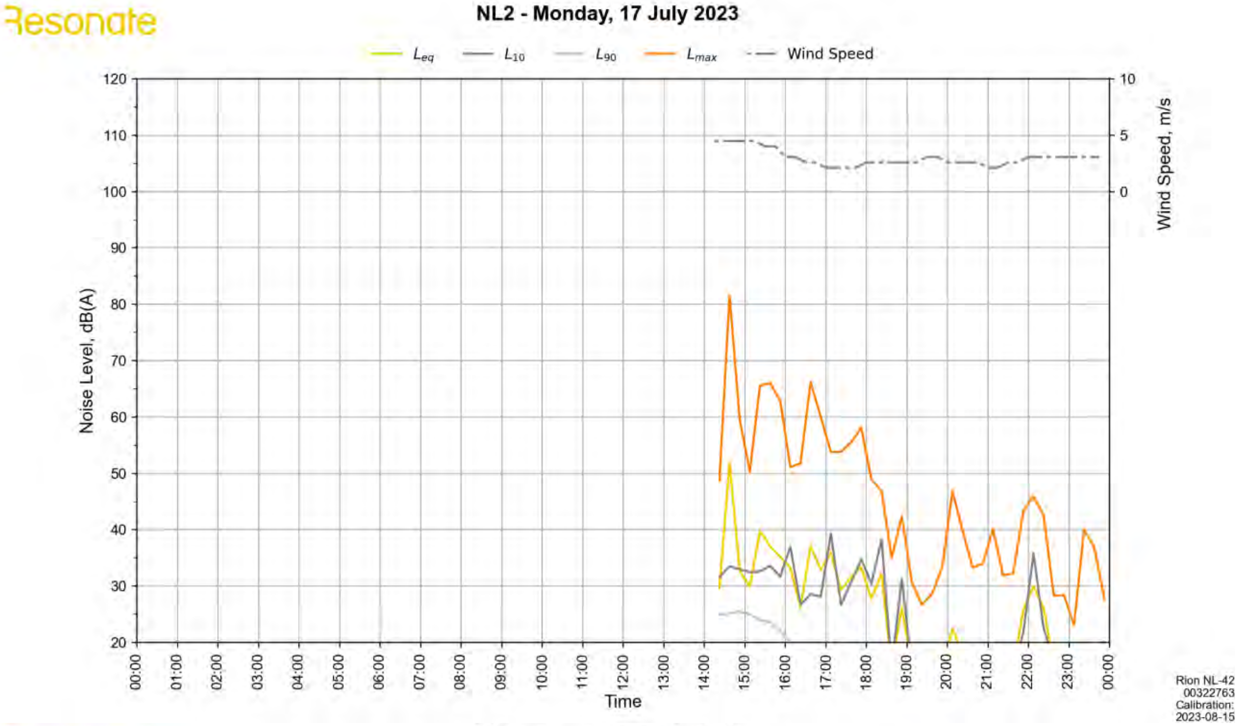

Resonate
NL1 - Saturday, 29 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
120
110
100
90
80
70
60
50
40
30
20
Noise Level, dB(A)
10
5
0
Wind Speed, m/s
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time
Rion NL-42
00946975
Calibration:
2023-08-15

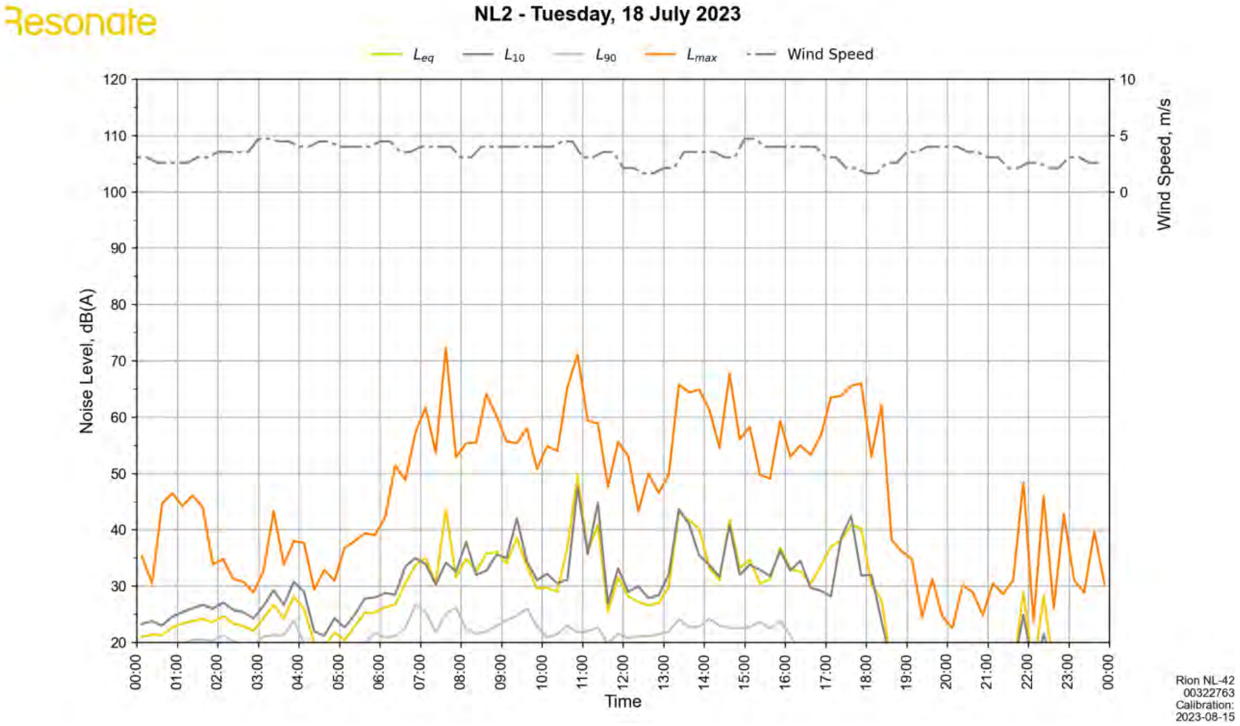

Resonate
NL1 - Sunday, 30 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
120
110
100
90
80
70
60
50
40
30
20
Noise Level, dB(A)
10
5
0
Wind Speed, m/s
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time
Rion NL-42
00946975
Calibration:
2023-08-15

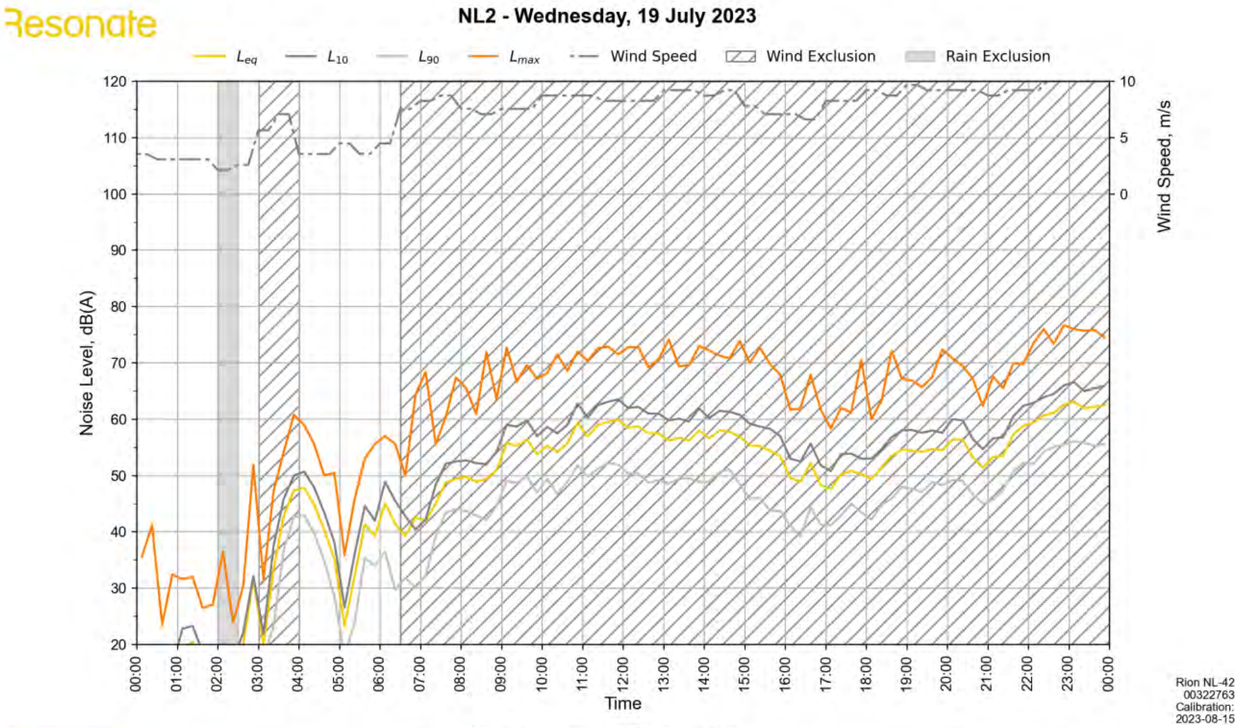

Resonate
NL1 - Monday, 31 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15

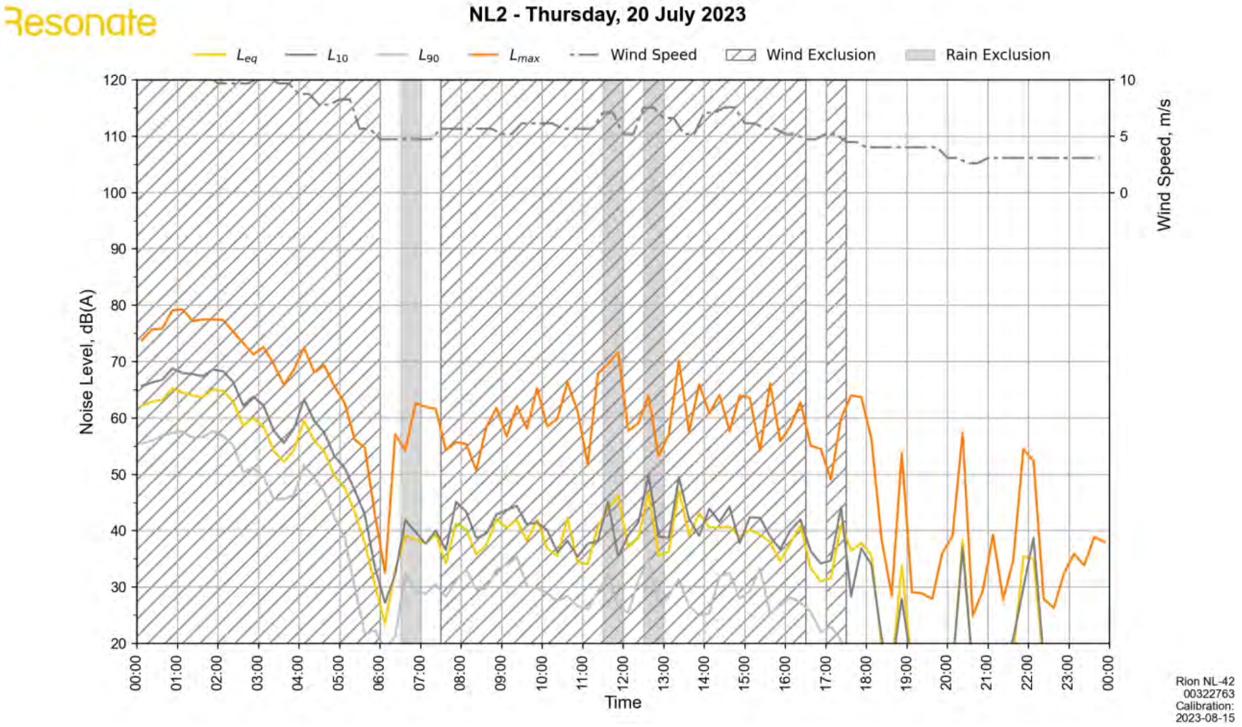

Resonate
NL1 - Tuesday, 1 August 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
120
110
100
90
80
70
60
50
40
30
20
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00946975
Calibration:
2023-08-15

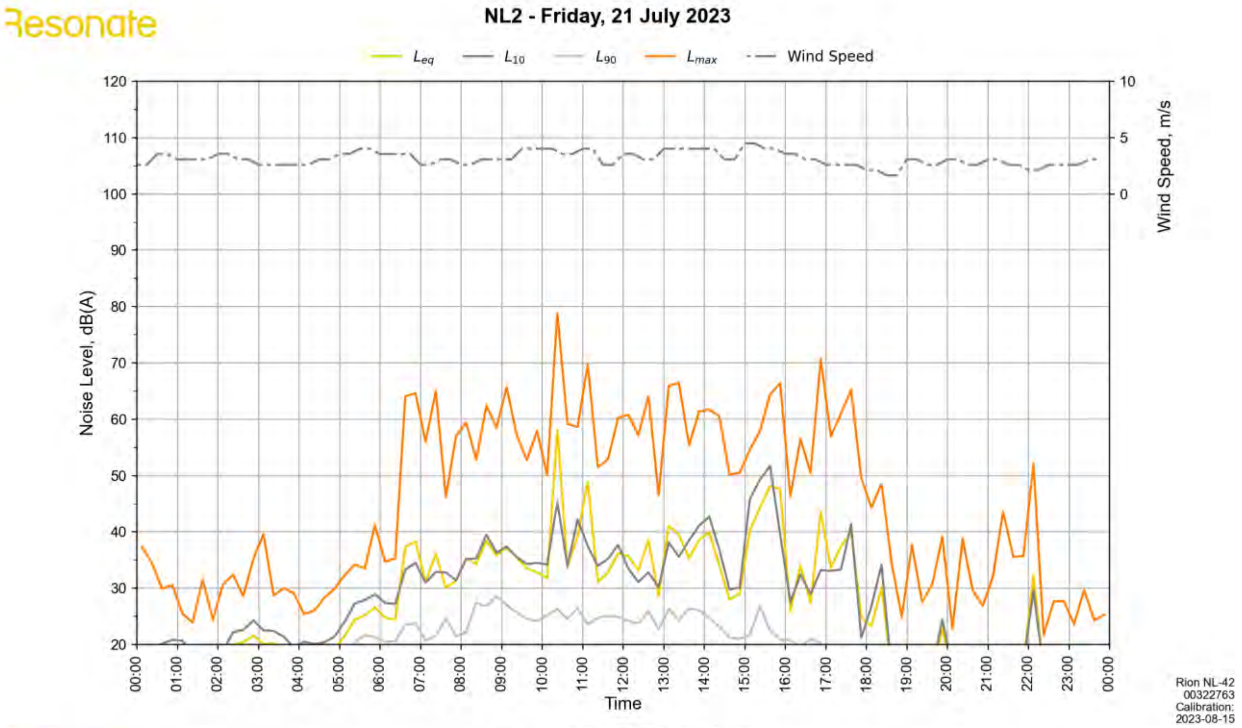
**NL2**

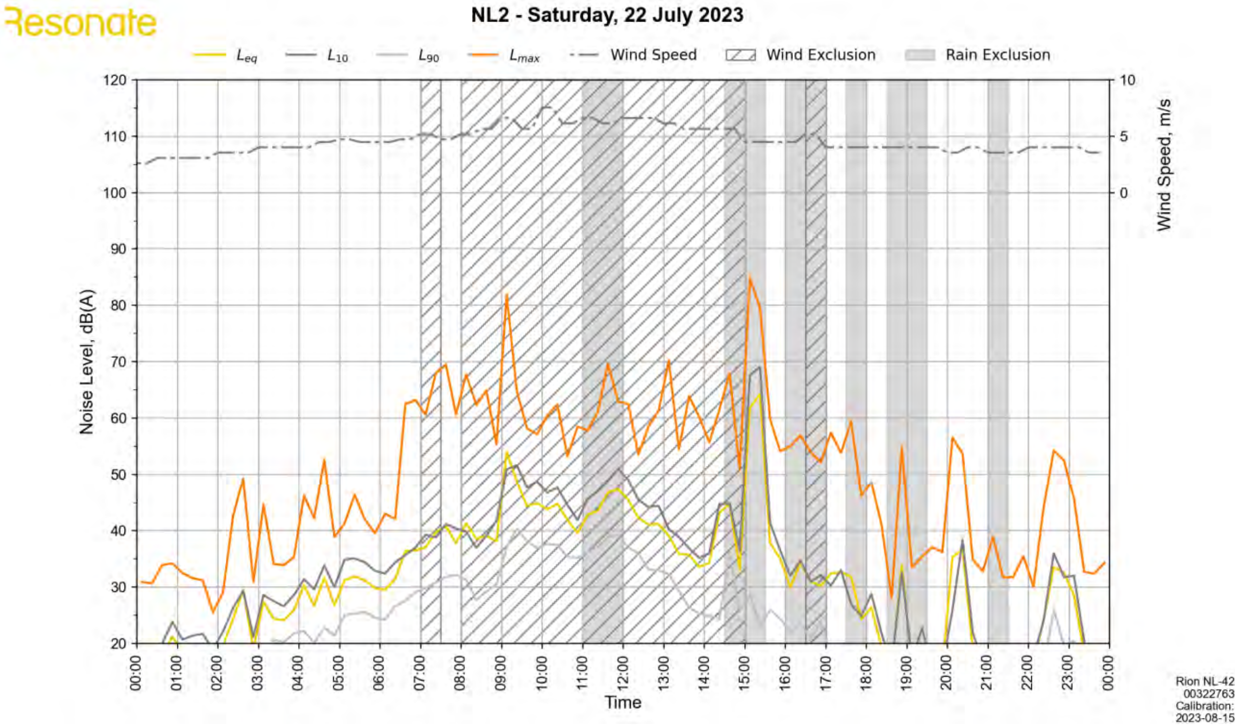

Resonate
NL2 - Monday, 17 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time
Rion NL-42
00322763
Calibration:
2023-08-15

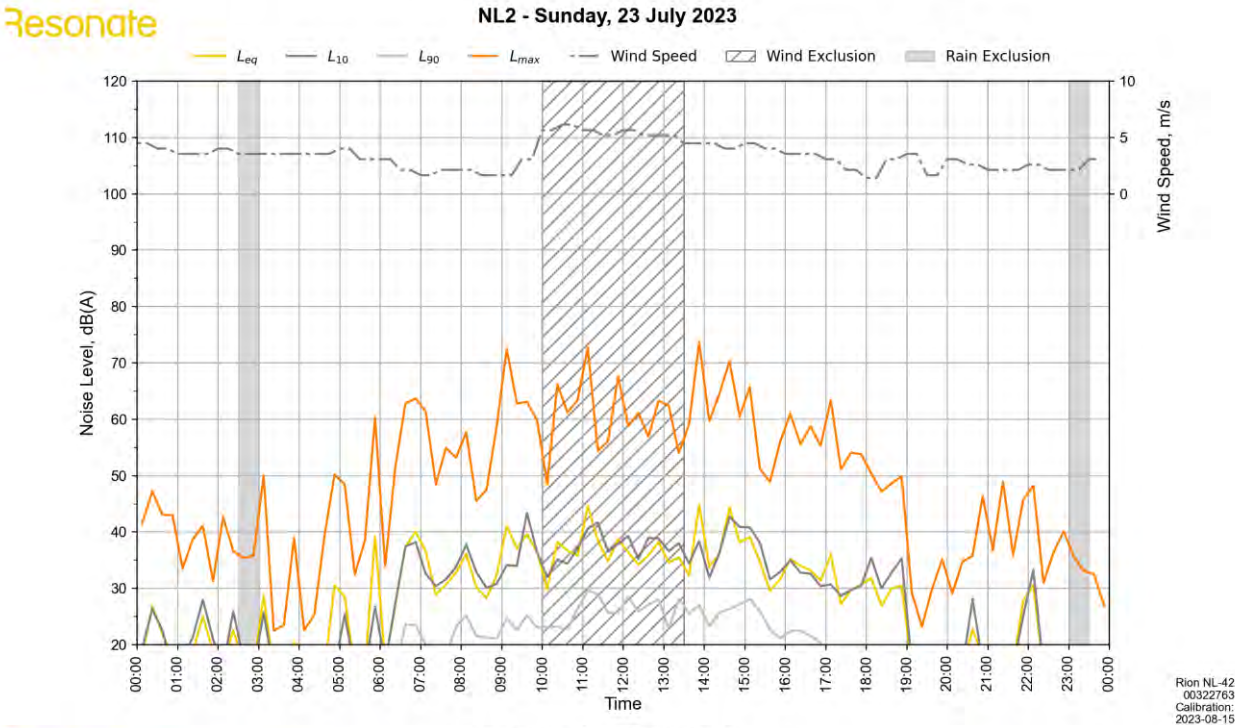

Resonate
NL2 - Tuesday, 18 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time
Rion NL-42
00322763
Calibration:
2023-08-15

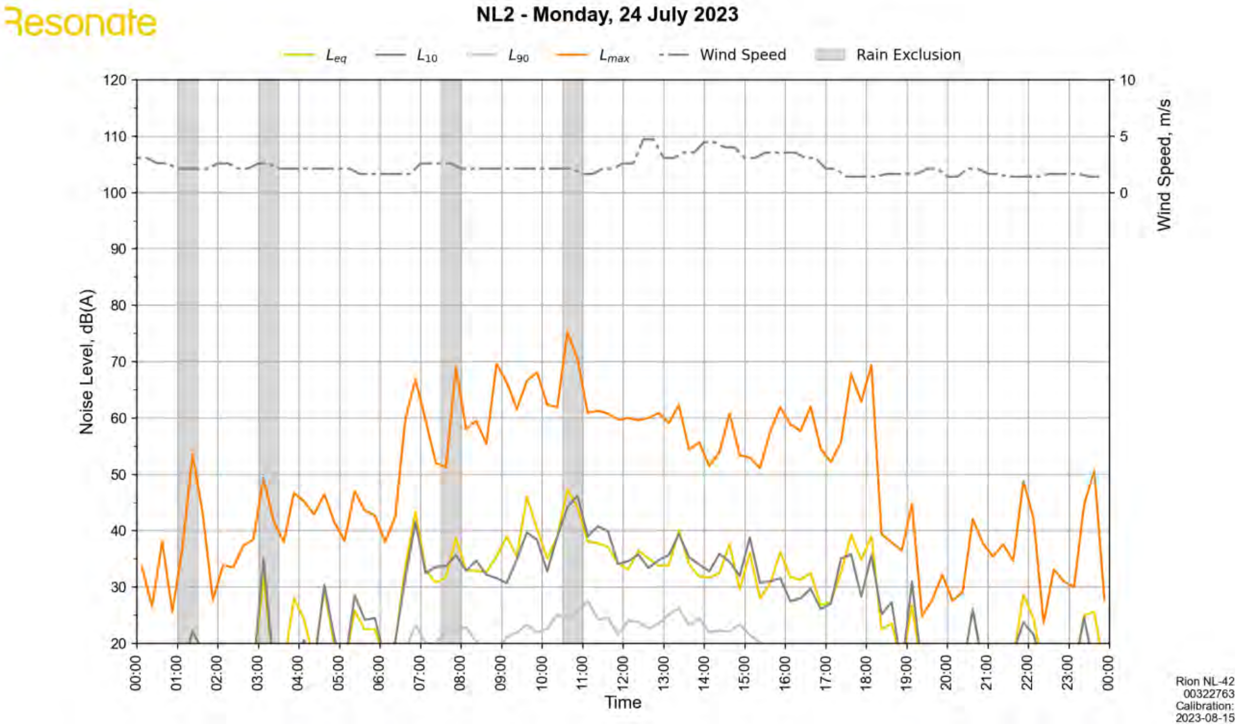

Resonate
NL2 - Wednesday, 19 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
10
5
0
Wind Speed, m/s
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time
Rion NL-42
00322763
Calibration:
2023-08-15

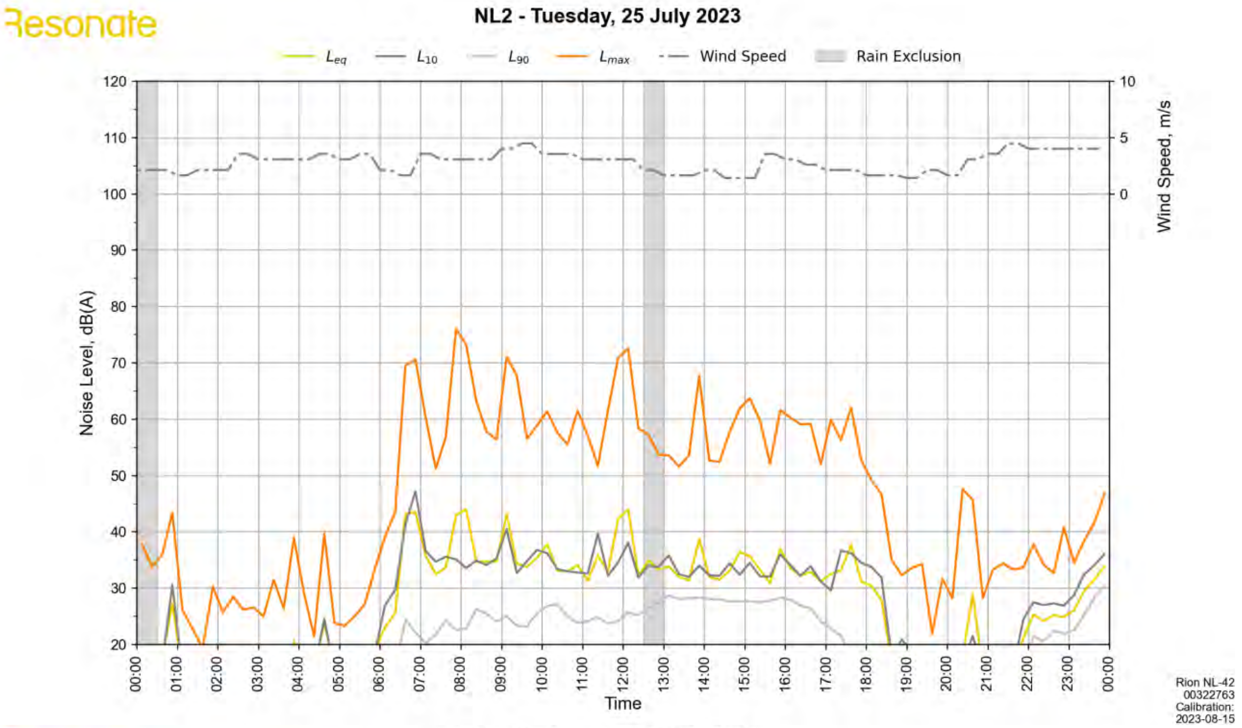

Resonate
NL2 - Thursday, 20 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
10
5
0
Wind Speed, m/s
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time
Rion NL-42
00322763
Calibration:
2023-08-15

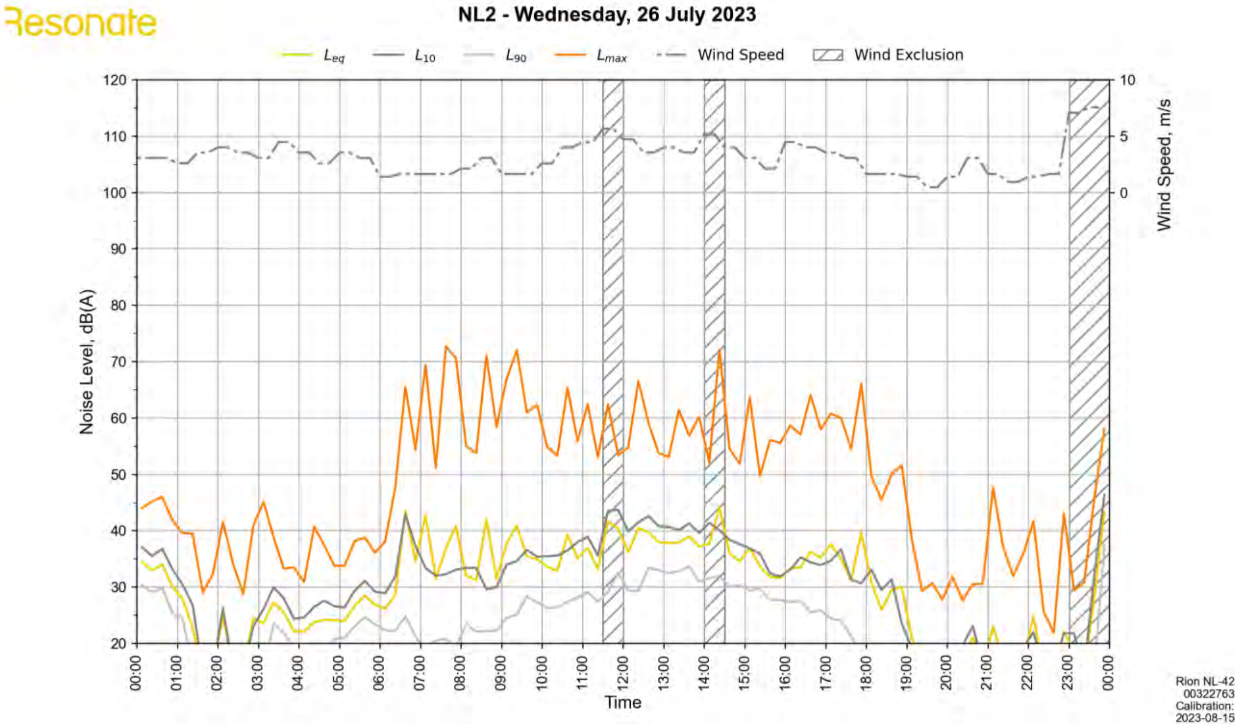

Resonate
NL2 - Friday, 21 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
Time
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00322763
Calibration:
2023-08-15


Resonate
NL2 - Saturday, 22 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
Time
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Rion NL-42
00322763
Calibration:
2023-08-15


NL2 - Sunday, 23 July 2023
Leq
L10
L90
Lmax
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00322763
Calibration:
2023-08-15


NL2 - Monday, 24 July 2023
Leq
L10
L90
Lmax
Wind Speed
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00322763
Calibration:
2023-08-15


Resonate
NL2 - Tuesday, 25 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Rain Exclusion
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time
Rion NL-42
00322763
Calibration:
2023-08-15


Resonate
NL2 - Wednesday, 26 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Noise Level, dB(A)
120
110
100
90
80
70
60
50
40
30
20
Wind Speed, m/s
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
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08:00
09:00
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19:00
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22:00
23:00
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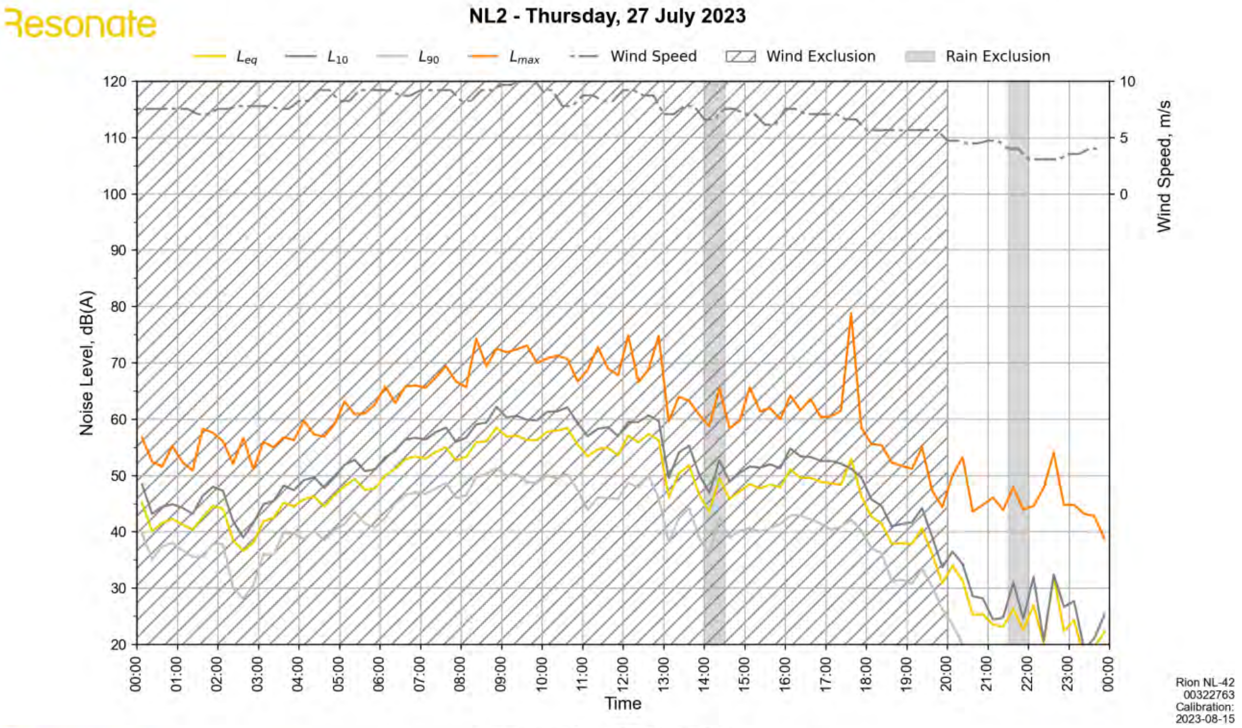
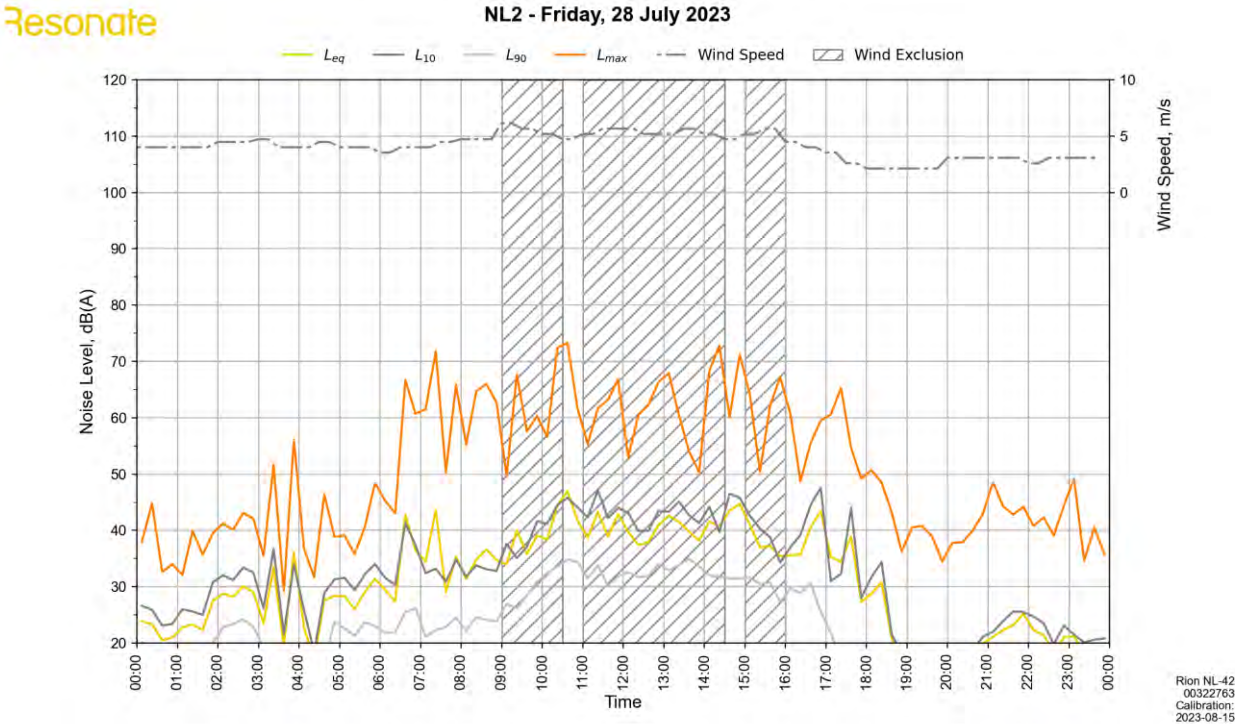
Time
Rion NL-42
00322763
Calibration:
2023-08-15


Resonate
NL2 - Thursday, 27 July 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00322763
Calibration:
2023-08-15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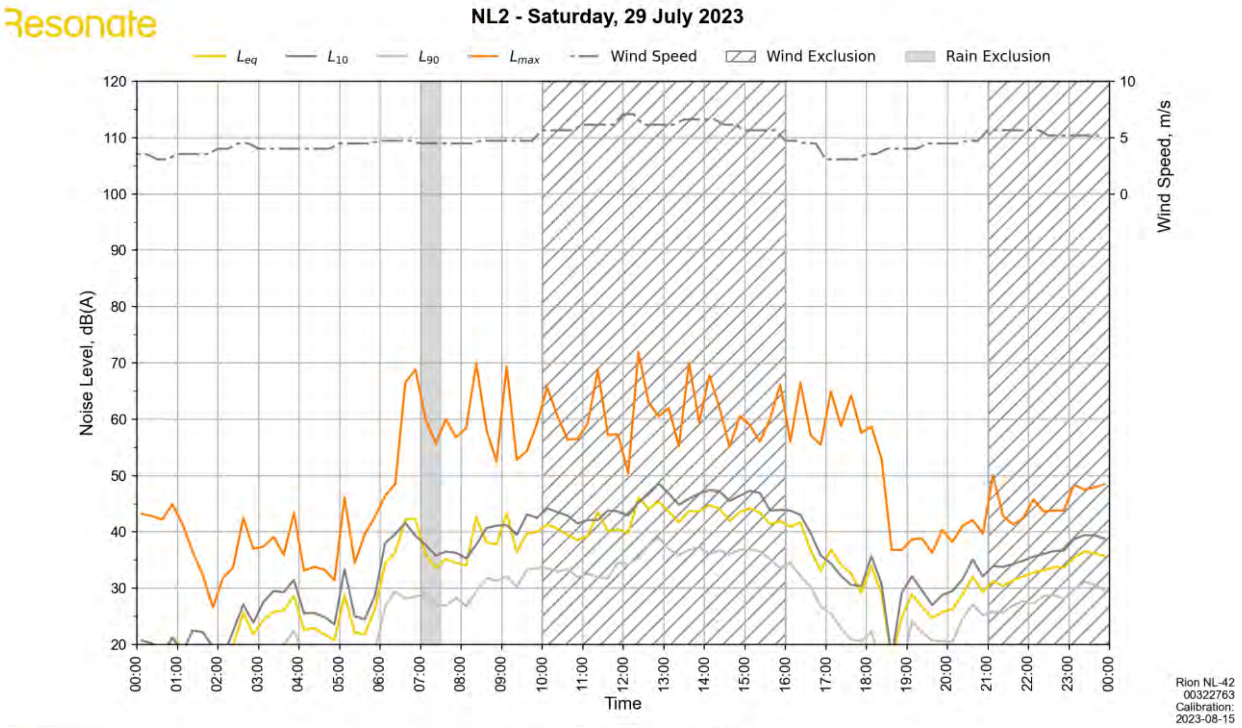
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$L_{90}$
$L_{max}$
Wind Speed
Wind Exclusion
Rain Exclusion
Noise Level, dB(A)
120
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Wind Speed, m/s
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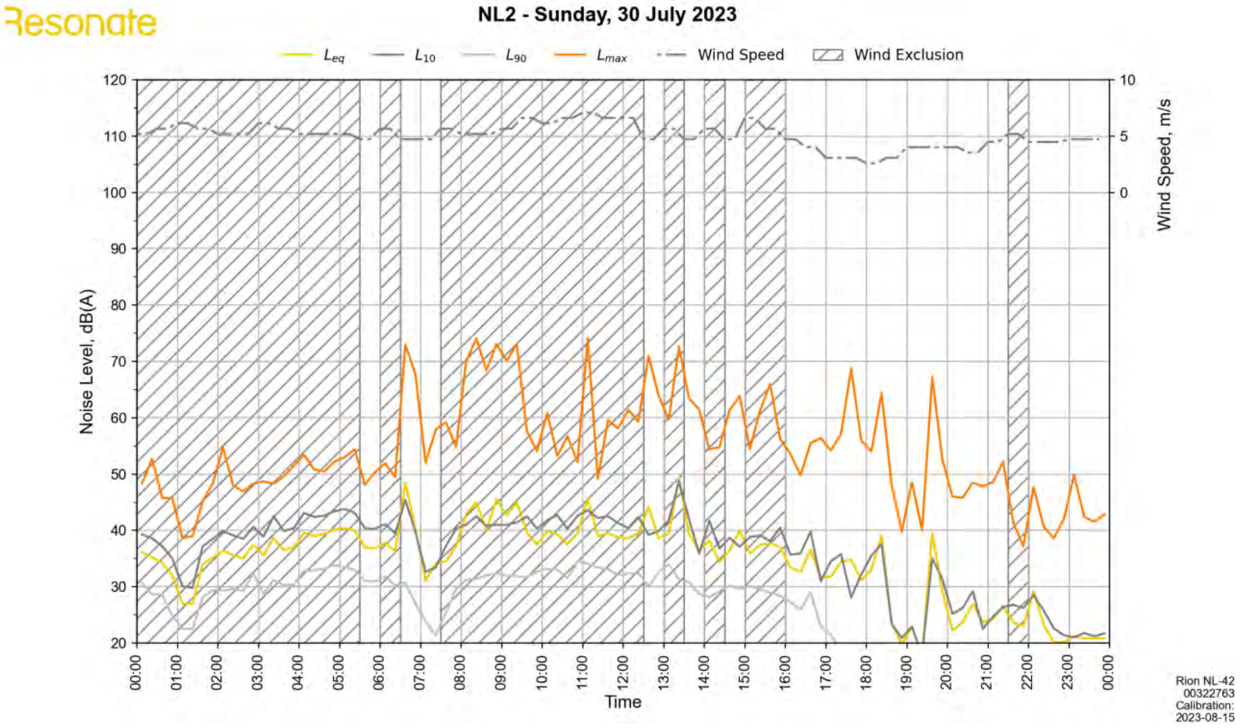
2023-08-15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$L_{max}$
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Wind Speed, m/s
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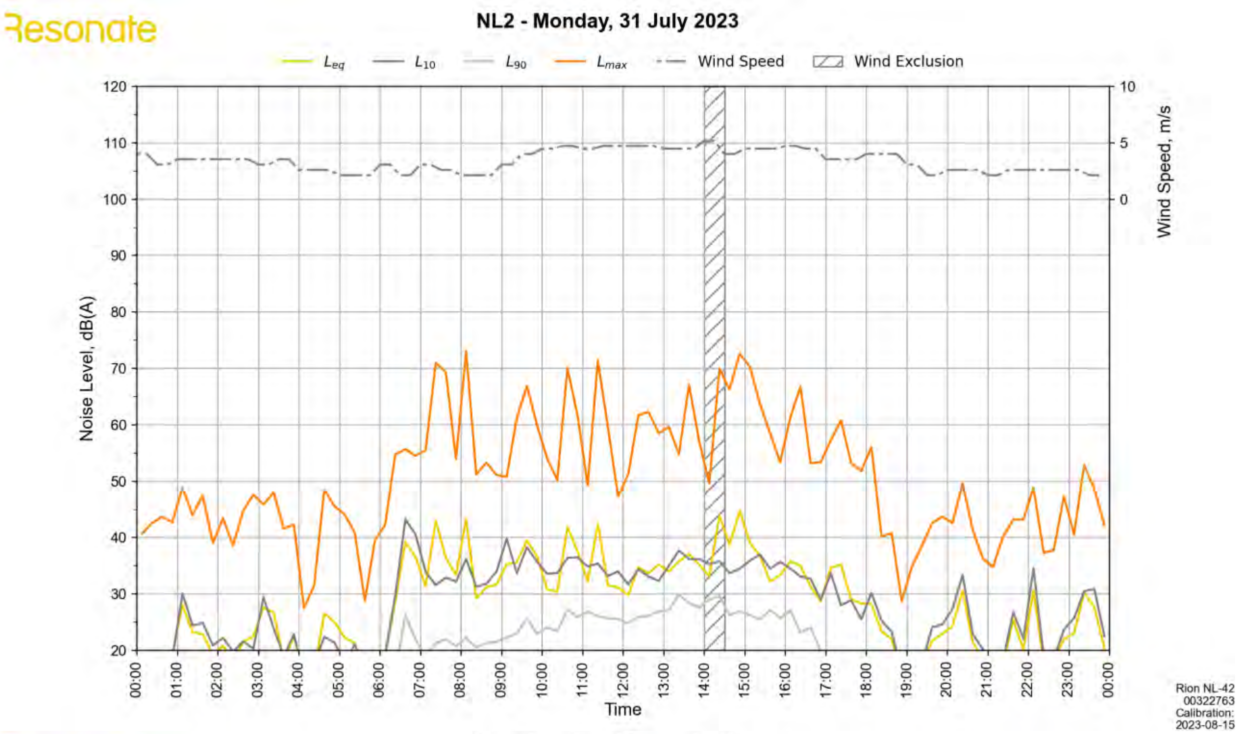
Calibration:
2023-08-15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$L_{max}$
Wind Speed
Wind Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
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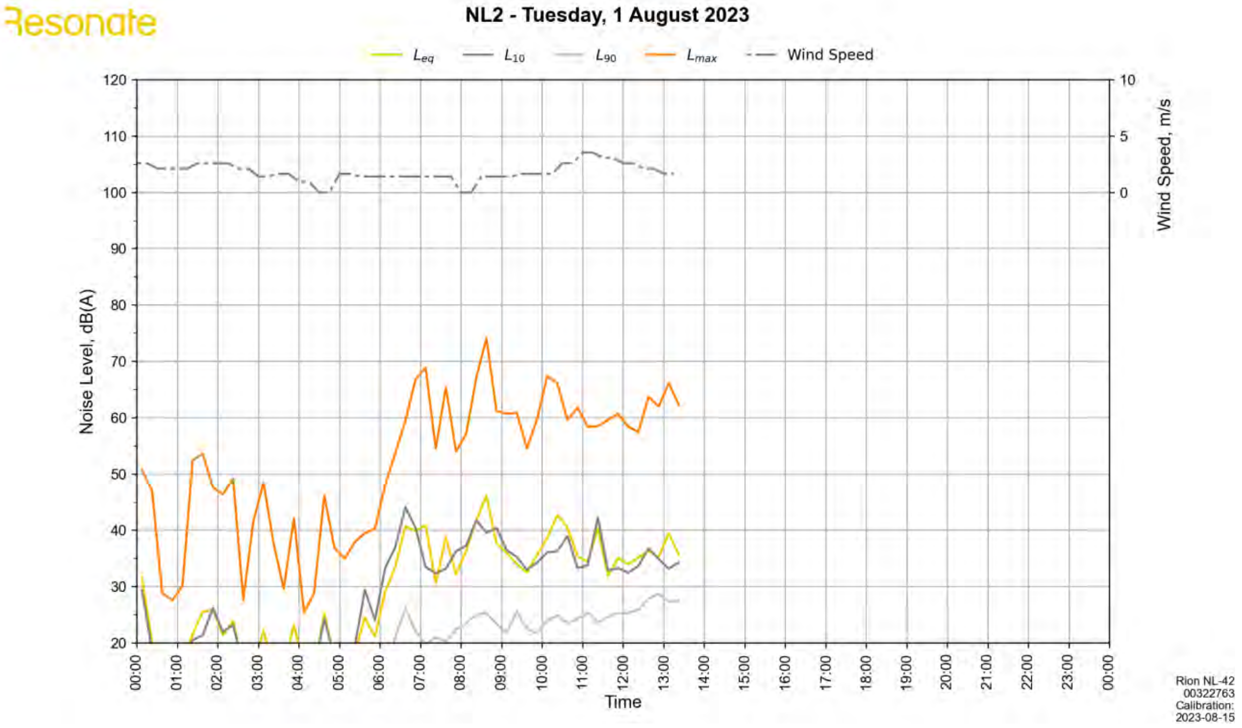
Resonate
NL2 - Tuesday, 1 August 2023
$L_{eq}$
$L_{10}$
$L_{90}$
$L_{max}$
Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
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00322763
Calibration:
2023-08-15

# 6

# AVIATION ASSESSMENT

July 2024

Aviation assessment

# Yadnarie Solar Power and Energy Storage Project

*Prepared for MasterPlan (on behalf of Photon Energy NV)*

AVIATION PROJECTS

# DOCUMENT CONTROL

| | |
|---|---|
| Document Title: | Yadnarie Solar Power and Energy Storage Project – Aviation Assessment |
| Reference: | 107301-01 |
| Prepared by: | J Bell |
| Reviewed by: | P White |
| Released by: | J Bell |

Revision History

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| 0.2 | Second draft | 25 July 2023 | MasterPlan | May 2024 |
| 1.0 | Final | 12 June 2024 | MasterPlan | 27 June 2024 |
| 1.1 | Minor updates to images | 03 July 2024 | | |
| 1.2 | Updated Final | 07 October 2024 | | |

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# LIST OF FIGURES

# LIST OF TABLES

# UNITS OF MEASUREMENT

| | | |
|---|---|---|
| ft | feet | (1 ft = 0.3048 m) |
| km | kilometres | (1 km = 0.5399 nm) |
| m | metres | (1 m = 3.281 ft) |
| nm | nautical miles | (1 nm = 1.852 km) |

# 1. EXECUTIVE SUMMARY

## 1.1. Introduction

Photon Energy AUS SPV 4 Pty Ltd (Photon Energy) is proposing to develop a solar power and energy storage facility near Cleve, in the Eyre Peninsula Region of South Australia, using RayGen Resources Pty Ltd (RayGen) solar cogeneration technology (the Project). The Project will incorporate 150MWac solar generation, 90MW grid connection/ 3.6 Gigawatt hours of storage (and 12 hours of dispatchable energy), with connection to the Yadnarie substation or 132kV overhead transmission line and ancillary infrastructure.

The Project is located approximately 9 km west of the Cleve township and aerodrome.

Aviation Projects has been engaged by MasterPlan on behalf of Photon Energy to conduct an aviation assessment of the Project. This study will assess the potential aviation impacts caused by the Project including impacts associated with tall objects and solar glare, and provide aviation safety advice in respect of relevant requirements of air safety regulations and procedures.

## 1.2. Project description

The Project is proposed to consist of the following:

- Site area of approximately 1530 hectares
- 150 fields of rotational mirrors (heliostats) orientated north. Each field comprises 273 individual heliostats. Each heliostat is approximately between 2.6 m and 5.6 metres above the ground and mounted on a steel post
- One receiver per field of heliostats, with a maximum height of 45 m above ground level (AGL)
- Three (3) thermal hydro pit units comprising:
  - 3 cold pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
  - 3 hot pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
- Three Thermal Hydro plants, each comprising:
  - An Organic Rankine Cycle (ORC) engine and generator, with net capacity of 30MW
  - Heat Exchangers
  - Tanks
  - Various pumps
  - Large Chiller and Heat Pump units
- Underground electrical cable reticulation on site
- Switch yard and connection via overhead transmission connection to the Yadnarie substation

- Operations and maintenance building and compound.
- Temporary construction compound.
- Security fencing around the site.
- Internal access roads.

The Project Area is shown in Figure 1 in relation to the town of Cleve, Cleve aerodrome (YCEE) and the Birdseye highway (Source, MasterPlan, Google Earth).

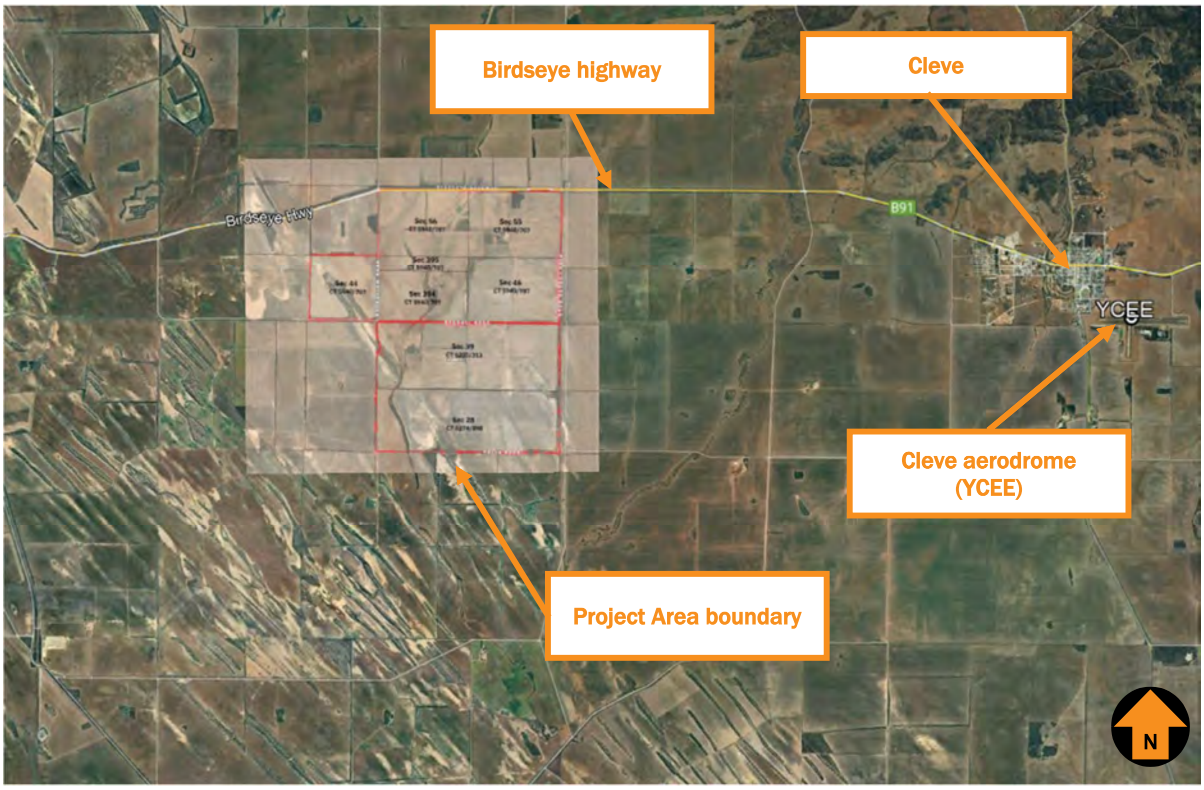

Figure 1 Project site

The general configuration of the Project is shown in Figure 2 (Source, MasterPlan, Google Earth).

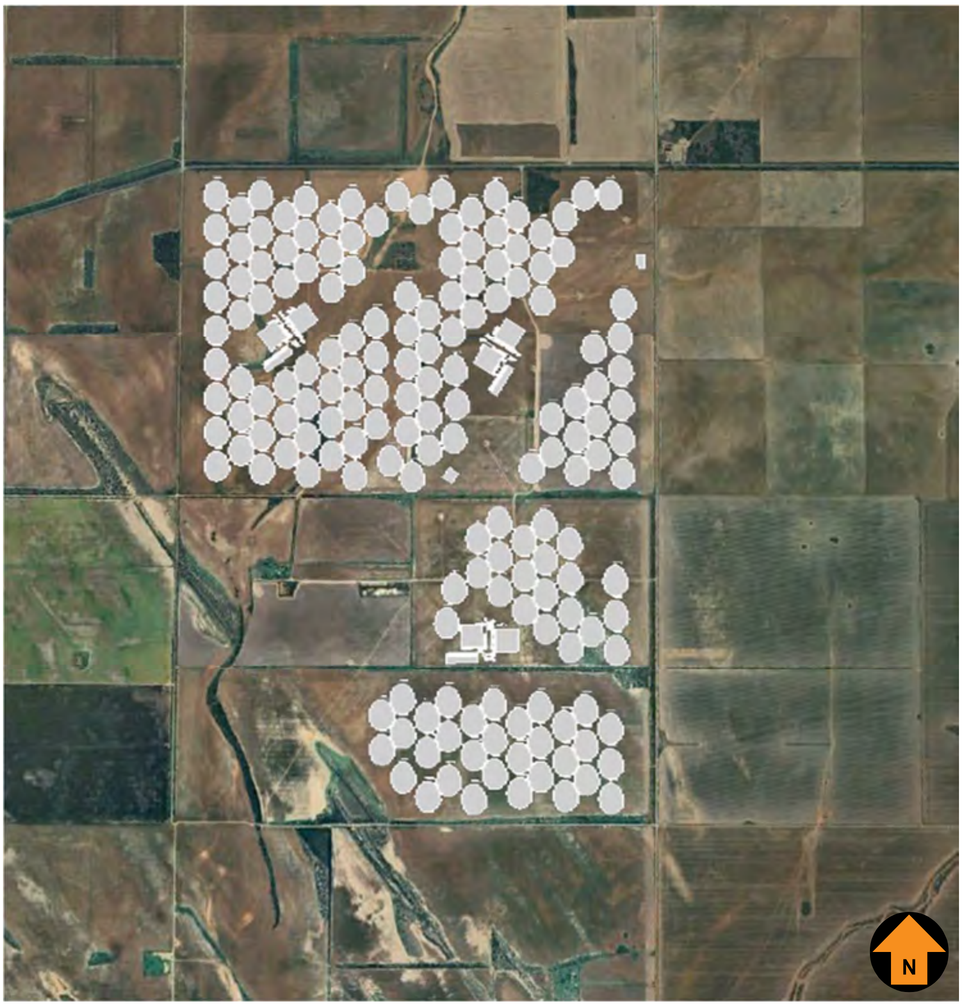

Figure 2 Yadnarie Plant Layout

Figure 3 to Figure 5 shows the general nature of the Project Area with photographs taken during a site assessment on 2 June 2023.

Figure 3 Northeast Project Area boundary

Figure 4 Project Area from central eastern boundary

Figure 5 Project Area from southern boundary

### 1.3. Project height

This assessment considers the potential aviation impacts caused by the receiving towers that will be installed in each heliostat field in the Project Area, at a maximum height of 45 m AGL. It is noted the existing transmission line towers in the Project Area are likely higher than 45 m AGL.

The maximum observed elevation within the Project Area was 185 m AHD on Google Earth. A 5 m error margin is applied for this assessment, resulting in a nominal maximum Project height of 235 m AHD (771 ft AMSL). This height will be referenced in analysis of potential impacts to aviation caused by tall objects associated with the Project.

Figure 5 shows a receiving tower installed at the RayGen Power Plant Carwarp Project, located approximately 30 km south of Mildura, Victoria.

It is understood the receiving towers for the Yadnarie Project will have a similar configuration.

Figure 6 Receiving tower Carwarp Solar Farm

# 2. EXTERNAL CONTEXT

This chapter explores the aviation regulatory and planning context that may impact the Project with respect to potential aviation impacts.

## 2.1. Federal Aviation Administration – Review of Solar Energy System Projects (interim policy 2013)

The Federal Aviation Administration (FAA) is the transportation agency of the United States (US) Government responsible for the regulation of civil aviation in the US. The FAA is considered in this assessment in relation to their regulation of solar energy systems developed near airports. The FAA does not have jurisdiction in Australia.

The FAA established a policy for the assessment of solar energy systems on airport property. The policy was introduced initially as an interim policy in 2013 and was applicable only to Federally Obligated airports (referring to those airports in the US that have accepted federal funds to buy land or develop and improve airports in the US).

Solar photovoltaic (PV) panels can produce glint (a momentary flash of bright light) and glare (a continuous source of bright light), which could result in an ocular impact to pilots or air traffic controllers.

The Federal Aviation Administration (FAA) provided a free tool called Solar Glare Hazard Analysis Tool (SGHAT) and supporting Interim Policy 78 FR 63276 for the assessment of solar glare.

The assessment requirement specified:

> *No potential for glare or "low potential for after-image" along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds). The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath.*

The analysis should determine the level of adherence to the FAA policy for these components:

1. Analysis time interval and eye characteristics used are acceptable
2. No glare of any kind for Air Traffic Control Tower(s) (ATCT) at cab height
3. Flight path receptor(s) do not receive yellow glare.

FAA policy has been referenced in the report for context only, as the policy is not strictly applicable in Australia although is often referenced in assessments of solar installations. Concentrated solar projects are not specifically referenced in the FAA policy.

This assessment notes that the 2013 interim FAA policy has been replaced, and the assessment of 2-mile flight path receptors is no longer required by the FAA.

## 2.2. Federal Aviation Administration – Review of Solar Energy System Projects (final policy) May 2021

In May 2021, the FAA released the final policy: *Review of Solar Energy System Projects on Federally Obligated Airports*. This policy replaces the interim policy which had until May 2021 been the basis for reviewing solar projects in relation to aviation impacts in the USA, and broadly accepted internationally as the preferred standard for the review of solar impacts for aviation.

The final policy only applies to Federally obligated airports in the USA and is primarily interested in the potential impact of solar glare on air traffic control tower personnel. (The interim policy required federally obligated airports to conduct an ocular analysis of potential glint and glare effects to pilots on final approach and air traffic control tower (ATCT) cabs before construction begins.)

Initially, the FAA believed that solar energy systems could introduce a novel glint and glare effect to pilots on final approach. FAA has subsequently concluded that in most cases, the glint and glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass facade buildings, parking lots, and similar features.

Subsequently, the final policy position of the FAA on solar energy systems near airports is that only air traffic control towers need to be assessed (not including other considerations including potential interference with navigational equipment and the control of tall objects related to the solar installation).

**Summary FAA Policy** – Solar projects developed on airports that do not have an air traffic control tower, or are not Federally-obligated (Regulated), or solar systems not located on airport property, are not subject to the FAA Policy and no assessment would be required.

The Project is not subject to the FAA Policy, in relation to any potential impacts to Cleve aerodrome caused by solar glare.

Concentrated solar projects are not specifically referenced in the FAA policy.

### 2.3. Civil Aviation Safety Authority – Aerodromes

The Civil Aviation Safety Authority (CASA) regulates aviation activities in Australia. Standards for certified aerodromes are established in Part 139 MOS 2019. Chapter 9.143 of Part 139 MOS (Other lighting on the aerodrome) states in section (8) and (9):

> *(8) An aerodrome operator must immediately notify CASA in writing of any proposals for equipment or lighting installation within the aerodrome boundary which would reflect sunlight, including solar panels, mirrors or reflective building cladding,* and
>
> *(9) An aerodrome operator must not proceed with any proposal mentioned in subsection (8) unless CASA has determined, in writing, that it will not cause a hazard to aircraft operations.*

The boundary of an aerodrome is not specifically defined by CASA, but generally refers to the cadastral boundary of the land designated for the aerodrome where land-use is controlled by the certified aerodrome owner or operator. Part 139 MOS 2019 specifies certain requirements for the control of activities that might be hazardous to aircraft (including tall objects and light sources) within an aerodrome boundary, recognising that the aerodrome operator has direct control over the land use and can prevent those activities.

The Project will not be located within the boundary of a certified aerodrome and is therefore not subject to the requirement of Part 139 MOS 2019 to report the Project to CASA for assessment (for glare impacts).

The aviation impact assessment section of this report will address the potential impact of tall objects associated the Project, in relation to Part 139 MOS 2019.

**Airspace Regulations 2007 – application to solar glare impacts**

The implementation of the airspace regulations is for the purpose of enabling CASA to perform the functions and exercise the powers in connection with the administration and regulation of Australian-administered airspace.

Section 6 of the regulation Designation of prohibited, restricted or danger areas specifies that:

> *(1) CASA may, in writing, make a declaration designating an area of Australian territory to be a prohibited area, a restricted area or a danger area.*
>
> *(2) CASA must not declare an area to be a prohibited area unless, in the opinion of CASA, it is necessary for reasons of military necessity to prohibit the flight ofaircraft over the area.*
>
> *(3) CASA must not declare an area to be a restricted area unless, in the opinion of CASA, it is necessary to restrict the flight of aircraft over the area to aircraft flown in accordance with specified conditions in the interests of any of the following:*
>
> > *(a) public safety, including the safety of aircraft in flight;*
> >
> > *(b) the protection of the environment;*
> >
> > *(c) security.*
>
> *(4) CASA must not declare an area to be a danger area unless, in the opinion of CASA, there exists within or over the area an activity that is a potential danger to aircraft flying over the area.*

A danger area is intended to provide pilots with information for airspace that may have activities that are dangerous to the flight of an aircraft. A danger area does not specifically prohibit an aircraft from entering the area, unlike the application of prohibited and restricted areas.

This assessment considers that the potential solar glare impacts caused by the Project would not initiate the application of a Danger Area.

## 2.4. Civil Aviation Regulations (CAR)

Civil Aviation Regulations Part 94 establishes the conditions applicable to dangerous lights installed near an aerodrome:

> *(1) Whenever any light is exhibited at or in the neighbourhood of an aerodrome, or in the neighbourhood of an air route or airway facility on an air route or airway, and the light is likely to endanger the safety of aircraft, whether by reason of glare, or by causing confusion with, or preventing clear reception of, a standard visual signal or aviation distress signal or of air route or airway facilities provided under the Air Services Act 1995; CASA may authorise a notice to be served upon the owner of the place where the light is exhibited or upon the person having charge of the light directing that owner or person, within a reasonable time to be specified in the notice, to extinguish or to screen effectually the light and to refrain from exhibiting any similar light in the future.*
>
> *(2) An owner or person on whom a notice is served under this regulation must comply with the directions contained in the notice.*
>
> *(3) If any owner or person on whom a notice under this regulation is served fails, within the time specified in the notice, to extinguish or to screen effectually the light mentioned in the notice, CASA may authorise an officer, with such assistance as is necessary and reasonable, to enter the place*

> *where the light is and extinguish or screen the light, and may recover the expenses incurred by CASA in so doing from the owner or person on whom the notice has been served.*

This assessment will help determine whether the Project is likely to endanger the safety of aircraft and is subject to the requirements of CAR Part 94.

### 2.5. National Airports Safeguarding Framework

The National Airports Safeguarding Advisory Group (NASAG) was established by the Commonwealth Department of Infrastructure and Transport to develop a national land use planning framework called the National Airports Safeguarding Framework (NASF). The purpose of this framework is to enhance the current and future safety, viability, and growth of aviation operations at Australian airports through:

- the implementation of best practice in relation to land use assessment and decision making in the vicinity of airports
- assurance of community safety and amenity near airports
- better understanding and recognition of aviation safety requirements and aircraft noise impacts in land use and related planning decisions
- the provision of greater certainty and clarity for developers and landowners
- improvements to regulatory certainty and efficiency
- the publication and dissemination of information on best practice in land use and related planning that supports the safe and efficient operation of airports.

The National Airport Safeguarding Framework Guideline E *Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports* provides guidance on the potential risk of distractions to pilots of aircraft from lighting and light fixtures near airports but does not specifically address solar glare.

NASF Guideline E provides advice for situations where lights are to be installed within a 6 km radius of a known aerodrome.

The Project is not located within 6 km of Cleve aerodrome or any other known aerodrome.

### 2.6. Aircraft operations at non-controlled aerodromes

There are several uncontrolled aerodromes in the region of the Project Area, including Cleve aerodrome. Advisory Circulars (ACs) provide advice and guidance from CASA to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements. Advisory Circular (AC) 91-10 v1.1 Operations in the vicinity of non-controlled aerodromes provides guidance for pilots flying at or in the vicinity of non-controlled aerodromes, with respect to CASR 91.

A conventional circuit pattern and heights are provided in AC 91-10 v1.1. The standard circuit consists of a series of flight paths known as legs when departing, arrival or when conducting circuit practice. Illustrations of the standard aerodrome traffic circuit procedures provided in AC 91-10 v1.1. are shown in Figure 7 and Figure 8 (Source, CASA).

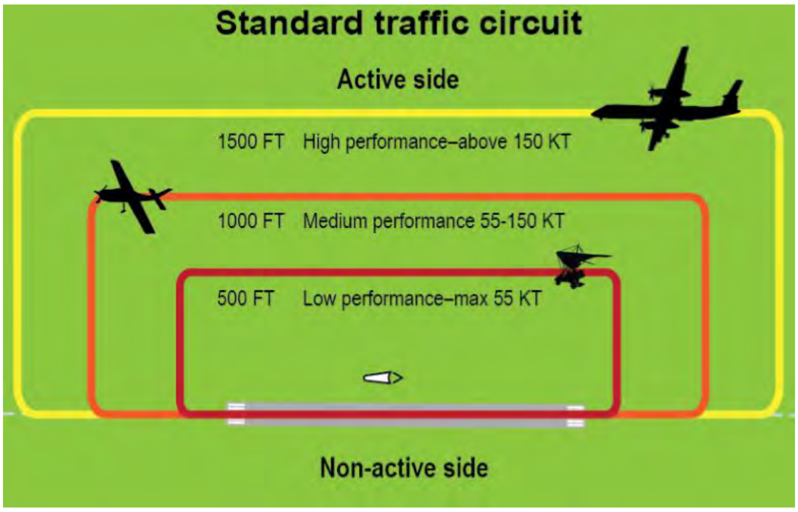

Figure 7 Lateral and vertical separation in the standard aerodrome traffic circuit

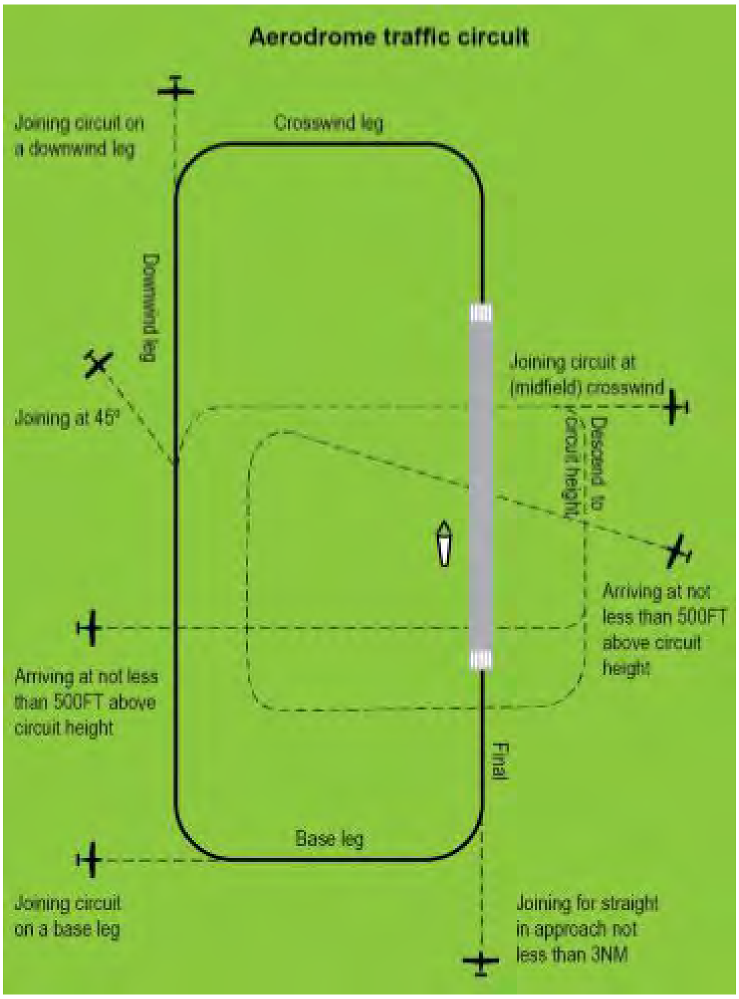

Figure 8 Aerodrome standard traffic circuit, showing arrival and joining procedures.

AC 91-10 v1.1. paragraph 7.10 refers to a distance that is "normally" well outside the circuit area and where no traffic conflict exists, which is at least 3 nm. The paragraph is copied below:

> *7.10 Departing the circuit area*
>
> *7.10.1 Aircraft should depart the aerodrome circuit area by extending one of the standard circuit legs or climbing to depart overhead. However, the aircraft should not execute a turn to fly against the circuit direction unless the aircraft is well outside the circuit area and no traffic conflict exists. This will normally be at least 3 NM from the departure end of the runway but may be less for aircraft with high climb performance. In all cases, the distance should be based on the pilot's awareness of traffic and the ability of the aircraft to climb above and clear of the circuit area.*

# 3. AVIATION ASSESSMENT

## 3.1. Introduction

This analysis considers the potential aeronautical impact of the Project on the following items, in relation to tall objects associated with the Project:

- The operation of nearby certified aerodromes
- The operation of nearby aircraft landing areas (uncertified aerodromes)
- Grid and air route Lowest Safe Altitudes (LSALTs)
- Airspace protection
- Aviation facilities
- Radar installations
- Local aircraft operations.

## 3.2. Nearby certified aerodromes

There is 1 certified aerodrome located within 30 nm of the Project Area boundary:

- Cleve aerodrome (YCEE)

Figure 9 shows the Project Area boundary with a 30 nm radius in relation to the nearest certified aerodromes (source, MasterPlan, Google Earth, Airservices). The certified aerodromes are identified by the location of the aerodrome reference point.

The 30 nm radius represents the 25 nm minimum sector altitude (MSA) for aerodromes with terminal instrument flight procedures. The 25 nm MSA minimum altitude is determined by assessing obstacles within 30 nm (25 nm plus 5 nm buffer) of the aerodrome reference point or navigational aid on which the MSA is based on.

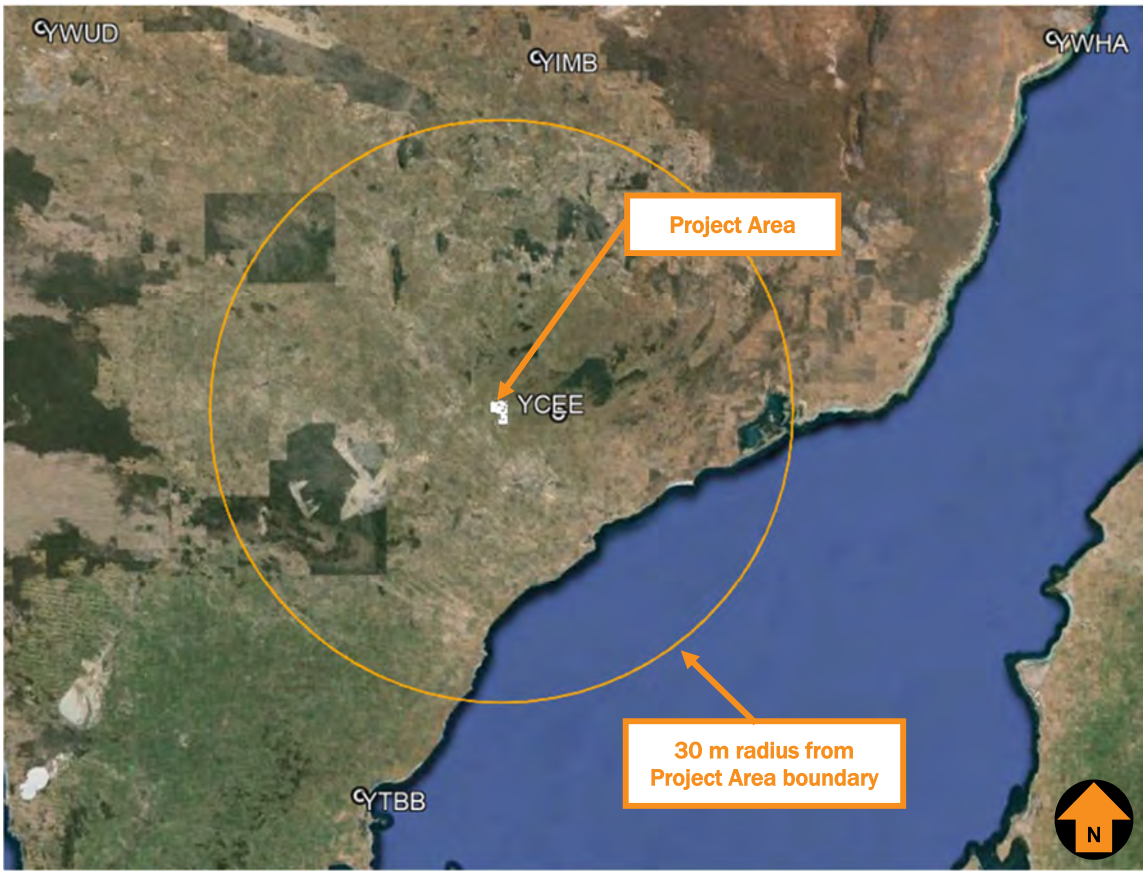

Figure 9 Project Area in relation to nearest certified aerodromes

### 3.3. Cleve aerodrome (YCEE)

YCEE is a certified airport, operated by the District Council of Cleve. YCEE has two runways:

- Runway 08/26, sealed, 18 m wide and 1350 m long, with a runway strip width of 90 m
- Runway 18/36, unsealed, 18 m wide and 895 m long, with a runway strip width of 60 m

Figure 10 shows the published aerodrome layout for YCEE (Source, Airservices Australia)

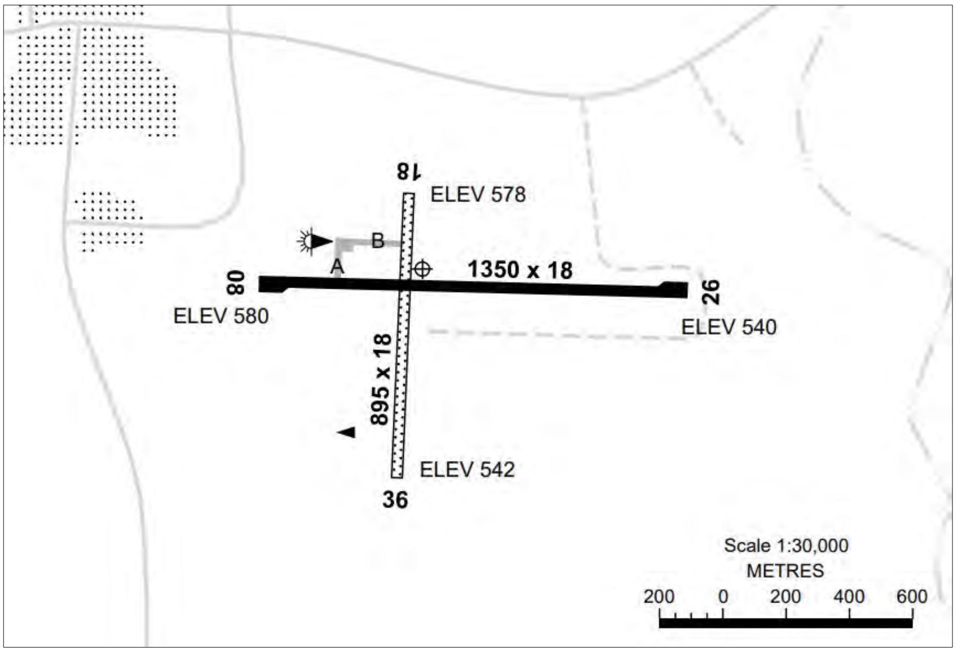

Figure 10 Published aerodrome layout YCEE

Figure 11 shows the nature of the YCEE aircraft parking apron.

Figure 11 YCEE aircraft parking area

The eastern Project Area boundary is located approximately 9.2 km (4.97 nm) west of the threshold of runway 08 at YCEE. Figure 12 shows the Project Area in relation to YCEE (Source, MasterPlan, Google Earth).

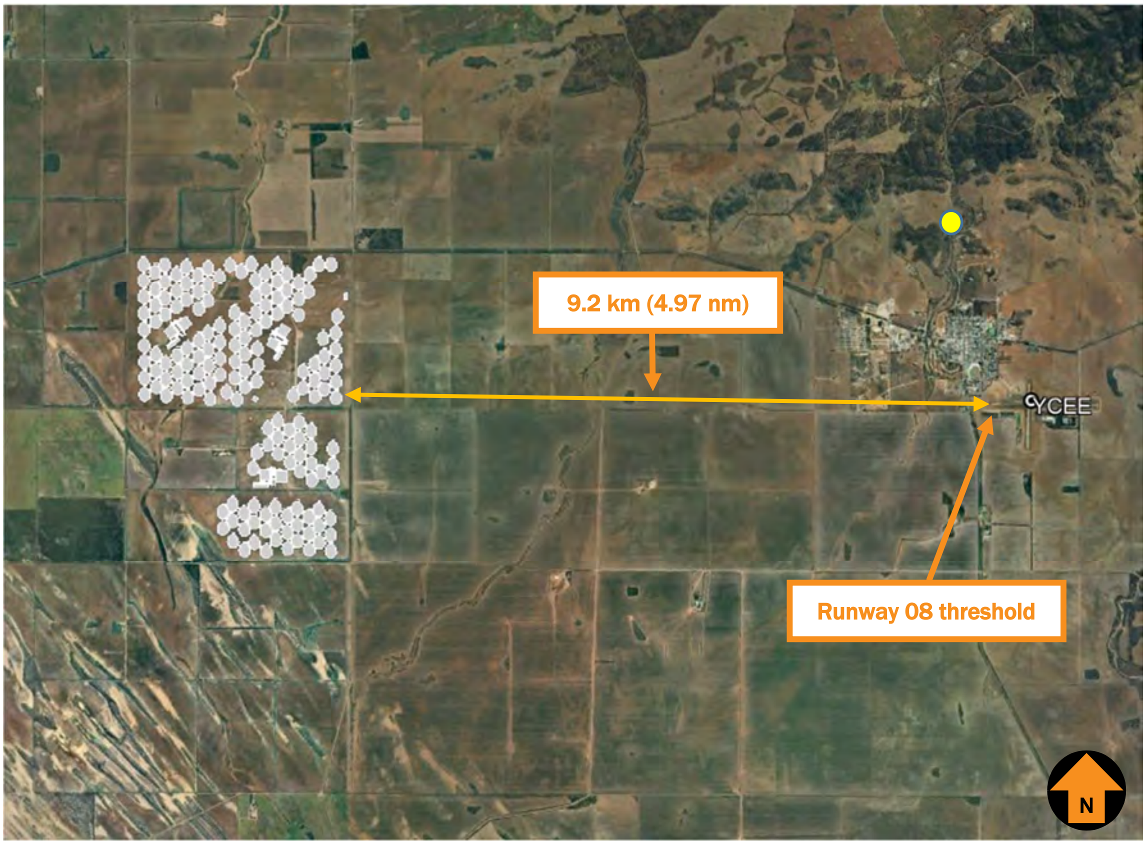

Figure 12 Project Area in relation to YCEE

### 3.4. Obstacle Limitation Surfaces – Cleve aerodrome

An Obstacle Limitation Surface (OLS) must be established at a certified aerodrome in accordance with the specifications established in Part 139 MOS 2019 Chapter 7. Objects located or proposed to be located within the OLS of an aerodrome must be reported to CASA and there may be some kinds of aerodrome operations that are limited or not permitted, as determined.

The OLS of an aerodrome is established based on certain operating characteristics and design specifications of the aerodrome. A certified aerodrome operator is responsible for ensuring the OLS for their aerodrome is established in accordance with Part 139 MOS 2019 specifications, and for implementing procedures to monitor the OLS.

The specifications applicable to the establishment of the OLS for YCEE are listed below for each runway:

- Runway 08/26, Code 2, Instrument non-precision
- Runway 18/36, Code 1, non-instrument

The take-off and approach areas for runway 08/26 extend to a distance of 2,500 m from the end of the runway strip, and the horizontal surfaces extend to 4,700 m from the runway strip ends. The take-off and approach areas for runway 18/36 extend to a distance of 1,600 m from the end of the runway strip, and the horizontal surfaces extend to 2,700 m from the runway strip ends.

Figure 13 shows the Project Area boundary in relation to the horizontal limit of the OLS at YCEE for all runway ends (Source, Google Earth, MasterPlan).

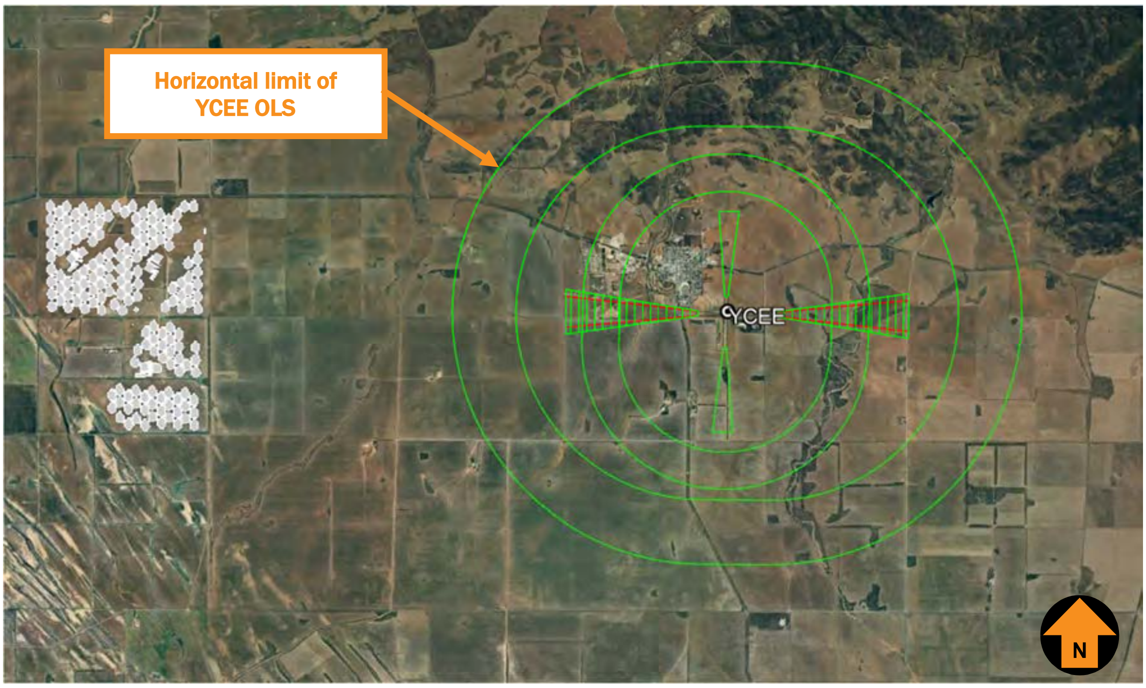

Figure 13 Project Area in relation to YCEE OLS

The entire Project is located beyond the horizontal limits of the OLS for Cleve aerodrome, and there will be no impact to the OLS caused by the Project.

### 3.5. Instrument procedures – YCEE

A non-precision instrument approach provides horizontal (lateral) guidance to an aircraft flying the published approach procedure and in general terms allows an aircraft to descend lower while in cloud or in low visibility conditions than what would otherwise be permitted when flying a visual approach.

A check of Aeronautical Information Package (AIP) via the Airservices Australia website showed that YCEE is served by non-precision terminal instrument flight procedures, with an RNP approach published for runway 26.

Table 1 identifies the aerodrome and procedure charts for YCEE, designed by Airservices Australia (AsA).

Table 1 YCEE aerodrome and procedure charts

| *Chart name* | *Effective date* |
|---|---|
| AERODROME CHART (AsA) | 23 March 2023 (CEEAD01-174) |
| RNP RWY 26 | 01 December 2022 (CEEGN01-173) |

An image of the Minimum Sector Altitude (MSA) published for YCEE is provided in Figure 14 showing the MSA based on the aerodrome reference point (ARP) (Source: AsA, 2024).

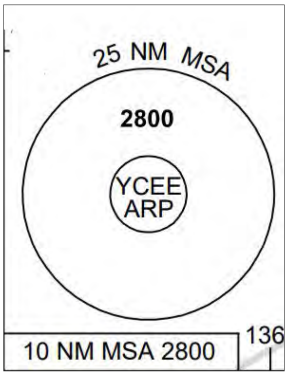

Figure 14 YCEE MSA

Minimum sector altitudes or terminal arrival altitudes are established for each aerodrome and provide at least 300m (1 000 ft) obstacle clearance within 46 km (25 NM) of the navigation aid, initial approach fix, or intermediate fix associated with the approach procedure for that aerodrome (Airservices Australia have advised they apply obstacle clearance of 984 ft for a published MSA).

Figure 15 shows the location of the Project in relation to the MSA established for YCEE, showing the Project is wholly located within the 10 nm MSA of YCEE (Source, MasterPlan, Google Earth).

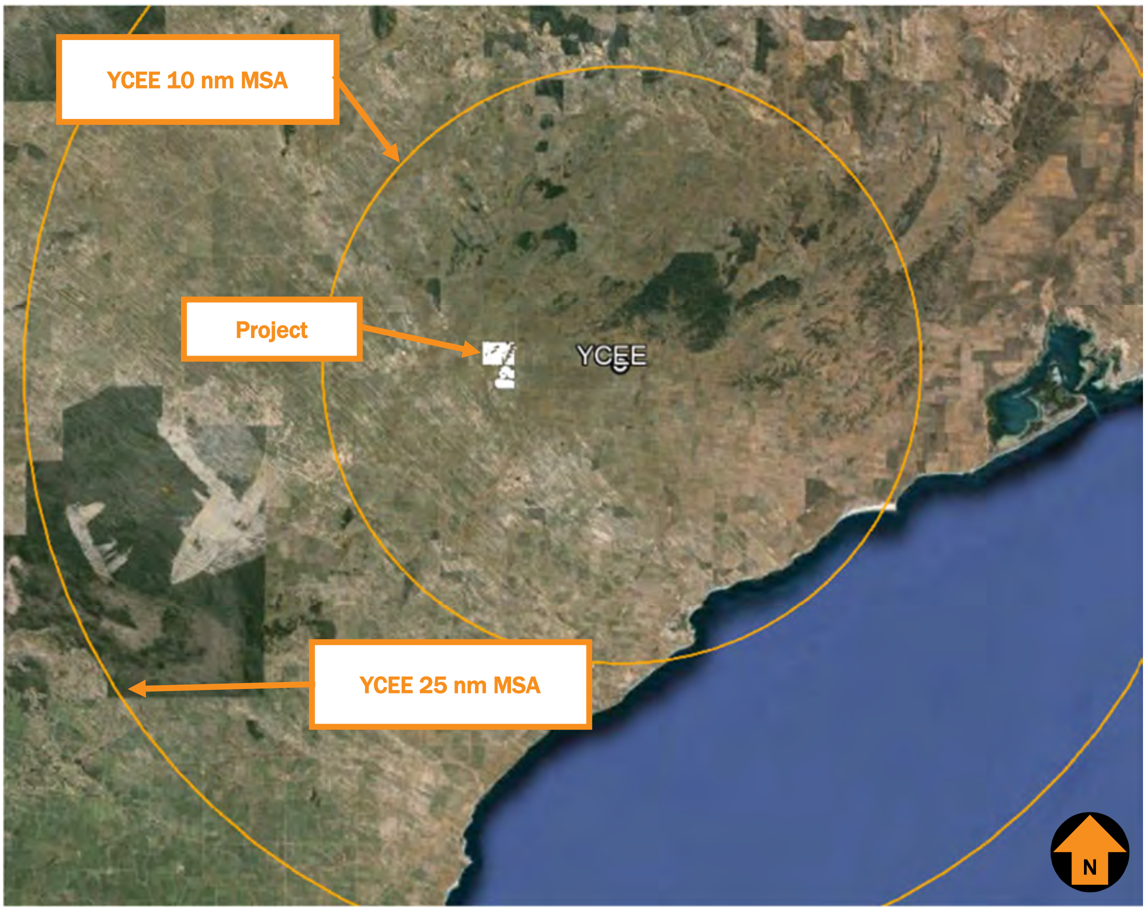

Figure 15 Project Area in relation to YCEE MSA

Table 2 provides a summary of an impact analysis of the MSA based on the maximum Project height of 235 m AHD (771 ft AMSL).

Table 2 YCEE MSA analysis

| *MSA* | *Minimum altitude (ft AMSL)* | *PANS OPS Surface (ft AMSL)* | *Impact on airspace design (WTGs)* | *Potential solution* | *Impact on aircraft ops* |
|---|---|---|---|---|---|
| 10 nm | 2800 | 1816 | Nil – Maximum Project height below surface by 1045 ft | N/A | N/A |
| 25 nm | 2800 | 1816 | Nil – Project outside area | N/A | N/A |

The Project will not affect the MSA and terminal instrument flight procedures for YCEE.

### 3.6. Circling approach areas – Cleve aerodrome

A circling approach is an extension of an instrument approach to the specified circling minima (lowest altitude permitted without visual reference to the ground) at which point the pilot will visually manoeuvre the aircraft to align with the runway for landing. Typically, a circling approach is only conducted where there is no runway-aligned instrument procedure, or if the runway used for the approach procedure is not suitable for landing.

Circling areas are established by the instrument flight procedure designer based on ICAO specifications, related to the performance category of the design aircraft. The circling area is determined by drawing an arc centred on the threshold of each usable runway and joining these arcs by tangents. The most demanding aircraft category provided for YCEE's instrument flight procedures is Category C.

The radii for each relevant category of aircraft are provided below:

- Category A – 1.68 nm / 3.11 km
- Category B – 2.66 nm / 4.93 km
- Category C – 4.20 nm / 7.78 km

The minimum obstacle clearance height for circling (above the aerodrome elevation) is specified by ICAO as:

- Category A and B: 90 m (295 ft)
- Category C and D: 120 m (394 ft)

The Project Area is located beyond the circling area for instrument flight procedures at YCEE and there will be no impact to instrument flight procedures.

### 3.7. Aircraft operations in the vicinity of the Project and Cleve aerodrome

Aircraft operations in the immediate vicinity of the Project Area would be mostly limited to aerial application operations on neighbouring properties, and aircraft arrival and departure procedures at Cleve aerodrome (YCEE).

Aircraft operations at Cleve aerodrome are mostly made up of general aviation aircraft including low-capacity air transport operations (including RFDS medical retrieval flights), aerial agriculture, flight training, private and recreational aircraft. The aerodrome is generally not currently suitable for regular high-capacity air transport aircraft, with limitations on the apron configuration and pavement strength, although these operations may still occur at the aerodrome.

Instrument approach procedure and aeronautical ground lighting system help facilitate night-time operations, likely primarily associated with medical retrieval flights conducted by the RFDS.

YCEE is an uncontrolled aerodrome meaning there is no air traffic control service at the aerodrome, and aircraft are responsible for ensuring their separation from other aircraft and will generally fly arrival and departure procedures in accordance with established procedures for uncontrolled aerodromes (as characterised in Section 2.6).

Approved and equipped aircraft and pilots operating to the aerodrome at night or in instrument meteorological conditions (generally, weather that is below the minimum requirements prescribed for visual flight and requires the use of instruments) are likely to arrive to the aerodrome using the RNP instrument approach procedure for runway 26, which commences at the initial approach fix at approximately 15 nm east of YCEE.

It is anticipated that aircraft operating from west of the aerodrome and planning on landing on runway 08 (to the east) may overfly the Project Area to commence a straight-in approach for runway 08, in which case they must be established on a final approach path at least 3 nm from the runway.

For aircraft departing from runway 26 (taking off towards the Project Area) and departing to the west or southwest, it is possible they may overfly the Project Area.

The general configuration of likely aircraft flight paths in relation to the Project Area is demonstrated in Figure 16, which shows a nominal 1 nm circuit configuration for runway 08/26 at YCEE, as well as a 5 nm final approach path aligned with runway 08. Aircraft using the terminal instrument flight procedures for YCEE may also manoeuvre near the Project Area (within the Category C circling area) while making an approach to land.

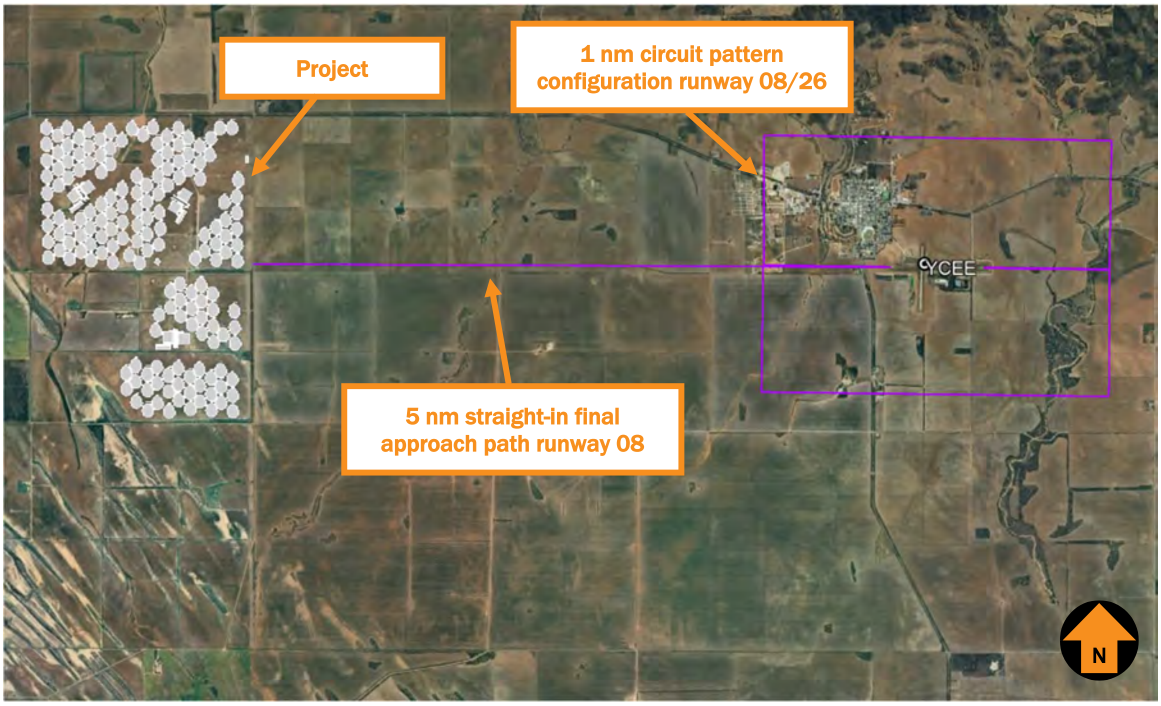

Figure 16 Project Area in relation to YCEE circuit and final approach configuration (runway 08/26)

Normal aircraft operations at YCEE and in the vicinity of the Project Area will not affected by the Project.

Aerial application operations

It is possible that aerial application operations may be conducted in the vicinity of the Project Area, including on neighbouring properties.

Aerial application operations including such activities as fertiliser, pest and crop spraying are generally conducted under day VFR below 500 ft AGL, usually between 6.5 ft (2 m) and 100 ft (30.5 m) AGL.

Due to the nature of the operations conducted, aerial agriculture pilots are subject to rigorous training and assessment requirements in order to obtain and maintain their licence to operate under these conditions.

The Project may cause a minor constraint for aerial application operations on neighbouring properties, particularly in the case of receiving towers installed close to the Project Area boundary. For operations close to the Project Area boundary, aerial application aircraft may need to change their operating procedures to avoid overflying the towers at low level to make their 180-degree turn if the spray pattern is conducted in line with the Project Area. Aerial agriculture operators conducting operations in the vicinity of the Project would conduct a risk assessment and would be aware of the Project configuration prior to commencing flight operations.

The Aerial Application Association of Australia (AAAA) has developed National Windfarm Operating Protocols (adopted May 2014) which provides advice and recommendations to wind farm developers intended to minimise impacts and disruption to aerial application operations by wind farm development.

Although not applicable to the Yadnarie Project, the AAAA specifies in relation to wind farm design that wind turbines should be installed at least 100 m from any boundary.

Given the height of the receiving towers (compared with wind turbines) it is considered that the impacts to aerial application operations are significantly less, and placement of receiving towers anywhere in the Project Area would not cause any significant adverse impacts to aerial application operations.

Solar glare from the receiving towers may cause a distraction for aerial application pilots, however only when flying on a northerly heading when operating on the property immediately south of the Project. In sunny conditions, it is anticipated that pilots would be wearing sun glasses or visors, and the glare would not cause a significant impact. Section 4 of this assessment addresses glare impacts to aviation caused by the Project.

## 3.8. Nearby aeroplane landing areas

An aeroplane landing area (ALA) is generally defined as any other aerodrome except for a certified aerodrome. As a guide, an area of interest within a 3 nm radius of an ALA is used to assess potential impacts of proposed developments on aircraft operations at or within the vicinity of the ALA.

A search on OzRunways, which sources its data from Airservices Australia (AIP), did not identify any ALAs in close proximity to the Project Area. The aeronautical data provided by OzRunways is approved under CASA CASR Part 175.

A review of NationalMap (an online map-based tool allowing access to spatial data from Australian government agencies) and Google Earth was also undertaken. No aeroplane landing areas were identified in close proximity to the Project Area.

### 3.9. Air routes and LSALT

MOS 173 requires that the published lowest safe altitude (LSALT), for a particular airspace grid or air route, provides a minimum of 1000 ft clearance above the controlling (highest) obstacle within the relevant airspace grid or air route tolerances.

The Project Area is located within a grid with a lowest safe altitude of 3000 ft AMSL with a minimum obstacle clearance surface height of 2000 ft AMSL. There is one low-level air route in proximity to the Project Area, A585, between waypoints FRAZA and MUTHA.

Figure 17 shows the Project Area in relation to applicable the grid and air route LSALT (Source, MasterPlan, Airservices ERC-Low National)

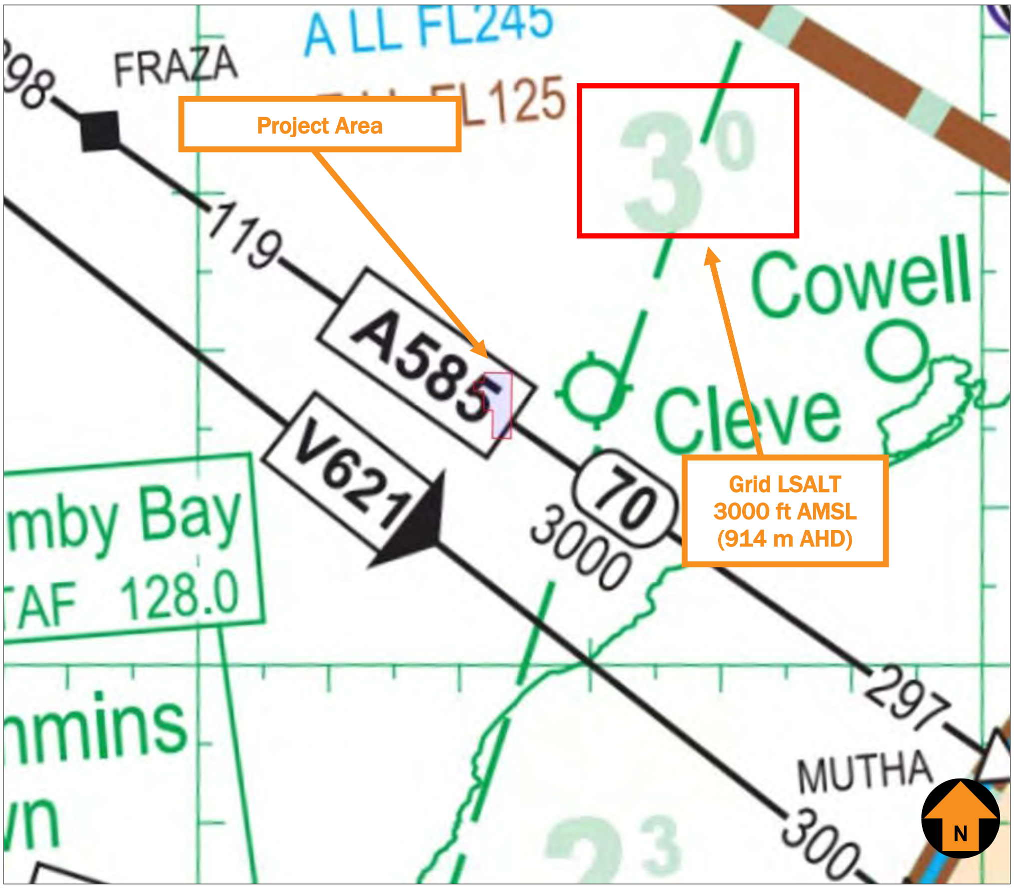

Figure 17 Project Area in relation to grid and route LSALT

Table 3 provides an analysis of the potential impact to the applicable LSALT based on the based on the maximum Project height of 235 m AHD (771 ft AMSL).

Table 3 LSALT analysis

| *Air route* | *Waypoint pair* | *LSALT* | *Obstacle Height Limit* | *Impact on airspace design* | *Potential solution* | *Impact on aircraft ops* |
|---|---|---|---|---|---|---|
| A585 | FRAZA – MUTHA | 3000 ft AMSL | 2000 ft AMSL | Nil – below surface by 1229 ft. | N/A | N/A |
| Grid (L) | N/A | 3000 ft AMSL | 2000 ft AMSL | Nil – below surface by 1229 ft. | N/A | N/A |

The Project will not affect any grid or air route LSALT

### 3.10. Communication, Navigation and Surveillance Systems

Part 139 MOS 2019 specifies the protection of aviation Communication, Navigation and Surveillance Systems (CNS) from development which may affect the function of these systems.

The Project is not located within the prescribed clearance zones or areas of interest as specified in Part 139 MOS 2019 Chapter 19 and will not affect any CNS facilities.

### 3.11. Radar installations

EUROCONTROL guidelines for assessing the potential impact of tall structures on radar surveillance sensors stipulate the following assessment requirements:

Primary Surveillance Radar (PSR)

1. Zone 1 0-500 m: Not permitted
2. Zone 2 500 m – 15 km: Detailed assessment
3. Zone 3: Further than 15 km but within maximum instrumented range and in radar line of sight: Simple assessment
4. Zone 4: Anywhere within maximum instrumented range but not in radar line of sight or outside the maximum instrumented range: No assessment

Secondary Surveillance Radar (SSR)

5. Zone 1: 0-500 m: Not permitted
6. Zone 2 500 m – 16 km but within maximum instrumented range and in radar line of sight: Detailed assessment
7. Zone 4: Further than 16 km or not in radar line of sight: No assessment
8. (Zone 3 is not established for secondary surveillance radar)

Due to the distance and intervening terrain between the Project Area and the radar facilities located at Adelaide airport, there will no impact to radar facilities caused by the Project.

# 4. GLINT AND GLARE ASSESSMENT (AVIATION IMPACT)

## 4.1. Overview

This section explores the relevant policies and guidelines applicable to solar glare for aerodromes, and characterises the potential impact to aircraft operations that may be caused by the Project associated with solar glare from the heliostats and receiving towers.

## 4.2. Project glare sources

The Project will consist of up to 150 fields of rotational mirrors (heliostats) orientated north comprising of 273 heliostats and 1 receiving tower facing south in each field with a maximum height of 45 m AGL.

Solar glare may be experienced from the following sources:

- Heliostats
- Receiving towers

## 4.3. Glare analysis

Solar glare analysis is not possible using the available solar glare hazard analysis tools for concentrated solar power systems. This section references glare studies undertaken by RayGen on the Ray Gen concentrated solar power technology. Other relevant studies and papers on concentrated solar power systems will be referenced in this section.

RayGen conducted a visual impact assessment on the solar receivers installed in the Carwarp solar plant. The visual assessment used guidance from an independent assessment on the existing Newbridge plant which used similar technology as the Carwarp project. The assessment was incorporated as part of the Environmental Management Plan required for that project.

The assessment considered visual receptors including roads, railways and residential areas and generally concluded that the development would *have a low visual impact on the surrounds due to existing screening vegetation and the long distance from the site to main viewpoints.*

Potential aviation impacts were not identified in the Ray Gen assessment.

RayGen subsequently assessed the optimised system SPP2 R3 PV Ultra installed at Carwarp for glare. This is the system that will be implemented at Yadnarie. The assessment was based on the application of the assessment methodology employed on the Carwarp Project glare assessment. T*he analytical glare model was prepared earlier to assess the glare emissions from both PV Ultra R1 and R3 systems. This utilised a model which was primarily based on mathematical equations and theories proposed by Sandia, and the approach undertaken for the modelling was based on the methods and background information publicly released by Sandia at that time.*

The assessment specified limitations to the results, including that *no modelling was undertaken for observation above ground level such as viewing from an elevated platform, or an aircraft.*

The assessment characterised glare into three categories, as established by Sandia's Solar Glare Hazard Analysis Tool (SGHAT):

- Low potential for after image (temporary after image), also referred as green glare.
- Potential for after image (flash blindness), also referred as yellow glare.
- Potential for permanent eye damage (retinal burn), also referred as red glare.

The results of the assessment indicate that an observer at ground level will have potential for an after-image effect and glance blindness if they glance at receiver for a duration of 0.15 seconds when they are within the following distances:

- Up to 280 m from the receiver, directly in front.
- Up to 240 m if viewing from a 25-degree angle offset (left or right side) from directly in front of the receiver.
- Up to 125 m if viewing from a 75-degree angle offset (left or right side) from directly in front of the receiver.

The map of ocular safety zones developed for RayGen based on the analytical model is shown in Figure 18 (Source, MasterPlan, RayGen Resources Pty Ltd)

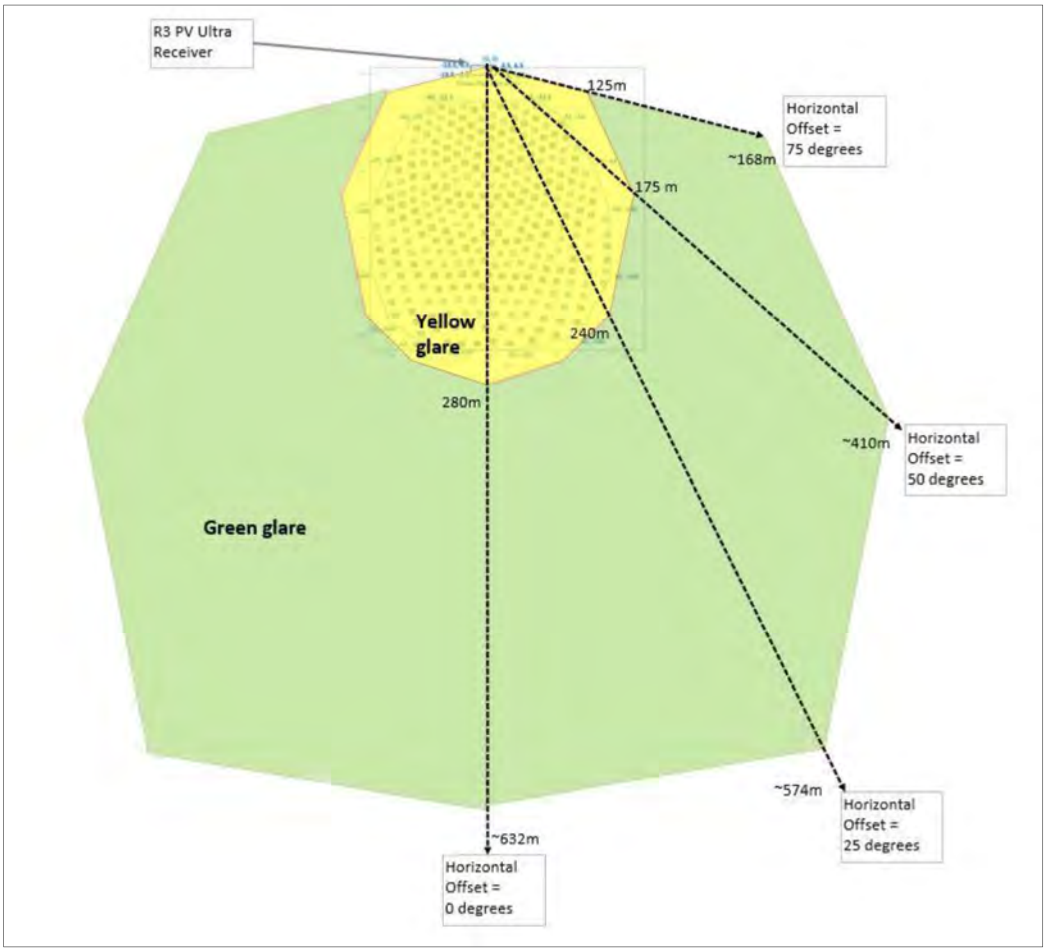

Figure 18 Map of ocular safety zones for glare from receiver

This aviation assessment considers that although modelling was not undertaken for receptors above ground level, the distances identified in the ocular safety zones are appropriate for considering the potential glare impact to aircraft operations, noting that only aerial application aircraft operations are anticipated in the immediate vicinity of the Project area and will be operating at low-level.

## 4.4. Summary of relevant aviation policy associated with sources of glare

Table 4 provides a summary of the relevant aviation policy and industry guidance in relation to the Yadnarie Project and aircraft operations at Cleve aerodrome.

Table 4 Aviation solar glare policy analysis summary

| Policy / Regulation | Requirement | Project result |
|---|---|---|
| FAA Final Policy (May 2021) | No yellow glare for an air traffic control tower at a Federally obligated airport. | Not applicable at Cleve aerodrome. No impact to Project |
| Part 139 MOS 2019 (Aerodromes) | A solar installation installed within the boundary of a certified aerodrome must be reported to CASA prior to installation. | Project not within the boundary of a certified aerodrome and not required to be reported to CASA.<br>No impact to Project |
| CAR 94 | No hazard for aircraft operations at aerodrome, air route or airway | Not applicable to Project area.<br>No impact to Project. |
| NASF Guidelines | Guidance applicable for situations where lights are to be installed within a 6 km radius of a known aerodrome. | Project not within 6 km of any aerodrome.<br>(Solar glare not specifically referenced in NASF guidance) |

# 5. MARKING, LIGHTING AND REPORTING

This section summarises the lighting, marking and reporting requirements applicable to the Project, in relation to tall objects (receiving towers).

## 5.1. Marking of tall objects

Part 139 MOS 2019 specifies the requirements applicable to the marking of obstacles and hazardous obstacles.

Chapter 8.109 specifies that the following objects or structures are to be marked in accordance with Part 139 MOS 2019 specifications:

> *(a) any fixed object or structure, whether temporary or permanent in nature, extending above the obstacle limitation surfaces; or*
>
> *(b) any object or structure on or above the movement area that is removable and is not immediately removed.*

The Project does not infringe any certified aerodrome's obstacle limitation surface and is not located in the vicinity of an aerodrome's movement area, and therefore there is no requirement to provide obstacle marking on the receiving towers.

## 5.2. Lighting of tall objects

Part 139 MOS 2019 specifies the situations where obstacle lighting is required, and the specifications for type and location of obstacle lighting.

Chapter 9.27 establishes the requirement for the use of obstacle lighting for objects and structures (in relation to a certified aerodrome intended to be used for night):

> *(a) an object or structure that extends above the take-off climb surface within 3 000 m of the inner edge of the take-off climb surface;*
>
> *(b) an object or structure that extends above the approach or transitional surface within 3 000 m of the inner edge of the approach surface;*
>
> *(c) an object or structure that extends above the applicable inner, conical or outer horizontal surfaces;*
>
> *(d) an object or structure that extends above the obstacle assessment surface of a T-VASIS or PAPI;*
>
> *(e) an object or structure in the vicinity of a taxiway, an apron taxiway or a taxilane, that is a hazard to aircraft using the taxiway, apron taxiway or taxilane, except that obstacle lights must not be installed on elevated ground lights or MAGS.*

Cleve aerodrome provides aeronautical ground lighting on runway 08/26 and is available for night-time operations. The Project is not located within any of the distances or locations specified in Part 139 MOS 2019 Ch 9.27, and there is no requirement to provide obstacle lighting on the receiving towers.

## 5.3. Reporting of tall objects

### Civil Aviation Safety Regulations 1998, Part 139—Aerodromes

CASR 139.165 requires the owner of a structure (or proponents of a structure) that will be 100 m or more above ground level to inform CASA. This must be given in written notice and contain information on the proposal, the height and location(s) of the object(s) and the proposed timeframe for construction. This is to allow CASA to assess the effect of the structure on aircraft operations and determine whether or not the structure will be hazardous to aircraft operations.

The receiving towers are 45 m AGL and there is no requirement to report the Project to CASA.

### Advisory Circular 139.E-01 v1.0—Reporting of Tall Structures

In Advisory Circular (AC) 139.E-01 v1.0—Reporting of Tall Structures, CASA provides guidance to those authorities and persons involved in the planning, approval, erection, extension or dismantling of tall structures so that they may understand the vital nature of the information they provide.

Airservices Australia has been assigned the task of maintaining a database of tall structures. The Royal Australian Air Force (RAAF) and Airservices Australia require information on structures which are:

a) 30 metres or more above ground level—within 30 kilometres of an aerodrome; or

b) 45 metres or more above ground level elsewhere for the RAAF, or

c) 30 m or more above ground level elsewhere for Airservices Australia.

The purpose of notifying Airservices Australia of these structures is to enable their details to be provided in aeronautical information databases and maps/charts etc used by pilots, so that the obstacles can be avoided.

Due to being located within 30 km of an aerodrome and at 45 m AGL, 'as constructed' details of the receiving towers should be provided to Airservices Australia, by submitting the form at this webpage: https://www.airservicesaustralia.com/wp-content/uploads/ATS-FORM-0085_Vertical_Obstruction_Data_Form.pdf to the following email address: vod@airservicesaustralia.com.

# 6. CONCLUSIONS

Conclusions resulting from the conduct of this assessment are provided below.

Tall objects (receiving towers)

1. The Project satisfies General Development Policies for Infrastructure and Renewable Energy Facilities established in relation to airport safeguarding, established in the South Australian Planning and Design Code, made under the Planning, Development and Infrastructure Act 2016.
2. The Project is located outside of and will not impact the obstacle limitation surface of Cleve aerodrome
3. The Project is located within the 10 nm MSA area of Cleve aerodrome. The maximum Project height will be at least 1045 ft below the 10 nm MSA protection surface and there will be no impact to instrument flight procedures established at Cleve aerodrome.
4. The Project will not affect any grid or route LSALT.
5. The Project will not affect any aviation Communication, Navigation and Surveillance Systems.
6. The Project does not require obstacle lighting or marking in accordance with Part 139 MOS 2019 specifications.
7. The Project maximum height is below 100 m AGL and there is no requirement to report the Project to CASA in accordance with CASR Part 139.165(1)(2).
8. Due to being located within 30 km of an airport and at 45 m AGL, as-built details of the receiving towers should be provided to Airservices Australia by submitting the form at this webpage: https://www.airservicesaustralia.com/wp-content/uploads/ATS-FORM-0085_Vertical_Obstruction_Data_Form.pdf to the following email address: vod@airservicesaustralia.com.

Solar glare considerations

9. The Project is not within the boundary of a certified aerodrome and CASA does not require an assessment of the Project for glare impacts.
10. The FAA Final Policy on the review of solar installations does not affect the Project.
11. The Project is located more than 6 km from any certified aerodrome, and is not located where glare will impact on any air route or airway, and therefore is not affected by Civil Aviation Regulations Part 94.
12. Aircraft operations in the immediate vicinity of the solar farm are anticipated to be infrequent and limited to aircraft potentially conducting low-level aerial application operations on neighbouring properties.
13. Glare from receiving towers is geometrically possible for aircraft approaching the Project from the south, however the glare experienced from the Project is not anticipated to inhibit or endanger VFR aircraft operations in the vicinity of the project and could be mitigated by the use of sunglasses sun visors. There are no aircraft operations likely to be conducted within the yellow glare zone of any receiving tower anywhere in the Project Area.

# ANNEXURE 1 – REFERENCES

References used or consulted in the preparation of this report include:

- South Australian Planning and Design Code, (version 2024.11 dated 20 June 2024)
- Airservices Australia, Aeronautical Information Package; including AIP Book, Departure and Approach Procedures and En Route Supplement Australia dated 13 June 2024
- Airservices Australia, Designated Airspace Handbook, effective 13 June 2024
- Civil Aviation Safety Authority, Civil Aviation Safety Regulations 1998 (CASR)
- Civil Aviation Safety Authority, *Part 139 (Aerodromes) Manual of Standards 2019*, dated 10 February 2024
- Department of Infrastructure and Regional Development, Australian Government, National Airport Safeguarding Framework, Guideline E *Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports*, dated October 2014
- OzRunways, aeronautical navigation charts extracts, June 2024

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# 7

# HERITAGE ASSESSMENT

# Heritage Assessment Summary

**Project Title:** Yadnarie Solar Farm and Energy Storage Project

**Location:** Cleve, South Australia

**Client:** MasterPlan Adelaide

**Date:** June 2024

**Associated Report:** IHC 2024. Yadnarie Solar Farm and Energy Storage Project – Desktop Heritage Assessment. Report prepared for Master Plan Pty Ltd.

Independent Heritage Consultants (IHC) has been engaged by MasterPlan to prepare an Aboriginal and historic heritage desktop assessment to support the development application for the proposed Yadnarie Cleve Solar Farm and Energy Storage Project. The project area is located in Cleve on the Eyre Peninsula in South Australia. The following document presents a summary of the findings of this assessment and recommended management measures.

## Historic Heritage

The historic heritage assessment has identified that there are no state or local heritage places within the current project area. Considering the heritage context for the area IHC has assessed a ***low risk*** of works associated with this project encountering the remains of undocumented built heritage and archaeological features of heritage significance.

### *Recommendations*

All historic heritage and archaeological features, whether listed or not, are protected and must be managed in line with the requirements of the *Heritage Places Act 1994 (HPA)* and the Planning, Development and Infrastructure Act 2016, (*PDIA)*.

In the event that works encounter the remains of undocumented built heritage and archaeological features of heritage significance, these should be managed under the requirements of s.27 of the Heritage Places Act.

Although not mandated by the HPA, a number of management options have been recommended to mitigate the assessed heritage risk. These include; implementation of a site discovery procedure, site inductions and archaeologists on call to identify potential discoveries.

## Aboriginal Heritage

The heritage assessment determined that there no known Aboriginal heritage sites within the project area. Considering the Aboriginal heritage context for the area, the environmental landforms, and the level of previous development, it was assessed that there is a ***low risk*** of works encountering unknown Aboriginal sites and objects in previously developed/ploughed areas, and a **moderate** risk in undeveloped/unploughed areas (i.e., seasonal creeks, creek margins, elevated sandy areas).

### *Recommendations*

All Aboriginal heritage sites are protected under the *Aboriginal Heritage Act 1988* (AHA), whether reported/registered or undocumented. Therefore, if a previously unknown Aboriginal heritage site is discovered during works and cannot be avoided, Ministerial authorisation under section 23 of the AHA will be required.

Although not mandated by the AHA, a number of management options have been recommended to mitigate the assessed heritage risk. These include; implementation of a site discovery procedure, site inductions and archaeologists on call to identify potential discoveries.

IHC has also advised that while the planned works are unlikely to impact any Aboriginal heritage sites, there are a number of Aboriginal groups with interests in the area who may wish to be consulted/engaged. This consultation is not a legal requirement and is at the discretion of the client.

## Native Title

The current project area is within the Barngarla Native Title Claim Area. The Federal Court has made a determination in relation to native title and deemed that it does not exist at this location.

# 8

# TRAFFIC IMPACT ASSESSMENT

Photon Energy

# RENEWABLE ENERGY FACILITY, BIRDSEYE HIGHWAY, YADNARIE

# TRAFFIC IMPACT ASSESSMENT

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October 2024

22-0074

# DOCUMENT ISSUE

| Revision issue | Date | Description | Approved by |
|---|---|---|---|
| Draft 1 | 09 Jul 24 | Draft for review | MLM |
| Draft 2 | 01 August 24 | Updated following review | MLM |
| Final | 20 August 24 | For DA | MLM |
| Rev A | 28 August 24 | Updated Plan Reference | MLM |
| Rev B | 03 October 24 | Updated Plan Reference | MLM |

# CONTENTS

# 1.0 INTRODUCTION

Photon Energy a global project developer, has developed a strategic partnership with RayGen Resources Pty Ltd (RayGen), with the objective of developing global renewable energy projects suitable for the roll-out of RayGen's unique solar power and electricity storage technology.

Photon Energy propose to utilise RayGen's technology for generation of solar power and energy storage at Yadnarie, west of Cleve on the Eyre Peninsula. The technology proposed and scale of electricity storage is new to the South Australian renewable energy sector and comprises RayGen's proprietary PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) technologies.

MFY has been commissioned by Photon Energy to complete a traffic impact assessment for the proposed renewable energy facility. The assessment includes a review of improvements to road infrastructure to facilitate access for the development and assessment of the design criteria for the site as it relates to traffic and parking criteria.

Critical to traffic safety relating to such developments is the potential for driver distraction. Specific to this facility, there is potential for distraction due to the reflection and refraction of light between the heliostats and the receiver. An assessment of the potential driver distraction has therefore been completed and detailed in this report.

The assessment also includes a review of the forecast traffic volumes during the construction and operation phases and the resultant impact on the road network.

This report has been based on "Site Plan - Access Points and Intersections" and "Site Plan – Admin and Control" by Worley (Drawing Number AU02-00-Y-CI-DLP-WA-0025 Revision 1 and AU02-00-Y-CI-DLP-WA-0024 Rev 1).

# 2.0 SUBJECT SITE

The subject site is at Yadnarie, approximately 10 km west of Cleve and is bound by Birdseye Highway to the north, Price Road to the south, Pine Corner Road to the east, and Broadview Road (in part) to the west. The subject site is bisected by an existing electricity transmission line.

Figure 1 identifies the subject site and frontage roads.

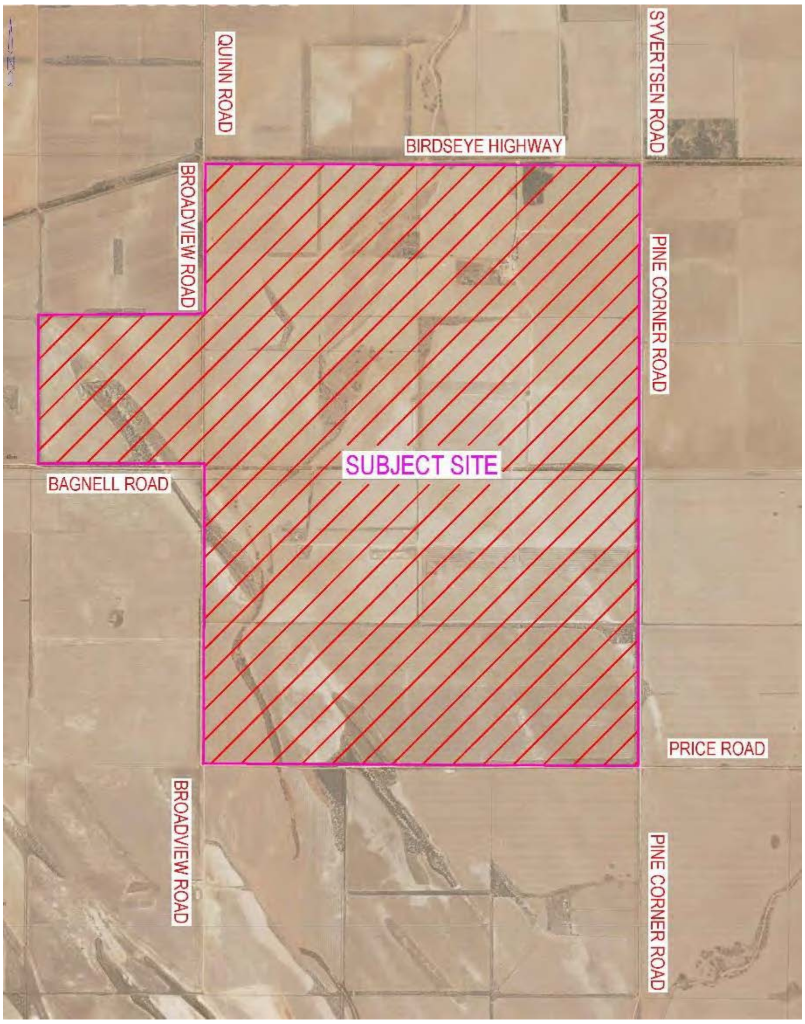


***Figure 1: Subject site***

Birdseye Highway is an arterial road within the care and control of the Commissioner of Highways. It has a sealed two-lane carriageway.

Birdseye Highway is subject to a posted speed limit of 110 km/h and has a traffic volume in the order of 360 vehicles per day (vpd). It is gazetted for use by PBS Level 3B vehicles and also for most of the oversize overmass (OSOM) vehicle types.

Price Road, Pine Corner Road, and Broadview Road are unsealed roads within the care and control of the District Council of Cleve. The rural default speed limit of 100 km/h will be applicable to these roads albeit slower speeds are expected to be realised due to the road conditions. The traffic volumes on these roads are anticipated to be low in the order of 50 to 100 vpd.

Pine Corner Road and Broadview Road form four-way intersections with Birdseye Highway. These intersections are treated with ‘Give Way’ control on the minor roads.

# 3.0 PROPOSAL

The proposal is for a solar power and energy storage facility. The proposed development is unique in that energy will be captured by using arrays of heliostats to reflect light to receivers mounted on towers. The heliostats will be located approximately 2.6-5.6 m above the ground while the receivers will be mounted at a height of approximately 45 m. Figure 2 is an illustration of the proposed technology.

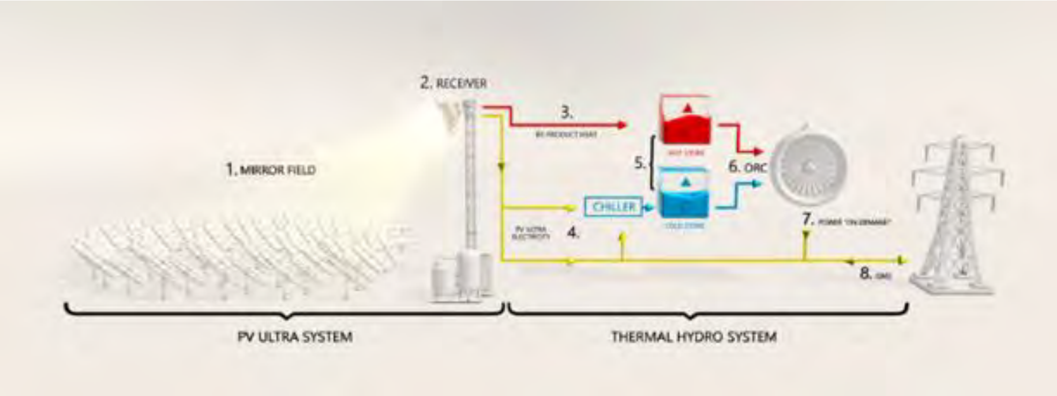


*Figure 2: Proposed energy capture and storage technology:  Source RayGen*

The proposal will include 150 fields of rotational mirrors (heliostats) orientated north. Each field comprises approximately 273 individual heliostats. Each heliostat is approximately between 2.6 and 5.6 metres above the ground and mounted on steel posts. Heliostat heights vary throughout the day as they track the sun.

The receivers will be clustered into three groups. Each group will be serviced by a power block which is where the energy will be processed and stored.

The development will be established in two stages. Stage 1 will include Power Block 1 and associated infrastructure and Stage 2 will include Power Block 2 and 3 and associated infrastructure.

The facility will include an administrative and control building compound which will include a workshop/assembly and storage facility, an operations area, associated amenities and car parking.

## 3.1 PINE CORNER ROAD

It is proposed to use Pine Corner Road to access the site. Broadview Road will be maintained in the event it is required during an emergency.

The Birdseye Highway/Pine Corner Road intersection will be upgraded to include basic right turn (BAR) and auxiliary left turn (AUL) treatments on Birdseye Highway for traffic entering Pine Corner Road. The facilities will be designed in accordance with Austroads

*Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (ARGD-04A).* Figure 3 identifies a concept design of the proposed upgrade.

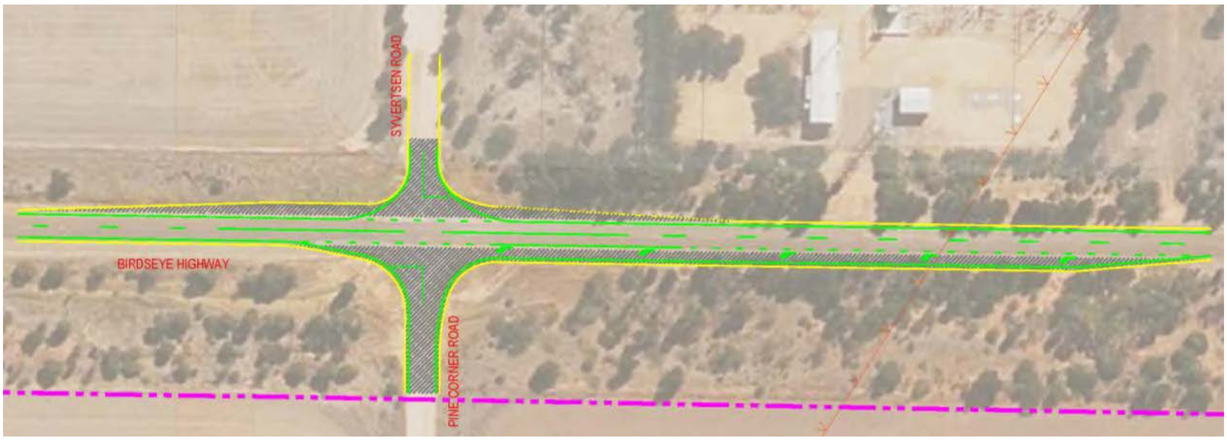


***Figure 3: Proposed upgrade of Birdseye Highway/Pine Corner Road intersection.***

MFY Drawing No 220074_02_SH01A which is a scaled version of the concept intersection upgrade is included in Appendix A.

The proposed upgrade will be designed to cater for the turning movements of a 19.0 m semi-trailer, as illustrated in Figure 4.

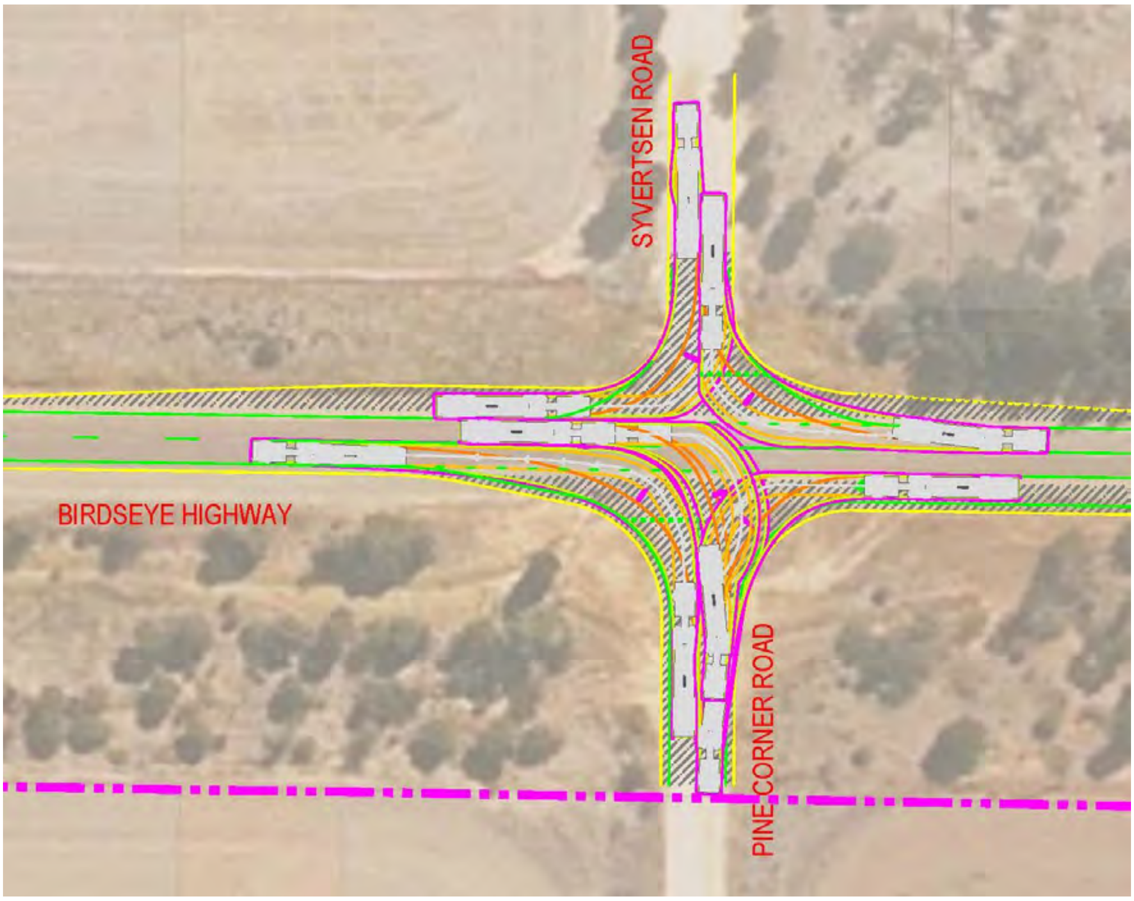


***Figure 4: Swept paths of semi-trailer navigating the proposed intersection***

Figure 5 illustrates that a PBS Level 3B vehicle will be able to pass a 19.0 semi-trailer stopped at the intersection to turn right.

***Figure 5: Swept path of a road train passing a semi-trailer***

## 3.2 SITE ACCESS

Access to the proposed renewable energy facility will be provided at two locations on Pine Corner Road. The access points will be designed in accordance with Australian/New Zealand Standard, *Parking Facilities Part 1: Off-street car parking (AS/NZS 2890.1:2004)* and Australian Standard, *Parking Facilities Part 2: Off-street commercial vehicle facilities (AS 2890.2:2018).*

Typical vehicles to access the site will be general maintenance and service vehicles (such as utility vehicles or vans). There will, however, be occasional demand for large vehicles up to 19.0 m semi-trailers to access the site. The access will therefore be designed to cater for entry and exit movements of these vehicles, as illustrated in Figure 6.

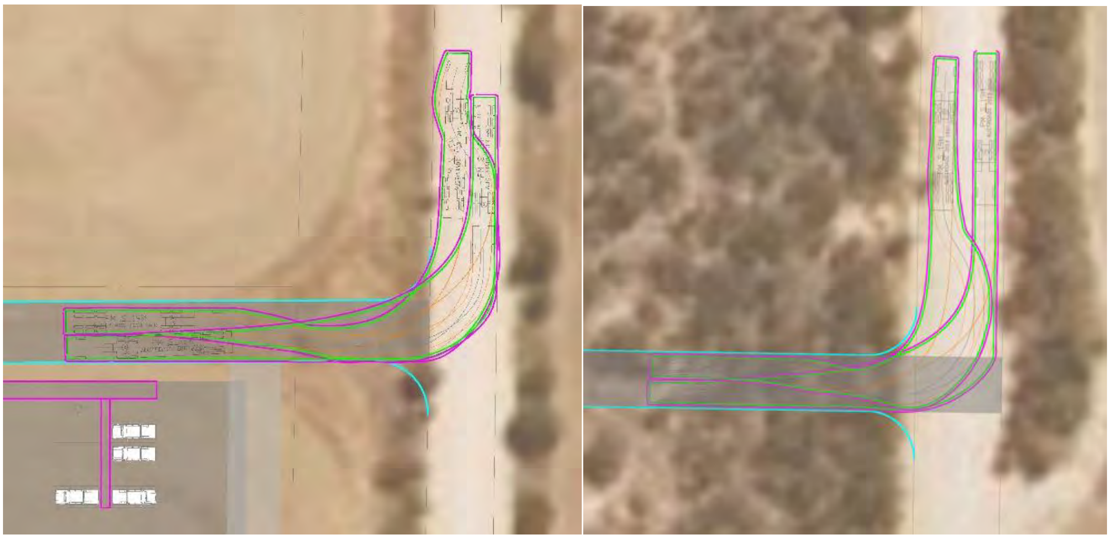


***Figure 6: 19.0 m semi-trailers entering and exiting the site at the proposed access points***

### 3.2.1 CONSTRUCTION VEHICLE ACCESS

All construction vehicles will access the site via Pine Corner Road. With the exception of OSOM vehicles, the largest vehicle expected to access the site during construction will be a PBS Level 2A (B-Double) vehicle. Figure 7 identifies PBS Level 2A vehicles are able to turn to and from Pine Corner Road at the Birdseye Highway intersection.

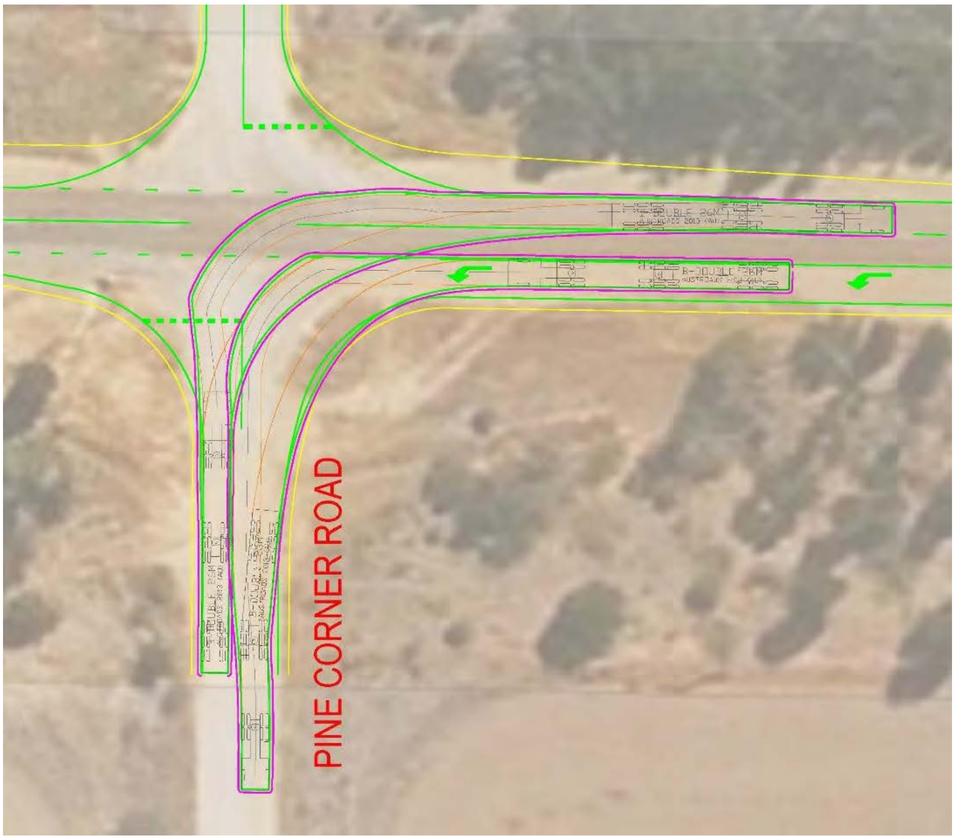


***Figure 7: PBS Level 2A vehicles turning to and from Pine Corner Road at the Birdseye Highway intersection***

There will be a requirement for up to 30 oversize overmass (OSOM) vehicles of various sizes to facilitate the construction of each stage during the construction period. Most of these vehicles will be low loaders with overmass items. It is anticipated that these vehicles will require escort vehicles.

OSOM vehicles will be able to use the existing OSOM routes, including Birdseye Highway, to access the site. Appropriate permits will be required where the route to the site detours from roads gazetted for the use of OSOM vehicles (for example, Pine Corner Road). This will require a route assessment and approval for traffic control.

The laydown area for construction of the facility will be located centrally to the three power blocks. The most efficient route for the vehicles to access the laydown area will be via the proposed northern access on Pine Corner Road as shown in Figure 8.

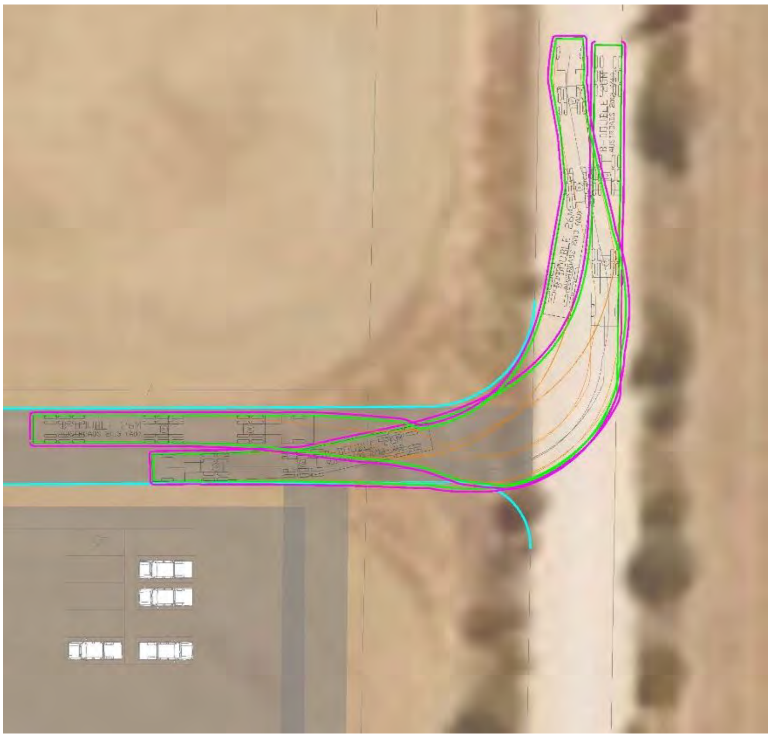


*Figure 8: B-Double entry and exit via Pine Corner Road northern access*

Equipment and materials would then be transported from the laydown area to the relevant development areas during construction.

## 3.3 MAINTENANCE VEHICLE ROUTES

Maintenance vehicles will only occasionally access the site. A series of unsealed internal driveways will be created to provide access to the facilities within the site including the heliostats, towers, power blocks and substation. Figure 9 identifies connectivity routes to facilities within the site.

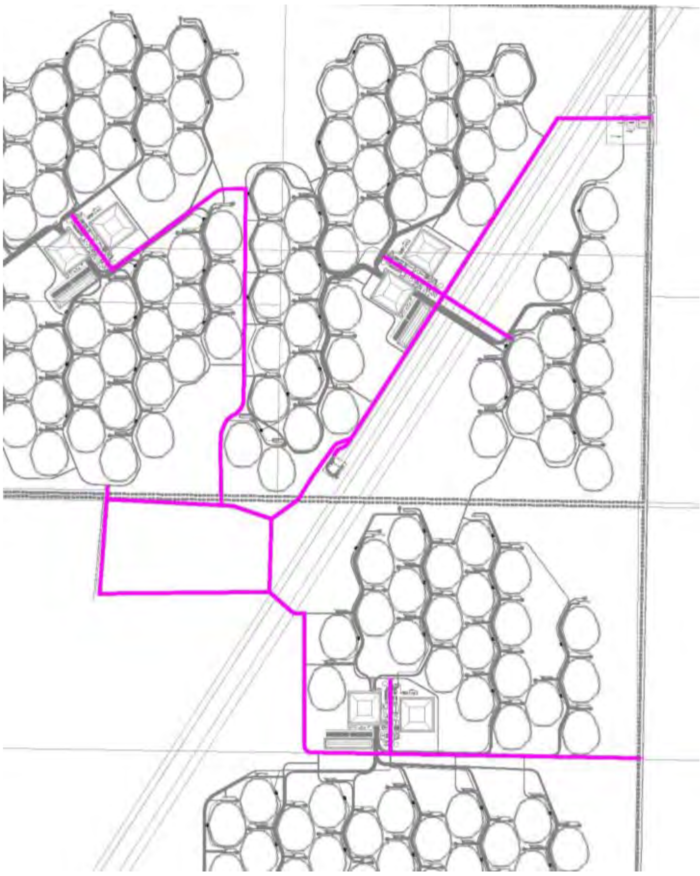


*Figure 9: Connectivity routes within the site to major development elements*

Driveways which will connect facilities to the access points will have a 7 m wide carriageway within a 10 m wide clear width to ensure that adequate clearance is maintained. Driveways which will provide access to specific equipment such as the heliostats and towers will have a 4 m wide carriageway within a 7 m wide clear width, although wider areas will be available to facilitate turning of vehicles where required.

The various facilities on site could command different types of vehicles for maintenance. Most facilities would be serviced by general maintenance vehicles 8.8 m MRV or smaller. This will include the heliostats and the towers. Figure 10 identifies an example of a MRV accessing a section of heliostats.

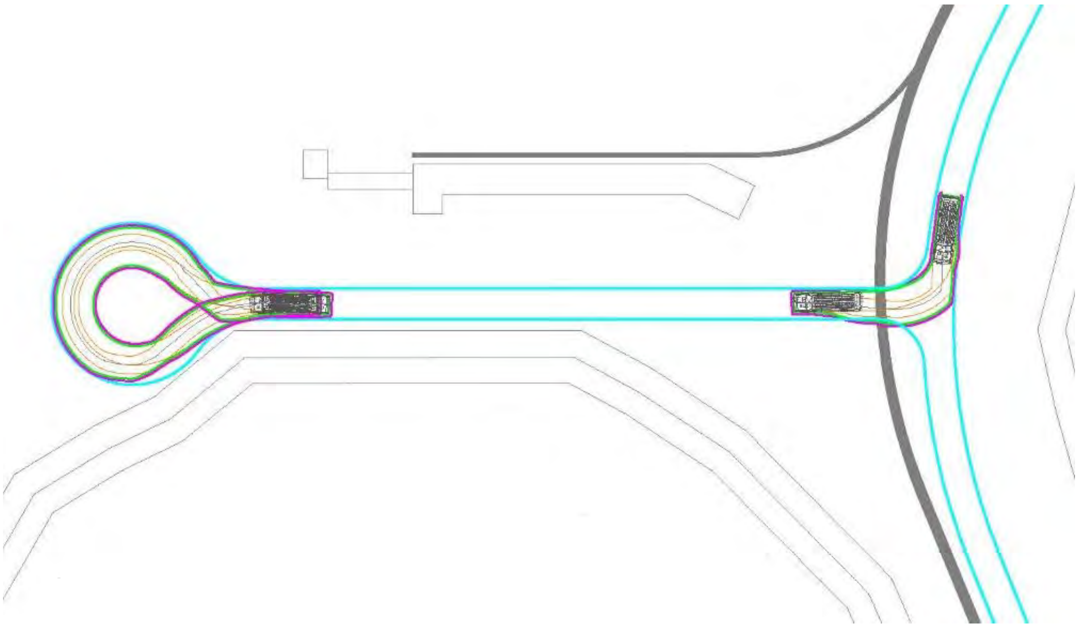


*Figure 10: An example of an 8.8 m MRV accessing the heliostats and tower*

Large facilities such as the power block and substation could potentially require the access of 19.0 m semi-trailers. These facilities will be serviced via the wider driveways which will cater for the access of semi-trailers as shown in Figure 11.

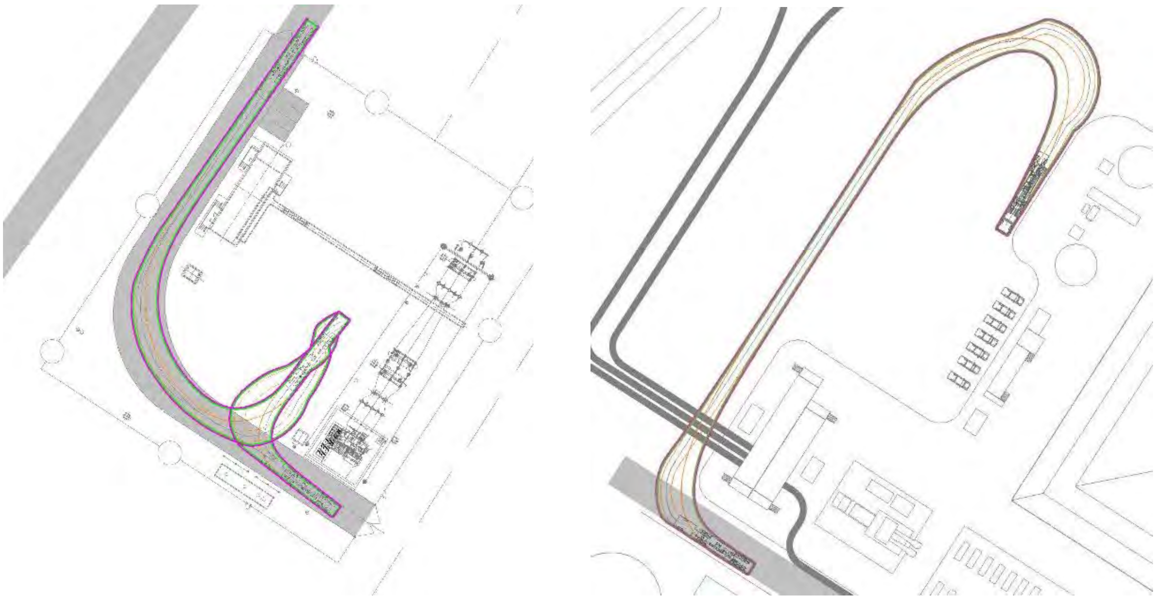


*Figure 11: An example of a 19.0 m semi-trailer accessing the power block and substation*

## 3.4 ADMINISTRATION AND CONTROL BUILDING

Access to the warehouse will be available for a semi-trailer. Figure 12 identifies that such a vehicle will access the paved area adjacent the warehouse to store while unloading.

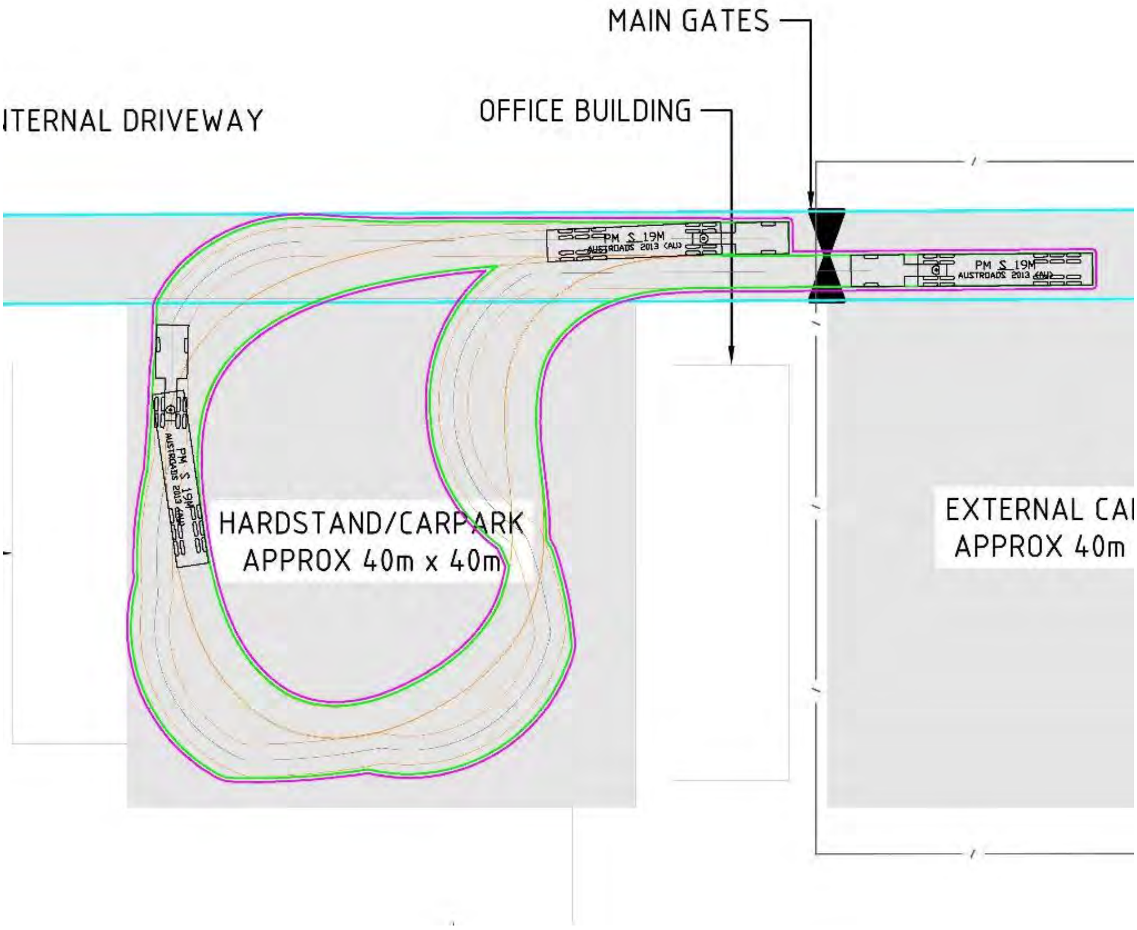


***Figure 12: 19.0 m semi-trailer accessing the paved area adjacent the warehouse***

Car parking will be provided adjacent the administration and control building. Spaces provided in this area should comply with the requirements in *Australian Standard Parking Facilities Part 1: Off-Street Parking (AS/NZS2890.1:2004)*.

# 4.0 TRAFFIC SAFETY ASSESSMENT

The technology will reflect light between the heliostat and the receiver. The glare from this reflection of light has been assessed to understand if it would present a distraction to drivers. The assessment has been completed based on the principles in Austroads “Guide to Road Design – Part 6: Roadside Design, Safety and Barriers” (AGRD06) and “Guide to Road Design - Part 6B: Roadside Environment” (AGRD06B).

## 4.1 CONE OF VISION ASSESSMENT

The cone of vision assessment considers the location of the heliostats and the receivers with respect to a driver’s general field of vision while driving. While AGRD06B does not stipulate that an object within the cone of vision will cause a distraction for drivers, removal of an object from the cone of vision will mitigate the risk of driver distraction.

The cone of vision relates to the angle of vision for drivers at any position along a road to the potential point of distraction. The speed of vehicles is also a factor in determining the potential distraction for drivers. Accordingly, the cone of vision has been assessed at the speed limit of the encompassing roads. An example of the assessment of drivers’ cone of vision adjacent to the subject site is identified in Figure 13, while the assessment for the site is shown on MFY Drawing No 220074_ 01_SH01E in Appendix B.

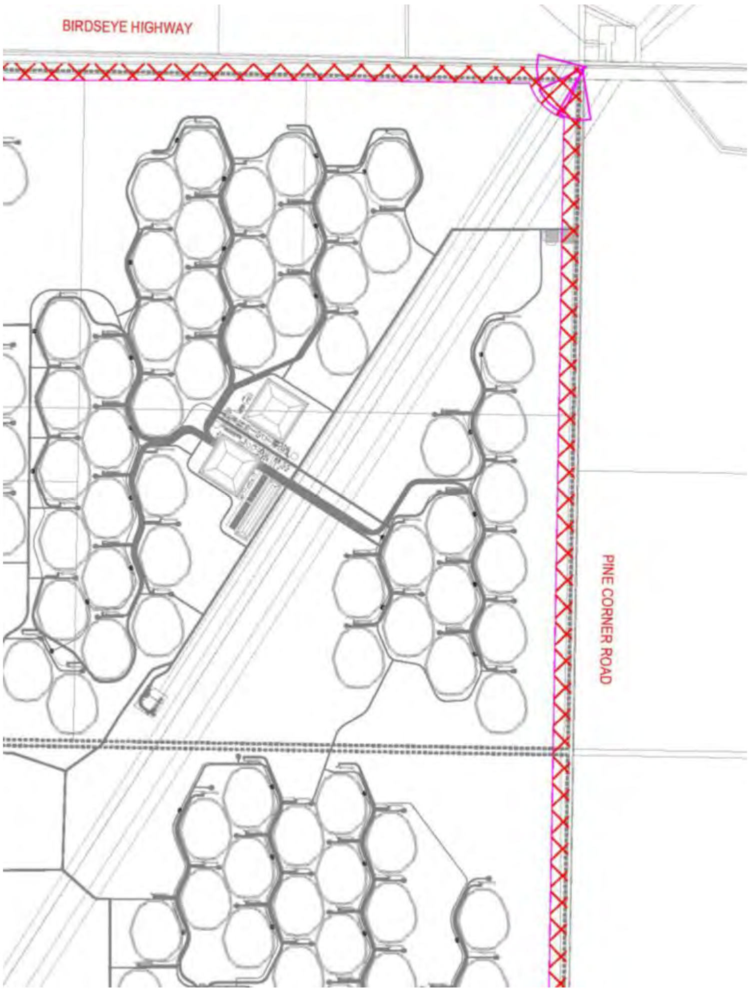
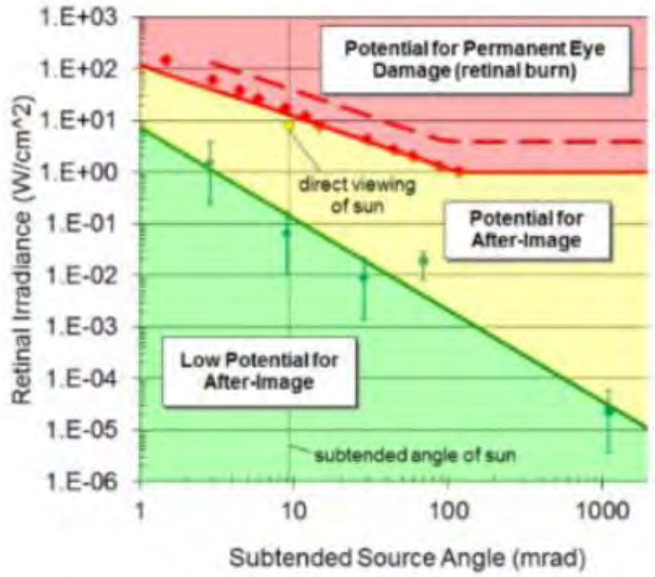


*Figure 13: Driver cone of vision assessment*

The assessment identifies that the receivers and heliostat fields will be located clear of drivers' cone of vision throughout the entirety of the development.

## 4.2 OCULAR GLARE ASSESSMENT

The ocular glare assessment considers the dispersion of light from the reflection and the potential impact to a driver's vision. The assessment has considered findings of a glare assessment undertaken for RayGen based on the optimised system SPP2 R3 PV Ultra installed at Carwarp. This is thy system that will be implemented at Yadnarie. This assessment identified the extent of glare associated with the heliostats and receivers could result in varying levels of ocular impact in accordance with the graph in Figure 14.



*Potential impact of retinal irradiance as a function of subtended source angle (Ho, 2011)*

*Figure 14: Potential for After Image Graph (Source: RayGen)*

RayGen also provided an ocular safety zone map in the glare assessment report which is identified in Figure 15.

*Figure 15: Glare zone map (Source: RayGen)*

The glare assessment was completed for RayGen using the Solar Glare Hazard Analysis Tool (SGHAT) by Sandia which classifies glare into three categories, namely:

- Low potential for after image (temporary after image), also referred as green glare.
- Potential for after image (flash blindness), also referred as yellow glare.
- Potential for permanent eye damage (retinal burn), also referred as red glare.

An assessment of the proposal has been completed to identify any areas of risk where the glare zone could encroach into the cone of vision of drivers, albeit the risk of impact associated with the green glare zone is significantly lower than those associated with the yellow glare zone. Further the risk associated with the green glare zone decreases as the distance from the receiver and the angle to the driver increases.

Figure 16 identifies an extract of the assessment. MFY Drawing No 220074_01_SH01E illustrates the assessment for the entire site and is included in Appendix B.

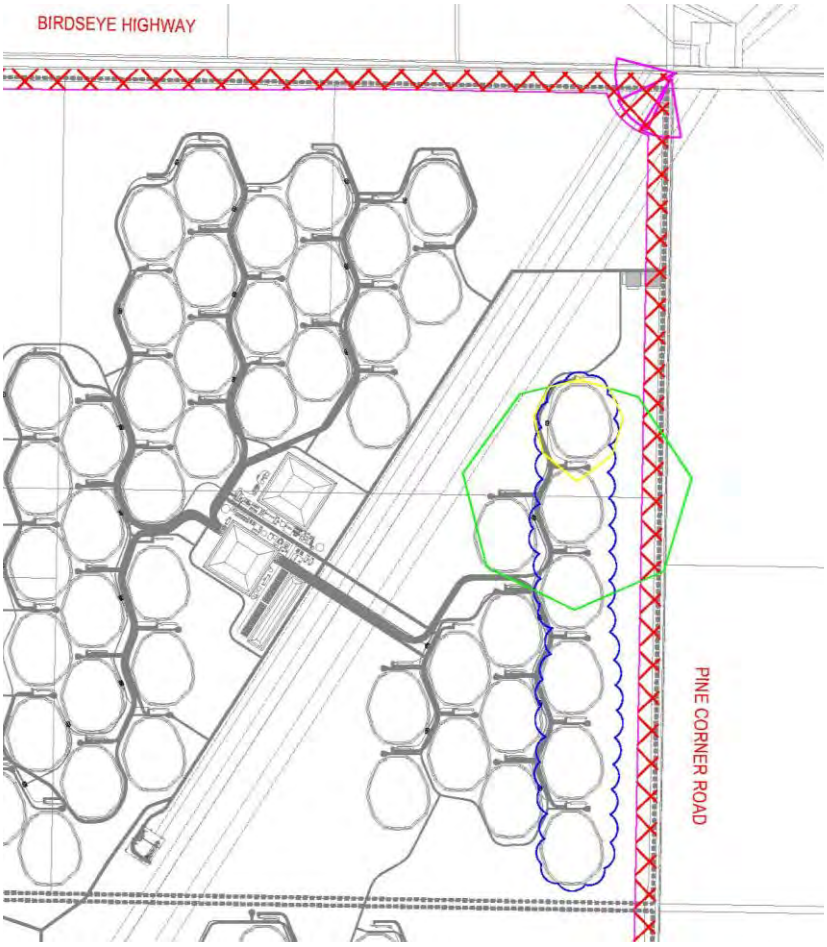


***Figure 16: Extract of ocular glare assessment results***

The assessment identified that all of the heliostats adjacent the Birdseye Highway are outside the glare map zone for drivers on the Birdseye Highway. This is important as this route presents the highest risk for drivers associated with the proposal.

A number of the heliostats and receivers on local roads (as clouded on Figure 16 and the plan in Appendix B) are in locations where the ocular safety zone extends into the cone of vision, thus identifying a risk of distraction or the potential for an after image for drivers. The potential intrusions were only identified at the extremity of the low risk of after image (green) zone where the risk of any impact is low.

Notwithstanding the above, an effective method to mitigate the risk of the after image is to ensure the driver does not have line of sight to the receiver in those locations where the ocular safety zone extends into the cone of vision would be to provide an effective screen (mound/vegetation or similar).

The height of the screen will depend on the levels of the road (at the driver position) and the receiver, the separation between the driver and the receiver and the location of the screen relative to the driver and the receiver. The extent of the screening at each location will be accurately determined during detailed design within the cone of vision, as illustrated in Figure 17.

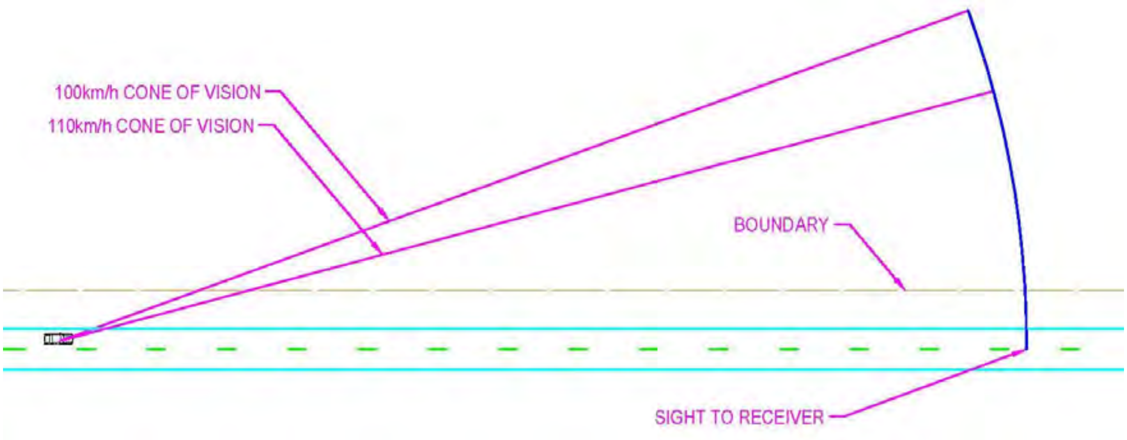


***Figure 17: Cone of Vision envelope in which the height of screen will be calculated to mitigate ocular glare impact***

The requirement for screening will vary along the route and will be impacted by existing landform and vegetation. It will also be specific to the separation between the driver and the receiver at any given point within the cone of vision. It will be accurately determined during detailed design by calculating the height differential at the location of the screening between the driver's eye height (approximately 1.15 m from the road surface) and the height of the tower (approximately 45 m from the ground), having regard to a driver's peripheral vision (above the eyes) and the position of the screen relative to both the driver and the receiver (as calculated using the methodology illustrated in Figure 17). Figure 18 is an example of how the screen height would be assessed.

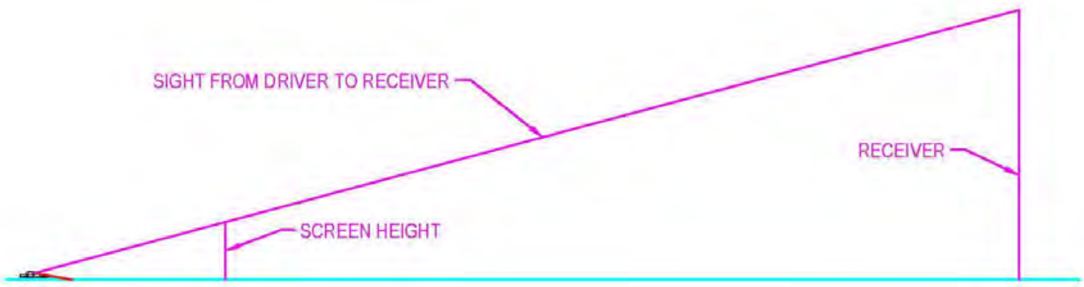


*Figure 18: An example of the screen height requirement assessment*

Consideration of the extent and angle of intrusion and the resulting risk of after image should also be included in the detailed site assessment as minor changes to the location or height of the receiving tower and confirmed position of the driver relative to the site will minimise the requirement for significant screening.

# 5.0 TRAFFIC IMPACT ASSESSMENT

## 5.1 OPERATIONS PHASE

Traffic generated by the development during the operational phase will be primarily related to staff who work on-site on a daily basis. It is estimated that there would be approximately 20 staff.

In the unlikely event that all staff arrived or departed the site during the same hour, the development will generate 20 trips within an hour. The forecast volumes are low and will be readily accommodated on Pine Corner Road and its intersection with Birdseye Highway.

Most of the above traffic will occur to and from Cleve which is located to the east of the site. Therefore, traffic turning movements will predominately left turn to Pine Corner Road and right turn to the Birdseye Highway. While the intersection is four-way, it is not anticipated that any movements will drive between Pine Corner Road and Syvertsen Road and hence there should be no crossing movements. Further, the very low turning movements at this intersection will minimise the risk of conflict at this location.

## 5.2 CONSTRUCTION PHASE

A higher volume of traffic will be generated during the construction phase of the project and therefore, this assessment has considered the forecast volumes associated with the construction of the development.

Most equipment and materials associated with construction will arrive to the site in containers on either semi-trailers or B-doubles. The number of trips generated by the transportation of goods will be dependent on the type of vehicle. If a B-double is used, the number of vehicles required will be lower when compared to the use of semi-trailers. For the purpose of this assessment, it is assumed that all containers will be transported via semi-trailers to ensure the higher volume potential has been considered.

Stage 1 of the project will include the construction of Power Block 1 and associated infrastructure. Stage 1 will be constructed in 24 months and the following number of vehicles are estimated to access the site during the construction period:

- approximately 32,000 light vehicles;
- approximately 900 rigid vehicles;
- approximately 1,000 semi-trailer vehicles; and
- approximately 30 OSOM vehicles.

Each vehicle will generate an entry and an exit trip. Based on a five-day work week, the average daily traffic generated by the development will equate to approximately 130 trips per day. It is estimated that there could be approximately or 60 trips in one hour when drivers are travelling to and from work.

Stage 2 of the project will include the construction of Power Block 2 and 3 and associated infrastructure. Stage 2 will be constructed in 24 months and, therefore, will potentially generate twice the volume of traffic generated in Stage 1. Accordingly, Stage 2 of the construction could generate approximately 260 trips per day or 120 trips in one hour.

The above forecast volumes will have no impact on the existing capacity on Pine Corner Road and will not change its nature or function.

Notwithstanding the above, it is proposed to provide an intersection treatment at the Pine Corner Road/Birdseye Highway intersection to provide improved traffic safety for existing road users and construction drivers accessing the development site. This treatment will continue to provide the improved safety following completion of construction.

# 6.0 SUMMARY

The proposed renewable energy facility in Yadnarie will provide an innovative alternative generation plus storage energy facility which pilots new technology to a larger scale facility. In regard to traffic and parking requirements, the proposal will have minimal impact, particularly during the operational phase of the project.

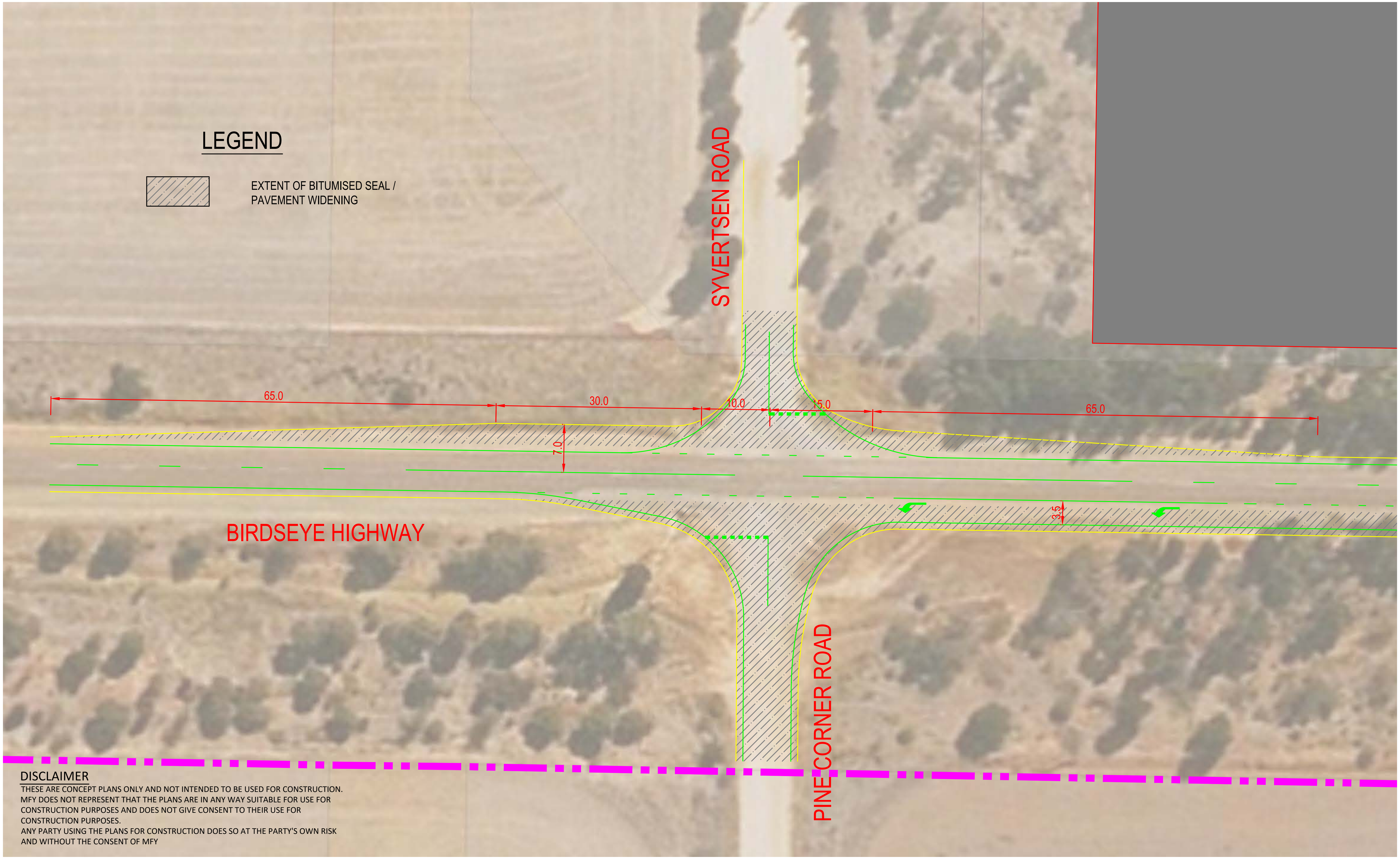
The key safety elements of the proposal are to ensure the existing road network can satisfactorily cater for the heavy vehicle construction access requirements and that the receivers do not have safety implications for drivers.

Notwithstanding the relatively low heavy vehicle volumes which will access the site during the construction period each day, it is proposed to upgrade the Pine Corner Road/Birdseye Highway intersection to provide for safe turning movements and improve safety for existing drivers on the highway.

The reflection of light from the heliostats to the receiver has the potential to cause distraction for drivers. The proposal has therefore included a detailed cone of vision and ocular glare assessment to ensure that receivers will either be outside the risk zone for drivers impact (as will be the case adjacent Birdseye Highway) or will be screened where required. The extent and the height of the screening will be confirmed during detailed design.

# APPENDIX A

## BIRDSEYE HIGHWAY/PINE CORNER ROAD INTERSECTION
## INTERSECTION TREATMENT
## MFY DRAWING MFY_22-0074_02_SH01A



## LEGEND

| | |
|---|---|
| ▨ | EXTENT OF BITUMISED SEAL / PAVEMENT WIDENING |

DISCLAIMER

THESE ARE CONCEPT PLANS ONLY AND NOT INTENDED TO BE USED FOR CONSTRUCTION.
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ANY PARTY USING THE PLANS FOR CONSTRUCTION DOES SO AT THE PARTY'S OWN RISK AND WITHOUT THE CONSENT OF MFY

# 4543 BIRDSEYE HIGHWAY CLEVE

## BAR Treatment (Solar Farm Access Road)

## Traffic Design (Preliminary)

**Drawing:** MFY_220074_02_SH01
**Drawn:** CJH
**Date:** 05.07.2023

**Revision:** A
**Scale:** 1:500
**Paper Size:** A3

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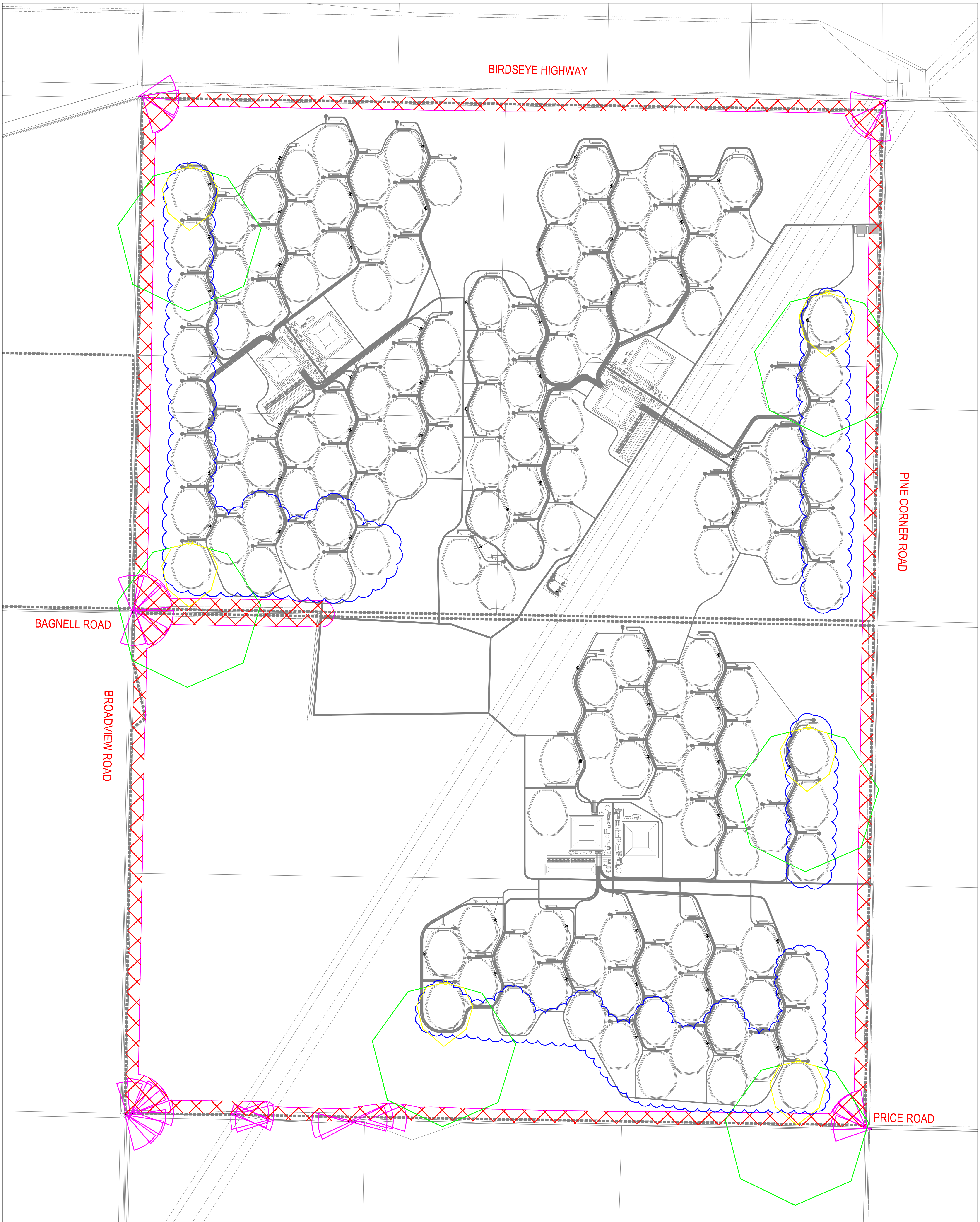
# APPENDIX B

## CONE OF VISION AND OCULAR GLARE ASSESSMENT
## MFY DRAWING MFY_220074_01_SH01E



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# Solar Farm
## Birdseye Highway, Cleve
## Receiver Cone of Vision Clearance

| | | | |
|---|---|---|---|
| **Drawing:** | MFY_220074_01_SH01 | **Revision:** | E |
| **Drawn:** | BH | **Scale:** | 1:15000 |
| **Date:** | 11.07.2024 | **Paper Size:** | A3 |

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Thursday, 3 October 2024 11:43:30 AM

# 9

# BUSHFIRE PROTECTION ASSESSMENT

# BUSHFIRE PROTECTION ASSESSMENT REPORT

## YADNARIE SOLAR FARM AND ENERGY STORAGE FACILITY

### Final Report – September 2024

## Document Control:

| Version | Date | Author | Nature of Change |
|---|---|---|---|
| V0.1 | 16 August 2023 | AJL Solutions Pty. Ltd. | First DRAFT |
| V0.2 | 25 August 2023 | AJL Solutions Pty. Ltd. | Second DRAFT |
| V1.0 | 7 May 2024 | AJL Solutions Pty. Ltd. | Third DRAFT |
| Final DRAFT | 16 August 2024 | AJL Solutions Pty. Ltd. | Final DRAFT |
| Final Report | 30 September 2024 | AJL Solutions Pty. Ltd. | Final Report |

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Photon Energy

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Telephone: +612 8021 3383

## Cover Photo:

Articulated mirrors (heliostats) and one PV Ultra Receiver – Carwarp Victoria. Image by Andrew Lawson, AJL Solutions Pty. Ltd. – July 2023.

## This report was prepared for:

MasterPlan SA, on behalf of Photon Energy Group (Aus) SPV 4 Pty. Ltd.

## By:

**ANDREW LAWSON** AFSM
Director
AJL Solutions Pty. Ltd.

e-mail: *andrew@ajlsolutions.com.au*
Address: 6 Hampton Road Mount Barker SA 5250

**ABN:** 48690 696 647.
**ACN:** 609 824 026.

AJL Solutions

## 1. Engagement:

Andrew Lawson AFSM, Director AJL Solutions Pty. Ltd. has been engaged by Photon Energy Group (Aus) Pty Ltd. (the 'Client') to provide a 'Bushfire Protection Assessment' for a solar farm and energy storage facility at Yadnarie, approximately 9 km west of Cleve on the Upper Eyre Peninsula.

## 2. Purpose:

The purpose of this report is to provide a 'Bushfire Protection Assessment' for the Photon Energy Group (Aus) Pty. Ltd. concerning a solar farm and energy storage facility at Yadnarie, with a focus on the following specified deliverables:

1. Review of application documentation.
2. Identification of potential bushfire sources.
3. Liaison with local Country Fire Service (CFS).
4. Commentary on local firefighting resources.
5. Commentary on bushfire firefighting methodologies likely to be engaged to control bushfire/s on and around the proposed development site.
6. Commentary on the potential impact of receivers on the safe operation of aerial firefighting assets.
7. Commentary on CFS radio communications systems and platforms used.
8. Firefighting vehicle access.
9. Bushfire firefighting water supply.
10. Legislative requirements (Bushfire).
11. Requirements for emergency management planning.

## 3. Disclaimer:

This report has been prepared for the sole benefit of the Photon Energy Group (Aus) Pty. Ltd. (the 'Client') and is not to be relied upon by any other person or entity without the prior written consent of Photon Energy (Aus) Pty. Ltd. and AJL Solutions Pty. Ltd. It is intended to address matters relevant to bushfire firefighting only and to provide professional advice regarding the potential impact of the proposed facility on the ability to fight bushfire/s from the ground and/or the air (aerial firefighting) in the Cleve area.

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**ANDREW LAWSON** AFSM
*Director - AJL Solutions Pty. Ltd.*

16 August 2024.

## 4. Introduction:

Photon Energy Group (Aus) Pty. Ltd. is proposing to develop a solar power and energy storage facility near Cleve, in the Upper Eyre Peninsula Region of South Australia, using RayGen Resources Pty. Ltd. ('RayGen') solar cogeneration technology (the 'Project'). It is understood that the project will include 150 megawatts of solar generation, a 90 megawatt grid connection and 720 megawatt-hours of storage (and 8 hours of dispatchable energy). The project will connect to the Yadnarie substation or 132 kilovolt transmission line and ancillary infrastructure.

The project is proposed to consist of the following infrastructure:

- 150 megawatts of solar generation, a 90 megawatt grid connection / 720 Megawatt-hours of storage and 8 hours of dispatchable energy.
- 150 fields of rotational mirrors (heliostats) orientated north comprising 273 individual heliostats. Each heliostat is approximately between 2.6 and 5.6 metres above the ground and mounted on a steel post. Heliostat heights will vary throughout the day as they track the sun. One receiver is 40-45 metres high, with one receiver per field of 273 heliostats. The receiver faces the field of mirrors in a southward direction. Each receiver has electrical switchgear and water pumping infrastructure at its base. One inverter is a 20 ft container shipping container-sized electrical device that converts DC power from the receivers to AC power for use. One inverter is required per two receivers for a total of 75 inverters.
- Three (3) thermal hydro pit units comprising:
  - 3 cold pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
  - 3 hot pits. Each pit/tank is 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
- Three Thermal Hydro plants, each comprising:
  - An Organic Rankine Cycle (ORC) engine and generator, with a net capacity of 30MW.
  - Heat Exchangers.
  - Tanks.
  - Various pumps.
  - Large Chiller and Heat Pump units.
  - connecting pipework.
  - Electrical infrastructure including switch rooms and transformers.
- Underground electrical cable reticulation on site.
- Switch yard and connection via overhead transmission connection to the Yadnarie substation.
- Operations and maintenance building and compound.
- Temporary construction compound.
- Security fencing around the site.
- Internal access roads.

Figure 1 - Articulated mirrors (heliostats) and PV Ultra Receiver – Carwarp Victoria

## 5. Constraints and Limitations:

As stated in Section 2 (above), the purpose of this report is to provide a 'Bushfire Protection Assessment' for the Photon Energy Group (Aus) Pty. Ltd. concerning a proposed solar farm and energy storage facility at Yadnarie. This report will not address the fire protection systems or hazardous materials storage and handling systems required at the Yadnarie site. It is noted that RayGen Resources Pty. Ltd. has engaged Worley Pty. Ltd. to provide a 'Fire Protection System Design Study'[1] to address the fire protection systems and the hazardous materials storage and handling systems required on the Yadnarie site. I have reviewed the Worley report and I have no concerns regarding the approach being proposed.

It is understood that the proposed development is likely to be referred to the South Australian Country Fire Service (CFS) during the assessment of this Crown Sponsored development (for essential infrastructure).

The Country Fire Authority (CFA), Victoria has recently published a guideline for the design and construction of renewable energy facilities in Victoria. The document – 'Design Guidelines and Model Requirements Renewable Energy Facilities V4'[2] is available in Appendix 1 of this Report. While South Australia does not currently have an equivalent document, I have been advised that CFS will use (endorse) and apply the CFA Guidelines when assessing renewable energy facilities in South Australia.

## 6. Review of Application Documentation:

In preparing this report, I have reviewed the following documents provided by either MasterPlan, Photon Energy Group (Aus) Pty. Ltd.(the 'Client') or RayGen Resources Pty. Ltd.:

1. **Request for Proposal** – MasterPlan – request for proposal to provide a Bushfire Protection Assessment – 18 March 2022.
2. **Preliminary Plan 2021** – MasterPlan (52274REP01 – Crown Final 22122021) – 22 December 2021.
3. **Factsheet** - Photon Energy Group (Aus) Pty. Ltd. Yadnarie Solar Farm – Factsheet PE factsheet (Yadnarie Solar Farm v3 PRINT) – 12 May 2023.
4. **Site Plan** – RayGen Solar Power Plant Yadnarie Plant Layout Site Plan Landscape and Screening Plan - AU02-00-Y-CI-DLP-WA-0025_0.
5. **Site Plan** – RayGen Solar Power Plant Yadnarie Plant Layout Site Plan Access Points & Intersections - AU02-00-Y-CI-DLP-WA-0027_0.
6. **Glint & Glare Report** – RayGen Resources Pty. Ltd. – Glint and Glare – R3 Glare Assessment by RayGen.
7. **Technical Memorandum** – Glint and Glare – R3 Glare Assessment by RayGen.
8. **Fire Protection System – Design Study** – Worley, RayGen Resources - Rev 0: 411010-00647-00-SR-TEN-00001 - 14 April 2023.
9. **DRAFT Aviation Assessment** – Aviation Projects, Photon Energy Group (Aus) Pty. Ltd. Yadnarie Solar Power, and Energy Project – Aviation Assessment – Reference 107301-01, Ver 0.2, 25 July 2023.

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[1] Worley – Fire Protection System – Design Study Solar Power Plant 2, Yadnarie.
Rev 0: 411010-00647-00-SR-TEN-00001) 14 April 2023.

[2] CFA - 240207-CFA DGMR Renewable Energy Facilities v4.2 V4 (May 2023).

10. **Emergency Management Plan** – RayGen Resources Pty. Ltd. – Document RPPC – EMP, Ver 2, 16 January 2023.
11. **Normal Operation of R3 Heliostats** – RayGen Resources Pty. Ltd. Reflectivity Management Plan – RayGen Resources Power Plant Carwarp, date unknown.

In addition to reviewing the documents provided by the client, I also accessed and reviewed the following documents:

1. **Guideline** – Victorian Country Fire Authority (CFA) Design Guidelines and Model Requirements for Renewable Energy Facilities – Government of Victoria, Version 4, May 2023.
2. **Map** – Reserves and Conservation Parks in the Cleve Region - Cleve-Regional-MAP_2018_A3-1, 1 July 2023.
3. **Map** – SACFS Primary Response Zone – Lower Eyre Peninsula PRZ, 12 August 2022.
4. **Factsheet** – Aerial Firefighting – Factsheet SACFS, 1 July 2023.
5. **Factsheet** – Emergency Management Plans – Government of South Australia, SafeWork SA, https://www.safework.sa.gov.au/workplaces/emergency-response, 1 July 2023.
6. **State Bushfire Management Plan** – Government of South Australia State Bushfire Management Plan 2021-2025, 1 May 2021.
7. **Bushfire Management Area Plan** – Government of South Australia Upper Eyre Peninsula Bushfire Management Area Plan, 1 December 21017.
8. **Guideline** – SA Fire Breaks, Fire Access Track and Sign Standards - Government of South Australia, State Bushfire Coordination Committee, 1 February 2015.
9. **Guideline** – SA Fire Services Emergency Planning Guideline 001, 18 December 2019.
10. **Policy** – SA Fire Authorities Built Environment Policy No. 14 – Above Ground Water Storage Tanks for Firefighting Purposes, Government of South Australia, 28 June 2016.
11. **Legislation** – SA Fire and Emergency Services Act 2005.
12. **Legislation** - Fire and Emergency Services Regulations 2021.

**Note:** These documents are also provided as appendices to this report.

## 7. Identification of Potential Bushfire Sources:

Bushfires (i.e., rural fires - meaning bush, scrub, grass, and crop fires) cannot be eliminated from the landscape, and there are circumstances when rural fires cannot be controlled. However, adequate planning and preparedness activities can reduce the frequency, spread and impact of bushfires.

There are three (3) possible ways in which rural fires may impact the Yadnarie site. Essentially, a rural fire in the landscape approaching the site from outside the area, a rural fire emanating from within the site and an infrastructure fire within the site, which may then cause a rural fire to start on the site.

The intent of Sections 13 - 16 of this report, as well as the 'Fire Protection System – Design Study' from Worley Pty. Ltd., is to mitigate the risk of fires starting on the site and to aid their timely control if a fire were to start. Therefore, the following report is intended to address the potential of a rural fire approaching the Yadnarie site from the surrounding landscape.

The project area is surrounded on three sides by cropping land (i.e., north, south, and west) with (at the time of inspecting the site), sheep grazing on the eastern perimeter of the site. The area also has scattered patches of remnant native vegetation (primarily roadside vegetation, as can be seen in Figures 3, 4, 5 and 6 below). Therefore, the type of rural fire that may threaten the project site is likely to be a crop and/or stubble fire, perhaps intensified locally by relatively small areas of native vegetation.

There are basically two (2) causes of rural fire in farming areas like the Yadnarie site. They are natural causes such as lightning, and human causes/activities such as 'harvesting operations' or 'burning-off operations'. Lightning can happen at any time of the year however, 'dry lightning'[3] (i.e., lightning not associated with rain) is more likely during November to December and then again during March and April each year in the Cleve area. Harvesting operations usually occur around November to December in the Cleve area and burning-off (i.e., burning stubbles after harvest) usually occurs around March and April. However, the use of burning-off is reducing over time in the Cleve area.

Rural fires can rapidly become uncontrollable when the fuel (i.e., bush and grass) is dry and the weather conditions deteriorate - see Section 7.3 below. The worst fire conditions are when it is hot and dry (i.e., low humidity) and there is a strong wind blowing. Therefore, the most threatening rural fires are likely to approach from the northwest (i.e., burning under a north-westerly wind) and/or the southwest (i.e., burning under a south-westerly wind). While a rural fire in the immediate area may be quite fast-moving and relatively intense, it is not likely to be 'spotting'[4] and the CFS is likely to be able to 'contain' the fire on or near the perimeter of the project site.

**Figure 2 – Yadnarie site, corner Birdseye Hwy & Pine Corner Road looking South West**

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[3] https://en.wikipedia.org/wiki/Dry_thunderstorm

[4] https://en.wikipedia.org/wiki/Ember_attack

Figure 3 – Yadnarie site, corner Birdseye Hwy & Broadview Road looking East

Figure 4 – Yadnarie site, corner Birdseye Hwy & Broadview Road looking South East

Figure 5 – Yadnarie site, Price Road looking East.

Figure 6 – Yadnarie site, Pine Corner Road looking North West.

### 7.1 Environment and Climate:

The Eyre Peninsula (EP) region has a coastal and rural environment with approximately one-third of South Australia's coastline, stretching over 2,000 kilometres from the upper Spencer Gulf to the Western Australian border. The landscape features a rugged and relatively undeveloped coastline, particularly on the western side of the Peninsula. The coastal and marine environment includes marine and conservation parks and encompasses numerous islands ranging in size from 180 to 40,000 square metres.

The region has a Mediterranean climate with warm to dry summers and cool, wet winters. Average maximum temperatures range from 25°C to 29°C near the coast, to 34°C inland. During winter, the average maximum temperatures range from 15°C to 18°C. The region is generally cooler than Adelaide in summer, and a degree or two warmer in winter. The Mean annual rainfall varies from 250 mm in the north and northwest to 500 mm in the south.

The strongest and most frequent winds are from the southeast in the summer and southwest in winter. Occasionally, in summer a strong hot wind blows from the north increasing bushfire risk to the region. Thunderstorms, often associated with dry lightning, usually occur around November to December and then again during March and April each year.

The majority of rainfall occurs between April and October and varies between 300 – 450 mm. However, the region is frequently subject to droughts with Cowell and Ceduna receiving the lowest annual rainfall of 281 mm and 292 mm.

The geographical relief is undulating and low, with most areas less than 150 metres above sea level. The largest hills are located in the Gawler Ranges north of Wudinna, with granite peaks reaching 500 metres. The Koppio Hills form a spine down the central part of the Lower Eyre Peninsula (LEP) and are the most prominent topographical feature in the southern part of the region.

A large proportion of the land has been cleared for agricultural production however, substantial areas of native vegetation remain. Vegetation clearance for agricultural purposes ranges from 14% in the far west to 72% in the south. About 15% of the region's grazing area is covered with scattered vegetation. Approximately 7.5 million hectares of land are contained in about 100 national parks, conservation parks and reserves. The Lincoln National Park and Coffin Bay National Park at the bottom of the Eyre Peninsula are significant parks and important tourist attractions. Other key parks and reserves include:

- Rudall Conservation Park (10 km northwest of the project site)
- Yeldulknie Conservation Park (15 km northeast of the project site)
- Hincks Conservation Park (20 km southwest of the project site)
- Hambidge Conservation Park (40 km northwest of the project site)
- Gawler Ranges National Park
- Great Australian Bight Marine Park
- Lake Giles Conservational Park
- Lake Newland Conservational Park
- Nullarbor National Park and Regional Reserve
- Whyalla Conservation Park
- Yellabinna Regional Reserve and Wilderness Protection Area

**Note:** A map of the local Reserves and Conservation Parks in the Cleve Region (Cleve-Regional-MAP 2018 A3-1, 1 July 2023) is attached in Appendix 2.

## 7.2 Fire History:

The Upper Eyre Peninsula (UEP) is a bushfire-prone environment with people, assets, and areas of environmental sensitivity at risk during bushfires. The map below illustrates the fire scars from 1950 to 2017 on the UEP, including prescribed burns.

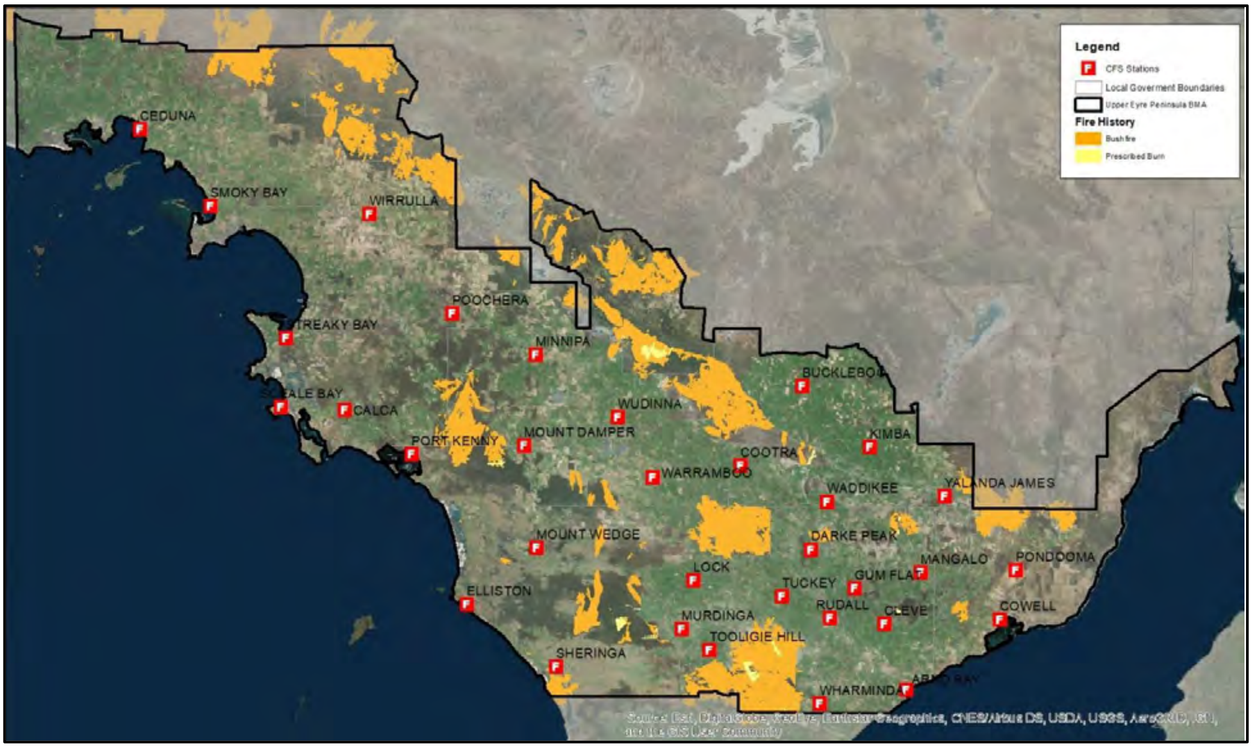

Figure 2 – Fire History – Upper Eyre Peninsula 1950 – 2017[5]

The following list contains examples of the years, the locations, and data of some fires relevant to the project area. It is not a definitive list of all fire occurrences within the region however it provides a guide regarding the frequency of notable rural fires in the region.

- 1959 Wudinna Fires, Upper Eyre Peninsula – 76,000 ha burnt grassland and scrub
- 1968-1969 near Murdinga, Upper Eyre Peninsula – 8,000 ha burnt
- 2002 Gawler Ranges National Park – 15,000 ha pastoral land burnt
- 2005 Darke Peak Fire - 2,505 ha burnt
- 2006 Hincks Fires 1 & 2 (Hincks CP and Wilderness Protection Area) – 7,800 ha
- 2012 & 2013 Nunnyha CP (now part of Pureba CP) Fire – 5,112 ha
- 2014 Ceduna complex of fires – 133,000 ha of conservation parks burnt
- 2014 Kiana Fire – 6,645 ha
- 2014 Pureba Fire – 5,080 ha
- 2016 Calca Fire – 77 ha
- 2017 Hincks Prescribed Burn – 8,265ha
- 2017 Cleve Fire – 43 ha

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[5] Bushfire Management Area Plan – Government of South Australia Upper Eyre Peninsula Bushfire Management Area Plan, 1 December 2017.

## 7.3 Fire Weather

Weather conditions play a significant role in the likelihood of a bushfire occurring and its behaviour and intensity should it establish and spread. A numeric index, the Fire Danger Index (FDI) is used to determine fire danger and the difficulty of suppressing a fire should one start. FDI's over fifty (50) are considered to be conducive to a rural fire becoming 'uncontrollable' and a Total Fire Ban (TFB) is routinely declared. Rural fires burning on such days, if not contained within the first 5 to 10 minutes of starting, are likely to burn out of control and will stay burning out of control until there is a significant moderation in the weather conditions (Koperberg, 2003).

The Yadnarie project area falls within the Eastern Eyre Peninsula (EEP) Fire Ban District (FBD). The Fire Danger Season (FDS) for the EEP FBD nominally commences on 1 November each year and concludes on 15 April the following year (almost 5 months). These dates may change, based on climate and actual weather conditions. Check the CFS Website[6] for the 'declared' FDS dates. The CFS website is the 'point of truth' regarding the FDS.

Data obtained from the Bureau of Meteorology (BOM) for the last ten (10) years for the EEP FBD is shown in Figure 3 below:

| Season | Severe | Extreme | Catastrophic | Total |
|---|---|---|---|---|
| 2013-14 | 20 | 6 | 0 | **26** |
| 2014-15 | 16 | 6 | 0 | **22** |
| 2015-16 | 13 | 2 | 0 | **15** |
| 2016-17 | 10 | 0 | 0 | **10** |
| 2017-18 | 7 | 2 | 1 | **10** |
| 2018-19 | 10 | 1 | 0 | **11** |
| 2019-20 | 10 | 1 | 1 | **12** |
| 2020-21 | 9 | 0 | 0 | **9** |
| 2021-22 | 6 | 0 | 0 | **6** |
| * 2022-23 | N/A | 15 | 0 | **15** |
| **Average** | **11.2** | **3.3** | **0.2** | **13.6** |

Figure 3 – Days per Year - Fire Danger Ratings - EEP 2013-2023[7]

* **Note:** The Australian Fire Danger Rating System (AFDRS) was modified in 2022, resulting in the 'Severe' category of Total Fire Ban (TBB) being removed. TFBs are now declared when the forecast FDR reaches 'Extreme' and/or 'Catastrophic'. Therefore prior to 2022, TFBs were declared when the forecast FDR reached 'Severe' whereas from 2022 onwards, TFBs are declared when the forecast FDR reaches 'Extreme' and/or 'Catastrophic'.

While FDR is not a direct indicator of the likelihood of a rural fire occurring, it is an indicator of its behaviour and intensity should one establish and spread. Therefore, the data above shows that, on average, the forecast FDR for the EEP (i.e., the Yadnarie project area) reaches 'Severe' (i.e., TFB) or above on approximately fourteen (14) days per year. Based on climate and actual weather conditions, some years may experience a significantly higher number of TFBs and some years may experience fewer - as can be seen in the data above for 2020-2021 and 2021-2022, which were La Niña[8] years.

In summary – the Yadnarie site is likely to experience challenging/difficult fire weather on a regular basis during the summer months.

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[6] https://www.cfs.sa.gov.au/warnings-restrictions/restrictions/fire-danger-season-dates-permits/

[7] Bureau of Meteorology (BOM) - Fire Danger Ratings - EEP 2013-2023.

[8] http://www.bom.gov.au/climate/updates/articles/a020.shtml

## 8. Liaison with local Country Fire Service:

While preparing this report, I have engaged with the following CFS staff and volunteers to ensure I have a current and full understanding of the issues faced by CFS firefighters in the Cleve area and firefighting personnel related to solar farms and aerial firefighting operations:

- **Nick Stanley** – CFS Manager State Aviation Operations (staff)
- **Corey Dunn** – CFS Air Attack Supervisor (staff)
- **Michael Matthew** – CFS Air Attack Supervisor (staff)
- **Brendon Saers** – CFS Regional Commander - Region 6 (staff)
- **Bryan Trigg** – CFS Group Officer – Eastern Eyre Peninsula CFS Group (volunteer)

While I have engaged with and briefed the CFS personnel listed above (using the publicly available information regarding the proposed Yadnarie site), it is acknowledged and understood that these staff members and volunteers and I are not authorised to provide any comment or advice on any fire protection systems, hazardous materials storage or handling systems or bushfire planning matters associated with the proposed Yadnarie site on behalf of the CFS.

In addition, I contacted Colin Paton, Fire Safety Officer from the CFS Development Assessment Services Unit, however, Colin declined the opportunity to engage with me until I submitted a formal written application as part of the formal planning/regulatory process. As I had not been engaged to do this, I have simply advised Colin that MasterPlan is coordinating the planning processes for this project and that they are fully aware of the regulated planning processes in South Australia.

## 9. Commentary on Local Firefighting Resources:

The Yadnarie solar farm is proposed to be built within the 'Primary Response Zone' (PRZ) of the Cleve CFS Brigade. Cleve CFS Brigade is a member of the Eastern Eyre Peninsula (EEP) CFS Group. The EEP CFS Group is in the EEP Fire Ban District (FBD) which is within CFS Region 6. The Eyre Peninsula Region (Region 6) is administered and managed from Port Lincoln. EEP CFS Group has ten (10) brigades with approximately 300+ firefighters and has the following firefighting resources available:

| Station / Group Base | Radio Callsign Capacity & Capability | Location Longitude & Latitude | Road Distance Kms | Travel Time Minutes |
|---|---|---|---|---|
| EEP CFS Group | BWC13, Car 1 & 2 | -33.702284,136.483929 | 9.0 | 6 |
| Cleve CFS Brigade | 34 & 34A (CAFS) | -33.702284, 136.483929 | 9.0 | 6 |
| Rudall CFS Brigade | 34 | -33.685751, 136.275875 | 16.9 | 12 |
| Gum Flat CFS Brigade | 14 | -33.589711, 136.369178 | 16.8 | 16 |
| Mangalo CFS Brigade | 34 | -33.535790, 136.618855 | 28.6 | 21 |
| Arno Bay CFS Brigade | 34 | -33.910959, 136.568827 | 31.1 | 22 |
| Tuckey CFS Brigade | 34 | -33.617572, 136.091735 | 38.5 | 26 |
| Darke Peak CFS Brigade | 44 | -33.467661, 136.201261 | 42.8 | 30 |
| Cowell CFS Brigade | 24P | -33.681816, 136.921744 | 46.6 | 31 |
| Wharminda CFS Brigade | 34 | -33.958269, 136.241311 | 41.3 | 33 |
| Pondooma CFS Brigade | 34 | -33.523033, 136.978347 | 70.9 | 49 |

Figure 4 – Local CFS Resources – Capacity & Capability.

**Notes:**

- CFS fire trucks have designated radio callsigns, which specify the quantity of water they carry and how many wheels drive, thus a 34 carries 3,000 litres of water and is 4-wheel drive truck.
- The designation 'CAFS' indicates that the appliance is fitted with a Compressed Air Foam System (CAFS)[9].
- The travel times above are simply an estimate of the time taken to travel at normal road speeds from their home station to the Yadnarie site. All CFS firefighters in the EEP CFS Group are volunteers and therefore may take 4+ minutes to respond to their home station.

From a local 'operational' perspective, the Cleve CFS Brigade and EEP CFS Group are under the 'Command' of the Eastern Eyre Peninsula CFS Group Officer (a volunteer position) based in Cleve. The EEP Group Officer is **Bryan Trigg** and is available via: bn.trigg@bigpond.com.

Cleve CFS Brigade and EEP CFS Group have recently developed a reasonable understanding of the size, nature, and impact of the Yadnarie Solar Farm project and are generally supportive. In addition, the Cleve CFS Brigade and EEP CFS Group are very well supported by numerous privately owned 'farm fire units'[10] across the district. Farm fire units are small/light privately-owned informal firefighting vehicles and they are likely to attend any rural fire in the Cleve district, in relatively large numbers. (it is common for 15-20 private farm fire units to attend a rural fire in the Cleve area)

## 10. Commentary on firefighting methodologies likely to be engaged for fire on and around the proposed development site:

As with all developments such as the Yadnarie solar farm and energy storage facility, CFS will respond in the normal manner to all rural fires in or near the development with both ground-based firefighting resources (fire trucks) and, if required and available, aerial firefighting resources (firebombers). The management of rural fires in or near a solar farm is almost identical to any rural fire. The only difference will be that if aerial firefighting resources attend, they will be made aware of the fact that there are multiple 45-metre solar receiver towers and numerous heliostats present. They will then treat the towers and heliostats much the same as any other elevated hazards or sensitive ground-based infrastructure such as solar panels and transmission lines.

CFS is likely to seek to contact the 'Operations Room' of the Yadnarie site to discuss the options available to ensure the safety of all aircraft, ground-based firefighters, and the assets on the site (including heliostats and other infrastructure). CFS has been made aware of the 'modes of normal operation' for R3 heliostats[11] and may seek to have the heliostats placed in the 'Park' or 'Storm Position' with the aim of placing the heliostats in the most appropriate 'mode' from a safety perspective for both aerial and ground-based firefighters and the protection of the sensitive components of the heliostats and other infrastructure.

Solar farms often have improved access via well-maintained roadways and perhaps limited rural fencing. Therefore, fighting a rural fire on or near a solar farm may be assisted by the fact that the access is improved from a ground-based perspective.

At the time of preparing this report, I was not aware of any instruction issued to CFS brigades that they should not attend rural fires in or near solar farms. They have however been advised to apply the standard CFS 'Dynamic Risk Assessment' (DRA) process when they attend rural fires in or near solar farms, and if an elevated tower or structure beyond their reach is on fire, they are to stay well clear and simply extinguish any secondary rural fires as/when/if they occur.

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[9] https://en.wikipedia.org/wiki/Compressed_air_foam_system

[10] https://www.cfs.sa.gov.au/plan-prepare/business-farms/farm-fire-units/

[11] Normal Operation of R3 Heliostats – RayGen Resources Pty. Ltd. Reflectivity Management Plan – RayGen Resources Pty. Ltd. Power Plant Carwarp, date unknown.

## 11. Commentary on the potential impact of receivers on the safe operation of aerial firefighting assets:

Aircraft (firebombers) used for aerial firefighting in South Australia may be responded to anywhere in the State to uncontrolled bushfires and grassfires however, priority for response will be given to where the risks to 'human life' and 'community assets' are greatest.

Therefore, the high-priority response areas are 'predefined' and are known as 'Primary Response Zones' (PRZ). The designated PRZs are in the Mount Lofty Ranges, the Lower South East, the Lower Eyre Peninsula, and the Mid North regions of South Australia. The remainder of the State is therefore outside the PRZ, an area of the state known as the 'State Response Zone' (SRZ).

### 11.1 Primary Response Zones:

The designated PRZs are as follows:

- **Mount Lofty Ranges** – Based at Claremont Air Base, near Brukunga north of Mt Barker in the Mount Lofty Ranges.
- **Lower South East** – Based at Mount Gambier Air Base, Mount Gambier Airport.
- **Lower Eyre Peninsula** – Based at Port Lincoln Air Base, Port Lincoln Airport.
- **Mid North** – Based at Hoyleton Air Base, near Hoyleton southwest of Clare.

**Note:** A map of the Lower Eyre Peninsula PRZ is available in Appendix 3 of this report[12].

**Note:** While Cleve Aerodrome is not a designated 'Air Base', it is a designated CFS aerial firefighting 'Reloading' site. This means that during a response to a rural fire in the Cleve area, the Cleve Aerodrome may be used to refill firebombers.

### 11.2 State Response Zone:

The Yadnarie site is outside the nearest PRZ (the LEP PRZ) and is therefore within the State Response Zone (SRZ). The SRZ is based at Claremont Air Base, near Brukunga north of Mt Barker in the Mount Lofty Ranges.

### 11.3 Dispatch of Firebombers within a PRZs within forecast fire weather criteria:

Firebombers within the Primary Response Zones are available on 'active standby' for early and rapid dispatch to any report of a rural fire within the PRZ. Firebombing aircraft are 'immediately available' when the forecast Fire Danger Index (FDI) for the PRZ reaches a predetermined level, which is generally 'High' fire danger or above (High, Extreme or Catastrophic).

If a rural fire occurs during these conditions (High, Extreme or Catastrophic) within a PRZ, firebombers will immediately be dispatched to the fire, noting that the Incident Controller (IC) (i.e., the local CFS Officer in Charge) does not need to request the aircraft. In the event that aircraft are not able to respond, due to other factors such as multiple fires or unsafe flying conditions, the IC may contact the Regional Duty Commander (RDC) to request advice regarding when aircraft may be responded.

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[12] Map – SACFS Primary Response Zone – Lower Eyre Peninsula PRZ, 12 August 2022.

### 11.4 Dispatch of Firebombers within the SRZ or outside forecast fire weather criteria:

Outside the PRZs or outside of the predetermined forecast fire weather criteria, a CFS IC may request the response of firebombers to rural fires. All requests for aircraft shall be from the IC via the RDC. A request for an aircraft does not guarantee a response. The RDC will request the State Duty Commander (SDC) to release firebombers. When considering the release of aerial firefighting resources, the SDC will consider the following response criteria:

- the decision to use bombers is based on life risk
- the likelihood of the fire causing significant community damage or loss
- the likelihood of bombers being effective in achieving the mission
- the likelihood of bombers achieving the mission given the time and space available
- fire response requirements across the State, and
- forecast weather conditions.

### 11.5 CFS Aerial Firefighting Fleet:

The CFS aerial firefighting fleet (firebombers and aerial observation aircraft) is based on the ‘exclusive’ (contracted) use of at least fourteen (14) ‘Single Engine Air Tankers’ (SEATs), supported by three (3) ‘Type 2 Helitankers’ (medium-volume helicopters) and several ‘Tactical’ and ‘Strategic Overview’ aircraft**.**

The SEATs used in South Australia are the Air Tractor AT802F – with a capacity of 3,200 litres and a cruise speed of 300 km per hour. The Type 2 Helitankers are Sikorsky UH-60A Black Hawks with a capacity of 4,500 litres and cruise speed of 230 km per hour. CFS firebombers will generally drop from a height of between 20 to 30 metres ‘Above Ground Level’ (AGL) and are capable of delivering water, firefighting foam[13], fire retardant[14] or firefighting gel[15].

CFS also uses several ‘Tactical’ and ‘Strategic Overview’ aircraft to support the firebombing fleet, aerial intelligence gathering and community safety. At least eight (8) helicopters and three (3) fixed-winged aircraft make up the CFS tactical and strategic fleet. These aircraft are used to observe, and collect information to help predict the path of the fire, gather, and relay information, and map the perimeter of the fire. They also help to coordinate firebombers to specifically support ground-based firefighters at problematic parts of the ‘fireground’ where ground crews may not be able to access the fire, or where people, homes and buildings may be in danger.

In addition, as part of the national arrangements under the ‘National Aerial Firefighting Centre’ (NAFC), CFS may request the response of ‘Large’ and ‘Very Large’ air tankers from interstate (generally NSW and/or Victoria). These fixed-winged firebombing aircraft carry between 15,000 and 38,000 litres of water and firefighting chemicals (see para’ above). The CFS Air Operations Team works with the support of the Royal Australian Air Force at Edinburgh (north of Adelaide) to refill the large air tankers if multiple drops are required.

**Note:** A Fact Sheet - CFS aerial firefighting fleet is available in Appendix 4 of this report[16].

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[13] https://en.wikipedia.org/wiki/Firefighting_foam

[14] https://en.wikipedia.org/wiki/Fire_retardant

[15] https://en.wikipedia.org/wiki/Fire_retardant_gel

[16] Factsheet – Aerial Firefighting – Factsheet SACFS, 1 July 2023.

### 11.6 Use of Firebombing Aircraft on or near the Project Site:

There is little doubt that elevated infrastructure associated with solar farms as proposed for Yadnarie (i.e., many receiver towers) and pre-existing high-voltage transmission lines pose risks for aerial firefighting operations. Specifically, the high number of receiver towers and the pre-existing high-voltage transmission lines may make it difficult for aerial firefighting assets to work safely in the direct vicinity of the heliostats and receivers. However, with appropriate planning and management, the risks posed to aerial firefighting operations can be mitigated, such that the presence of a solar farm (as proposed for Yadnarie) will not universally exclude the use of aerial firefighting resources.

CFS firefighting aircraft operate under 'Visual Flight Rules' (VFR) and as such, firefighting aircraft only operate during daylight hours and where there is clear and unobstructed visibility. Aircraft operators will always undertake a 'Dynamic Risk Assessment' (DRA) of all risks to aircraft safety during all incidents. The presence of receiver towers and/or pre-existing transmission lines, in or near a rural fire would be considered as part of the DRA undertaken by each pilot in 'command' of each firebombing aircraft, as well as the CFS 'Air Attack Supervisor' (AAS), flying in a separate aircraft. A decision will then be made with regard to the safety and effectiveness of any aerial operations based on the identified limitations or obstructions. This process is used for all firebombing operations, given proximity to any towers, transmission lines or other elevated or ground-based assets/obstacles.

As the Yadnarie site is outside the LEP PRZ and therefore within the SRZ, it is unlikely that CFS firebombing aircraft will be dispatched in the first instance. However, it is possible that if a rural fire were to approach or be in the vicinity of the Yadnarie site, the CFS IC may request firebombing aircraft and they may be dispatched. If this were to occur, the responding aircraft are likely to be initially dispatched from the Port Lincoln Air Base and backed up, if necessary, from other air bases further east (Mid North and/or Mount Lofty Ranges Air Bases). Therefore, it is possible that a rural fire on or near the Yadnarie site may have fixed-winged and rotary-winged firebombing aircraft attend as well as 'Tactical' and 'Strategic' aircraft.

The responding aircraft will conduct a DRA and determine how and if the firebombing aircraft can be used on or near the Yadnarie site. As mentioned in Section 10 above, the CFS is likely to seek to contact the 'Operations Room' of the Yadnarie site to discuss the options available to ensure the safety of all aircraft, ground-based firefighters, and the assets on the site, including heliostats and other infrastructure. CFS has been made aware of the 'modes of normal operation' for R3 heliostats[17] and may seek to have the heliostats placed in the 'Park' or 'Storm Position' with the aim of placing the heliostats in the most appropriate 'mode' considering the safety of both aerial and ground-based firefighters as well as the protection of the sensitive components of the heliostats and other infrastructure.

## 12. Commentary on CFS Radio Communications Systems and Platforms used:

CFS uses multiple communications systems, including the South Australian Government Radio Network (SAGRN), Very High Frequency (VHF) radios, Ultra High Frequency (UHF) Citizen Band (CB) radios, mobile telephones, and Global Positioning Systems (GPS).

- The SAGRN is a trunked system using a UHF network – primarily used for command-level (strategic) communications
- The VHF system is a line-of-sight system – primarily used for fireground-level (tactical) communications

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[17] Normal Operation of R3 Heliostats – RayGen Resources Pty. Ltd. Reflectivity Management Plan – RayGen Resources Power Plant Carwarp, date unknown.

- The UHF CB system is the standard local system – used primarily to communicate with local farm fire units and others with access to the UHF CB system
- Mobile phones used by the CFS are standard mobile phones – primarily used for one-to-one non-tactical communications
- The GPS system is the standard publicly available system – primarily used to provide navigation and location services.

While I am not able to provide any specific professional advice regarding the potential impact of any Electromagnetic Interference (EMI) created by the Yadnarie site on the communications systems used by the CFS, the communications systems and equipment normally used on the site are not expected to interfere in any way with any communications systems used by the CFS.

## 13. Firefighting Vehicle Access:

Providing adequate heavy vehicle access to and within solar farm facilities will greatly assist the CFS in responding to and managing fires on or adjacent to the site. Section 6.2.1 of the CFA 'Design Guidelines and Model Requirements for Renewable Energy Facilities' (Version 4) is considered to be the minimum expectation for emergency vehicle access at renewable energy facilities. While South Australia does not currently have an equivalent Guideline or Model Requirements, it is my understanding that CFS will use and apply the CFA (Victorian) Guidelines when assessing renewable energy facilities in South Australia.

## 14. 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 responses 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. Section 4.2.2 of the CFA 'Design Guidelines and Model Requirements for Renewable Energy Facilities' (Version 4) is considered to be the minimum expectation for the provision of firefighting water supplies. In particular, attention is drawn to the 'Model Requirements' of the CFA 'Design Guidelines and Model Requirements for Renewable Energy Facilities' for firefighting water at solar facilities.

While South Australia does not currently have an equivalent Guideline or Model Requirements, it is my understanding that CFS will use and apply the CFA (Victorian) Guidelines when assessing renewable energy facilities in South Australia.

## 15. Legislative Requirements (Bushfire):

Bushfire prevention and preparedness is a shared responsibility of government, local councils, fire agencies, individuals, landholders, asset managers (public and private), and the broader community.

Section 105F of the *'Fire and Emergency Services Act 2005'* (FES Act 2005), outlines the responsibilities of owners of land (i.e., government organisations, businesses, corporations, the community, and the public) to prepare for, prevent or inhibit the spread of any bushfire.

Therefore, everyone is responsible for mitigating the bushfire risk for themselves, their neighbours, and their community, and therefore need to understand and participate in bushfire prevention and preparedness activities.

In particular, Section 105F of the *South Australian Fire and Emergency Services Act 2005,* (the FES Act) states that:

> ***105F - Private land***
>
> *(1) An owner of private land must take reasonable steps —*
>
> > *(a) to prevent or inhibit the outbreak of fire on the land; and*
> >
> > *(b) to prevent or inhibit the spread of fire through the land; and*
> >
> > *(c) to protect property on the land from fire; and*
> >
> > *(d) to minimise the threat to human life from a fire on the land.*

While Section 105F of the FES Act specifically mentions *"an owner of private land"* – these obligations are equally applicable to the owners/operators of the Yadnarie solar farm. All activities of any employees or contractors of Photon Energy Group (Aus) Pty. Ltd. shall be undertaken so as to prevent or inhibit the outbreak and the spread of fire on the land, during both the 'construction' and 'operations' phases of the project.

### 15.1 Angle Grinders, Welders, or Cutting Tools:

The use of certain appliances may cause a fire (i.e., such as grinders, welders, or cutting tools). Therefore, any activities involving the use of these appliances must only be carried out under specific circumstances during the declared Fire Danger Season (FDS) in the Eastern Eyre Peninsula (EEP) Fire Ban District (FBD).

Section 89 of the FES Act restricts the use of certain appliances as follows:

> ***89 - Restriction on use of certain appliances etc***
>
> *A person must not, during the fire danger season, operate an engine, vehicle or appliance of a prescribed kind in the open air, or use any flammable or explosive material of a prescribed kind, or carry out any prescribed activity, except in accordance with the relevant regulations.*

Regulation 39 of the FES Regulations states:

> ***39 - Gas welding, soldering, metal cutting, grinding and abrasion***
>
> *(1) Pursuant to section 89 of the Act, appliances used to carry out the following activities are prescribed:*
>
> > *(a) gas welding or soldering with an exposed flame;*
> >
> > *(b) metal cutting;*
> >
> > *(c) metal grinding;*

> *(d) metal abrasion.*
>
> *(2) A person must not, during the fire danger season, operate an appliance referred to in subregulation (1) in the open air unless -*
>
> *(a) the space immediately around and above the appliance is cleared of all flammable vegetation to a distance of at least 10 m; and*
>
> *(b) an appropriate agent to extinguish a fire is at hand; and*
>
> *(c) a person who is able to control the appliance is present at all times while the appliance is in use or alight.*
>
> *(3) Despite subregulations (1) and (2), a person must not operate an appliance referred to in subregulation (1) in the open air for any purpose on a day in relation to which a total fire ban under section 80 of the Act has been imposed in any part of the State to which the total fire ban applies.*

### 15.2 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.

Section 4.2.5 of the CFA ‘Design Guidelines and Model Requirements for Renewable Energy Facilities’ (Version 4) is considered to be the minimum expectation for fire breaks for all solar farm facilities.

To be a little more prescriptive it is recommended that all fire break(s) should be:

1. At the perimeter of each block, commence from the boundary of the facility or from the vegetation screening (landscape buffer) inside the property boundary
2. Be constructed of mineral earth or non-combustible mulch (such as crushed rock)
3. Be free of vegetation at all times, and
4. Be free of all obstructions (e.g., no stored materials of any kind) at all times.

While South Australia does not currently have an equivalent Guideline or Model Requirements, it is my understanding that CFS will use and apply the CFA (Victorian) Guidelines when assessing renewable energy facilities in South Australia.

### 15.3 Vegetation and Fuel Management:

The effective management of vegetation and fuel can reduce both the risk of fire entering the facility and the consequences of fire on the site.

Section 6.2.2 of the CFA ‘Design Guidelines and Model Requirements for Renewable Energy Facilities’ (Version 4) is considered to be the minimum expectation for vegetation and fuel management on solar farms.

To be a little more prescriptive it is recommended that the area under the heliostats should be non-combustible materials such as mineral earth; non-combustible mulch such as stone; or other vegetation managed or grazed to no more than 100 mm. Combustible materials must not be allowed to accumulate around and under site infrastructure, including heliostats, inverters, concentrated light tower receivers/PV Ultra units, thermal hydro storage and plant areas, control rooms, substations, dangerous goods storage and plant areas.

While South Australia does not currently have an equivalent Guideline or Model Requirements, it is my understanding that CFS will use and apply the CFA (Victorian) Guidelines when assessing renewable energy facilities in South Australia.

## 16. Requirements for Emergency Management Planning:

Effective emergency planning ensures that all solar facilities are prepared in the event of an emergency, providing for the safety of site personnel, emergency responders and the community. An emergency planning process, informed by AS 3745-2010: 'Planning for Emergencies in Facilities' provides a framework for the development of an Emergency Management Plan through the formation and activities of an Emergency Planning Committee. The Emergency Planning Committee is responsible for the development, implementation, and maintenance of the Emergency Management Plan (EMP).

Sections 7 and 8 of the CFA 'Design Guidelines and Model Requirements for Renewable Energy Facilities' (Version 4, August 2023) are considered to be the minimum expectation for the development of an Emergency Management Plan and a Bushfire Management Plan. While South Australia does not currently have an equivalent Guideline or Model Requirements, it is my understanding that CFS will use and apply the CFA (Victorian) Guidelines when assessing renewable energy facilities in South Australia.

Prior to commissioning the facility, operators should offer a familiarisation visit and explanation of emergency procedures to the local and Regional CFS personnel. Information in relation to the specific hazards and fire suppression requirements of the site should be provided to the CFS during this visit. In addition, a schedule for ongoing site familiarisation to account for changing personnel, site infrastructure and hazards should be developed in conjunction with the local CFS Brigade (see Section 16.2 below).

As mentioned in Section 6 above, I have reviewed the Emergency Management Plan (EMP) for the Carwarp site[18]. This document is considered to be a suitable template for the development of an EMP for the Yadnarie site. In addition, a Factsheet 'Emergency Management Plans' produced by SafeWork SA (available in Appendix 5) may provide some additional guidance when developing the EMP for the Yadnarie site.

### 16.1 Emergency Exercises:

It is recommended that Photon Energy Group (Aus) Pty. Ltd. conduct regular practical exercises drawn from scenarios identified in the site's EMP to test emergency procedures and ensure ongoing effectiveness and staff familiarisation. I recommend inviting the local CFS fire brigade to participate in this process on an annual basis.

### 16.2 CFS Fire Brigade Interaction:

It is recommended to establish a schedule of regular interaction with the local CFS brigade to facilitate site familiarisation in relation to site infrastructure, to support the development of brigade pre-plans (i.e., fire protection systems, dangerous goods installations, site hazards and infrastructure) and to establish and maintain cooperative working relationships in the event of an incident at the site. The intent is to ensure that the following are established:

- Triggers for notifying CFS during incidents
- Access to contact the Yadnarie 'Control Room' during an emergency on the site and/or when a rural fire may be in the vicinity of the site
- Access arrangements for the site, and
- Procedures for handover to CFS during incidents.

**End Report**.

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[18] Emergency Management Plan – RayGen Resources Pty. Ltd.– Document RPPC – EMP, Ver 2, 16 January 2023.

## Acronyms:

| Acronym | Explanation |
|---|---|
| Aus | Australia |
| AAS | Air Attack Supervisor |
| AFDRS | Australian Fire Danger Rating System |
| AGL | Above Ground Level |
| BMAP | Bushfire Management Area Plan |
| BOM | Bureau of Meteorology - Australia |
| BWC | CFS Bulk Water Carrier – 12K litres |
| CAFS | Compressed Air Foam System |
| CAR | CFS Command Vehicles – Light 4WD |
| CASA | Civil Aviation Safety Authority - Australia |
| CFA | Country Fire Authority Victoria |
| CFS | South Australian Country Fire Service |
| DRA | Dynamic Risk Assessment |
| EEP | Eastern Eyre Peninsula |
| EMI | Electromagnetic Interference |
| EMP | Emergency Management Plan |
| FBD | Fire Ban District |
| FDI | Fire Danger Index |
| FDR | Fire Danger Rating |
| FDS | Fire Danger Season |
| FES Act | South Australian Fire and Emergency Services Act 2005 |
| FES Regulations | South Australian Fire and Emergency Services Regulations 2021 |
| GPS | Global Positioning System |
| IC | CFS Incident Controller |
| NAFC | National Aerial Firefighting Centre |
| ORC | Organic Rankine Cycle |
| PRZ | Primary Response Zone |
| RDC | CFS Regional Duty Commander |
| SEAT | Single Engine Air Tanker - Firebomber |
| SRZ | Secondary Response Zone |
| SDC | CFS State Duty Commander |
| TFB | Total Fire Ban |
| UHF CB | Ultra-High Frequency – Citizen Band - Transceiver |
| UHF GRN | Ultra-High Frequency – SA Government Radion Network Transceiver |
| UEP | Upper Eyre Peninsula |
| VHF | Very High Frequency – Transceiver |
| VFR | Visual Flight Rules |
| 24, 34, 44 | CFS Firefighting Vehicle (Fire Truck) – Litres carried and drive wheels |

## Appendices:

1. **Guideline** – Victorian Country Fire Authority (CFA) Design Guidelines and Model Requirements for Renewable Energy Facilities – Government of Victoria, Version 4, May 2023.
2. **Map** – Reserves and Conservation Parks in the Cleve Region - Cleve-Regional-MAP_2018_A3-1, 1 July 2023.
3. **Map** – SACFS Primary Response Zone – Lower Eyre Peninsula PRZ, 12 August 2022.
4. **Factsheet** – Aerial Firefighting – Factsheet SACFS, 1 July 2023.
5. **Factsheet** – Emergency Management Plans – Government of South Australia, SafeWork SA, https://www.safework.sa.gov.au/workplaces/emergency-response, 1 July 2023.
6. **State Bushfire Management Plan** – Government of South Australia State Bushfire Management Plan 2021-2025, 1 May 2021.
7. **Bushfire Management Area Plan** – Government of South Australia Upper Eyre Peninsula Bushfire Management Area Plan, 1 December 2017.
8. **Guideline** – SA Fire Breaks, Fire Access Track and Sign Standards - Government of South Australia, State Bushfire Coordination Committee, 1 February 2015.
9. **Guideline** – SA Fire Services Emergency Planning Guideline 001, 18 December 2019.
10. **Policy** – SA Fire Authorities Built Environment Policy No. 14 – Above Ground Water Storage Tanks for Firefighting Purposes, Government of South Australia, 28 June 2016.
11. **Legislation** – SA Fire and Emergency Services Act 2005.
12. **Legislation** – Fire and Emergency Services Regulations 2021.

Design Guidelines and Model Requirements

# Renewable Energy Facilities v4

OUR COMMUNITY • OUR CFA

Version 4, August 2023

CFA Specialist Risk and Fire Safety Unit

# Foreword

Victoria is rapidly transitioning towards energy generation from renewable alternatives.  Although the focus has been on the domestic generation of solar energy using photoelectric voltaic panels often supplemented with a battery energy storage system, the role commercial generation of energy plays cannot be underestimated.

Large commercial and industrial projects are being planned and built across the country. They range in size from small installations to supplement an individual company's needs, to projects capable of supplying power to hundreds of thousands of Victorian homes annually.  These projects include one of the largest operating battery energy storage facilities in Australia to date, located in Moorabool, and other large facilities planned across the country area of Victoria, helping the state meet its renewable energy target of 65% by 2030.

New and emerging renewable energy technology has outpaced the development of fire and emergency management standards and guidance. To bridge this gap, CFA has worked with stakeholders nationally and globally to develop guidelines that can be used when designing a new facility or modifying or operating an existing one. These guidelines advocate a holistic approach to fire and emergency risk management.

As renewable energy facilities become critical electricity infrastructure, CFA are expected to facilitate prevention and suppression of fire should any incident occur. Ensuring that designers, owners and operators consider these guidelines is critical to supporting CFA's mission to protect life and property.

It's important that all those with responsibilities in designing, constructing, and operating these facilities – large or small – are fully aware of, and understand, their responsibilities and obligations to ensure fire safety within their premises.

Fire safety not only makes good sense from a community safety point of view, it's also a good risk management business decision. CFA invites key stakeholders to consider these guidelines and work together to maintain and improve a satisfactory level of fire safety.

Finally, CFA gratefully acknowledges the support of our regulatory partners and industry in the development and application of these guidelines. CFA is particularly grateful for the support and expertise of Professor Paul Christensen, Professor of Pure and Applied Electrochemistry at the University of Newcastle UK and Senior Advisor to the National Fire Chiefs Council UK, in ensuring these guidelines reflect the latest research in lithium-ion battery fire safety.

**Jason Heffernan**
**CFA Chief Officer**

**Please Note:**
This guideline, *CFA's Design Guidelines and Model Requirements for Renewable Energy Facilities v4 (May 2023)*, supersedes the following CFA guidance:

- *CFA Design Guidelines and Model Requirements for Renewable Energy Facilities v3, March 2022*
- *CFA Guidelines for Renewable Energy Installations v2, March 2021*
- *CFA Guidelines for Renewable Energy Installations v1, February 2019*
- *CFA Emergency Management Guidelines for Wind Energy Facilities, May 2015*

# Content Guide

# 1 Introduction

***This guideline provides standard considerations and measures for fire safety, risk and emergency management in designing, constructing and operating new renewable energy facilities, and upgrading existing facilities.***

Facilities that support the generation of electricity in Victoria include wind energy facilities, solar energy facilities and facilities with battery energy storage systems. These facilities are the focus of this guideline.

The principles and model requirements within this guideline can also be applied to emerging renewable technologies such as geothermal and biomass, where applicable.

These guidelines are designed to:

- Facilitate consideration of fire risk management in the design, construction and operation of renewable energy facilities.
- Reduce the occurrence and consequences of fire at renewable energy facilities through risk-based design, and enable safe and effective emergency response through the provision of fire protection systems.
- Inform fire and risk management processes for all phases of a facility's lifespan, through the preparation of Risk Management Plans by designers, and Fire Management Plans by facility operators.
- Support operators to prepare Emergency Plans that effectively consider fire risk from the facility, and bushfire.

## 1.1 How to use these guidelines

The guidelines are arranged according to facility development stages - planning and design, construction and commissioning, and operation.

The Model Requirements in this guideline are CFA's minimum requirements for renewable energy facilities in low-risk environments, and must be specified in the Risk Management Plan.

**Model Requirement (Sample)**

A Risk Management Plan must be developed for all renewable energy facilities.

Modifications to Model Requirements must be in consultation with CFA.

Where there are ***additional*** (or where specified, ***alternative***) requirements specific to a facility type - that is, the technology proposed - they are represented under the following banners:

**All Facilities**

**Wind Energy Facilities**

**Solar Energy Facilities**

**Battery Energy Storage Systems**

## 1.2 Fire Risk Management Principles

While these guidelines have been developed based on the latest information available, it has not been possible to capture every possible renewable energy facility configuration or battery chemistry due to the rapid evolution of the technology.

These guidelines are designed so that where they do not address a specific arrangement or technology, the principles can still be applied.

**Fire Risk Management Principles**

**1.** Effective identification and management of hazards and risks specific to the landscape, infrastructure, layout, and operations at the facility.

**2.** Siting of renewable energy infrastructure so as to eliminate or reduce hazards to emergency responders.

**3.** Safe access for emergency responders in and around the facility, including to renewable energy and firefighting infrastructure.

**4.** Provision of adequate fire-fighting infrastructure for safe and effective emergency response.

**5.** Vegetation sited and managed so as to avoid increased bushfire and grassfire risk.

**6.** Prevention of fire ignition on-site and spreading to adjoining properties.

**7.** Prevention of fire spread between site infrastructure (solar panel banks, wind turbines, battery containers/enclosures).

**8.** Prevention of external fire impacting and igniting site infrastructure.

**9.** Provision of accurate and current information for emergency responders during emergencies.

**10.** Effective emergency planning and management, specific to the site, infrastructure, operations and hazards (including bushfire).

## *1.3 Key Terms*

*Based on information and definitions from:*

- *Australian Renewable Energy Agency* (ARENA)
- *AS 5139-2019: Electrical installations - Safety of battery systems for use with power conversion equipment.*
- *FM Global 2020, Property Loss Prevention Data Sheet 5-33: Electrical Energy Storage Systems.*

**Cell**

Unit consisting of one or more energy storage cells connected in series, parallel or series parallel arrangement.

**Module**

One or more cells linked together. May also have incorporated electronics for monitoring, charge management and/or protection. Generally they are stored in racks within containers/enclosures.

**Battery Energy Storage System**

A system comprising one or more cells, modules or batteries, power conversion equipment (PCE) and isolation and protection devices. Battery energy storage systems convert energy into electrical energy and stores the energy internally.

For the purposes of this guideline:

- Large-scale battery systems: >1 MWh
- Small-scale battery systems: ≤1 MWh

**Battery Energy Storage System Container/Enclosure**

A dedicated enclosure, often resembling a shipping container, containing the battery system (eg., racks), associated components and free space.

**Battery Energy Storage System Cabinet**

A dedicated enclosure smaller than a container/enclosure with little to no free space, containing the battery system and associated components.

***NOTE:*** *The exact terminology used to describe battery energy storage systems varies with manufacturer, but in general, the smallest unit of a battery is the cell, many cells make a module. The cells can be arranged in series or a combination of series and parallel configurations. The modules can have incorporated electronics for monitoring, charge management and/or protection. Modules are generally stored in racks within enclosures: the latter are typically either container- or cabinet- based.*

**Power Conversion Unit/Equipment (PCU/PCE)**

Electrical device converting and/or manipulating one kind of electrical power from a voltage or current source into another kind of electrical power with respect to voltage, current and/or frequency.

**Renewable Energy**

Renewable energy is produced using natural resources that are constantly replaced and never run out. Common technologies include solar, wind and hydropower. Emerging technologies include geothermal, bioenergy and ocean energy.

**Renewable Energy Facility**

A site or installation dedicated to the generation and/or capture of renewable energy. Stand-alone battery energy storage systems are considered renewable energy facilities for the purposes of this guideline.

**Solar Energy Facility**

A facility where solar panels convert sunlight into direct current (DC) electricity; then power conversion equipment (inverters) convert the power into alternating current (AC). The facility may include grid connection infrastructure to feed power into the electricity grid. Solar energy facilities may utilise either solar photovoltaic or solar thermal technologies.

- Large-scale solar: >5 MW
- Micro solar: ≤5 MW

**Solar Panel Bank (Pod or Zone)**

A 'bank' of solar panels may be that connected to a single power conversion unit/inverter.

**Wind Energy Facility**

A facility where wind turbines use the energy of the wind to spin an electric generator which produces electricity, then power conversion equipment (inverters) convert the power into alternating current (AC). The facility may include grid connection infrastructure to feed power into the electricity grid.

Refer to FM Global 2020, Property Loss Prevention Data Sheet 5-33: Electrical Energy Storage Systems for pictographs of battery energy storage system components.

These guidelines must be read in conjunction with the following documents from the Department of Transport and Planning:

**Solar Energy Facilities Design and Development Guidelines**

Outlines the assessment and development process for large-scale solar energy facilities in Victoria.

**Development of Wind Energy Facilities in Victoria, Policy and Planning Guidelines**

Provides a framework, requirements and guidance on preparing planning applications for wind energy facilities.

# 2 CFA Involvement with Renewable Energy Facilities

## 2.1 Why is CFA involved in renewable energy proposals?

The Country Fire Authority Act 1958 gives CFA statutory responsibilities for taking and enforcing all necessary steps for the prevention and suppression of fires in the country area of Victoria.

For renewable energy facilities, CFA's Specialist Risk and Fire Safety Unit leads CFA's involvement through facility planning, design and operation. This single point of contact ensures that firefighter safety and fire risks are considered and managed by:

- Providing fire risk management expert advice during facility planning, design and operation.
- Participating in statutory planning processes.
- Engaging with CFA districts and regions.

Involving CFA early in planning and design can save time and money in avoiding retrofitting of safety systems, and developers can benefit from CFA's expertise.

## 2.2 How do I engage with CFA?

These guidelines have been developed to inform various design, planning application, construction and operational requirements.

The following table contains CFA's expectations for involvement. CFA encourages consultation throughout a renewable energy facility's lifecycle, from planning to construction and operation.

Engagement with CFA's Specialist Risk and Fire Safety Unit is via firesafetyreferrals@cfa.vic.gov.au.

| | **Pre-Planning/Planning Application** | **Prior to Development Commencing** | **Prior to Use Commencing** | **During Operation** |
|---|---|---|---|---|
| **Consultation** | Initial discussions with CFA's Specialist Risk and Fire Safety Unit. | Further discussions with CFA's Specialist Risk and Fire Safety Unit regarding fire risk management specific to the facility. | Further discussions with CFA's Specialist Risk and Fire Safety Unit, as required. | Invitation for local CFA brigade and CFA's Specialist Risk and Fire Safety Unit to visit the facility. |
| **Risk Management Plan** | Provision of draft Risk Management Plan, incorporating bushfire assessment at *VPP Clause 13.02-1S*, to CFA's Specialist Risk and Fire Safety Unit. | Provision of draft Risk Management Plan, incorporating risks to and from battery energy storage systems (Fire Safety Study), to CFA's Specialist Risk and Fire Safety Unit. | Implementation of all fire protection measures shown on the endorsed plans. | |
| **Fire Mgt Plan** | Provision of draft, or commitment to develop Fire Management Plan in consultation with CFA. | Provision of draft Fire Management Plan to CFA's Specialist Risk and Fire Safety Unit. | | |
| **Emergency Plan** | Provision of draft, or commitment to develop Emergency Plan in consultation with CFA. | Provision of draft Emergency Plan for facility construction to CFA's Specialist Risk and Fire Safety Unit. | Provision of draft Emergency Plan for facility operation to CFA's Specialist Risk and Fire Safety Unit. | |

*2.2 How do I engage with CFA? (Continued)*

## 2.2.1 Pre-Planning

Consultation with CFA's Specialist Risk and Fire Safety Unit, by requesting a meeting or providing draft documents, should occur early in the planning and facility design phase, before or during the development of planning applications.

Early consultation, prior to the submission of the planning permit application, ensures that CFA can effectively consider fire risk management and emergency response implications.

### 2.2.1.1 What information does CFA need for initial consultation?

While consultation with CFA is encouraged at any stage of a project's life cycle, the availability of the following information during initial consultation supports the provision of specific advice:

- The site address/land parcel information (eg., a current *VicPlan Property Planning Report*).
- Locality plan, showing the facility within the landscape.
- Details of the facility, its type and size (eg., the area, perimeter, number of solar panels/arrays, wind turbines, battery containers, power conversion equipment/units).
- Site plans, showing the proposed location of site vehicle access points, internal roads, solar arrays/wind turbines/battery containers, substations, buildings, fire water supplies, vegetation.
- Specifications/technical data sheets on battery energy storage systems (where applicable and available).

## 2.2.2 Planning Applications

A planning permit application for a renewable energy facility does not require referral to CFA under Section 55 of the Planning and Environment Act 1987 (*PE Act*). However, applications may be notified to CFA under Section 52 as part of the application process.

***To ensure fire risk management can be effectively assessed by CFA, CFA expects that all planning applications address all relevant aspects of fire safety, including landscape and bushfire hazards, and hazards to and from the proposed technologies.***

To enable CFA to provide relevant and timely comments on a proposal, an appropriate level of information must be provided within the planning application. The level of information will vary depending on the type of facility, proposed technology, scale, location and complexity of the proposal.

### 2.2.2.1 What does CFA expect in planning applications?

The planning application must be prepared with consideration to the design advice and model requirements provided in this guideline, so far as practical at the planning stage.

**Model Requirements**

**a)** Where located within a Bushfire Prone Area, bushfire risk is addressed according to the *Victoria Planning Provisions, Clause 13.02-1S (Bushfire Planning)*, through bushfire hazard identification and assessment (including a bushfire hazard site and landscape assessment). This assessment must include risks to the proposed technologies from the landscape (bushfire/grassfire).

**b)** Address risks from proposed technologies through a comprehensive risk management process, documented in a Risk Management Plan.

**c)** Indicate where the exact specifications of elements within the renewable energy facility will be determined during the detailed design phase, such as solar panel and wind turbine model/manufacturer and battery chemistry.

**d)** Explicitly state that the following documentation will be prepared in accordance with this guideline, in consultation with CFA, before development starts:

  - Risk Management Plan
  - Fire Management Plan
  - Emergency Plan

Modifications to Model Requirements must be in consultation with CFA.

While renewable energy facilities are not referenced under the use and development policy contained within *Clause 13.02-1S Bushfire Planning*, other policies in the control still apply.

CFA expects that the risk of bushfire to people, property and community infrastructure is considered, and that appropriate bushfire protection measures to address the identified bushfire risk to and from the proposed development are proposed to at least the level within this guideline within the planning application.

*2.2 How do I engage with CFA? (Continued)*

#### 2.2.2.2 CFA's response to planning applications

CFA will review planning applications and supporting information, develop conditions, and recommend the conditions to the responsible authority. Where CFA determines that the requirements in this Guideline have not been satisfactorily addressed in planning applications, CFA will recommend conditions to the responsible authority specific to those matters.

### 2.2.3 Prior to Development Commencing

CFA expects that the following documentation will be developed in consultation with CFA, to the satisfaction of the responsible authority:

- A Risk Management Plan for the facility developed in accordance with **Section 3.3**.
- A Fire Management Plan developed in accordance with **Section 6.1**.
- An Emergency Plan developed in accordance with **Section 7**.

Draft versions of these documents can be provided to CFA for preliminary comment at any stage of their development.

Documentation submitted to CFA for review must clearly outline how the proposed facility meets the requirements of this guideline, and where it does not, it needs to effectively demonstrate how risk is managed to ensure the safety of emergency responders.

CFA will consider the specific technologies, infrastructure, landscape hazards and operations of your facility in the provision of advice.

### 2.2.4 During Operation

CFA's Specialist Risk and Fire Safety can visit your facility to provide advice on existing and additional fire risk management. Requests for site visits can be submitted to firesafetyreferrals@cfa.vic.gov.au, marked attention to the 'Specialist Risk and Fire Safety Unit'.

## *2.3 Additional emergency services consultation that may be required*

### 2.3.1 Building Fire Safety

All buildings on site are required to comply with the *National Construction Code (NCC)*. Where fire safety matters listed under Regulation 129 in the *Building Regulations 2018* do not meet the deemed to satisfy provisions of the NCC, the report and consent of the fire authority Chief Officer is required.

### *Further Guidance Material*

The following publications offer support in developing a bushfire hazard assessment.

**Victoria Planning Provisions, Clause 13.02 (Bushfire Planning) (2023)**

**Department of Transport and Planning, Planning Permit Applications Bushfire Management Overlay - Technical Guide (2017)**

**Department of Transport and Planning, Bushfire Hazard (2023)**

**CSIRO Assessing Bushfire Hazards (2023)**

### 2.3.2 Dangerous Goods Storage and Handling

Where the facility includes a battery energy storage system or other significant quantities of dangerous goods, a request for emergency services written advice under Regulations 52 and/or 53 of the *Dangerous Goods (Storage and Handling) Regulations 2022* may be required.

The quantity of dangerous goods must be determined for the purposes of requesting emergency services written advice. For lithium-ion based battery energy storage systems, the net weight of the lithium-ion battery cells (rather than the gross weight of the battery enclosure/container) must be provided.
For example, if a battery enclosure/container is 12t, the battery cells may only be 3t (25% of the gross container weight).

**Section 6.2** contains considerations for dangerous goods storage and handling during facility operations.

## *2.4 Other statutory requirements*

Sections 113A and 83BA of the *Electricity Safety Act 1998* require major electricity companies and specified operators of at-risk electric lines to prepare and submit a Bushfire Mitigation Plan to Energy Safe Victoria for acceptance.

Sections 6 and 7 of the *Electricity Safety (Bushfire Mitigation) Regulations 2023* contain the requirements for Bushfire Mitigation Plans.

A list of relevant legislation is provided in **Appendix D**.

# 3 Fire Risk Management

***Fire risk must be identified and measures to eliminate or reduce its occurrence and consequences must be incorporated into facility design and operations.***

## 3.1 Why should fire risk be managed?

Identifying and managing fire risk at renewable energy facilities protects site personnel, firefighters and the community. Under occupational health and safety legislation, designers have a duty to ensure that buildings and structures are safe and without risks to health.

> ***"A person who designs a building or structure or part of a building or structure who knows, or ought reasonably to know, that the building or structure or the part of the building or structure is to be used as a workplace must ensure, so far as is reasonably practicable, that it is designed to be safe and without risks to the health of persons using it as a workplace for a purpose for which it was designed."***
>
> ***s28 OHS Act***

A risk management process that meets occupational health and safety requirements for eliminating or reducing risk so far as is reasonably practicable provides the foundation for effective fire management and emergency planning.

## 3.2 How can fire risk be managed?

CFA expects 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. The following two documents are the outputs of this process.

A **Risk Management Plan** describes the risk management process and its outcomes, including the specific site hazards/risks and their analysis, control measures, and the monitoring and review process. The Risk Management Plan must inform the design of the facility.

A **Fire Management Plan** is based on the outcomes of the Risk Management Plan. It outlines the activities, processes and accountabilities for the ongoing management of fire risk at the facility. See **Section 6.1** for more information on developing a Fire Management Plan.

### Risk Management Process

***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.***

The risk management process includes:

**Risk identification** to understand the potential sources of fire including on-site hazards (eg., electrical faults, operational faults, chemical releases, operational practices/processes, animal management); off-site hazards (eg., bushfire, grassfire, storm, lightning, flood), and any other operational, financial or strategic risks that could affect the ability of the organisation or operation to meet its objectives.

**Risk analysis (and evaluation)** to identify the nature of risk and its characteristics. Analysis includes investigation and evaluation of controls, based on assessment of their effectiveness and the practicality of their implementation.

**Risk treatment/control** to eliminate or mitigate risks, by identifying evidence-based controls for risks based on the hierarchy of controls, and industry good practice, and selecting and implementing effective controls for each identified risk.

**Monitoring and reviewing, recording and reporting** throughout the design and operation of facilities to ensure that emerging risks are identified; existing risks are effectively controlled; and controls are appropriate and effective by conducting regular and comprehensive review of risks and controls through monitoring of site hazard and risks.

The risk management process should be:

- Comprehensive and consultative, involving those involved in the design, construction, operation and management of the facility (including employees and contractors).
- Include analysis of infrastructure, activities and operations at the facility, and take into consideration lessons from previous fires and other emergencies at similar facilities in Australia and globally.
- Project- and organisation-wide, supported by organisational management at all levels, documented, underpinned by organisational policy, and integrated into organisational decision-making.

## *3.3 Risk Management Plan*

**All Facilities**

**Model Requirement**

A Risk Management Plan must be developed for all renewable energy facilities.

Modifications to Model Requirements must be in consultation with CFA.

A Risk Management Plan is critical in informing fire risk management in the design and operation of facilities, particularly where infrastructure or operations pose additional hazards to the landscape, occupants and emergency responders.

A Risk Management Plan also supports CFA to effectively understand and provide advice in relation to on-site risks and hazards and potential emergency response matters.

### 3.3.1 Content of Risk Management Plans

The Model Requirements within this guideline are CFA's minimum requirements for renewable energy facilities in low-risk environments, and must be reflected in the RMP. The RMP structure may reflect the framework outlined in *AS/ISO 31000-2018: Risk Management - Guidelines*.

CFA will only consider reducing the requirements of this guideline where alternative controls that provide at least an equivalent level of fire safety are proposed and supported by evidence, within a Fire Safety Study.

### 3.3.2 Risk Factors

The following factors must be considered in the risk-based design of renewable energy facilities.

#### 3.3.2.1 Location and Siting within the Landscape

Is the site in a designated Bushfire Prone Area or within the Bushfire Management Overlay? Is there a risk of grassfire from neighbouring properties? Is the site (or BESS) within the Land Subject to Inundation Overlay? Is there peat on the property? Is the site located near hazardous industries?

#### 3.3.2.2 Facility Layout

Does the proposed layout of the site impact fire risk? Is fire service infrastructure safely accessible? Are there hazards or infrastructure that may impact safe evacuation?

**Model Requirements**

The Risk Management Plan must:

**a)** Describe the infrastructure (natural and built), landscape, nature of operations and occupancy of the facility.

**b)** Describe the risks and hazards at the facility to and from the renewable energy infrastructure (including battery energy storage systems).

**c)** Specify and justify, in accordance with **Section 4.2** of this guideline:

- The **location** of the facility in the landscape, and the proposed infrastructure on-site.
- **Emergency vehicle access** to and within the facility that:
    - Includes site access points of a number suitable to the size and hazards of the facility (a minimum of two).
    - Provides access to renewable energy infrastructure, substations and fire service infrastructure.
- **Firefighting water supply** for the facility.
- A **fire break width** of 10m or greater, based on radiant heat flux (output) as an ignition source:
    - Around the perimeter of the facility.
    - Between any landscape buffer/vegetation screening and infrastructure.
- The **separation distance**, based on radiant heat flux (output) as an ignition source, between:
    - Adjacent renewable energy infrastructure (eg., between adjacent battery containers/enclosures).
    - Battery containers/enclosures and related battery infrastructure, buildings/ structures, and vegetation.
- **All other controls** for the management of on- and off-site hazards and risks at the facility (including all proposed battery energy storage system safety and protective systems).

**d)** Provide an evidence-based determination of the effectiveness of the risk controls against the identified hazards, including justification for the omission of any battery safety and protective system/s.

**e)** Form the basis for the design of the facility.

*Modifications to Model Requirements must be in consultation with CFA.*

### 3.3.2.3 Vegetation On-Site

Does the prevalence, type, density or location of vegetation (including screening vegetation) impact fire risk?

### 3.3.2.4 Infrastructure: Electrical, Chemical, Technological

Does the infrastructure on site contribute to fire risk, or potentially impede firefighting operations? Are dangerous goods stored on site?

### 3.3.2.5 Site Activities and Operations

What activities undertaken on-site contribute to fire risk?  How is electricity infrastructure de-energised and isolated? How often is critical maintenance undertaken?

### 3.3.2.6 Site Occupancy

Will the facility be occupied or unoccupied? Will there be vulnerable occupants?

### 3.3.2.7 Local Weather Conditions

What is the prevailing wind speed and direction? Rainfall during the year?  What is the humidity and temperature during the Fire Danger Period?

## 3.3.3 Hazards Specific to Facility Type

Determining the fire hazards at your facility can be achieved with various tools and techniques, some of which are detailed in *SA/SNZ HB 89-2013 Risk management - Guidelines on risk assessment*.

Hazards will be specific to each facility due to the unique location, infrastructure and operations. However, there are common hazards to each type of facility that must be considered due to their potential to ignite, spread or intensify fire.

***The following is not an exhaustive list; hazards must be identified through the risk management process.***

### Wind Energy Facilities

Fire hazards at wind energy facilities may include:

- Electrical hazards, such as wind turbine electrical faults; power surges; hot surfaces; lightning strike.
- Chemical hazards, such as the leakage of oils and lubricants within the turbine/ancillary equipment.
- Potential fire spread, due to air flow impact or falling debris from fire-impacted turbines.
- Landscape hazards, such as bushfire/grassfire ignition from fire within the facility, or external ignition of site infrastructure from embers or radiant heat.
- Falling blades.
- Wind turbines as a potential obstruction for aerial firefighting.   See **Section 4.2.5** for guidance on mitigating this hazard.

### Solar Energy Facilities

Fire hazards at solar energy facilities include:

- Electrical hazards, such as panel/inverter electrical faults; power surges; lightning strikes; water ingress; retained DC electricity in solar panels after shut-down/isolation.
- Potential fire spread and limited emergency response due to proximity of panel banks to each other, on-site infrastructure and vegetation (including screening vegetation).
- Landscape hazards, such as bushfire/grassfire ignition from fire within the facility, or external ignition of site infrastructure from embers or radiant heat.

### Battery Energy Storage Systems

Fire hazards at facilities with battery energy storage systems include:

- Electrical hazards, such as battery faults; overcharging; rapid discharge; loss of remote monitoring systems; internal short circuits; overheating; water ingress; lightning strike (leading to thermal events/runaway).
- Chemical hazards, such as the inherent hazards of the stored dangerous goods; spills and leaks of transformer oil/diesel, refrigerant gas/coolant; chemical reactions.
- Explosions, from ignition of venting gases.
- Potential fire spread due to proximity of batteries (and containers/enclosures) to each other, on-site infrastructure and vegetation (including screening vegetation).

- Mechanical damage to battery containers/enclosures due to vehicular impact.
- Landscape hazards, such as bushfire/grassfire ignition from fire within the facility, or external ignition of site infrastructure from embers, radiant heat and flame contact.

Abuse of a lithium-ion cell can send it into thermal runaway, where heat and gases are produced causing the cell to vent. Heat is propagated (thermal propagation) from cell-to-cell. Immediate ignition of the gases can result in jet-like flames. If the gases do not ignite, thermal propagation with the evolution of explosive and toxic gases, can continue with delayed ignition causing explosion.

If fire is extinguished without preventing thermal propagation, the hazard switches from fire to explosion.

Where the consequences of electrical, chemical and explosion hazards pose additional risks to firefighters, these must also be addressed in the Risk Management Plan. Consequences may include off-gassing of explosive, toxic gases.

The management of fire water runoff must also be addressed, refer to **Section 4.2.5**.

### 3.3.4 Review of Risk Management Plans

Risk management plans should be reviewed prior to any changes in the design or at the site that can impact on fire safety.

### 3.3.5 Additional Requirements Specific to Facility Type

## Battery Energy Storage Systems

#### 3.3.5.1 Fire Safety Study

CFA expects that a Fire Safety Study is conducted and provided to CFA's Specialist Risk and Fire Safety Unit for facilities with battery energy storage system(s) where the Model Requirements in this guideline are proposed to be reduced.

CFA recommends that the content and structure of fire safety studies reflects NSW Planning's *Hazardous Industry Planning Advisory Paper 2: Fire Safety Study Guidelines (2011)*, and includes the following:

- Identification of fire hazards and risks from the BESS containers.
- Details of tests conducted on the BESS and a summary of results.
- On-site and off-site consequence analysis of thermal runaway and possible fire scenarios within BESS containers:
  - Radiant heat flux from the BESS container to various distances (eg., 3m - 10m).
  - The assumptions on which the radiant heat flux calculations are based, including weather conditions.
  - Site plan/excerpts that show radiant heat flux contours to site elements, including adjacent BESS containers, PCUs, fire water infrastructure.
  - Plume analysis for fumes/vapour clouds that show likely spread.
- Fire prevention and explosion strategies and measures to be implemented, including those within and external to the BESS.
- Analysis of the requirements for fire detection.
- Where installed fire safety systems are proposed (eg., gas suppression), an analysis of the performance of the system.
- Where proposing to reduce the minimum fire water requirements for battery energy storage systems, a calculation of the fire water supply and demand must be provided.
- Measures for containment of contaminated firefighting water.
- First-aid fire protection equipment.

# 4 Facility Location and Design

## 4.1 Facility Location

***Renewable energy facilities are to be located in low-risk environments wherever possible, to reduce the risk of external fire impacting the facility and its consequences.***

Choosing the right location for a renewable energy facility requires careful consideration of a number of factors, including wider environmental conditions and other potential sources of fire hazard in the surrounding area.

CFA acknowledges that renewable energy facilities are often limited as to their placement by the existing power transmission infrastructure. However, directing their development to low-risk environments wherever possible helps to minimise the risk and consequence of fires that start outside of the site. It also helps limit the impacts of fires that may start within the facility on the environment and the wider community.

### *Low-Risk Environment Attributes*

Indicators of a lower risk environment where development should be directed, include:

- Grassland.
- No continuous other vegetation types within 1-20km of the project site.
- Generally flat topography, some undulation may be present.
- Slopes are less than 5 degrees.
- Good road access with multiple routes available to and from the project site.
- No Bushfire Management Overlay applies.
- No Land Subject to Inundation Overlay applies.

### Wind Energy Facilities

Wind energy facilities can be located on open grassed areas, such as grazed paddocks, where practicable. Vegetation throughout the facility must be managed according to planning permit conditions and **Section 6.2** of this guideline.

Where wind energy facilities are located within high-risk environments (including timber plantations) requirements for vegetation management may be increased. Refer to **Section 4.2.4**.

### Solar Energy Facilities

Where practicable, solar energy facilities can be sited on grazed paddocks. Vegetation throughout the facility must be managed in line with planning permit conditions and **Section 6.2** of this guideline.

### Battery Energy Storage Systems

Wherever possible, battery energy storage systems must be sited in low risk location, such as where the BMO and LSIO do not apply.

The Risk Management Plan must inform the siting of battery energy storage systems.

### 4.1.1 High-Risk Environments

### All Facilities

**Model Requirements**

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

**a)** An assessment against policy at *Clause 13.02-1S (Bushfire Planning)* where the facility is located in a Bushfire Prone Area (BPA).

**b)** The impact of any ignitions arising from the infrastructure (solar panels, wind turbines, battery energy storage systems, electrical infrastructure) on nearby communities, infrastructure and assets.

**c)** The impact of bushfire on the infrastructure (eg., ember attack, radiant heat impact, flame contact).

**d)** Assessment of whether the proposal will lead to an increase in risk to adjacent land and how the proposal will reduce risks on site to an acceptable level.

*Modifications to Model Requirements must be in consultation with CFA.*

## *4.1 Facility Location (Continued)*

Renewable energy facilities in high-risk environments present increased safety risks that may impact effective firefighting operations.

Where renewable energy facilities are located within high-risk environments, strengthened or additional risk mitigation measures will be required. High-risk environments include:

- The Bushfire Management Overlay and Bushfire Prone Areas.
- The Land Subject to Inundation Overlay.
- Areas with peat.

As landscape risk increases there must be a corresponding increase in the bushfire mitigation. For example, where there is forest vegetation in the landscape, timber plantations, long fire runs, or areas of higher fuel load, a tailored set of requirements is likely to apply.

***Consultation with CFA for fire risk management for renewable energy facilities in high-risk environments must occur at the facility planning and design stage.***

### 4.1.1.1 Bushfire Prone Areas and the Bushfire Management Overlay

Properties identified as within a Bushfire Prone Area (BPA) or the Bushfire Management Overlay (BMO) are those likely to be subject to bushfire.

Whether a facility sits within these areas can be determined through *VicPlan*.

Understanding the level of risk and likely fire behaviour at the site are critical factors in determining whether the location of a proposed facility is appropriate.

The requirements of the BMO can be used to guide responses to bushfire risk within planning applications and Fire Management Plans, even when no permit is triggered under the control.

### 4.1.1.2 Peat

Peat is generated gradually in wetlands through the build-up of partially decayed vegetation. Peat is vegetation with a high carbon content that has decomposed and become a section of the soil profile. Peat sources can be found above ground or buried many metres below the soil surface. Wetlands close to each other may be interconnected by subsurface peat deposits.

Once ignited by the presence of a heat source (eg., a bushfire penetrating the subsurface), it smoulders. These smouldering fires can burn undetected for very long periods of time (months, years, and even centuries) propagating in a creeping fashion through the underground peat layer.

Peat may experience a fire at any stage of its life and the suppression methods employed to achieve success will vary. Peat fires are extremely difficult to extinguish, and fire authorities require large amounts of water to suppress fires within peat.

Developers of renewable energy facilities must undertake an assessment to ascertain the presence of peat within subject lands.

Where peat is found:

**a)** All reasonable steps must be taken to ensure that facility infrastructure is not located in peat areas on-site.

**b)** An exclusion zone of at least 10 (ten) metres, or greater as determined through a risk management process, must be provided between peat areas and facility infrastructure.

**c)** The risk assessment process, documented in a Risk Management Plan, must inform the provision and capacity of fire protection systems and equipment at facilities with peat areas.

## *4.2 Facility Design*

***Renewable energy facilities must be designed to eliminate or reduce the risk of fire occurring and if it does occur, its consequences.***

### 4.2.1 Emergency Vehicle (Fire Truck) Access

#### All Facilities

Providing adequate fire truck access to and within facilities assists CFA to safely and effectively respond to areas within the site that may be threatened by fire.

**Model Requirements**

**a)** Construction of a minimum four (4) metre perimeter road within the perimeter fire break.

**b)** Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes (eg., no compacted earth).

**c)** Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface. Ensure any fencing along access routes allows for width of fire vehicles.

**d)** The average grade should be no more than 1 in 7 (14.4% or 8.1°) with a maximum of no more than 1 in 5 (20% or 11.3°) for no more than fifty (50) metres.

**e)** Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.

**f)** Roads must incorporate passing bays at least every 600 metres, which must be at least twenty (20) metres long and have a minimum trafficable width of six (6) metres. At least one passing bay must be incorporated where roads are less than 600 metres long.

**g)** Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, battery energy storage systems and related infrastructure, substations and grid connection areas.

**h)** Provision of at least two (2) but preferably more access points to each part of the facility. The number of access points must be informed through a risk management process, in consultation with CFA.

*Modifications to Model Requirements must be in consultation with CFA.*

Vehicle access to a hardstand should be designed to allow for a fire truck to leave the hardstand in a forward direction. This can be achieved with loop roads, perimeter roads and the like. Where this cannot be achieved, the maximum distance that a fire truck can be expected to reverse safely is 60m.

Where vehicle access to a hardstand is greater than 60m, such as dead-end roads or a single access, a turning area complying with one of the following options should be provided. No parking is permitted in the turning area and appropriate 'NO PARKING' signage is to be provided.

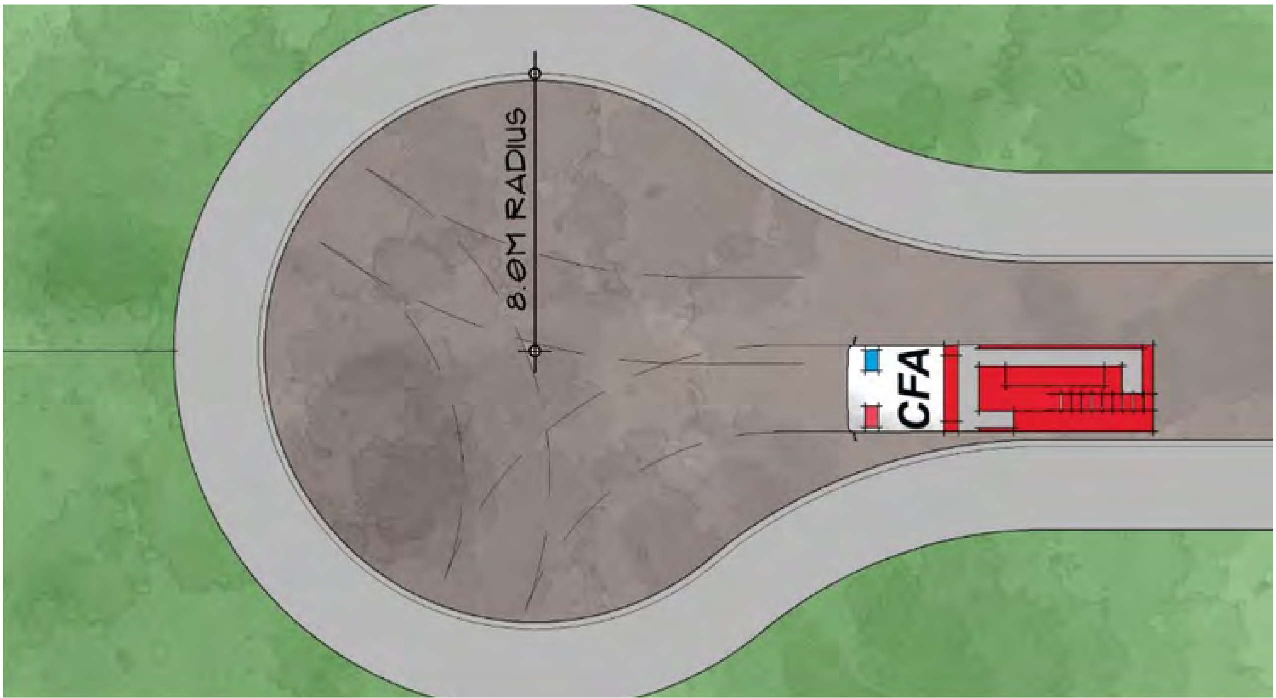


***Figure 1:*** *Court-bowl style, minimum 8m radius.*

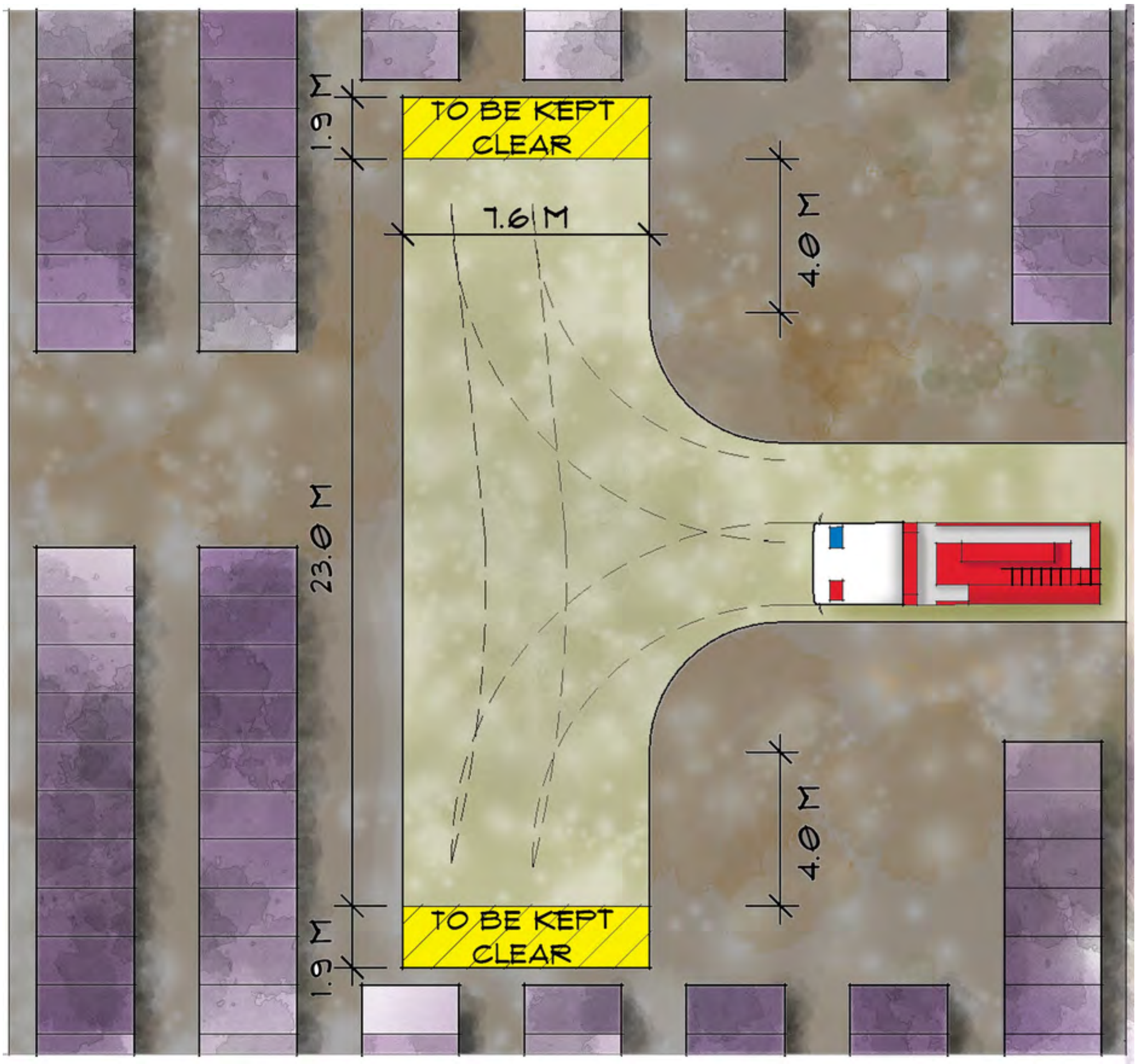


**Figure 2:** *'T' head style.*

*4.2 Facility Design (Continued)*

## Wind Energy Facilities

Construction of a four (4)-metre perimeter road is not required for wind energy facilities **(4.2.1(a))**. However, suitable fire truck access is required to each turbine and building on-site.

**Model Requirement**

Constructed roads developed during the construction phase of facilities must be maintained post-commissioning and throughout the operational life of the facility, to allow access to each turbine for maintenance and emergency management purposes. The number and location of vehicle access points must be determined in consultation with CFA.

Modifications to Model Requirements must be in consultation with CFA.

## Solar Energy Facilities

**Model Requirement**

Where solar energy facilities are designed over several land parcels separated by private or public roads, overhead powerlines, and/or water courses, vehicle entrances are to be provided into each section. The number and location of vehicle access points must be determined in consultation with CFA.

Modifications to Model Requirements must be in consultation with CFA.

## Solar Energy Facilities (Micro)

Construction of a four (4)-metre perimeter road **(4.2.1(a))** and the incorporation of passing bays to perimeter roads **(4.2.1(f))** may be disregarded for micro solar facilities without battery energy storage systems.

Where micro solar facilities include battery energy storage systems, perimeter roads may be disregarded where roads suitable for emergency vehicles are provided to fire service infrastructure, and to and around the BESS **(4.2.1(g))**, with turning circles for dead-end roads.

## Battery Energy Storage Systems

**Model Requirement**

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

Modifications to Model Requirements must be in consultation with CFA.

### 4.2.2 Firefighting Water Supply

## All Facilities

In the event of a fire (structure fire, grassfire or bushfire), sufficient water must be available and safely accessible to emergency responders and trucks to ensure that fire suppression activities are safe, timely, effective and not hindered in any way.

Firefighting infrastructure must be designed to allow effective response to the risks and hazards at the facility. Fire water must be provided to cover buildings, control rooms, substations and grid connections

The quantity of water supply must be established through a comprehensive risk management process that considers all relevant hazards, documented in the Risk Management Plan, in consultation with CFA.

**Minimum fire water quantity requirements are specified under each facility type below.**

**Model Requirements**

**a)** Water access points must be clearly identifiable and unobstructed to ensure efficient access.

**b)** Static water storage tank installations must comply with *AS 2419.1-2021: Fire hydrant installations – System design, installation and commissioning*.

**c)** The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel.

**d)** The static water storage tank(s) must be capable of being completely refilled automatically or manually within 24 hours.

**e)** The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure (solar panels, wind turbines, battery energy storage systems, etc.).

**f)** The hard-suction point must be provided, with a 150mm full bore isolation valve **(Figure 3)** 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* **(Figure 4)** *with a matching blank end cap to be provided.*

*(Continued overleaf.)*

## *4.2 Facility Design (Continued)*

### Model Requirements (Continued)

**g)** The hard-suction point must be positioned within four (4) metres to a hardstand area and provide a clear access for emergency services personnel.

**h)** An all-weather road access and hardstand must be provided to the hard-suction point. The hardstand must be maintained to a minimum of 15 tonne GVM, eight (8) metres long and six (6) metres wide or to the satisfaction of the CFA.

**i)** The road access and hardstand must be kept clear at all times.

**j)** The hard-suction point must be protected from mechanical damage (eg., bollards) where necessary.

**k)** Where the access road has one entrance, an eight (8) metre radius turning circle must be provided at the tank.

**l)** An external water level indicator must be provided to the tank and be visible from the hardstand area.

**m)** Signage **(Figure 5)** indicating 'FIRE WATER' and the tank capacity must be fixed to each tank.

**n)** Signage **(Figure 6)** must be provided at each vehicle entrance to the facility, indicating the direction to the nearest static water tank(s).

Modifications to Model Requirements must be in consultation with CFA.

***Figure 3:*** *150mm full-bore isolation valve.*

***Figure 4:*** *125mm, 100mm, 90mm, 75mm, 65mm Storz tree adapters.*

***Figure 5:*** *Fire water signage to comply with AS 2419.1-2021, Clause 11.3.6: Water storage tanks and equipment.*

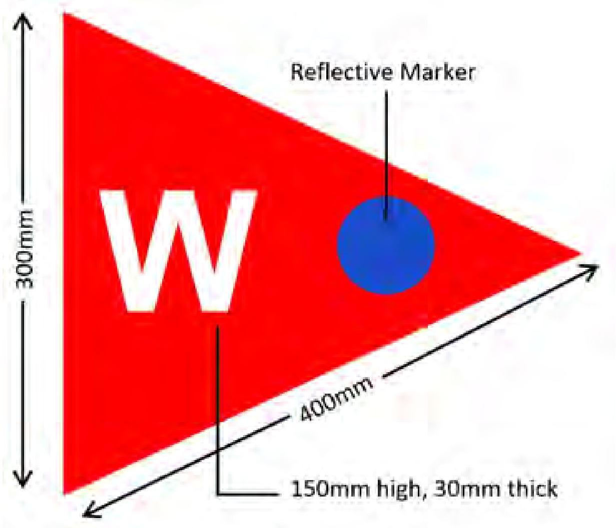


***Figure 6:*** *Directional signage: fade resistant, fixed to a rigid post in contrasting lettering, white sign writing on red background, with a circle reflective marker. 'W' in 150mm upper case lettering.*

## Wind Energy Facilities

A fire protection system must be provided for wind energy facilities. The fire protection system must be designed to allow adequate response to the risks and hazards at the facility, in consultation with CFA.

### Model Requirements

**a)** The fire protection system for wind energy facilities must incorporate at least one static fire water storage tank of at least 45,000L effective capacity at each site entrance.

**b)** Additional static fire water storage tanks of at least 45,000L effective capacity must also be incorporated in facility design. The number and location of tanks is to be determined through a comprehensive risk management process (Risk Management Plan), in consultation with CFA.

**c)** Nacelles must be equipped with automatic fire detection, alarm and fire suppression systems.

Modifications to Model Requirements must be in consultation with CFA.

Where wind energy facilities include battery energy storage systems, additional fire water supply must be provided in accordance with the below.

### *4.2 Facility Design (Continued)*

## Solar Energy Facilities

A fire protection system must be provided for solar energy facilities. The fire protection system must be designed in consultation with CFA to allow a safe, adequate response to the risks and hazards at the facility.

### Model Requirements

**a)** The fire protection system for solar energy facilities must incorporate at least one (1) x 45,000L static water tank at the primary vehicle entrance to each the part of the facility.

**b)** Additional static fire water tanks of at least 45,000L effective capacity must also be incorporated for every 100ha.

Modifications to Model Requirements must be in consultation with CFA.

For example, for solar energy facilities without battery energy storage systems:

- A **500ha area** requires a minimum of five (5) x 45,000L static water tanks. (Eg. 45,000L at the main entrance and four (4) additional 45,000L.)
- A **350ha area** requires a minimum of three (3) x 45,000L static water tanks. (Eg., 45,000L at the main entrance and two (2) additional 45,000L).

Where solar facilities include battery energy storage systems, additional fire water supply must be provided in accordance with the below.

## Solar Energy Facilities (Micro)

For micro solar facilities, up to and including 5MW without battery storage, fire water of not less than 22,500 litres effective capacity may be provided. Fire water tank(s) must be located at the primary vehicle access point to the facility.

Where micro solar facilities include battery energy storage systems, additional fire water supply must be provided in accordance with the below.

## Battery Energy Storage Systems

A fire protection system suitable for the risks and hazards at the facility must be provided. For battery energy storage systems, the water supply quantity must:

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

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

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

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

## Battery Energy Storage Systems (Centralised or Stand-Alone Facilities)

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

### Model Requirements

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

**a)** Where reticulated water is available, a fire hydrant system that meets the requirements of *AS 2419.1-2021: Fire hydrant installations*, Section 3.9: Open Yard Protection, and Table 2.2.5(D): Number of Fire Hydrant Outlets Required to Flow Simultaneously - 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.*

**OR**

**b)** Where no reticulated water is available, a fire hydrant system that complies with *AS 2419.1-2021* must be provided:

**i.** The fire water supply must be of a quantity no less than 288,000L or as per the provisions of *AS 2419.1-2021: Fire hydrant installations*, Table 2.2.5(D) for open yards flowing for a period of no less than four hours at 20L/s, whichever is the greater.

*(Continued overleaf.)*

## *4.2 Facility Design (Continued)*

**Model Requirements (Continued)**

**ii.** The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from *AS 2419.1-2021: Fire hydrant installations*, Table 2.2.5(D).

*(E.g., For battery installations with an aggregate area of over 27,000m$^2$, 4 (four) hydrant outlets are required to operate at 10L/s for four hours, which equates to a minimum static fire 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. (Eg., Fire water tanks are to be located closer to the site entrance than the battery energy storage system).

**vi.** The fire water supply must comply with *AS 2419.1-2021: Fire hydrant installations, Section 5: Water storage tanks*.

*Modifications to Model Requirements must be in consultation with CFA.*

***Figure 7:*** *Best-practice arrangement of fire service infrastructure for facilities with centralised battery energy storage systems with reticulated water supply meeting the performance requirements of AS 2419.1-2021: Fire hydrant installations.*

*4.2 Facility Design (Continued)*

## Battery Energy Storage Systems (Decentralised)

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

***All model requirements for battery energy storage systems contained within this guideline apply to decentralised battery energy storage systems unless otherwise specified.***

### Model Requirements

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

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

**OR**

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

Modifications to Model Requirements must be in consultation with CFA.

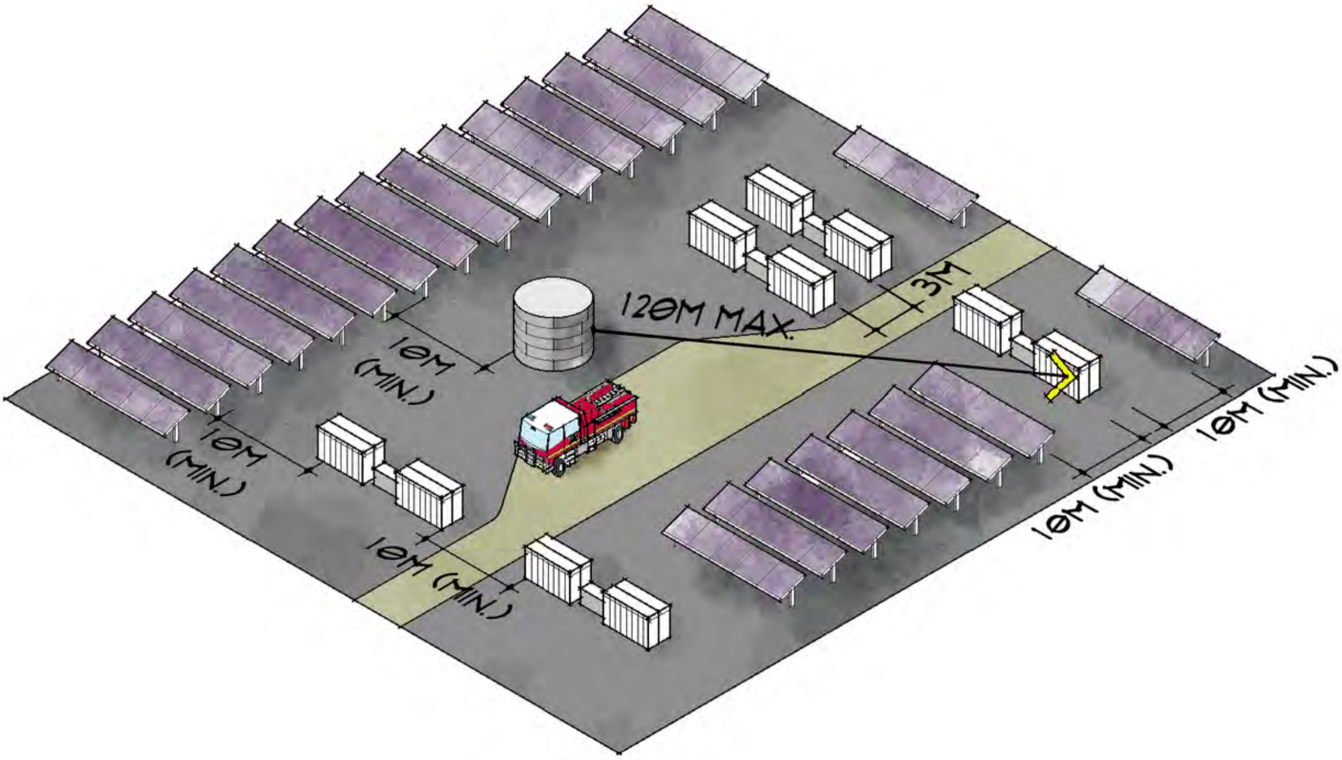


***Figure 8:*** *Potential arrangement for fire water supply tank(s) for facilities with decentralised battery energy storage systems with no reticulated water supply to the site.*

## *4.2 Facility Design (Continued)*

***Figure 9:*** *Best-practice arrangement of fire service infrastructure at facilities with centralised battery energy storage systems without reticulated water supply, or a reticulated water supply that does not meet the performance requirements of AS 2419.1-2021: Fire hydrant installations.*

### 4.2.3 Fire Detection and Suppression Equipment

**All Facilities**

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

**Model Requirements**

Suitable fire detection and suppression equipment must be provided:

**a)** For on-site buildings and structures, according to the requirements of the National Construction Code.

**b)** For storages of dangerous goods, according to the requirements of any Australian Standards for storing and handling of dangerous goods.

**c)** For electrical installations, a minimum of two (2) suitable fire extinguishers must be provided within 3m-20m of each PCU.

**d)** In all vehicles and heavy equipment, each vehicle must carry at least a nine (9)-litre water stored-pressure fire extinguisher with a minimum rating of 3A, or other firefighting equipment as a minimum when on-site during the Fire Danger Period.

*Modifications to Model Requirements must be in consultation with CFA.*

*4.2 Facility Design (Continued)*

### 4.2.4 Landscape Screening and On-Site Vegetation

#### All Facilities

Any proposed or existing vegetation must be considered in the Risk Management Plan for its potential to intensify and propagate fire within and away from the site.

Where landscape screening is required, for example, to screen visual impacts or to prevent visual glare from a solar energy facility, the design must consider any potential increase in fire risk due to the type (species), density, height, location and overall width of the screening.

Facilities must be designed so that the radiant heat flux (output) from vegetation does not create the potential for ignition of on-site infrastructure or other vegetation.

Radiant heat impact leading to ignition may be mitigated through:

- Vegetation removal (where permitted).
- Separation from nearby infrastructure (e.g., fire breaks; refer below).
- The provision of thermal barriers at nearby infrastructure.
- Other means in consultation with CFA.

Consultation with CFA is required regarding landscape screening in high-risk environments.

#### Wind Energy Facilities

Where wind turbines are sited in high-risk environments, additional vegetation management must be considered in the Risk Management Plan.

CFA recommends considering the implementation of an additional reduced-fuel zone around the base of wind turbines, abutting the fire break. The reduced fuel zone may be:

- No less than 20m, or
- To the envelope of the wind turbine blades.

This zone is to be cleared of trees and scrub (where permitted by the responsible authority) and grass must be no more than 100mm during the Fire Danger Period.

#### Solar Energy Facilities

Where practicable, low-flammability vegetation (such as root vegetables) may be planted under solar panels, provided foliage does not extend beyond the panel footprint.

#### Substations and Electric Lines

Substations should be surfaced to eliminate all vegetation including grasses.

The *Electricity Safety (Electric Line Clearance) Regulations 2020* prescribe the vegetation clearance requirements for electric lines based on the assigned fire hazard rating for land established under Section 80 of the *Electricity Safety Act 1998*. Fire hazard ratings are available from CFA by request.

### 4.2.5 Fire Breaks

#### All Facilities

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.

**Model Requirements**

A fire break must be established and maintained around:

**a)** The perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary.

**b)** The perimeter of control rooms, electricity compounds, substations and all other buildings on-site.

*The width of fire breaks must be a minimum of 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.*

*Modifications to Model Requirements must be in consultation with CFA.*

Where screening or other vegetation is a width of 20m or less (open density as per *AS 3959-2018: Construction of buildings in bushfire-prone areas*), or 15m or less (closed density as per *AS 3959-2018*), a fire break of 10m may be appropriate to prevent radiant heat from vegetation fully involved in fire becoming an ignition source for on-site infrastructure.

Outside these parameters, separation must be at least the distance where radiant heat flux (output) from the vegetation does not create the potential for ignition of on-site infrastructure.

## *4.2 Facility Design (Continued)*

The width of the vegetation includes any existing vegetation from neighbouring properties or road reserves abutting the proposed or existing vegetation for the renewable energy facility.

Vegetation may be classified as per *AS 3959-2018* for the purposes of determining radiant heat flux (output).

Fire breaks must be:

- Non-combustible, constructed of concrete, mineral earth or non-combustible mulch such as crushed rock.
- Free of vegetation and obstructions at all times. No plant or equipment of any kind is to be stored in fire breaks.

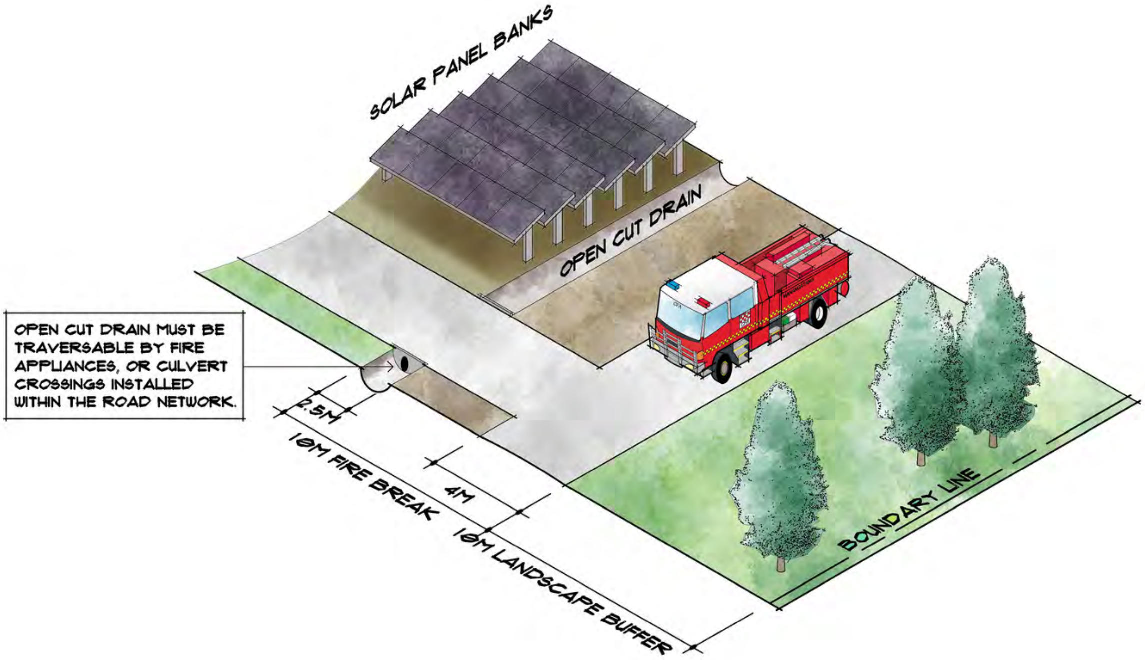


***Figure 10:*** *Typical cross-section indicating fire break requirements at a solar energy facility.*

## Wind Energy Facilities

Fire breaks are not required around the perimeter(s) of wind energy facilities.

### Model Requirement

A fire break must be established and maintained around the base of wind turbines.

Modifications to Model Requirements must be in consultation with CFA.

## Battery Energy Storage Systems

### Model Requirement

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

Modifications to Model Requirements must be in consultation with CFA.

In addition to radiant heat flux (output) from vegetation, the width of fire breaks between vegetation and battery energy storage systems must be at least the distance where the radiant heat flux (output) from the battery energy storage system fully involved in fire does not create the potential for ignition of vegetation.

### *Further Guidance Material*

**AS 3959-2018: Construction of buildings in bushfire-prone areas (Standards Australia)**
Contains information on classifying vegetation that may be useful for bushfire hazard assessments, see Table 2.3 and Figures 2.4(a)-(h).

**CFA Plant Selection Key**
The Plant Selection Key helps you choose plants for a garden in a high bushfire risk.

**CFA Landscaping for Bushfire**
While aimed at residential garden design, this publication contains information that may be useful for design of renewable energy facilities.

*4.2 Facility Design (Continued)*

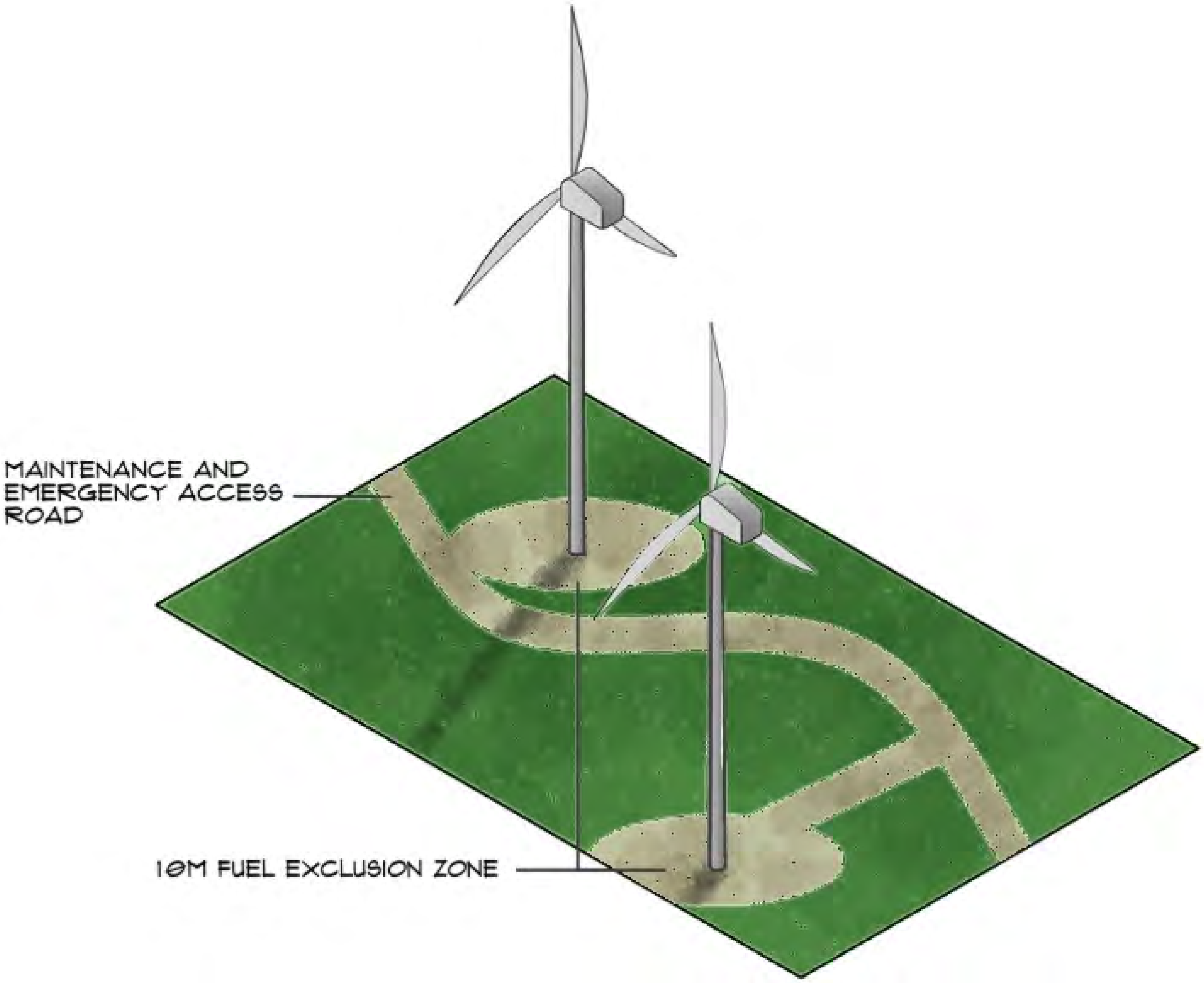


***Figure 11:*** *Typical wind turbine arrangement with fuel exclusion zone and access roads.*

## 4.2.6 Design Specific to Facility Type

### Wind Energy Facilities

#### 4.2.6.1 Aerial Firefighting

Wind energy facilities pose hazards for aerial firefighting operations in certain weather and terrain conditions.

Fire suppression aircraft operate under Visual Flight Rules. Most fire suppression aircraft operate during the day, but only specialised aircraft have the ability for fire suppression at night, under strict protocols.

The following model requirements support safe and effective firefighting operations. The installation must be notified to CFA and Air Services Australia for inclusion in the Vertical Obstruction Database.

**Model Requirements**

**a)** Wind turbines must be located no less than 300 metres apart.

**b)** Wind turbines must be provided with automatic shut-down, and the ability to be completely disconnected from the power supply in the event of fire.

**c)** Installed weather monitoring stations must be notified to the Civil Aviation Safety Authority (CASA) as per CASA Advisory Circular AC 139.E-05 v1.1, October 2022 (as for all structures 110m or more above the ground).

**d)** All guy wires and monitoring towers must be clearly marked, even where marking is not required by CASA.

Modifications to Model Requirements must be in consultation with CFA.

## *4.2 Facility Design (Continued)*

*CFA air response to a grass fire in a wind energy facility, February 2022.*

## Solar Energy Facilities

### 4.2.6.2 Separation Between Banks

Adequate separation of solar panel banks facilitates safe and effective firefighting operations and can limit fire spread.

**Model Requirement**

Solar energy facilities are to have a minimum six (6) metre separation between solar panel banks.

Modifications to Model Requirements must be in consultation with CFA.

The separation between solar panel banks must be considered in the Risk Management Plan.

Long runs of solar panel arrays without breaks due to natural site features or access roads can pose hazards to firefighters, prolong incidents and increase the potential for asset damage.

CFA recommends that separation wherever possible:

- Is between each 'bank' of solar panels, where a 'bank' is that connected to a single power conversion unit/inverter, or
- Is provided so that no unbroken area of solar panels is greater than 25ha, or
- Is designed in consultation with CFA.

This zone is to be cleared of trees and scrub (where permitted by the responsible authority) and grass must be no more than 100mm during the Fire Danger Period.

**For the purposes of this guideline, a 'bank' of solar panels may be that which is connected to a single power conversion unit/inverter.**

## Solar Energy Facilities (Micro)

Separating solar panel banks by six (6) metres is not required for micro solar facilities.

## *4.2 Facility Design (Continued)*

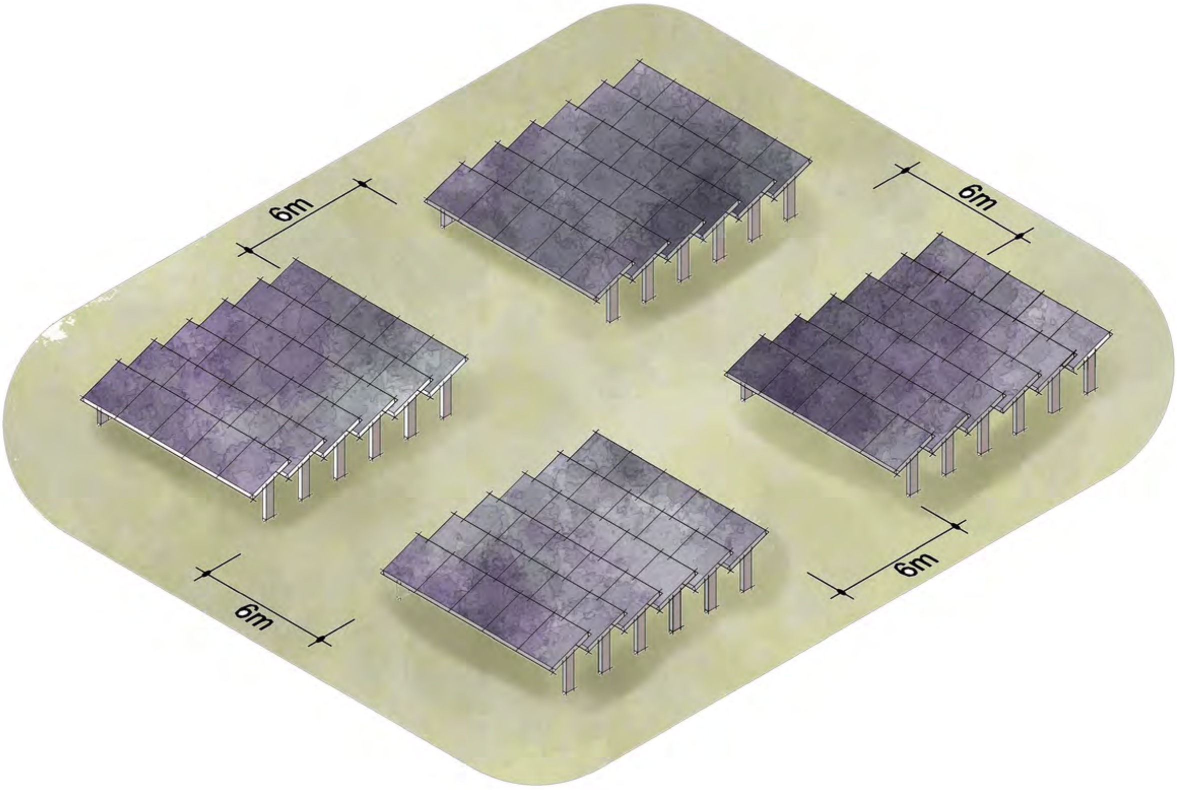


***Figure 12:*** *Six metre separation between solar panel banks (indicative only).*

*CFA air response to a grass fire in a solar facility, December 2022.*

## *4.2 Facility Design (Continued)*

### Battery Energy Storage Systems

CFA acknowledges that battery technologies are continually evolving, and that not all battery energy storage systems have the same level of fire risk. While CFA's guidelines are based on lithium-ion battery chemistries which all have the potential for thermal runaway, including lithium iron phosphate batteries. The principles of risk-based facility design can be adopted across the spectrum of large-scale battery technologies and configurations.

Facility design can reduce the potential for ignition and the consequences of fire should it occur.  Facilities with battery energy storage systems must be designed with an ultimate goal of fire prevention.

***Where a lithium-ion battery goes into thermal runaway, cooling surrounding infrastructure to prevent further spread may be the only safe response option available to CFA.***

The battery management and safety systems within the chosen battery technology will largely dictate whether thermal runaway will occur and its initial management.

CFA recommends considering the provision of non-combustible, floor-to-ceiling partition ‘walls’ (thermal barriers) between battery racks (stacked modules) within battery containers/enclosures. For details, refer to *FM Global Property Loss Prevention Data Sheet 5-33 (2020) Electrical Energy Storage Systems*.

In the absence of a specific Australian Standard for large-scale battery energy storage system facilities, the current versions of the following should be used in the design and operation of battery energy storage systems, except where varied by this guideline.

- *NFPA 855: Standard for the Installation of Stationary Energy Storage Systems*
- *UL 9540: Energy Storage System Requirements*
- *UL 9540A: Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems*
- *FM Global Property Loss Prevention Data Sheet 5-33 Electrical Energy Storage Systems*

If applying NFPA 855, CFA considers an 'exposure' as anything in the immediate range of a fire that is not burning but could start burning if the fire is not contained, including adjacent battery energy storage system containers/enclosures.

### Model Requirements

**1)** The design of the facility must incorporate:

**a)** A separation distance that prevents fire spread between battery containers/enclosures and:

- Other battery containers/enclosures.
- On-site buildings.
- Substations.
- The site boundary.
- Any other site buildings.
- Vegetation.

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

**b)** A fire break around the battery energy storage system and related infrastructure, of a width of no less than 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.*

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

**2)** Battery energy storage systems must be:
**a)** Located to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).

**b)** Located so that the site entrance and any fire water tanks are not aligned to the prevailing wind direction (therefore least likely to be impacted by smoke in the event of fire at the battery energy storage system.)

**c)** Provided with in-built fire and gas detection systems. Where these systems are not provided, measures to effectively detect fires within containers must be detailed within the Risk Management Plan.

*(Continued overleaf.)*

*4.2 Facility Design (Continued)*

### Model Requirements (Continued)

**d)** Provided with explosion prevention via sensing and venting, or explosion mitigation through deflagration panels.

**e)** Provided with suitable ember protection to prevent embers from penetrating battery containers/enclosures.

**f)** Provided with suitable access roads for emergency services vehicles, to and within the site, including to battery energy storage system(s) and fire service infrastructure.

**g)** Installed on a non-combustible surface such as concrete.

**h)** Provided with suitable ventilation.

**i)** Provided with impact protection to at least the equivalent of a W guardrail-type barrier, to prevent mechanical damage to battery containers/ enclosures.

**j)** Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection.

**k)** Provided with spill containment that includes provision for management of fire water runoff.

*Modifications to Model Requirements must be in consultation with CFA.*

## Battery Energy Storage Systems (Decentralised)

Where battery energy storage systems are decentralised (eg., in multiple, separate locations on-site) they 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 enclosure/container/cabinet fully involved in fire does not create the potential for ignition of the adjacent infrastructure.

### 4.2.6.4 Management of Fire Water Runoff

CFA recommends that infrastructure is provided for the containment and management of contaminated fire water runoff from battery energy storage systems.

Infrastructure may include bunding, sumps and/or purpose-built, impervious retention facilities. A fire water management plan may consist of the containment and disposal of contaminated fire water.

CFA recommends a containment and management capacity equivalent to the on-site fire protection system. Containment is to be provided as per *AS 4681-2000: The storage and handling of class 9 dangerous goods*, Section 7.3.9: Control of run-off.

## 4.3 Battery Energy Storage System Safety and Protective Systems

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

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

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

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

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

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

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

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

# 5 Facility Construction and Commissioning

***Fire risks must be identified and effectively managed during the construction and commissioning of renewable energy facilities.***

The construction of facilities comes with additional risks, including fire risks. During the construction phase, CFA expects that a risk management process is undertaken to effectively identify risks and develop and implement appropriate and effective controls.

## *5.1 Recommended Risk Controls*

**All Facilities**

CFA recommends the following risk controls for the construction of facilities. This is not an exhaustive list and must be supplementary to the site-specific risk management process outcomes and any relevant requirements under legislation.

### 5.1.1 Fire Detection and Suppression Systems

**a)** Install and commission fire detection and suppression systems for the facility at the earliest possible stage of construction.

**b)** Provide first-aid firefighting equipment, such as fire extinguishers (and where possible, portable fire hose reels), appropriate to the identified emergency scenarios, at all construction portables/buildings on-site, in the vicinity of all construction activities, and in site-based vehicles.

**c)** Provide the required fire protection equipment for any storages of dangerous goods as per the relevant Australian Standards.

### 5.1.2 Fire Risk Management

**a)** Obtain appropriate permits for work during the Fire Danger Period, and ensure that any conditions on permits are adhered to.

**b)** Adhere to restrictions on Total Fire Ban or days of elevated fire danger according to CFA's website.

**c)** During the Fire Danger Period, ensure vehicle operators are instructed to remain on tracks and are not permitted to drive through paddocks.

**d)** Restrict smoking to prescribed areas and provide suitable ash and butt disposal facilities.

**e)** Provide remotely-accessible site/system security monitoring at the facility.

### 5.1.3 Personnel Training

**a)** Provide training for personnel in the use of on-site first-aid firefighting equipment, and responsibilities during emergencies.

**b)** Ensure all on-site personnel complete CFA's online training module 'Bushfire Safety for Workers'.

### 5.1.4 Emergency Management

**Model Requirement**

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

Modifications to Model Requirements must be in consultation with CFA.

**a)** The Emergency Plan must address the requirements of **Section 7** of this guideline.

**b)** An emergency communication system must be provided that is reliable and will operate in the event of power failure.

**c)** CFA must be notified at least seven (7) days prior to the commissioning of any high-risk infrastructure at the facility (eg., battery energy storage systems).

### 5.1.5 Occupational Health and Safety

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

**a)** Electricity and chemical management.

**b)** Vegetation management.

**c)** Site security.

**d)** Ignition source control, including hot works.

**e)** Infrastructure, equipment and vehicle maintenance.

**f)** Emergency management.

***Further Guidance***

**WorkSafe Victoria: Effective Emergency Response Plans on Construction Sites**

# 6 Facility Operation

***Fire risks must be effectively managed for the duration of the operational life of renewable energy facilities.***

## *6.1 Fire Management Plan*

### All Facilities

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

Modifications to Model Requirements must be in consultation with CFA.

A Fire Management Plan details the fire hazards and risks at and to your facility. It specifies the activities and accountabilities for developing and implementing appropriate and effective risk control measures.

An effective Fire Management Plan is based on a sound risk management process, which CFA recommends is documented in a Risk Management Plan (**Section 3.3**).

***The Fire Management Plan informs operational and emergency management practices at your facility.***

CFA expects that the Fire Management Plan follows the structure and incorporates the information detailed below.

The Fire Management Plan may be a stand-alone document or incorporated into the facility's Emergency Plan (**Section 7**).

| Fire Management Plan Structure and Content | |
|---|---|
| A summary of fire hazards and risks to and from the site, specific to its location, infrastructure, activities and occupancy. | Based on sound hazard identification and risk management processes. This must include risks to firefighter safety during emergencies. |
| Description of control measures to prevent fire occurring and limit the consequences of fire at the facility. | Fire permits, ignition source controls, hot work permits, job hazard analyses, infrastructure/vehicle/equipment/road/fence/access maintenance, waste management, compliant dangerous goods storage and handling, vegetation/fuel reduction and management, peat management, Emergency Plan. |
| Description of control measures to prevent and reduce the consequences of external fire impacting the facility. | Bushfire monitoring, bushfire preparedness, reduced personnel presence/activities/travel on days of Severe and above Fire Danger Rating, creation and management of fire breaks at the site perimeter and around infrastructure, vegetation/fuel reduction and management, Emergency Plan. |
| Details of equipment and resources to manage fire at the facility. | Fire detection and suppression systems, fire water supplies, automatic shut-down and isolation systems, monitored alarms, communications equipment, occupant warning systems, designated evacuation assembly areas, Emergency Information Container(s), Emergency Plan. |
| Policies and procedures that ensure all control measures are appropriate and effective, and remain so. | Performance standards for risk controls, specific activities to verify controls (servicing/maintenance, housekeeping inspections, external audits), review processes for risk control effectiveness. |
| Procedures for review of the Fire Management Plan. | Review triggers and schedule, organisational accountability for the Plan, allocated responsibilities (to persons or roles) for the ongoing review and development of the Plan. |

## *6.2 Fire Hazards and Risk Controls*

The following matters must be addressed within the Fire Management Plan.

### 6.2.1 Bushfire and Grassfire

**All Facilities**

Bushfire risk is different for every location, and the potential impact of bushfire is unique to renewable energy facilities facility due to the infrastructure, electrical and chemical hazards.

Your facility may be at-risk of bushfire if it is:

- Located in an area close to or amongst dense or open bush, unmanaged grassland, near coastal scrub, or at an urban fringe.
- Identified as being in a Bushfire Prone Area, or within the Bushfire Management Overlay.

**Model Requirement**

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

Modifications to Model Requirements must be in consultation with CFA.

Bushfire preparedness activities must be supported by procedures that specify the personnel accountable for their completion, the specific actions required, and a schedule.

#### 6.2.1.1 Bushfire Prevention and Preparedness during the Non-Fire Danger Period

Preparing for bushfire is a year-round activity. Activities and procedures must be in place to prepare for bushfire well before the commencement of the Fire Danger Period.

***Understand Landscape and Site Fire Risk***

Site occupiers must:

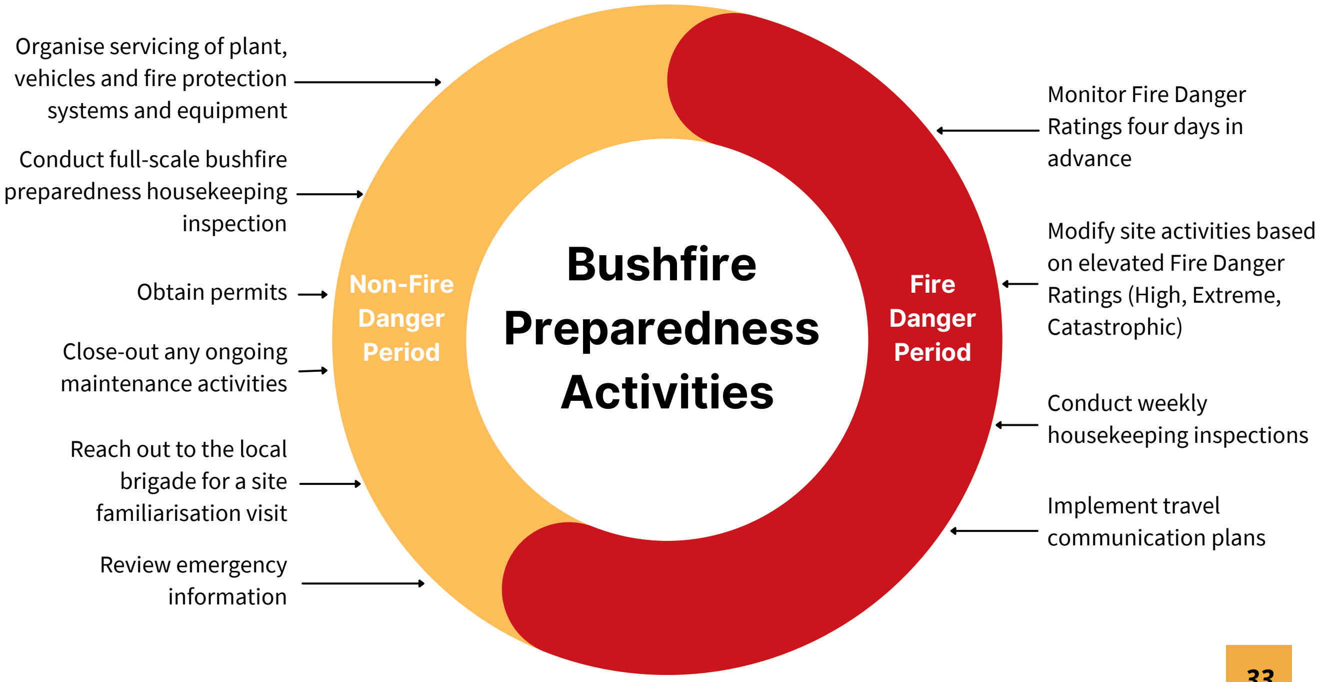
**a)** Take steps to understand how a bushfire may affect site occupants, facility infrastructure, and the surrounding community.
**b)** Ensure that fire risk controls commensurate to the fire risk are developed, implemented and reviewed.
**c)** Be proactive in modelling and maintaining both a culture of bushfire awareness and safety.
**d)** Establish and maintain a relationship with the local CFA brigade.

***Develop and Implement Fire Risk Controls***

Fire risk controls appropriate to the hazards and risks to and from the landscape, to and from your facility, must be developed and implemented.

**a) Fire permits and restrictions** - ensuring that fire permits are obtained and followed, and that restrictions based on Fire Danger Ratings or Total Fire Ban status are implemented.

**Bushfire Preparedness Activities**



## *6.2 Fire Hazards and Risk Controls (Continued)*

**b) Job/task fire risk management** - ensuring job hazard analysis processes are developed and implemented that consider site infrastructure, operations and landscape hazards.
**c) Vegetation management** - ensuring that any accumulation of combustible materials are cleared and removed from site.
**d) Facility and system monitoring** - ensuring systems to monitor faults and abnormalities are effective.
**e) Maintenance** - ensuring fire protection and detection systems, plant, vehicles and equipment are regularly maintained.
**f) Safe dangerous goods storage and handling** - ensuring safe and compliant practices.
**g) Site-wide bushfire preparedness housekeeping inspections** - ensuring bushfire-focused inspections are conducted at least three months, and again one month, prior to the Fire Danger Period.

### 6.2.1.2 Bushfire Prevention and Preparedness During the Fire Danger Period

All activities during the Fire Danger Period must be planned and implemented prior to the commencement of the Fire Danger Period.

#### *Implement Bushfire Monitoring Procedure*

Developing a bushfire monitoring procedure for the Fire Danger Period assists site occupiers in understanding the potential for bushfire near the facility. Bushfire monitoring allows maximum implementation time for preparedness actions.

Bushfire monitoring involves:

- Nominating a person/role in your Emergency Control Organisation to be responsible for identifying, responding to and communicating Fire Danger Ratings at least four days ahead.
- Identifying bushfire activity within 50km of the facility, through the VicEmergency website, app, or ABC local radio.
- Communicating this information to everyone likely to be present on-site, and relevant off-site personnel.

#### *Prepare to Modify Site Activities*

A risk management process must be undertaken to determine the modification of site activities where there is risk of bushfire and grassfire.

Modifications to site activities:

- Must be in line with legislated restrictions for the Fire Danger Period and days of Total Fire Ban, any permits issued, and the Fire Danger Rating.
- Must be determined well before the Fire Danger Period, as part of risk management and emergency planning processes, and not left to be decided on the day.

Modified activities may include, but not limited to:

- Closing the site on days of (for example) ***Extreme*** and above Fire Danger Rating.
- Limiting non-essential activities on days of ***High*** and above Fire Danger Rating.
- Limiting travel on days of ***High*** and above Fire Danger Rating.
- Postponing planned maintenance shut-downs.
- Including bushfire ignition hazards in any Job Hazard Analysis or similar activity-based risk management process.
- Communicating modified activities and expectations to site personnel and visitors.

Fire Management Plans must:

**a)** List the modified activities for each Fire Danger Rating and during the Fire Danger Period.
**b)** Provide details of the modification based on the requirements of Fire Danger Period or Total Fire Ban permit/s, the Fire Danger Rating, and the risk management process.

#### *Plan Travel*

Where driving on days of ***High*** and above Fire Danger Rating is critical and unavoidable, procedures must be developed and implemented for planning and undertaking this travel. Never travel into any high-risk bushfire area where ***Catastrophic*** fire danger has been declared.

- Download the VicEmergency App and set ‘watch zones’ for areas of travel.
- Save the number for the VicEmergency Hotline in your phone: 1800 226 226.
- Safety equipment must be provided, and serviced, in all company vehicles that may be used during the Fire Danger Period.
- A communications plan must be in place to verify that personnel required to travel have arrived safely at each destination.

See CFA’s advice on staying safe when you travel.

*6.2 Fire Hazards and Risk Controls (Continued)*

### 6.2.2 Vegetation Management

#### All Facilities

Effective vegetation management can reduce both the risk of fire entering your facility, and the consequences of fire if it does occur.

All renewable energy facilities within the Bushfire Management Overlay or a Bushfire Prone Area must maintain the vegetation to the prescriptions listed within planning permits.

**Model Requirements**

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

**a)** Grass must be maintained at or below 100mm in height during the declared Fire Danger Period.

**b)** Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation.

**c)** Restrictions and guidance must be adhered to during the Fire Danger Period, days of ***High*** (and above) fire danger and Total Fire Ban days (refer to www.cfa.vic.gov.au).

Modifications to Model Requirements must be in consultation with CFA.

#### Solar Energy Facilities

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.

#### Battery Energy Storage Systems

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.

#### Substations and Electric Lines

Vegetation management within any electric line easement must ensure that falling trees would not impact the transmission lines, towers and associated infrastructure.

***Managing Vegetation On-Site***

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

### 6.2.3 Arc Flash Hazard Management

#### All Facilities

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

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

Refer to Energy Safe Victoria's **Arc Flash Hazard Management Guideline** (2022) for information.

### 6.2.4 Facility and System Monitoring

#### All Facilities

**Model Requirement**

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

Modifications to Model Requirements must be in consultation with CFA.

*6.2 Fire Hazards and Risk Controls (Continued)*

**Battery Energy Storage Systems**

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

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

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

### 6.2.5 Maintenance

**All Facilities**

**Model Requirement**
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.
Modifications to Model Requirements must be in consultation with CFA.

Ensuring facility infrastructure, equipment and vehicles are maintained in safe, effective working order contributes to efficiency, reliability and importantly, fire safety.

A procedure, including a schedule and relevant personnel accountabilities, must be developed to inspect and maintain all infrastructure, equipment and vehicles.

- Any activities that involve flame cutting, grinding, welding or soldering (hot works) must be performed under a ‘hot work permit’ system or equivalent job hazard safety or risk management process.
- Any defects, faults or matters affecting the performance of fire protection systems and any equipment for emergency use must be identified through routine testing and servicing. Maintenance activities must be closed-out before the Fire Danger Period.

Fire detection and protection (suppression) systems, alarms, warning systems, communications and any other emergency equipment must always be in effective working order.

**Battery Energy Storage Systems**

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

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

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

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

Any identified issues must be immediately rectified.

### 6.2.6 Safe Dangerous Goods Storage and Handling

**All Facilities**

Signage and labelling compliant with the *Dangerous Goods (Storage and Handling) Regulations 2022* and the relevant Australian Standards must be provided at the site entrance, dangerous goods storage locations, and storage tanks where applicable.

Appropriate material for cleaning up 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.

*6.2 Fire Hazards and Risk Controls (Continued)*

### 6.2.7 Housekeeping

**All Facilities**

Site-wide housekeeping inspections must be conducted regularly at facility. If your facility is at-risk of bushfire, site-wide bushfire preparedness housekeeping inspections must be conducted at least three months, and again one month, prior to the Fire Danger Period.

Housekeeping inspections must incorporate:

**a) Hazard identification** - ensuring that infrastructure, plant, equipment, vehicles and safety/warning signs show no signs of damage or dilapidation.

**b) Facility access** - ensuring all vehicle site access points, including emergency access points, are clear and accessible.

**c) Fire protection systems and equipment** - ensuring that all equipment is unobstructed, clearly identifiable, in-service and performing optimally.

**d) Vegetation management** - ensuring that any accumulation of combustible materials is cleared from infrastructure, buildings and fire breaks, and removed from the site.

**e) Security measures** - ensuring that fences, gates, and security cameras are inspected for damage, and that any damage is immediately actioned (eg., repaired or replaced).

***CFA Renewable Energy Fire Safety Resources***

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

*Unmanaged vegetation at string commander box.*

### 6.2.8 Additional Requirements Specific to Facility Type

**Battery Energy Storage Systems**

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

**a)** A schedule, list of activities and accountabilities for the inspecting, testing, monitoring and servicing of the battery and its monitoring, safety and protective systems.

**b)** Monthly inspections of battery enclosures/containers and related infrastructure for physical damage. Any damage must be immediately assessed and rectified by a suitably qualified person.

**c)** Seismic activity as a trigger for inspecting, testing and servicing of the battery energy storage system and its related infrastructure. Any damages or changes in operating parameters must be immediately assessed and rectified by a suitably qualified person.

**d)** Regular inspection and removal of all combustible materials near the battery enclosures/containers and related infrastructure.

## *6.3 Fire Risk Review*

**All Facilities**

Fire risk must be effectively managed at operating facilities to meet obligations for providing a safe workplace under the OHS Act.

CFA recommends that facility operators consider the design guidelines and model requirements contained in this document and develop procedures to ensure that:

**a)** The **Fire Management Plan** is reviewed and updated regularly, in line with any reviews and changes to hazards and risk management as per the **Risk Management Plan**, and where there is a near-miss or incident at the facility.

**b)** The **Emergency Plan** is reviewed and updated to reflect any changes in the **Fire Management Plan**, including where fire risks emerge or change, risk controls are added or modified, or where there is a near-miss or incident at the facility.

Where substantive changes are made to these documents, CFA recommends considering peer-review by a suitably qualified, independent third party.

CFA's Specialist Risk and Fire Safety Unit can also visit your site by invitation to provide specific advice on fire risk management and emergency planning in line with this guideline.

# 7 Emergency Planning

***Emergencies at renewable energy facilities must be planned for and effectively managed.***

**All Facilities**

**Model Requirement**

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

Modifications to Model Requirements must be in consultation with CFA.

Effective emergency planning ensures that your facility is prepared in the event of an emergency, providing for the safety of site personnel, emergency responders and the community.

An emergency planning process, informed by *AS 3745-2010: Planning for emergencies in facilities*, provides a framework for developing an Emergency Plan through the formation and activities of an Emergency Planning Committee.

The Emergency Planning Committee is responsible for developing, implementing and maintaining the Emergency Plan.

## 7.1 Emergency Plans

### 7.1.1 Why Develop an Emergency Plan?

An Emergency Plan (EP) details the arrangements for managing emergencies, including the facility details, structures, procedures, resources and training. EPs must be specific to the infrastructure, operations and location of facilities, and informed by a sound risk management process.

An Emergency Plan may also assist employers in meeting their obligations under the OHS Act in providing a workplace that is safe and without risks to health.

### 7.1.2 Structure and Content of Emergency Plans

CFA recommends that facility operators develop an Emergency Plan consistent with *AS 3745-2010: Planning for emergencies in facilities*.

The structure and content of Emergency Plans must be adapted to the facility's specific infrastructure, hazards and arrangements.

Emergency Plans must be developed to cover the construction and commissioning, and operational phases and must cover:

**a)** Emergency prevention, preparedness and mitigation activities.

**b)** Activities for preparing for emergencies.

**c)** Control and coordination arrangements for emergency response (eg., evacuation procedures, shelter-in-place arrangements, emergency assembly areas and emergency response procedures).

**d)** The agreed roles and responsibilities of on-site personnel (eg., equipment isolation, fire brigade liaison, evacuation management, shelter-in-place management, if applicable).

To facilitate fire brigade response Emergency Plans must include:

**a)** A facility description, including infrastructure details, operations, number of personnel, and operating hours.

**b)** A site plan depicting infrastructure (solar panels, wind turbines, inverters, battery energy storage systems, generators, substations, grid connection points, transmission lines, dangerous goods storages, buildings, bunds), site access points and internal roads; fire services (water tanks, pumps, booster systems, fire hydrants, fire hose reels); drainage; and neighbouring properties.

**c)** An emergency response procedure for each credible emergency event and scenario, based on a comprehensive risk management process. CFA recommends including building, infrastructure and vehicle fires, and grassfire and bushfire.

**d)** Up-to-date contact details for facility personnel, and any relevant off-site personnel that could provide technical support during an emergency.

**e)** Evacuation procedures and where appropriate, shelter-in-place procedures for facilities at-risk of bushfire or grassfire, if it is too late to evacuate.

**f)** Details of emergency resources, including fire detection and suppression systems and equipment; gas detection; emergency eye-wash and shower facilities; spill containment systems and equipment; emergency warning systems; communication systems; personal protective equipment; and first aid.

**g)** A manifest of dangerous goods (if required under the *Dangerous Goods (Storage and Handling) Regulations 2022*).

## *7.2 Emergency Response Procedures*

Emergency response procedures, as part of the Emergency Plan, contain the assigned responsibilities and actions to respond to and manage emergencies.

CFA recommends that emergency response procedures are developed in accordance with Section 4 of *AS 3745-2010: Planning for emergencies in facilities*.

Emergency response procedures must:

**a)** Include a specific action to notify (or verify notification) the emergency services, at the earliest possible stage of the emergency.

**b)** Specify the person or role responsible for making or verifying the notification.

**c)** Include '000' number in the procedure.

### 7.2.1 Emergency Response Procedures for Bushfire

Any emergency response actions for bushfire must be determined before the Fire Danger Period, and must consider the modified site activities in the Fire Management Plan.

Emergency procedures for bushfire must include:

**a)** Communicating with site personnel and supporting their physical relocation.

**b)** Ensuring all buildings and plant are adequately secured.

**c)** Initiating any bushfire protection measures such as sprinkler or deluge systems.

**d)** Liaising with the emergency services where possible.

**e)** Ensuring that evacuation/shelter in place areas are equipped with suitable resources.

### 7.2.2 Emergency Response Procedures for Facility Plant and Equipment

Procedure(s) must be developed and implemented for the isolation, shut-down, fail safe or management of critical/high-risk plant, equipment, and utilities (eg., electricity/gas) at the facility, should evacuation be required.

## *Australian Fire Danger Rating System*

The Fire Danger Rating tells you how dangerous a fire would be if one started.

The four (4)-day Fire Danger Rating forecast is available on the CFA website during the Fire Danger Period.

**https://www.cfa.vic.gov.au/warnings-restrictions/total-fire-bans-and-ratings**

Find out what you can and can't do during the declared Fire Danger Period, and on days of Total Fire Ban at:

**https://www.cfa.vic.gov.au/warnings-restrictions/total-fire-bans-and-ratings/can-i-or-cant-i**

### *Emergency Warnings*

You should never wait to receive an official warning before you leave. Fires can start quickly and threaten homes and lives within minutes.

Warnings are issued when a fire has started and you need to take action.

Make sure you understand the three levels of warnings and what they mean. The three levels of warnings are:

- Advice
- Watch and Act
- Emergency Warning

Warnings can be issued in any order. The first warning you could get could be an Emergency Warning.

**https://www.cfa.vic.gov.au/warnings-restrictions/about-warnings**

## *7.3 Evacuation and Shelter-in-Place*

Being absent from the site, or leaving early, on days of ***Extreme*** and above Fire Danger Rating is the safest option to protect site personnel and those for whom employers have a duty of care under the *Occupational Health and Safety Act 2004*. Leaving early means leaving the area before a fire starts, not when flames or smoke are visible.

Evacuating or sheltering-in-place at your workplace during a bushfire potentially puts you, your site personnel and firefighters at extreme risk. This risk is amplified where your business involves:

- Large numbers of people.
- High fire-risk operations or processes.
- Production of combustible materials or their storage/use in production.
- Electrical infrastructure (substations, solar panels, battery energy storage systems).
- Unrestrained products, plant or equipment.
- The storage and handling of dangerous goods.

Commercial and industrial buildings have not routinely been constructed with any additional bushfire protections and may only provide very limited protection.

Leaving once a fire has started may be an option in some circumstances. This is an inherently risky option and safety will be affected by many factors, including the proximity of the fire, access to safe evacuation routes and timely access to incident information.

*AS 3745-2010: Planning for emergencies in facilities* advises that sheltering in place should only be considered where an evacuation might reasonably expose people to a greater level of danger.

Sheltering-in-place at your facility should only be considered when the following are thoroughly analysed through a risk management process:

- The type of facility.
- Where the facility is located relative to the threat.
- Whether the buildings have been constructed against bushfire impact.
- Whether the grounds and buildings are being maintained to suitable standards.
- The area of defendable space around buildings and infrastructure.
- How the buildings, grounds and plant may be affected by a bushfire.
- The number of occupants.
- Occupants requiring personal emergency evacuation plans (PEEP).
- Accessibility of the site (number and quality of roads in and out of the facility).

Where the Emergency Planning Committee considers sheltering in place an option at your facility, CFA recommends that last-resort procedures are developed to provide direction to site personnel if it is too late to safely evacuate due to bushfire threat, and sheltering-in-place is the only remaining option.

Emergency Management Victoria advises that informal places of shelter should only be considered when all other survival options have failed. Informal shelter options (such as a workplace) may provide some protection from radiant heat, the biggest killer in a bushfire.

Emergency procedures for sheltering-in-place are to consider:

- Who makes the decision for personnel to shelter on-site.
- When the decision is made.
- Where personnel are to shelter on-site.
- How to communicate the need to shelter, and the sheltering location, to personnel on-site.
- The on-site emergency resources and equipment to be provided to this location.
- The provision of appropriate signage to identify the shelter location. Signage may also provide additional information such as procedures relating to the use of the place during a fire event.
- Access to incident information.
- Company position and actions if someone insists on leaving the site.
- All vehicle site access points, including emergency access points, must be clear and accessible.

## *7.4 Personnel Training*

### All Facilities

Employers must provide information, instruction and training in accordance with the *Occupational Health and Safety Act 2004*.

CFA recommends that at least the following information and training be provided to any personnel working at the facility, and visitors as appropriate.

- Facility and operational risks and hazards.
- Facility emergency management roles, responsibilities and arrangements (as per the Emergency Plan).
- The on-site emergency warning systems and location of evacuation assembly areas.
- The safe and effective use of any fire-fighting equipment where there is an expectation for staff to undertake first aid firefighting.
- The storage, handling and emergency procedures for dangerous goods at the facility.
- The location of first aid facilities and application of first aid equipment.

For facilities with bushfire or grassfire risk, CFA recommends that all site personnel:

- Download the VicEmergency App and set ‘watch zones’ for the facility location and any related areas of travel.
- Information and training on the warning levels and messages issued by CFA and Emergency Management Victoria.
- Complete CFA's free ‘Bushfire Safety for Workers’ e-learning module before the Fire Danger Period. CFA recommends that this module is considered mandatory professional development for all personnel at the facility.

### *Further Guidance*

CFA recommends the Australian Institute for Disaster Resilience Handbooks, particularly:

- **Managing Exercises** (2017) for further guidance on the designing, conducting and evaluating of practical exercises.
- **Lessons Management** (2019) for further guidance on applying learning experiences from events and exercises.

## *7.5 Emergency Exercises*

### All Facilities

Emergency exercises provide valuable opportunities to test the effectiveness of Emergency Plans. Emergency exercises should be planned well in advance, and be focused on strengthening emergency management structures, responsibilities and activities.

Where personnel are present on-site, an annual emergency exercise should be conducted at the facility, with an invitation extended to the local CFA brigade to participate.

CFA recommends that an ongoing program of site-specific emergency response exercises is developed as per *AS 3745-2010: Planning for emergencies in facilities* – Section 7: Emergency response exercises.

Emergency exercises should:

- Test emergency structures, prescribed activities, personnel knowledge, and any assumptions built into the Emergency Plan.
- Be consistent with the emergency procedures (based on identified hazards) in the Emergency Plan.
- Be conducted in various formats, from internal desktop to multi-agency practical field exercises.
- Be appropriately designed, conducted and evaluated.
- Incorporate 'failure', that is, things 'going wrong' or 'not to plan', such as communication system failures, the absence of the Chief Warden, delays in the arrival of the fire brigade, escalation scenarios. How well does the Emergency Plan work in those instances? How can it be modified to be adaptable?
- Be prefixed with an announcement indicating it as an exercise only, and include provision for alerting participants of an actual emergency during the exercises (i.e., ‘NO DUFF’).
- Incorporate a 'no blame' feedback/evaluation process that includes debriefing and at least one additional feedback method that enables anonymous feedback to be provided.
- On completion, be summarised in written format as a consolidated record of 'lessons identified', with measures and accountabilities to ensure those lessons are incorporated into the Emergency Plan (or elsewhere) as required.
- Be a trigger for reviewing the Emergency Plan.

## 7.6 Reviewing Emergency Plans

### All Facilities

An Emergency Plan is a 'living document' that must be regularly reviewed to ensure its currency and effectiveness.

CFA recommends that Emergency Plans are reviewed:

- Following any changes to the risk on-site pertaining to site infrastructure and operations (Risk Management Plan).
- Following any review of the Fire Management Plan.
- After any activation of the EP or incident involving notification to the emergency services.
- After emergency exercises.
- At least annually.

Reviews of Emergency Plans for renewable energy facilities should be conducted in conjunction with reviews of the Risk Management Plan and the Fire Management Plan.

CFA can provide support and advice on emergency planning for renewable energy facilities, and provide advice on Emergency Plans. Requests can be made via CFA's Fire Safety Referrals team at firesafetyreferrals@cfa.vic.gov.au.

### Notifications

Early notification to CFA during emergencies via 000 allows CFA the best opportunity to provide safe and timely response in the event of rapid escalation.

Outside of emergencies, the local CFA district must also be notified by phone or email at least seven days prior to:

- The commissioning of battery energy storage systems.
- Annual servicing of battery energy storage systems.

*CFA recommends that annual servicing of battery energy storage systems should not take place on days of* ***High*** *or above Fire Danger Rating, except where the system is experiencing malfunction or abnormal behaviour.*

Contact with the local CFA brigade can be made through the local CFA district office. Refer to: https://www.cfa.vic.gov.au/contact/#district.

Fire protection system outages (eg., water-off due to faults or maintenance activities) must be notified as far in advance as possible to ESTA at burnoffs@esta.vic.gov.au or 1800 668 511.

## *7.7 Emergency Planning Specific to Facility Type*

### Wind Energy Facilities

A wind energy facility Emergency Plan must additionally include:

**a)** Emergency procedures for fires within, and near, wind turbines.

**b)** Details of any triggers or circumstances for ceasing the operation of wind turbines or shutting down the facility, such as on ***Extreme*** or above days or approach of bushfire/grassfire to the facility.

**c)** Maximum (safe) operational wind speed and temperature conditions and operating procedures to limit fire risk.

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

Wherever possible, rotors must be stopped into a 'Y' pattern during emergencies.

### Solar Energy Facilities

A solar energy facility Emergency Plan must additionally include:

**a)** Emergency procedures for isolation and shut-down where solar panels and/or related infrastructure are involved in fire.

**b)** Emergency procedures for fires within the vicinity of solar energy facilities.

**c)** Specifications for safe operating conditions for temperature, and the hazards related to electricity generation at the facility.

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

### Battery Energy Storage Systems

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

**a)** Contact information for 24/7/365 specialist technical support for the battery energy storage system.

**b)** Emergency response procedures based on identified risks and hazards of the battery energy storage system and related infrastructure, including but not limited to:

**i.** Electrical infrastructure faults and fire.

**ii.** Battery energy storage system damage or faults, including battery monitoring faults, temperature increases above normal operating parameters, electrical faults, chemical spills or reactions, off-gassing, thermal events/runaway, smoke and fire.

**iii.** Bushfire and grassfire.

**iv.** The management of fire water runoff.

**c)** Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available (eg., at the BESS containers, in an on-site control room, off-site monitoring facilities).

**d)** A plan for partial and full decommissioning of the battery energy storage system in the event of an emergency incident that renders the facility inoperable or unsafe, before its anticipated end-of-life.

**e)** Any information that supports the considerations in **Appendix B: Emergency Response Considerations for Large-Scale Battery Energy Storage Systems**.

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

# 8 Provision of Emergency Information

## *8.1 Developing an Emergency Information Book*

### All Facilities

**Model Requirement**

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

Modifications to Model Requirements must be in consultation with CFA.

Renewable energy facilities pose special hazards for firefighters during emergency response. Providing accurate, current information about potential risks and hazards to emergency responders during emergencies facilitates effective intervention, reduces delays during response, and contributes to providing a safe workplace for emergency responders.

Providing emergency information to responding emergency services is also a requirement of numerous Victorian regulations and Australian Standards.

CFA's preferred format for providing emergency information is an Emergency Information Book, within an Emergency Information Container. CFA's Guideline for the Provision of Emergency Information contains CFA's expectations for developing an Emergency Information Book.

The Emergency Information Book must include:

**a)** A description of the premises, its infrastructure and operations.

**b)** Site plans that include the layout of the entire site, including buildings, internal roads, infrastructure, fire protection systems and equipment, dangerous goods storage areas, gas detectors, battery energy storage systems, substations/terminals, grid connections, drains and isolation valves, neighbours and the direction of north.

**c)** A manifest of dangerous goods (if required) as per Schedule 3 of the *Dangerous Goods (Storage and Handling) Regulations 2022*.

**d)** Procedures for the management of emergencies, including evacuation, shelter-in-place (for facilities at-risk of bushfire/grassfire), containment of spills and leaks, and fire procedures (including infrastructure/plant fires, vehicle fires, grassfire/bushfire).

**e)** Details of emergency equipment, including the type and location of gas detectors.

**f)** Up-to-date contact details for site personnel, regulatory authorities and site neighbours.

**g)** Safety Data Sheets (SDS) for dangerous goods stored on-site.

Emergency Information Containers must be:

**a)** Painted red and marked 'EMERGENCY INFORMATION' in white contrasting lettering not less than 25mm high.

**b)** Located at all vehicle access points to the facility, installed at a height of 1.2 metres – 1.5 metres.

**c)** Accessible with a fire brigade standard '003' key.

**d)** Kept clear of obstructions, including products, rubbish, vehicles, vegetation and any hazards (eg., pest infestation).

### Battery Energy Storage Systems

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

**a)** Specifications for safe operating conditions for temperature.

**b)** Schematics and technical data for battery energy storage system containers/enclosures, the number of containers/enclosures on-site, and the number of battery racks or modules within each container/enclosure.

**c)** Details of the hazards for the battery energy storage system, including thermal events/runaway, electrical safety hazards, explosion hazards, dangerous goods hazards (including off-gassing and associated vapour clouds), and the effects of fire on the battery energy storage system (eg., explosion, release of toxic gases).

**d)** Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available (eg., at the BESS containers, in an on-site control room, off-site monitoring facilities).

**e)** Details of all provided battery safety and protective systems, including a description, the activation process/automatic trigger, and associated hazards.

*8.1 Developing an Emergency Information Book (Continued)*

**f)** The shut down and/or isolation procedures if the batteries are involved in fire, and appropriate personnel contact details for verifying that the battery enclosure/container system has been isolated/shut-down and de-energised during emergencies.

## 8.2 Fire Brigade Site Familiarisation

### All Facilities

Before commissioning of the facility, operators are to offer a familiarisation visit and explanation of emergency procedures to CFA brigades and other emergency services.

Site familiarisation visits allows brigades to obtain information and develop pre-plans based on the facility's:

- Operations and personnel complement.
- Site access points, layout and infrastructure.
- Specific hazards.
- Installed fire detection and suppression systems.

Providing brigades with an opportunity to understand site infrastructure, operations and hazards is critical to safe and effective response, as there are additional hazards for firefighters at renewable energy facilities.

Contact information for at least two persons who may be able to provide information or support during emergencies (24 hours a day) must be provided for unoccupied facilities.

A schedule for ongoing site familiarisation to account for changing personnel, facility infrastructure and hazards, and emergency exercises should be developed in conjunction with the local CFA brigade.

Contact with the local CFA brigade can be made through the local CFA district office. Refer to: https://www.cfa.vic.gov.au/contact/#district.

## 8.3 Review of Emergency Information

### All Facilities

A review of the information contained within the facility's Emergency Information Container and Book must be undertaken before the Fire Danger Period. Any corrections, removal or addition of information must be completed as a matter of urgency.

# 9 Battery Energy Storage Systems at Commercial and Industrial Facilities

## *9.1 Risk Management Considerations*

Increasingly, small-scale battery energy storage systems (<1MW) are being installed at commercial and industrial buildings to supplement power requirements for business operations.

***CFA recommends that any proposed small-scale battery energy storage system installation is subject to a comprehensive risk management process.***

### 9.1.1 Siting

Battery containers/enclosures/cabinets must not be sited in restricted or hazardous areas as per *AS/NZS 5139-2019: Electrical installations - Safety of battery systems for use with power conversion equipment*.

CFA recommends that battery containers/enclosures/cabinets are sited externally to buildings wherever possible. Externally-located batteries should be:

- Sited in an area reasonably adjacent to a site vehicle entrance suitable for emergency vehicles.
- Sited within 60m of a serviceable, accessible, compliant, clearly marked on-site or street fire hydrant capable of achieving 20L/s for a period of not less than four hours.
- Sited in an area with minimal potential for vehicle impact, eg., away from traffic flows and vehicle parking areas. Car parking should be prohibited within 10m of the battery container, unless a radiant heat shield is provided that extends no less than 2m either side, and no less than 1m above the battery container/enclosure/cabinet.
- Separated from buildings by at least 10m, or a distance that prevents radiant heat exposure from the battery container fully involved in fire from igniting the building and vice versa.
- Sited as far as possible from neighbouring residential premises.
- Located within a secure compound to prevent unauthorised access to the cabinet and related equipment. The enclosure must be secured at all times. Protocols must be developed to control and track authorised access to the enclosure.
- Provided with impact protection equivalent to at least a W barrier.
- Provided with appropriate spill containment (bunding or otherwise) that includes provision for managing fire water runoff.

Where batteries are installed in buildings, CFA recommends that they are:

- Located in a fire-separated compartment under the National Construction Code (eg., with adequate separation and fire-rated construction to prevent impact from radiant heat, vapour clouds and smoke in the event of thermal runaway or external fire impact).
- Located away from switchboards and other electrical installations and appliances.
- Located in sprinkler-protected areas (where a sprinkler system is provided in the building).
- Located in a room with a detector linked to the Fire Indicator Panel/FDCIE (where a FDCIE is provided in the building). For all other buildings a smoke alarm and gas detector should be installed within the same room, as per *AS/NZS 5139-2019*.
- Provided with ventilation that exhausts to outside of the building only as per *AS/NZS 5139-2019*.
- Kept clear of extraneous or stored materials. Only items related to the battery are to be stored in rooms with battery energy storage systems.

### 9.1.2 Design and Operation Risk Controls

CFA recommends:

- Batteries are provided with gas, fire, explosion detection and protection systems appropriate to the battery chemistry, electrical and other hazards. The detection and protection systems within the battery container must have direct alarm monitoring to the fire brigade whenever possible.
- Batteries are provided with adequate ventilation as per the manufacturer's requirements/the Safety Data Sheet(s) for the BESS and/or any relevant national or international standards.
- Batteries are equipped with appropriate monitoring systems to ensure that any shorts, faults, off-gassing, equipment failures and increases in temperature outside of the defined operating parameters of the manufacturer are immediately intercepted, and any off-gassing, smoke, fire or explosion is immediately notified to the emergency services.
- Batteries are regularly inspected, tested and serviced according to manufacturer's requirements.

*BESS at Commerical and Industrial Facilities (Continued.)*

## 9.2 Emergency Planning

Before commissioning of supplemental battery energy storage systems, CFA recommends that the facility's Emergency Plan is comprehensively reviewed and updated to:

- Consider risks and hazards from and to the battery energy storage system and the impact of fires involving the battery energy storage system, such as facility egress and paths of travel to evacuation assembly areas during emergencies.
- Incorporate emergency procedures based on hazards associated with the battery energy storage system. Emergency procedures must include battery monitoring faults, temperature increases above normal operating parameters, electrical faults, chemical spills or reactions, off-gassing, and thermal runaway (smoke, fire and explosion).
- Incorporate a plan for partial and full decommissioning of the battery energy storage system in the event of an emergency that renders the battery inoperable or unsafe, before its anticipated end-of-life.

## 9.3 Fire Brigade Site Familiarisation

CFA recommends that arrangements are made for site familiarisation with the local brigade before the commissioning of the battery energy storage system to confirm access arrangements, fire detection, suppression and protection systems, and contact information for at least two persons who can provide information or support during emergencies (24 hours a day).

## 9.4 Provision of Emergency Information

CFA recommends that the facility's existing emergency information is updated to include information relevant to the battery energy storage system.

### 9.4.1 Site Drawings

The location of solar panels, power conversion units, battery energy storage systems, and system shut-down controls must be marked on:

- Site plans for the use of emergency services (eg., within the Emergency Information Book and at the Fire Indicator Panel/FDCIE).
- Block plans for the facility (as per *AS 2419.1-2021: Fire hydrant installations*, Clause 11.5: Block plan).
- Essential Services drawings for the facility.

### 9.4.2 Emergency Information Book

CFA recommends that the following information is included within the Emergency Information Book:

- A summary of the installation, including:
    - The capacity, chemistry and safety systems.
    - The location of all system infrastructure on-site.
- Specifications for safe operating conditions for temperature (including ambient and internal temperatures) for battery energy storage systems.
- Schematics and technical data for battery energy storage system containers.
- Details of the hazards for the battery energy storage system, including thermal runaway, electrical safety hazards, explosion hazards, dangerous goods hazards (including off-gassing), and the effects of fire on the battery energy storage system.
- Details of battery monitoring systems and safety systems, including battery smoke and fire detection systems, fire suppression systems, thermal detection, gas detection and pressure relief systems, cooling systems, and warning and alarm systems at the facility.
- The shut down and/or isolation procedures if the batteries are involved in fire. These instructions must also be provided at the PCE/inverters and battery energy storage system.

# 10 Neighbourhood Battery Energy Storage Systems

## *10.1 Risk Management Considerations*

Across Victoria, battery energy storage systems are being proposed in local communities to enable the power network to support more rooftop solar.

Community or neighbourhood-scale battery energy storage systems range from approximately 100kW to 5MW, and where connected to a section of the electricity distribution network operating with a nominal voltage not exceeding 66,000 volts, may be exempt from planning permit requirements in most planning zones.

CFA's Specialist Risk and Fire Safety Unit can provide expertise to support fire risk management for your specific proposal, including:

- Fire risk considerations in site selection and design.
- Fire brigade access and response requirements.
- Considerations for firefighter and community safety during emergency response.

To ensure fire risk is effectively considered within proposals, engaging with CFA as early as possible is essential.

***CFA recommends that any proposed neighbourhood battery energy storage system is subject to a comprehensive risk management process.***

CFA recommends that the installation complies with *AS/NZS 5139-2019: Electrical installations - Safety of battery systems for use with power conversion equipment*, where required. CFA recommends that risk management processes considers the following matters.

**CFA recommends that neighbourhood batteries are notified to CFA's Specialist Risk and Fire Safety Unit:**

- During the initial project development phase, prior to finalising the design.
- At least 30 days prior to commissioning.

**CFA recommends that neighbourhood batteries are sited:**

- In low risk locations.
- Only in areas where the Bushfire Management Overlay and the Land Subject to Inundation Overlay do not apply.
- In the vicinity of a fire water supply that provides coverage to the proposed neighbourhood battery (such as an on-site hydrant, fire water supply or street hydrant).
- Outside of the fall/drop zone of overhead trees and branches.
- On a non-combustible surface, such as a concrete plinth.

Where neighbourhood batteries are proposed within 50m of a dwelling, CFA recommends that a Fire Safety Study is prepared to the satisfaction of CFA. Refer **Section 3.3.5** for CFA's expectations for Fire Safety Studies.

CFA recommends that where neighbourhood batteries are located within a commercial or industrial building, the siting, emergency planning and emergency information requirements of **Section 9** must be considered.

**Neighbourhood batteries must be tested in accordance with *UL 9540A: Battery Energy Storage System (ESS) Test Method*.**

CFA recommends that neighbourhood batteries are provided with:

- Security infrastructure, such as fences, cameras.
- Protection from potential mechanical damage.
- Appropriate water ingress protection, including flood water.
- Remote monitoring to ensure that any faults and increases in temperature outside of the defined operating parameters of the manufacturer are immediately intercepted and notified to the emergency services.
- Measures to manage fire water runoff.

**CFA recommends that neighbourhood batteries are provided with prominent markings to the satisfaction of CFA, including:**

- Warning notices for the electrical and high voltage hazards as required by *AS/NZS 4777.1 - Grid connection of energy systems* and *AS 5139 - Electrical installations*.
- Contact details of the owners and specialist response personnel who can provide 24/7/365 support to emergency responders.
- Emergency procedures.

CFA recommends that fire risk controls are determined in consultation with CFA's Specialist Risk and Fire Safety Unit.

**CFA recommends that neighbourhood batteries are maintained:**

- To be clear of combustible materials at all times, such as fallen leaves, branches and rubbish.
- Through regular inspection, testing and servicing as required under legislation and by the manufacturer.
- Through periodic inspection following significant weather events and reports of damage.

# Appendix A: Guideline Checklist

## Section 2: Consultation

| ***Consulting with CFA*** | ***How do I demonstrate this?*** |
|---|---|
| Early consultation with CFA's Specialist Risk and Fire Safety Unit, before developing a planning permit application. | ☐ Provide consultation details, including dates, personnel involved and summary of discussions. |

## Section 3: Fire Risk Management

| ***Risk Management Plan*** | ***How do I demonstrate this?*** |
|---|---|
| A Risk Management Plan must be developed for the facility, in consultation with CFA, before development starts. | ☐ Provide a copy of the **Risk Management Plan**.<br>**OR**<br>Confirm that a Risk Management Plan will be developed in consultation with CFA, before development starts. |

## Section 4: Facility Location

| ***Landscape Risk to Facility*** | ***How do I demonstrate this?*** |
|---|---|
| An assessment against policy at *VPP Clause 13.02-1S (Bushfire Planning)* that considers:<br>**a)** The impact of any ignitions arising from the infrastructure on nearby communities, infrastructure and assets.<br>**b)** The impact of bushfire on the infrastructure (eg., ember attack, radiant heat impact, flame contact). | In the **Risk Management Plan**:<br>☐ Demonstrate application of the best available science to identify vegetation, topographic and climatic conditions that create a bushfire hazard to:<br>• Provide an assessment of bushfire hazard based on landscape conditions, local conditions, neighbourhood conditions, and the site for development.<br>• Provide appropriate bushfire protection measures. |
| ***Facility Risk to Landscape***<br>As assessment of the fire risk from the proposed facility to the landscape. | ☐ Provide an evidence-based assessment of the fire risk from the proposed technologies to:<br>• Identify whether the proposal will lead to an increase in risk to adjacent land.<br>• Identify how the proposal will reduce risks at the site to an acceptable level. |

## Section 4: Facility Design

| ***Emergency Vehicle Access*** | ***How do I demonstrate this?*** |
|---|---|
| **a)** Construction of a minimum four (4) metre perimeter road within the perimeter fire break.<br>**b)** Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes (eg., no compacted earth).<br>**c)** Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface. Ensure any fencing along access routes allows for width of fire trucks. | In the **Risk Management Plan**:<br>☐ Confirm provision of minimum four (4) metre perimeter road within the perimeter fire break.<br>☐ Confirm that roads will be designed to meet or exceed these requirements (B-E). |

## *Appendix A: Guideline Checklist (Continued.)*

| ***Emergency Vehicle Access (Continued)*** | ***How do I demonstrate this?***<br>In the **Risk Management Plan**: |
|---|---|
| **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.<br>**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. | ☐ Confirm that road networks will incorporate passing bays. |
| **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. | ☐ Confirm that road networks will be designed to enable emergency vehicle access to all areas of the facility. |
| **h)** The provision of at least two (2) but preferably more access points to each part of the facility. | ☐ Confirm that at least two access points will be provided into each part of the facility. |
| ***Additional Requirements for Wind Facilities***<br>The provision of access roads to, and around, each wind turbine. | ☐ Confirm the provision of access roads to, and around, each wind turbine. |
| ***Additional Requirements for Solar Facilities (>5MW)***<br>The provision of at least two access points into each non-adjoining area of the facility over 5MW (eg., a main access point and an emergency access point in each fenced area), or to the satisfaction of CFA. | ☐ Confirm that at least two access points will be provided into each non-adjoining area of facility. |
| ***Additional Requirements for Battery Energy Storage Systems***<br>The provision of at least two access points into each section where battery energy storage systems are located. | ☐ Confirm that at least two access points will be provided into each BESS section. |
| ***Firefighting Water Supply***<br>**a)** Water access points must be clearly identifiable and unobstructed to ensure efficient access.<br>**b)** Static water storage tank installations must comply with *AS 2419.1-2021: Fire hydrant installations – System design, installation and commissioning*.<br>**c)** The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel.<br>**d)** The static water storage tank(s) must be capable of being completely refilled automatically or manually within 24 hours.<br>**e)** The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure. | ☐ Confirm that fire water supplies will be designed to meet or exceed these requirements (A-N). |

## *Appendix A: Guideline Checklist (Continued.)*

| ***Firefighting Water Supply (Continued)*** | ***How do I demonstrate this?*** |
|---|---|
| **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.<br>**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.<br>**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.<br>**i)** The road access and hardstand must be kept clear at all times.<br>**j)** The hard-suction point must be protected from mechanical damage where necessary.<br>**k)** Where the access road has one entrance, an eight (8) metre radius turning circle must be provided at the tank.<br>**l)** An external water level indicator must be provided to the tank and be visible from the hardstand area.<br>**m)** Signage indicating 'FIRE WATER' and the tank capacity must be fixed to each tank.<br>**n)** Signage must be provided at each vehicle entrance to the facility, indicating the direction to the nearest static water tank(s). | In the **Risk Management Plan**:<br>☐ Confirm that fire water supplies will be designed to meet or exceed these requirements (A-N). |
| ***Additional Requirements for Wind Facilities*** | |
| **a)** Fire water storage tanks of at least 45,000L are provided at each site entrance.<br>**b)** Additional fire water storage tanks of at least 45,000L are incorporated in facility design, in consultation with CFA.<br>**c)** Nacelles are equipped with automatic fire detection, alarm, and fire suppression systems. | ☐ Confirm the provision of fire water tanks of a capacity in line with this requirement. |
| ***Additional Requirements for Solar Facilities >5MW*** | |
| **a)** The provision of fire water tanks of at least 45,000L at the primary vehicle entrance to each part of the facility.<br>**b)** The provision of additional fire water tanks of at least 45,000L effective capacity for every additional 100ha (after the initial 100ha). | ☐ Confirm the provision of fire water tanks of a capacity in line with this requirement. |
| ***Additional Requirements for Solar Facilities <5MW*** | |
| The provision of fire water tanks of at least 22,500L at the primary vehicle entrance to the facility. | ☐ Confirm the provision of fire water tanks of a capacity in line with this requirement. |

## *Appendix A: Guideline Checklist (Continued.)*

| ***Additional Requirements for Battery Energy Storage Systems - Centralised BESS*** | ***How do I demonstrate this?***<br>In the **Risk Management Plan**: |
|---|---|
| **a)** Where reticulated water is available, the provision of a fire hydrant system that meets the requirements of *AS 2419.1-2021: Fire hydrant installations*, Clause 3.9: Open Yard Protection, and Table 2.2.5(D): Number of Fire Hydrants Required to Flow Simultaneously - Open Yards. | ☐ Confirm the provision of fire hydrants to provide coverage to the battery energy storage system. |
| ***OR*** | ***OR*** |
| **b)** Where no reticulated water is available, provision of a fire water supply in static storage tanks, where:<br>**i.** The fire water supply must be of a quantity no less than 288,000L or as per the provisions for Open Yard Protection of *AS 2419.1-2021: Fire hydrant installations*, flowing for a period of no less than four hours at 20L/s, whichever is the greater.<br>**ii.** The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from *AS 2419.1-2021: Fire hydrant installations*, Table 2.2.5(D).<br>**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.<br>**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).<br>**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. (Eg., Fire water tanks are to be located closer to the site entrance that the battery energy storage system).<br>**vi.** The fire water supply must comply with *AS 2419.1-2021: Fire hydrant installations*, Section 5: Water storage tanks. | ☐ Confirm the provision of fire water tanks for the battery energy storage system of a capacity in line with this requirement. |
| ***Additional Requirements for Battery Energy Storage Systems - Decentralised BESS*** | |
| **a)** Where reticulated water is available, a fire protection system as per Model Requirement (1a) under 'Centralised Battery Energy Storage Systems'. | ☐ Confirm the provision of reticulated fire water. |
| ***OR*** | ***OR*** |
| **b)** Where no reticulated water is available, a firewater supply in static storage tanks, where a minimum 45,000L static water tank is provided within 120m of each battery container, to the satisfaction of CFA. | ☐ Confirm the provision of fire water tanks of a capacity in line with this requirement. |

## *Appendix A: Guideline Checklist (Continued.)*

| ***Fire Detection and Suppression Equipment*** | ***How do I demonstrate this?***<br>In the **Risk Management Plan**: |
|---|---|
| **a)** For on-site buildings and structures, according to the requirements of the National Construction Code.<br>**b)** For storages of dangerous goods, according to the requirements of any Australian Standards for the storage and handling of dangerous goods.<br>**c)** For electrical installations, a minimum of two suitable fire extinguishers must be provided within 3m-20m of each PCU. | ☐ Confirm the provision of required fire detection and suppression equipment for buildings, storages of dangerous goods and electrical installations. |
| **d)** In all vehicles and heavy equipment, each vehicle must carry at least a nine (9)-litre water stored-pressure fire extinguisher with a minimum rating of 3A, or other firefighting equipment as a minimum when on-site during the Fire Danger Period. | ☐ Confirm the provision of a fire extinguisher in line with this requirement in on-site vehicles and heavy equipment. |
| ***Fire Breaks***<br>The provision of fire breaks:<br>**a)** Around the perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary. *(N/A for wind energy facilities.)*<br>**b)** Around the perimeter of control rooms, electricity compounds, substations and all other buildings onsite. | ☐ Confirm that fire breaks will be provided around the perimeter of the facility, infrastructure and buildings on-site. |
| **c)** Of a width of at least 10m. | ☐ Confirm that fire breaks will be a width of at least 10m. |
| ***Additional Requirements for Wind Facilities***<br>**a)** The provision of fire breaks around the base of each wind turbine. | ☐ Confirm the provision of fire breaks around the base of each wind turbine. |
| ***Additional Requirements for Battery Energy Storage Systems***<br>**a)** The provision of a fire break around battery energy storage systems and related infrastructure. | ☐ Confirm the provision of fire breaks around the battery energy storage system and related infrastructure. |
| ***Design Specific to Facility Type***<br>***Requirements for Wind Facilities***<br>**a)** Wind turbines are located no less than 300 metres apart. | ☐ Confirm wind turbines are no less than 300 metres apart. |
| **b)** Provision of automatic shut-down, and the ability for wind turbines to be completely disconnected from the power supply in the event of fire. | ☐ Confirm provision of automatic shut-down and ability for disconnection of wind turbines. |
| **c)** Notification of installed weather monitoring stations to the Civil Aviation Safety Authority (CASA). | ☐ Confirm intention to notify CASA. |
| **d)** Marking of all guy wires and monitoring towers. | ☐ Confirm provision of markers for all guy wires and monitoring towers. |
| ***Requirements for Solar Facilities >5MW***<br>**a)** Provision of a minimum six (6) metre separation between solar panel banks. | ☐ Confirm the provision of minimum six (6) metre separation between solar panel banks. |

## *Appendix A: Guideline Checklist (Continued.)*

| ***Design Specific to Facility Type (Contined)***<br>***Requirements for Battery Energy Storage Systems*** | ***How do I demonstrate this?***<br>In the **Risk Management Plan**: |
|---|---|
| **1.** Facility design that incorporates: | |
| **a)** A separation distance that prevents fire spread between battery containers/enclosures and other site elements. | ☐ Specify and justify the separation distance between battery containers and other infrastructure is sufficient to prevent fire spread. |
| **b)** A fire break around the battery energy storage system and related infrastructure, of a width of no less than 10m. | ☐ Confirm the provision, and specify the width, of a fire break around the battery energy storage system and related infrastructure. |
| **c)** A layout of site infrastructure that:<br>**i.** Considers the safety of emergency responders.<br>**ii.** Minimises the potential for grassfire and/or bushfire to impact the battery energy storage system.<br>**iii.** Minimises the potential for fires in battery containers/enclosures to impact on-site and offsite infrastructure. | ☐ Specify how the site layout has been designed to meet or exceed these requirements. |
| **2.** Battery energy storage systems must be: | |
| **a)** Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles). | ☐ Confirm the location of the battery energy storage system is adjacent to a site vehicle entrance. |
| **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.) | ☐ Confirm that any smoke/vapour cloud from the battery energy storage system is unlikely to impact the site entrance and access to the fire water supply. |
| **c)** Provided with in-built fire and gas detection systems. | ☐ Specify the in-built fire detection and suppression systems to be provided. |
| **d)** Provided with explosion prevention via sensing and venting, or explosion mitigation through deflagration panels. | ☐ Confirm provision of explosion prevention via sensing and venting, or explosion mitigation through deflagration panels. |
| **e)** Provided with suitable ember protection. | ☐ Confirm provision of suitable ember protection. |
| **f)** Provided with suitable access roads for emergency services vehicles. | ☐ Confirm provision of suitable access roads to battery energy storage systems. |
| **g)** Installed on a non-combustible surfaces. | ☐ Confirm installation of battery energy storage systems on non-combustible surfaces. |
| **h)** Provided with suitable ventilation. | ☐ Confirm provision of suitable ventilation. |
| **i)** Provided with suitable impact protection. | ☐ Confirm provision of suitable impact protection. |
| **j)** Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection. | ☐ Confirm provision of enclosed wiring and buried cabling. |
| **k)** Provided with spill containment that includes provision for management of fire water runoff. | ☐ Confirm provision of suitable spill containment that includes provision for management of fire water runoff. |

*Appendix A: Guideline Checklist (Continued.)*

## Section 5: Facility Construction and Commissioning

| | ***How do I demonstrate this?*** |
|---|---|
| ***Emergency Plan***<br>An Emergency Plan must be developed for the construction and commissioning phase of the facility. | ☐ Provide a copy of the construction and commissioning **Emergency Plan**.<br>**OR**<br>Confirm the development of a construction and commissioning Emergency Plan in consultation with CFA. |

## Section 6: Facility Operation

| | ***How do I demonstrate this?*** |
|---|---|
| ***Fire Management Plan***<br>A Fire Management Plan must be developed for the facility, in consultation with CFA, before development starts. | ☐ Provide a copy of the **Fire Management Plan**.<br>**OR**<br>Confirm that a Fire Management Plan will be developed in consultation with CFA, before development starts. |
| ***Bushfire and Grassfire***<br>If your facility is at-risk of bushfire, prevention and preparedness activities must be detailed in the Fire Management Plan. | ☐ In the Fire Management Plan, specify bushfire prevention and preparedness. |
| ***Vegetation Management***<br>Facility operators must undertake the following measures during the Fire Danger Period:<br>**a)** Grass must be maintained at or below 100mm in height during the declared Fire Danger Period.<br>**b)** Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation.<br>**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). | ☐ In the Fire Management Plan, specify that vegetation will be managed in line with these provisions. |
| ***Arc Flash Hazard Management***<br>Where required, appropriate demarcation of arc boundaries to at least 10m from PCU arc flash outlet flaps (blow-out panels) must be provided. | ☐ In the Fire Management Plan, confirm the management of arc flash hazards. |
| ***Facility and System Monitoring***<br>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. | ☐ In the Fire Management Plan, confirm the provision of appropriate monitoring for facility infrastructure. |
| ***Maintenance***<br>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. | ☐ In the Fire Management Plan, confirm the provision of appropriate monitoring for facility infrastructure. |

*Appendix A: Guideline Checklist (Continued.)*

## Section 7: Emergency Planning

| | |
|---|---|
| ***Emergency Plan (Operational)***<br>An Emergency Plan must be developed for the operational phase, specific to the facility, in consultation with CFA, before development starts. | ***How do I demonstrate this?***<br>☐ Provide a copy of the **Emergency Plan** for the operational phase of the facility.<br>**OR**<br>Confirm the development of an operational Emergency Plan in consultation with CFA. |

## Section 8. Provision of Emergency Information

| | |
|---|---|
| ***Developing an Emergency Information Book***<br>An Emergency Information Book must be developed and available to emergency responders. Emergency Information Books must be located in Emergency Information Containers, provided at each vehicle entrance the facility. | ***How do I demonstrate this?***<br>☐ Confirm the development of an **Emergency Information Book**.<br>☐ Confirm the provision of Emergency Information Containers at each vehicle entrance to facilities. |

# Appendix B: Emergency Response Considerations for Large-Scale Battery Energy Storage Systems

Emergency Plans must contain information on the behaviour of battery energy storage systems during emergencies to enable safe and effective response by site personnel and emergency services.

CFA recommends addressing the following questions within Emergency Plans and Emergency Information Books.

System information and emergency response procedures should be discussed with local CFA brigades during site familiarisation visits.

## *B1 Status of the Equipment*

- **What are the warning systems** at or associated with the BESS (lights, alarms, codes)? What are the triggers for the activation of each warning system?
- **What is the severity of each alarm**? How quickly must action be taken? (Eg., Immediately, within a day, within a week, etc.)

**Any detection of critical faults must trigger the immediate shut-down of the battery until a suitably qualified person has checked it.**

- **What happens at each alarm level**? What systems are automatically activated or deactivated within the BESS, and at what time intervals?
- **What systems are connected to the BESS**? How must these systems be considered during emergency response? (Eg., PV installations.)
- **How does power outage** affect these systems?

## *B2 Notifications*

- **What are the contact details** for off-site personnel who can provide technical support during emergencies? Who can emergency services seek advice from about safe actions to take?
- **Who is notified** at each alarm stage?
- **What actions can be taken** by those notified to prevent escalation? Remotely and on-site? What are the success and failure criteria for these actions?
- **When are emergency services notified?** What triggers this notification? Are notifications automatic? Who is responsible for making/verifying notifications?

## *B3 Activation of Fire Safety Systems*

- **Where are the E-Stops?** If present, only activate if safe to do so.
- **What are the triggers for the activation** of the fire safety systems? Are they automatic, manual or both? Can manual systems be remotely activated?
- **How can emergency responders understand** what is happening with the BESS and fire safety systems?

## *B4 Arrival of Emergency Services*

- **How are actions taken remotely communicated to responders?** How do responders know which systems have been shut down or activated remotely?
- **Where is the affected BESS enclosure/container/cabinet**? How will this be communicated to emergency responders?
- **What are the hazards to emergency responders** from any activated fire safety systems? What measures are in place to ensure their safety?
- **Where are the system shut-downs**/isolation points/switchboards on-site? Use labelled site plans, diagrams and aerial imagery to show all relevant locations. What are the hazards after shut-down?
- **What is the shut-down/isolation procedure**? Use labelled diagrams and photos of the actual BESS containers, components, display panels and boards.

**Isolation procedures must clearly state that the product is not de-energised after isolation.**

## *B5 Supporting Response Activities*

**Where safe to do so:**

- **Provide information** on the incident, site layout, infrastructure and its hazards.
- **Ensure clear access** into the site and to fire protection equipment for fire trucks and personnel.
- **Account for persons on-site** and evacuate non-required personnel from the site.
- **Provide on-site monitoring equipment** (TICs, gas detectors, etc.) that may assist with emergency response.

## *B6 Site Handover, Ongoing Monitoring and Equipment Disposal*

- **How will affected BESS containers be monitored** for delayed thermal runaway and fire?
- **How will affected equipment be removed** and disposed of? Where will it be removed to?

# Appendix C: Document Relationship Map

***Risk Management Plan***

***AS ISO 31000***

***Fire Safety Study***

***International Standards***

***Describes the risk management process and its outcomes, including the specific site hazards/risks and their analysis, control measures, and the monitoring and review process.***

***The Risk Management Plan informs the Emergency Plan and Fire Management Plan.***

***Emergency Plan***

***AS 3745***

***Fire Management Plan***

***Describes the arrangements for managing emergencies, including facility details, structures, procedures, resources and training.***

***Based on AS 3745-2010: Planning for Emergencies in Facilities.***

***The Emergency Plan is informed by the Risk Management Plan, incorporating response structures, procedures and resources for all credible emergency scenarios based on identified risks and hazards, including fire.***

***The Emergency Plan may incorporate the risks and their controls from the Fire Management Plan.***

***Describes the activities, processes and accountabilities for the ongoing management of fire risk at the facility.***

***The Fire Management Plan may be stand-alone or integrated into the Emergency Plan.***

# Appendix D: References and Resources

## CFA Resources

***This guideline is on CFA's website at:***
***Renewable Energy Fire Safety***

CFA will periodically place clarifying or complementary information on this page between revisions of this guideline. Please refer to this page when applying this guideline.

Other relevant information from the CFA website (current at the time of publishing):

- About Warnings
- Am I at Risk?
- Bushfire Safety for Workers
- Can I or Can't I?
- Electric Line Fire Hazard Ratings
- Fire Danger Period Restrictions
- Fire Permits
- Landscaping for Bushfire
- Planning and the Bushfire Management Overlay
- Plant Selection Key
- Staying Safe When You Travel
- Total Fire Bans and Ratings

Country Fire Authority 2019, Guideline for the Provision of Emergency Information - 2019 Update, Burwood, Victoria.

## Victorian Government Resources

Agriculture Victoria, Emergency Management - Bushfires *(Accessed June 2023)*.

Emergency Management Victoria, Bushfire Shelter Options (Accessed June 2023).

Energy Safe Victoria 2023, Arc Flash Hazard Management, ESV, Melbourne.

Energy Safe Victoria 2023, Safety Standards for High Voltage and Complex electrical installations, ESV, Melbourne.

Environment Protection Authority (Victoria) 2018, 1698: Liquid storage and handling guidelines, EPA, Melbourne.

Victorian Department of Energy, Environment and Climate Action (DEECA), Neighbourhood batteries *(Accessed July 2023)*.

Victorian Department of Transport and Planning, Bushfire (Accessed June 2023).

Victorian Department of Transport and Planning, Building in bushfire prone areas *(Accessed July 2023)*.

Victorian Department of Transport and Planning, Building in the bushfire management overlay *(Accessed July 2023)*.

Victorian Department of Transport and Planning 2021, Community Engagement and Benefit Sharing in Renewable Energy Developments, Victorian Government, Melbourne.

Victorian Department of Transport and Planning 2021, Development of Wind Energy Facilities in Victoria - Policy and Planning Guidelines, Victorian Government, Melbourne.

Victorian Department of Transport and Planning 2022, Solar Energy Facilities – Design and Development Guidelines, Victorian Government, Melbourne.

Victorian Department of Transport and Planning 2023, Victoria Planning Provisions.

Victorian Department of Transport and Planning, Victoria Planning Provisions Clause 13.02-1S: Bushfire Planning (*Accessed June 2023*).

Victorian Department of Transport and Planning, Victoria Planning Provisions Clause 53.02: Bushfire Planning (*Accessed June 2023*).

## Relevant Legislation

Designers and operators of renewable energy facilities are subject to various legislative frameworks and instruments. *For acts and statutory rules currently in force for the below, refer to Victorian Legislation.*

Building Act 1993
Building Regulations 2018
Dangerous Goods Act 1985
Dangerous Goods (Storage and Handling) Regulations 2022
Electricity Safety Act 1998
Electricity Safety (Bushfire Mitigation) Regulations 2023
Electricity Safety (Electric Line Clearance) Regulations 2020
Electricity Safety (Equipment Safety Scheme) Regulations 2019
Electricity Safety (General) Regulations 2019
Occupational Health and Safety Act 2004
Occupational Health and Safety Regulations 2017
Planning and Environment Act 1987
Planning and Environment Regulations 2015

## *Australian Resources*

Australasian Fire and Emergency Service Authorities Council 2022, Operational Response and Lithium Ion Batteries (Video), Presentation by Prof. Paul Christensen (*Accessed July 2023*).

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

Civil Aviation Safety Authority 2022, Advisory Circular AC 139.E-05 v1.1, Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome.

CSIRO, Assessing Bushfire Hazards (*Accessed July 2023*).

NSW Government and Fire and Rescue NSW 2023, Technical Information - Large-scale external lithium-ion battery energy storage systems - Fire safety study considerations, FRNSW.

NSW Planning 2011, NSW Planning's Hazardous Industry Planning Advisory Paper 2: Fire Safety Study Guidelines (2011).

Safe Work Australia 2012, Fact Sheet - Emergency Plans and Procedures.

## *International Guidance and Standards*

CFPA Europe, Wind Turbines Fire Protection Guideline (CFPA-E No. 22:2022 F), March 2022.

FM Global 2020, Property Loss Prevention Data Sheet 5-33: Electrical Energy Storage Systems, FM Global.

Prof. Paul Christensen, Lithium Ion Safety (*Accessed July 2023)*.

National Fire Protection Association (NFPA) 2023, NFPA 855: Standard for the Installation of Stationary Energy Storage Systems, NFPA.

UK National Fire Chiefs Council 2022, Grid Scale Battery Energy Storage System planning – Guidance for Fire and Rescue Services, Version 1, UK NFCC.

UL, Energy Storage Systems and Equipment (2023), UL 9540.

UL, Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (2019), UL 9540A.

## *Australian Standards*

Standards Australia 2023, AS/IEC 62619-2023: Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications, Sydney NSW, Standards Australia.

Standards Australia 2023, AS 3780-2023: The storage and handling of corrosive substances, Sydney NSW, Standards Australia.

Standards Australia 2021, AS 2419.1-2021: Fire hydrant installations – System design, installation and commissioning, Sydney NSW, Standards Australia.

Standards Australia 2019, AS/NZS 5139-2019: Electrical installations – Safety of battery systems for use with power conversion equipment, Sydney NSW, Standards Australia. *(For systems 200kW or less.)*

Standards Australia 2018, AS 3959-2018: Construction of buildings in bushfire prone areas, Sydney NSW, Standards Australia.

Standards Australia 2018, AS ISO 31000-2018: Risk Management – Guidelines, Sydney NSW, Standards Australia.

Standards Australia 2017, AS 1940-2017: The storage and handling of flammable and combustible liquids, Sydney NSW, Standards Australia.

Standards Australia 2013, SA/SNZ HB 89: Risk management - Guidelines on risk assessment techniques, Sydney NSW, Standards Australia.

Standards Australia 2010, AS 3745-2010: Planning for emergencies in facilities, Sydney NSW, Standards Australia.

Standards Australia 2000, AS 4681-2000: The storage and handling of class 9 dangerous goods, Sydney NSW, Standards Australia.

**CFA Design Guidelines and Model Requirements for Renewable Energy Facilities v4.2, 7/2/2024**

# 10

# DEVELOPMENT ASSESSMENT REPORT

# Development Assessment Report

## Yadnarie Renewable Energy Facility

225 Broadview Road, 4543 Birdseye Highway and Lot 28 Pine Corner Road, Cleve, South Australia

October 2024

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# Development Assessment Report

## Yadnarie Renewable Energy Facility

225 Broadview Road,
4543 Birdseye Highway and
Lot 28 Pine Corner Road,
Cleve, South Australia
October 2024

| Version | Date | Detail | Prepared | Review |
|---|---|---|---|---|
| Draft | 20 Aug 2024 | 52274REP05 - Development Assessment Report | Julie Jansen | Photon Energy and RayGen |
| Draft | 18 Sept 2024 | 52274REP05RevA | Julie Jansen | |
| Draft | 24 Sept 2024 | Minor Amendments | Julie Jansen | |
| Draft | 8 Oct 2024 | Minor corrections | Julie Jansen | Photon Energy and RayGen |
| Final | 24 Oct 2024 | | Julie Jansen | |
| Final | 28 Oct 2024 | | Julie Jansen | |

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## Executive Summary

Photon Energy NV (Photon Energy), a global project developer, has developed a strategic partnership with RayGen Resources Pty Ltd (RayGen), with the objective of developing global renewable energy projects suitable for the roll-out of RayGen's unique solar power and electricity storage technology.

Photon Energy propose to utilise RayGen's technology for generation of solar power and energy storage at Yadnarie, west of Cleve on the Eyre Peninsula. The technology proposed and duration of electricity storage is new to the South Australian renewable energy sector and comprises RayGen's proprietary PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) technologies.

The development proposed by Photon Energy is a facility with 150MW of solar generation, 90MW grid connection and at least 720 Megawatt hours of storage ( 8 hours of dispatchable energy). Electricity will be supplied to the national electricity grid via a 90MW connection to the existing Yadnarie substation (opposite the subject land) or the existing 132kV transmission line.

Photon Energy has sought and obtained crown sponsorship of the project from the Department for Energy and Mining, for the development to occur as essential infrastructure pursuant to Section 131 of the *Planning, Development and Infrastructure Act, 2016*.

The site of the proposed development is located within the Rural Zone, in which renewable energy facilities are expressly envisaged. An assessment of the merits of the proposed development has been undertaken against the relevant provisions of the Planning and Design Code. The proposed renewable energy project adequately and appropriately addresses potential impacts, particularly those associated with noise, visual amenity, protection of flora and fauna, interface between land uses, European and Aboriginal heritage, bushfire, aviation and traffic movements in a manner sought by the relevant policies of the Planning and Design Code.

On balance, the proposal is a suitable form of development within the Rural Zone and appropriately addresses potential impacts and thereby warrants the granting of development authorisation.

A summary of the project is contained in **Table 1**.

**Table 1: Project Overview**

| Project Overview | |
|---|---|
| **Applicant** | Photon Energy AUS SPV 4 Pty Ltd (ACN 615 353 314) |
| **Proposed Development** | A solar power and energy storage renewable energy facility, incorporating 150MW solar generation and 90MW ORC generation with at least 720 MW hours of storage ( 8 hours of dispatchable energy), with a 90MW grid connection to the Yadnarie substation or 132kV overhead transmission line, and ancillary infrastructure.<br>Constructed in stages:<br>Stage 1: (50MW solar and 30MW ORCp): Q3 2025 – Q3 2027<br>Stage 2: (additional 100MW solar and 60MW ORCp): Q4 2027 – Q4 2029 |
| **Property Location** | Street address: 225 Broadview Road, 4543 Birdseye Highway and Lot 28 Pine Corner Road, Cleve, SA 5640<br>• Section 39, Hundred of Yadnarie, in the area named Cleve in Certificate of Title Volume 6205 Folio 513;<br>• Section 44 Hundred of Yadnarie in the area named Rudall and Sections 46, 55, 56, 394 and 395 Hundred of Yadnarie in the area named Cleve, in Certificate of Title Volume 5940 Folio 707; and<br>• Section 28, Hundred of Yadnarie, in the area named Cleve, in Certificate of Title Volume 6274 Folio 890<br>Subject land is shown on the Site Plan (**Attachment A**) |
| **Valuation Numbers.** | Valuation No: 9261687008<br>Valuation No: 9261691007<br>Valuation No: 9261683007 |
| **Land Type** | Freehold |
| **Local Government Area** | District Council of Cleve |
| **Subject Land - Area** | 1,530 hectares (approximately) |
| **Zoning** | Rural Zone, Planning and Design Code<br>(version 2024.9 dated 23 May 2024) |
| **Land Use** | Primary production – livestock grazing and cropping |
| **Estimated Capital Expenditure** | Approximately $750 million |

# 1 Introduction

MasterPlan SA Pty Ltd was engaged by Photon Energy to undertake an assessment of the proposed renewable energy facility (the project) against the provisions of the Planning and Design Code. This report provides an assessment against the relevant provisions of the Planning and Design Code.

## 1.1 Document Review

In preparing this report, all relevant investigations have been undertaken including:

- review of relevant legislation, including the *Planning, Development and Infrastructure Act, 2016*;
- review of the provisions of the Planning and Design Code (version 2024.9 dated 23 May 2024);
- Review of Volume 1 - Project Summary of the development application documents
- Review the technical assessment reports as contained in Volume 2 - Technical Reports in the development application documentation, as listed below:
  - Ecological Assessment report by EBS Ecology (EBS)
  - Native Vegetation Data Report by EBS Ecology (EBS)
  - EPBC Self Assessment report by EBS Ecology (EBS)
  - Landscape Character and Probable Visual Effect Assessment by Wax Design and Dr Brett Grimm
  - Environmental Noise Assessment by Resonate
  - Aviation Assessment by Aviation Projects
  - Traffic Impact Assessment by MFY
  - Heritage Assessment summary by Independent Heritage Consultants
  - Bushfire Protection Assessment Report by AJL Solutions
- Review of Volume 3 - Drawings, Maps and Figures comprising the plans and figures which describe the development visually, including plans of the project by Worley, Greenway Architects and Action Steel.
- Review of the Draft Construction Environmental Management Plan contained in Volume 4 of the development application documentations.

In addition to reviewing the abovementioned plans and reports, a site and locality inspection has been undertaken, as well as a site inspection of the RayGen commercial demonstration facility at Carwarp, near Mildura in Victoria.

## 1.2 Crown Development

In accordance with Section 131(2)(c) of the *Planning, Development and Infrastructure Act 2016* (the PDI Act), Photon Energy are proposing to develop electricity infrastructure, with the electricity proposed to be generated by RayGen's proprietary PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) technologies, to be distributed to the national grid.

The South Australian Department for Energy and Mining (state agency) has endorsed the proposed development for the purposes of Section 131 of the PDI Act.

In accordance with the definition of "essential infrastructure" in Section 3(1) of the PDI Act, Photon Energy are providing electricity infrastructure, as identified in part (a):

> *essential infrastructure means-*
>
> *infrastructure, equipment, structures, works and other facilities used in or in connection with -*
>
> *(i) the generation of electricity or other forms of energy; or*
> *(ii) the distribution or supply of electricity, gas or other forms of energy; and ...*

Consistent with the requirements of Schedule 6 of the *Planning, Development and Infrastructure (General) Regulations 2017*, a certificate from the Office of the Technical Regulator must be obtained and accompany a development application for electricity generation exceeding 5MW that is connected to the State's electricity system. The energy storage system of the project will have the capability to meet the Office of the Technical Regulator (OTR) technical requirements and a certificate has been obtained (and included in the development application documentation – Volume 1 – Project Summary).

### 1.3 Time in Which to Commence and Complete the Development

As part of this development application, Photon Energy seeks a period of two years in which to substantially commence the proposed development from the operative date and substantial completion five years from the operative date of the development authorisation.

- Photon Energy intends to undertake the development in the following stages:Stage 1: (50MWp): Q3 2025 - Q3 2027
- Stage 2: (additional 100MWp): Q4 2027 - Q4 2029

Photon Energy intends to commence construction of the project in the third quarter of 2025 and within two years of obtaining development authorisation. It is anticipated that construction of Stage 1 would take approximately 18 months to two years, with Stage 2 following and overall project completed by the end of 2029.

**Table 2: Outlines the likely timetable for construction and operation of the project.**

| Table 2: Project Timing | |
|---|---|
| **Phase** | **Duration** |
| Pre-construction, project planning, community engagement and development authorisation | 3 years (end 2nd Quarter 2025) |
| Financial Close | 3rd Quarter 2025 |
| Construction | Stage 1: 18 months (between 3rd Quarter 2025 and 2nd Quarter 2027)<br>Stage 2: 18 months – two years (between 4th Quarter 2027 and Quarter 4 2029) |
| Commissioning | Stage 1: 3rd Quarter 2027<br>Stage 2: 4th Quarter 2029 |
| Operation | 30 years |
| Maintenance | Ongoing |
| Decommissioning or replacement | At completion of project life |

## 2 Description of the Proposed Development

Volume 1 – Project Summary of the development application documents in conjunction with Volume 3 – Drawings, Maps and Figures provide a detailed description of the development.

The RayGen technology to be deployed in this project includes three proven technologies (shown illustratively in Figure 1 and described by RayGen):

1. Solar Generation – PV Ultra: PV Ultra generates electricity and heated water from solar modules, operating at power density at 4,000 times higher than traditional solar panels.

2. Storage – Pit Thermal Energy Storage: A hot reservoir is heated by the PV Ultra and thermal hydro system. The cold reservoir is cooled with an electric chiller, using electricity from PV Ultra or the grid.

3. Heat to power - Organic Rankine Cycle (ORC): the stored temperature difference is used to generate electricity using an Organic Rankin Cycle engine, optimised to operate as a thermal turbine below $100^0$C.

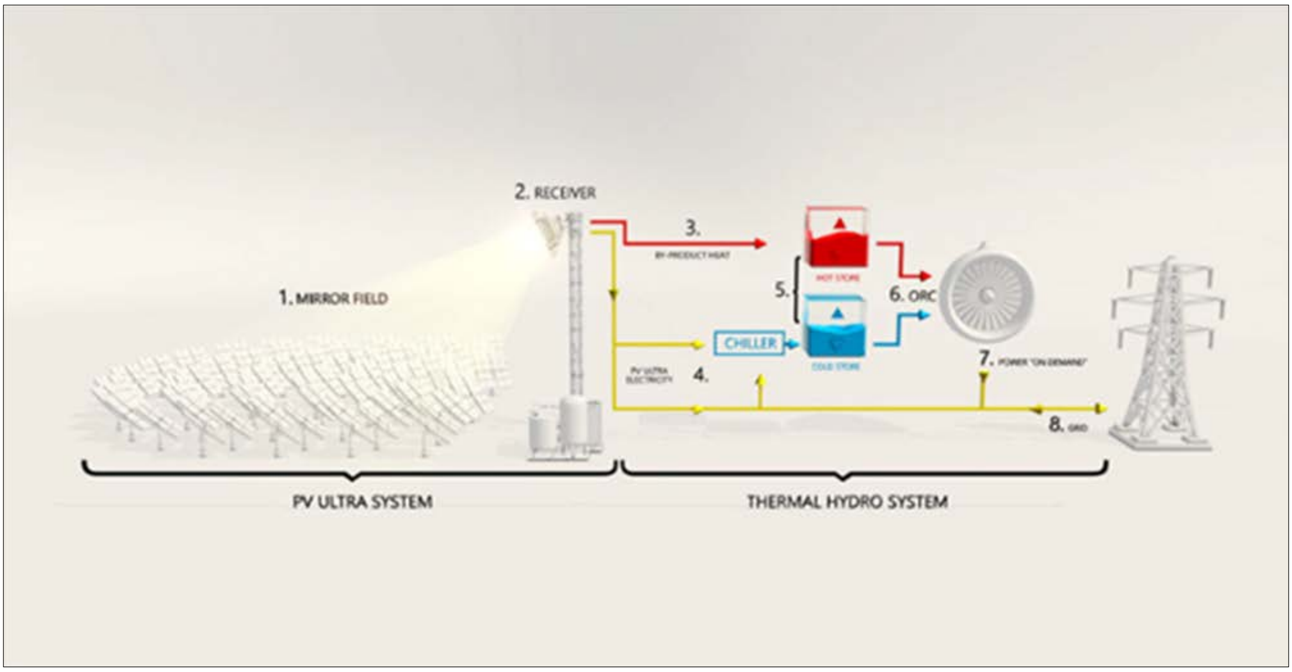


**Figure 1: RayGen technology incorporating PV Ultra, Thermal Hydro System and connection to the electricity grid. (Source: RayGen)**

The elements to be developed as part of the project include:

- Site area that is significantly less than the size of the subject land (of approximately 1530 hectares), taking account of the natural land features, infrastructure setbacks and retention of vegetation.
- Demolition of existing dwellings and structures.

- 150 fields of rotational mirrors (heliostats) orientated north. Each field comprises 273 individual heliostats. Each heliostat is approximately between 2.6 and 5.6 metres above the ground and mounted on a steel post. Heliostat heights will vary throughout the day as they track the sun. Each field has one receiver mounted on a tower 45 metres high. The receiver faces the field of mirrors in a southward direction. Each receiver has electrical switchgear and water pumping infrastructure at the base of its tower. For every two fields, there is one inverter for a total of 75 inverters. It is a 6m (20ft) container shipping container sized electrical device that converts DC power from the receivers to AC power ready for the grid.
- Three (3) thermal hydro pits units comprising:
  - 3 cold pits. Each pit/tank up to 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
  - 3 hot pits. Each pit/tank up to 28,000 square metres with a height above ground level of 3.0 metres and up to 230,000 cubic metres capacity.
  - Associated excavation, lining and covering of pits.

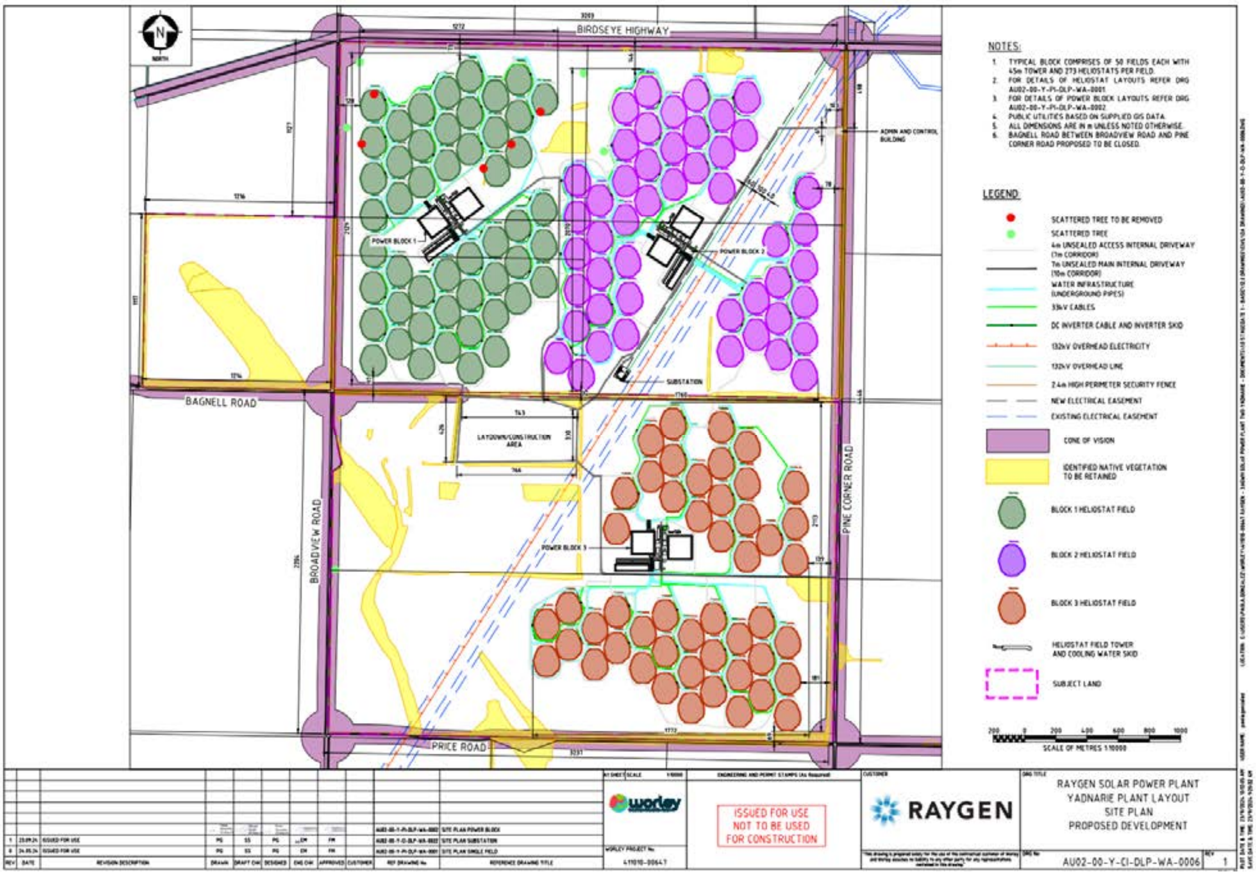
- Three (3) Thermal Hydro plants, each comprising:
  - An Organic Rankine Cycle (ORC) engine and generator, with net capacity of 30MW
  - Heat Exchangers
  - Tanks
  - Various pumps
  - Large Chiller and Heat Pump units
  - Connecting pipework
  - Associated buildings.

- Three (3) waste heat pits, each comprising up to 10,000 square metres with a height above ground of 3.0 metres and a capacity up to 75,000 cubic metres.
- Underground electrical cable reticulation on site.
- Underground water reticulation.
- Switch yard/substation and connection via overhead transmission connection to the Yadnarie substation or existing 132kV transmission line.
- Emergency venting of ammonia systems, elevated for personnel safety.
- Ammonia handling and disposal systems to support maintenance of the process equipment and pipework.
- Water treatment system with filtrate water stream potentially suitable for alternative uses.
- Administration building, car parking, workshop and amenities
- Operations, maintenance building and compound.
- Security fencing around the site.
- Internal access driveways.
- Areas of landscape screening and revegetation.

RayGen's solar-plus-storage technology has been developed in a commercial demonstration facility at Carwarp, near Mildura in Victoria and is illustrated in the photograph below.

**Figure 2: RayGen commercial demonstration facility Carwarp, Victoria – Source photograph RayGen**

The layout of the proposed facility at Yadnarie is illustrated in the site layout plan **below**.



NOTES:

1. TYPICAL BLOCK COMPRISES OF 50 FIELDS EACH WITH 45m TOWER AND 273 HELIOSTATS PER FIELD.
2. FOR DETAILS OF HELIOSTAT LAYOUTS REFER DRG AU02-00-Y-PI-DLP-WA-0001
3. FOR DETAILS OF POWER BLOCK LAYOUTS REFER DRG AU02-00-Y-PI-DLP-WA-0002
4. PUBLIC UTILITIES BASED ON SUPPLIED GIS DATA.
5. ALL DIMENSIONS ARE IN m UNLESS NOTED OTHERWISE.
6. BAGNELL ROAD BETWEEN BROADVIEW ROAD AND PINE CORNER ROAD PROPOSED TO BE CLOSED.

**Figure 3: Site Plan of Proposed Development by Worley.**

# 3 Site and Locality Description

## 3.1 Subject Land

The subject land is located to the south of Birdseye Highway, between Cleve and Rudall and within the District Council of Cleve local government area.  Currently the land contains two dwellings and several agricultural buildings with the principal land use being cropping.

As described in the Executive Summary, the subject land is approximately 1,530 hectares and comprises:

- Section 39, Hundred of Yadnarie, in the area named Cleve in Certificate of Title Volume 6205 Folio 513.
- Section 44 Hundred of Yadnarie in the area named Rudall and Sections 46, 55, 56, 394 and 395 Hundred of Yadnarie in the area named Cleve, in Certificate of Title Volume 5940 Folio 707.
- Section 28, Hundred of Yadnarie, in the area named Cleve, in Certificate of Title Volume 6274 Folio 890.

Each of these Certificates of Titles are subject to easements for electricity infrastructure. The Eyre Peninsula Link is a new double-circuit 132kV transmission line between Cultana and Port Lincoln via Yadnarie incorporating electricity transmission towers of approximately 65 metres in height. The newly constructed transmission line (by Electranet) is illustrated in the photograph **below**.

**Figure 4: Transmission line with towers evident across the subject land and beyond (including Yadnarie substation). Photograph from the principal driveway to 4543 Birdesye Highway, looking in a north easterly direction.**

As illustrated in the Site Plan of the proposed development by Worley (in **Figure 3** above) the infrastructure associated with the proposed renewable energy facility does not incorporate all of the subject land.  There are large areas of the subject land, including the area to the south west and Section 44 (west of Broadview Road) which do not comprise infrastructure.  It is estimated that the infrastructure is located across approximately 810 hectares of the subject land.

Further description of the subject land is contained within the Volume 1 – Project Summary report. Similarly, that report provides a detailed description of the locality.

## 3.2 Locality

Detailed landscape and environmental assessments of the locality have been undertaken by WAX Design and EBS Ecology, and these reports form part of Volume 2 of the application documents. The landform of the area is defined by numerous ridgelines and inland dunes that run north-west south-east. The development is located within a modified landscape which contains the following elements:

- Open agricultural landscape dominated by cropped paddocks.
- Scattered areas of native vegetation, generally along road verges and creek lines.
- Farm buildings including dwellings and other structures.
- A range of arterial and local roads.
- Infrastructure electricity distribution/transmission lines.

In general terms, the area in which the development is proposed is one of a pleasant open rural character, comprising a variety of natural and man-made features, although highly modified by agricultural activities which has over time resulted in clearance of native vegetation.

# 4 Planning and Design Code Assessment

## 4.1 Nature of the Proposed Use

Part 7 of the Planning and Design Code defines a renewable energy facility as:

> *Renewable Energy Facility: Means land and/or water used to generate electricity from a renewable source such as wind, solar, tidal, hydropower, biomass and/or geothermal.*
>
> *This use may also include:*
>
> *(a) any associated facility for the storage and/or transmission of the generated electricity;*
> *(b) any building or structure used in connection with the generation of electricity.*

Within the Rural Zone, a renewable energy facility is not an 'accepted' or 'deemed-to-satisfy', form of development. Renewable energy facilities are a 'restricted' form of development within the Rural Zone should either a Significant Landscape Protection Overlay or a Character Preservation Overlay apply to the subject land. Neither of these overlays apply to the subject land. Development of a renewable energy facility on the subject land within the Rural Zone is a 'performance based' form of development when assessed against the Planning and Design Code.

Table 3 - Applicable Policies for Performance Assessed Development of the Rural Zone do not specify policies applicable to development of a renewable energy facility, rather the development defaults to "*All other Code Assessed Development*", where all relevant policies of the Planning and Design Code are applicable.

In accordance with *"Part 9.1 Referral Body: Environment Protection Authority"* of the Planning and Design Code, *"energy generation and storage facilities"* is an activity of environmental significance which requires referral to the Environment Protection Authority (EPA). More specifically, *"development involving an electricity generating plant (other than a battery storage facility or pumped hydroelectricity production works) using any other energy source (excluding fuel burning and solar photovoltaic) with a capacity to generate or store 30 megawatts (MW) or more"*, requires referral to the EPA. The proposed development proposes to generate 150MW solar and subsequently requires referral to the EPA as part of the application process.

## 4.2 Planning and Design Code Policy

The subject land is located within the Rural Zone of the Planning and Design Code (version 2024.9 dated 23 May 2024[1]). A search of the Planning and Design Code notes the following Zone, Overlays and Technical and Numerical Variations apply to the subject land.

---

[1] Planning and Design Code applicable at the date of lodgment of the development application.

**Table 3: Applicable Zone and Overlays for Subject Land**

| Applicable Zone or Overlay | Subject Land | | |
|---|---|---|---|
| | 4543 Birdseye Hwy –S44, 46, 55, 56, 394 and 395 | 225 Broadview Rd – S39 | Lot 28 Pine Corner Rd – S28 |
| Zone: Rural | x | x | x |
| Dwelling Excision Overlay | x | x | x |
| Hazards (Bushfire – Regional) Overlay | x | x | x |
| Hazards (Flooding – Evidence Required) Overlay | x | x | x |
| Key Outback and Rural Routes Overlay | x | | |
| Native Vegetation Overlay | x | x | x |
| Water Resources Overlay | x | x | x |

The subject land is located within the Rural Zone, as illustrated in **Figure 5** below.

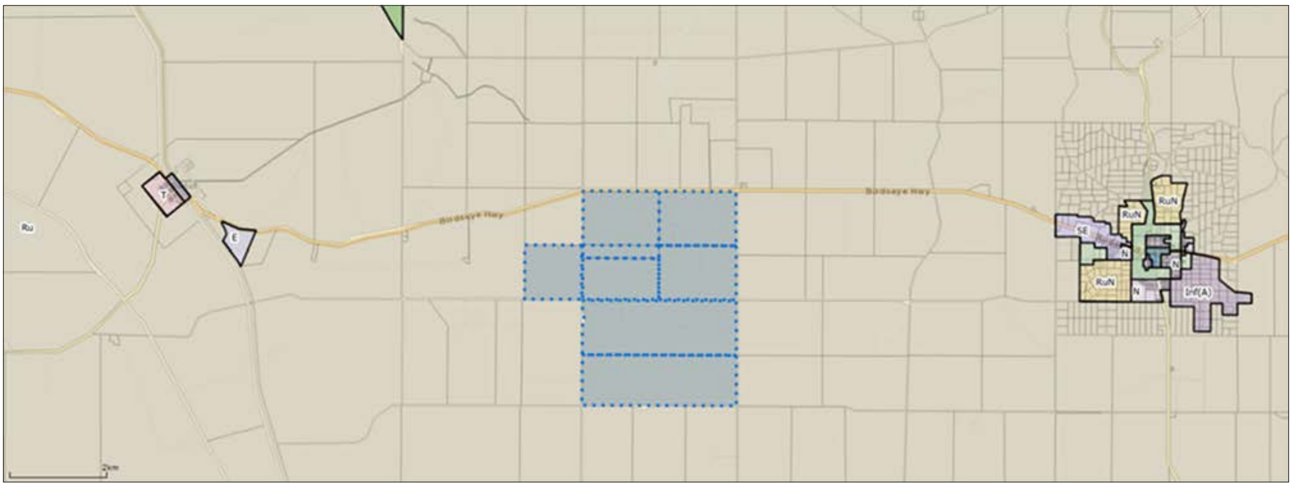


**Figure 5: Extract from the SA Property and Planning Atlas (SAPPA) illustrating subject land (blue outline) within the Rural Zone and located between the townships of Cleve (east) and Rudall (west).**

### 4.2.1 Overlays

As illustrated in **Table 3**, there are several Overlays that apply to various properties within the subject land. However, not all Overlays apply to all properties which form the site of the development. Furthermore, the relevant authority may determine that one or more of the Overlays or the policies of the Overlays is not relevant.

It is further noted that in interpreting the Planning and Design Code, that if there is an inconsistency between provisions in the relevant policies for a particular development, the provisions of an overlay will prevail over all other policies applying in the particular case.

### *4.2.1.1 Key Outback and Rural Routes Overlay*

The Key Outback and Rural Routes Overlay is the only Overlay which does not apply over the entirety of the subject land. This Overlay aims to ensure safe and efficient vehicle movement and access is provided along key outback and rural routes. Subsequently, the Overlay only applies to Section 55 and 56 which are adjacent the Birdseye Highway. The spatial application of the Key Outback and Rural Routes Overlay is shown in **Figure 6** below.

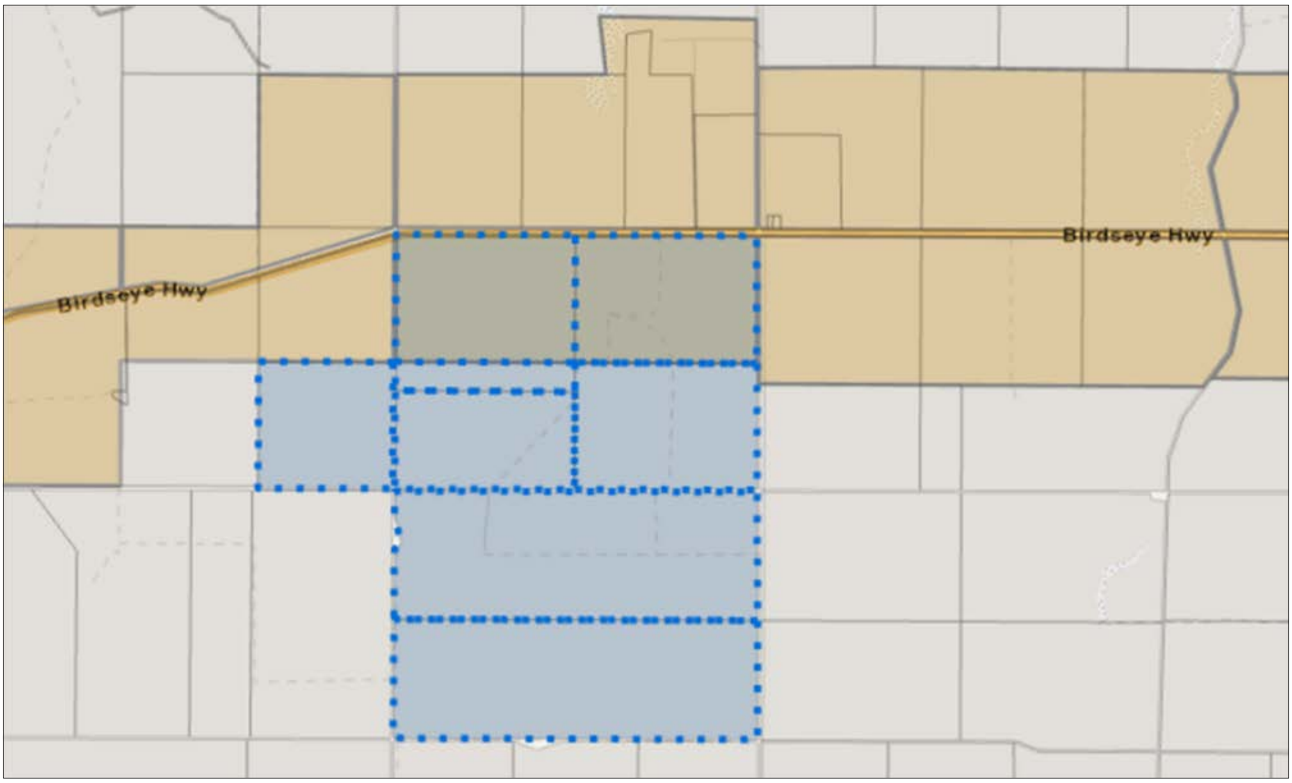


**Figure 6: Extract from the SA Property and Planning Atlas (SAPPA) illustrating the Key Outback and Rural Routes Overlay (shaded) as it relates to the subject land (blue outline)**

An assessment of the movement of vehicles for the Project during construction and operation has been undertaken by MFY in the Traffic Impact Assessment (TIA) report, which is further discussed in **Section 4.3** of this report. The Key Outback and Rural Routes Overlay applies to a section of the subject land adjacent the Birdseye Highway and the development adjacent this arterial road is discussed in the TIA in terms of vehicle access and the potential impact of the infrastructure on road users.

| Key Outback and Rural Routes Overlay<br>Desired Outcome | |
|---|---|
| DO 1<br>Safe and efficient movement of vehicle and freight traffic on Key Outback and Rural Routes. | |
| DO2<br>Provision of safe and efficient vehicular access to and from Key Outback and Rural Routes. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| PO 1.1<br>Access is designed to allow safe entry and exit to and from a site to meet the needs of development and minimise traffic flow interference associated with access movements along adjacent State maintained roads. | DTS/DPF 1.1<br>An access point satisfies (a), (b) or (c):<br>(a) where servicing a single dwelling / residential allotment:...<br>(b) where the development will result in 2 and up to 6 dwellings:...<br>(c) where the development will result in 7 or more dwellings, or is a non-residential land use:<br>(i) it will not result in more than one access point servicing the development site<br>(ii) where on a road with a speed limit of 80 km/h or greater vehicles can enter and exit the site using left turn only movements<br>(iii) vehicles can enter and exit the site in a forward direction<br>(iv) vehicles can cross the property boundary at an angle between 70 degrees and 90 degrees<br>(v) it will have a width of between 6m and 7m (measured at the site boundary), where the development is expected to accommodate vehicles with a length of 6.4m or less<br>(vi) it will have a width of between 6m and 9m (measured at the site boundary), where the development is expected to accommodate vehicles with a length from 6.4m to 8.8m<br>(vii) it will have a width of between 9m and 12m (measured at the site boundary), where the development is expected to accommodate vehicles with a length from 8.8m to 12.5m<br>(viii) it provides for simultaneous two-way vehicle movements at the access:<br>A. with entry and exit movements for vehicles with a length up to 5.2m vehicles being fully within the kerbside lane of the road<br>and<br>B. with entry movements of 8.8m vehicles (where relevant) being fully within the kerbside lane of the road and the exit movements of 8.8m vehicles do not cross the centreline of the road. |

#### 4.2.1.2 *Dwelling Excision Overlay*

As the proposed development does not propose or include any land division associated with the creation of an additional allotment around an existing habitable dwelling, the policies of the Dwelling Excision Overlay have no role to play in the assessment of the application.

<table>
<tr><th colspan="2">Dwelling Excision Overlay<br>Desired Outcome</th></tr>
<tr><td colspan="2">DO 1<br>Creation of allotments to accommodate existing habitable dwellings in primary production areas is limited to avoid undermining primary production.</td></tr>
<tr><th>Performance Outcome</th><th>Deemed-to-Satisfy Criteria / Designated Performance Feature</th></tr>
<tr><td>PO 1.1<br>Land division creating an additional allotment to accommodate an existing dwelling does not undermine the role of primary production areas by being limited and designed to achieve the following:<br>(a) accommodate a dwelling that has had a long term association with primary production on the same allotment<br>(b) contain the excised dwelling within an allotment capable of providing a suitable rural residential amenity<br>(c) maintain all other land (ie land outside the allotment containing the excised dwelling) in suitably sized allotments to support primary production<br>(d) no other dwelling has been excised from the primary production allotment.</td><td>DTS/DPF 1.1<br>Land division satisfies all the following:<br>(a) no other dwelling has previously been excised from the allotment by creating an additional allotment<br>(b) it does not create more than one additional allotment where the resultant allotments satisfy (i) and (ii):<br>(i) one allotment will contain a single existing lawful dwelling that existed prior to 1 December 2011 and meets all of the following:<br>A. no allotment boundary is closer than 40m to an existing dwelling<br>B. the allotment is no less than 1 hectare and no greater than 4 hectares in area<br>C. if the allotment is of a battle-axe configuration, the driveway ‘handle’ is no more than 50 metres in length<br>(ii) any other allotment has an area not less than that identified in the Minimum Site Area Technical and Numeric Variation layer in the SA planning database.</td></tr>
</table>

#### 4.2.1.3 *Hazards (Bushfire – Regional Risk) Overlay*

The Project is sited within the Hazards (Bushfire -Regional Risk) Overlay, which seek to mitigate the threat and impact of bushfires on life and property. Bushfire risk and mitigation has been considered in the design of the project and is further discussed in Volume 1 – Project Summary in Section 5.9.

| **Hazards (Bushfire – Regional Risk) Overlay**<br>**Desired Outcome** | |
|---|---|
| DO 1<br>Development, including land division responds to the relevant level of bushfire risk and is sited and designed to mitigate the threat and impact of bushfires on life and property taking into account the increased frequency and intensity of bushfires as a result of climate change. | |
| DO2<br>To facilitate access for emergency service vehicles to aid the protection of lives and assets from bushfire danger. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Siting** | |
| PO 1.1<br>Buildings and structures are located away from areas that pose an unacceptable bushfire risk as a result of vegetation cover and type, and terrain. | DTS/DPF 1.1<br>None are applicable. |
| **Built Form** | |
| PO 2.1<br>Buildings and structures are designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against or underneath the building or structure, or between the ground and building floor level in the case of transportable buildings and buildings on stilts. | DTS/DPF 2.1<br>None are applicable. |

#### *4.2.1.4 Hazards (Flooding – Evidence Required) Overlay*

Appropriate siting and design of buildings and infrastructure to mitigate potential impacts of flood is sought by the Hazards (Flooding-Evidence Required) Overlay. The proposed development does not include habitable buildings, and the siting of the infrastructure is located within areas which have some potential to flood (1% AEP). A hydrology assessment of the proposed development has been undertaken by Worley and is further described and discussed in **Section 4.3** below.

| **Hazards (Flooding-Evidence Required) Overlay**<br>**Desired Outcome** | |
|---|---|
| DO 1 Development adopts a precautionary approach to mitigate potential impacts on people, property, infrastructure and the environment from potential flood risk through the appropriate siting and design of development. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Flood Resilience** | |
| PO 1.1<br>Development is sited, designed and constructed to minimise the risk of entry of potential floodwaters where the entry of flood waters is likely to result in | DTS/DPF 1.1<br>Habitable buildings, commercial and industrial buildings, and buildings used for animal keeping incorporate a finished floor level at least 300mm above: |

| Hazards (Flooding-Evidence Required) Overlay | |
|---|---|
| undue damage to or compromise ongoing activities within buildings. | (a) the highest point of top of kerb of the primary street<br>or<br>(b) the highest point of natural ground level at the primary street boundary where there is no kerb |
| **Environmental Protection** | |
| PO 2.1<br>Buildings and structures used either partly or wholly to contain or store hazardous materials are designed to prevent spills or leaks leaving the confines of the building. | DTS/DPF 2.1<br>Development does not involve the storage of hazardous materials. |

### *4.2.1.5 Native Vegetation Overlay*

A detailed assessment of flora and fauna within the site of the development has been undertaken by EBS Ecology (EBS) in the Native Vegetation Data Report (refer Volume 2 – Technical Reports in the application documents for this report). This assessment in the context of the policies of the Native Vegetation Overlay, which seek to protect and avoid or minimise clearance of native vegetation is discussed in Section 4.3 below.

| Native Vegetation Overlay<br>Desired Outcome | |
|---|---|
| DO 1 Areas of native vegetation are protected, retained and restored in order to sustain biodiversity, threatened species and vegetation communities, fauna habitat, ecosystem services, carbon storage and amenity values. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| PO 1.1<br>Development avoids, or where it cannot be practically avoided, minimises the clearance of native vegetation taking into account the siting of buildings, access points, bushfire protection measures and building maintenance. | DTS/DPF 1.1<br>An application is accompanied by:<br>(a) a declaration stating that the proposal will not, or would not, involve clearance of native vegetation under the Native Vegetation Act 1991, including any clearance that may occur:<br>(i) in connection with a relevant access point and / or driveway<br>(ii) within 10m of a building (other than a residential building or tourist accommodation)<br>(iii) within 20m of a dwelling or addition to an existing dwelling for fire prevention and control<br>(iv) within 50m of residential or tourist accommodation in connection with a requirement under a relevant overlay to establish an asset protection zone in a bushfire prone area<br>or |

| Native Vegetation Overlay | |
|---|---|
| | (b) a report prepared in accordance with Regulation 18(2)(a) of the Native Vegetation Regulations 2017 that establishes that the clearance is categorised as 'Level 1 clearance'. |
| PO 1.2<br>Native vegetation clearance in association with development avoids the following:<br>(a) significant wildlife habitat and movement corridors<br>(b) rare, vulnerable or endangered plants species<br>(c) native vegetation that is significant because it is located in an area which has been extensively cleared<br>(d) native vegetation that is growing in, or in association with, a wetland environment. | DTS/DPF 1.2<br>None are applicable. |

### *4.2.1.6 Water Resources Overlay*

The Water Resources Overlay seeks to protect the quality of surface water and the natural flow of watercourses, and manage flood waters and stormwater runoff. An assessment of the proposed development on protection and management of water resources has been undertaken by Worley and is further described and discussed in Section 4.3 below.

| Water Resources Overlay<br>Desired Outcome |
|---|
| DO 1<br>Protection of the quality of surface waters considering adverse water quality impacts associated with projected reductions in rainfall and warmer air temperatures as a result of climate change. |
| DO2<br>Maintain the conveyance function and natural flow paths of watercourses to assist in the management of flood waters and stormwater runoff. |

## 4.3 Assessment Considerations

An assessment has been undertaken against all relevant policies of the Planning and Design Code and this considers the following matters:

- Land use.
- Visual amenity.
- Noise.
- Glint and glare.
- Impact on flora and fauna/native vegetation.
- Hydrology

- Traffic and access.
- Aviation.
- Indigenous and European heritage.
- Bushfire/fire risk.

These matters are discussed and assessed below.

### *4.3.1 Land Use*

Renewable energy facilities are a form of development that the Desired Outcome (DO) of the Rural Zone envisages to support the economic prosperity of South Australia, as stated in DO1.

| **Rural Zone**<br>**Desired Outcome** |
|---|
| DO 1<br>A zone supporting the economic prosperity of South Australia primarily through the production, processing, storage and distribution of primary produce, forestry and the generation of energy from renewable sources. |
| DO2<br>A zone supporting diversification of existing businesses that promote value-adding such as industry, storage and warehousing activities, the sale and consumption of primary produce, tourist development and accommodation. |

| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
|---|---|
| **Land Use and Intensity** | |
| PO 1.1<br>The productive value of rural land for a range of primary production activities and associated value adding, processing, warehousing and distribution is supported, protected and maintained. | DTS/DPF 1.1<br>Development comprises one or more of the following:<br>(a) Advertisement<br>…<br>(r) Renewable energy facility… |
| **Renewable Energy Facilities** | |
| PO 9.1<br>Renewable energy facilities and ancillary development minimises significant fragmentation or displacement of existing primary production. | DTS/DPF 9.1<br>None are applicable. |

Performance Outcome (PO) 1.1 of the Rural Zone anticipates a range of primary production and value adding activities on rural land. Designated Performance Feature (DPF) 1.1 identifies renewable energy facilities as a land use that is envisaged to satisfy PO 1.1. In accordance with the rules of interpretation of the Planning and Design Code, a *"DPF provides a guide to a relevant authority as to what is generally considered to satisfy the corresponding performance outcome…"*. DPF 1.1(r) clearly anticipates that a renewable energy facility satisfies PO 1.1, and by extension is considered a productive use of land.

There is potential tension between PO 1.1/DPF 1.1 and PO 9.1 of the Rural Zone. Performance Outcome 9.1 seeks to ensure that renewable energy facilities minimise fragmentation or displacement of existing primary production. The emphasis of protecting primary production land and facilitation of renewable energy within and over primary production land must be viewed in terms of the policy agenda for the zone set by the Desired Outcomes. Desired Outcome 1 of the Rural Zone anticipates both primary production and generation of energy from renewable sources as land uses to be undertaken in the Rural Zone to support the economic prosperity of South Australia. It is therefore considered that primary production and renewable energy facilities are anticipated in the Rural Zone and by extension, the renewable energy facilities as an anticipated land use would occur on productive land.

It appears that the intent of PO 9.1 is therefore to minimise the amount of land that is fragmented or displaced from primary production. This intent is not considered to be site or development specific, but rather a wider consideration in the locality or in the Rural Zone throughout the State. Within the locality of the subject land, there are no other developed and operational renewable energy facilities. Establishment of the Yadnarie renewable energy facility does not add to a cumulative displacement of primary production land within the locality.

In relation to the subject land, there is an intent to retain some land for primary production purposes and have a mix of energy generation and cropping and grazing activities. The subject land on which the proposed development is proposed is approximately 1,530 hectares. Not all this land is utilised for infrastructure for the development. It is estimated approximately 810 hectares would be utilised in some capacity for the renewable energy infrastructure.

Whilst the development would preclude land containing infrastructure from being cropped, some areas of the subject land, such as Section 44 to the west of Broadview Road, which is 134 hectares, and approximately 165 hectares in the south western area of the subject land will continue to be available for cropping. Large areas of the land comprising infrastructure will continue to be available for grazing. RayGen's heliostats are pole driven steel posts which have a low footprint on the land, allowing sheep grazing in and around this infrastructure. RayGen has operational solar-plus-storage developments in Newbridge, Victoria which has supported sheep grazing since commencing operation in 2015 (as shown in **Figure 7**).

**Figure 7: Sheep grazing at renewable energy facility at Newbridge, Victoria.**

Areas proposed to be utilised for the power plants, office and maintenance areas would not be available for cropping or grazing.  These areas are relatively small in terms of the overall subject land, which means that some form of agricultural production would be maintained within large areas of the land.  Whilst not a traditional form of primary production, the development can be viewed as a mix of electricity generation/storage with some farming activity.

As stated previously, renewable energy facilities are an envisaged land use within the Rural Zone and this desired outcome supports the economic prosperity of South Australia. Utilisation of agricultural land for renewable energy facilities may result in loss of primary production, but this should be balanced against the economic prosperity achieved by renewable energy.

Impacts of the proposed development on primary production on adjoining land and farming activities in the wider region are considered minimal. One concern frequently raised in relation to wind farm developments is an adverse impact on aerial application/spraying of agriculture land. Whilst the proposed development is not a wind farm, it does introduce elevated towers throughout the subject land. The proposed receiving towers would be considered in a similar manner to the electricity transmission infrastructure (towers and wires) which is a notable feature within the locality.

Towers are noted as hazards by aviation authorities and would be known to landowners and aerial agriculture operators.  These towers would then be considered in any flight planning of aerial application operators. Given the existence of large transmission towers in the locality and the location of the proposed infrastructure being contained to a defined area bounded by public roads, it is considered that the proposed development would not unreasonably interfere with low altitude aircraft movements associated with agriculture and therefore not impact on the productive value of rural land in the locality.

In addition to the policies contained in the Rural Zone, the General Development Policies – Infrastructure and Renewal Energy Facilities incorporate specific policies to guide siting and design of renewable energy facilities. In relation to Desired Outcome 1 of the Infrastructure and Renewable Energy Facilities policies, the proposed development provides an efficient renewable energy facility that will assist in providing electricity to the national grid in a manner that assists with the stability of the South Australian electricity network.

| **Infrastructure and Renewable Energy Facilities**<br>**Desired Outcome** |
|---|
| DO 1<br>Efficient provision of infrastructure networks and services, renewable energy facilities and ancillary development in a manner that minimises hazard, is environmentally and culturally sensitive and manages adverse visual impacts on natural and rural landscapes and residential amenity. |

Impacts on visual amenity, flora and fauna, acoustics, aviation, traffic, hydrology and bushfire are discussed in detail in the following sections of this assessment report.

The proposed development provides a new and highly efficient renewable energy facility that utilises solar-plus-storage technology to provide electricity to the national grid in a manner that assists with the stability of the South Australian electricity network.  The development is an anticipated land use within the Rural Zone which directly aligns with the strategic plan of the State Government and thereby addresses the desire for development to add to the economic prosperity of the State.

### *4.3.2 Visual Amenity*

Desired Outcome 1 of the Infrastructure and Renewable Energy Facilities General Development Policy, seeks to manage adverse visual impacts of infrastructure and renewable energy facilities. The technology employed in the proposed development is a combination of heliostats (solar PV ultra), solar receiving towers, storage in hot and cold water pits, substation, transmission lines and associated infrastructure. Policies contained in the Infrastructure and Renewable Energy Facilities General Development Policy do not specifically address some of the elements of the proposed development and their potential visual impact. However, an assessment of the intent of the policies, as relevant, has been undertaken.

In general terms, the policies of the Infrastructure and Renewable Energy Facilities General Development Policy seeks suitable setbacks from boundaries, sensitive receivers and townships for renewable energy facilities. The proposed development has the following setback characteristics:

- Setback approximately 7.0 kilometres from the eastern property boundary of the subject land and the Rural Neighbourhood Zone of Cleve.
- Setback approximately 7.0 kilometres from the western property boundary of the subject land to the Township Zone of Rudall
- There are two non-involved dwellings within 2 kilometres of the boundaries of the subject land and a further 12 dwellings within 5 kilometres, as shown on the locality plan in **Figure 8** below (and Attachment B)
- Setback approximately 47 metres from Pine Corner Road, the architecturally designed office building is the nearest piece of infrastructure to a site boundary.
- A setback of 73 metres is the closest piece of infrastructure (a solar receiving tower) to Birdseye Highway
- The closest infrastructure to Broadview Road is the boundary of a heliostat field which is setback approximately 128 metres
- The heliostat fields are setback approximately 78 metres at the closest point from the boundary of Pine Corner Road
- The closest infrastructure to Price Road is the boundary of a heliostat field which is setback approximately 69 metres
- A setback of approximately 1.3 kilometres applies to the setback of the substation to Pine Corner Road
- The transmission line from the onsite substation to the Yadnarie substation follows the same alignment as the existing 132kV transmission line
- The power plants are located centrally within the heliostat fields, with approximate setbacks of:

  - Power block 1: 500m to Broadview Road and 920m to Birdseye Highway
  - Power block 2: 1000m to Birdseye Highway and 750m to Pine Corner Road
  - Power block 3: 880m to Pine Corner Road and 1050m to Price Road.

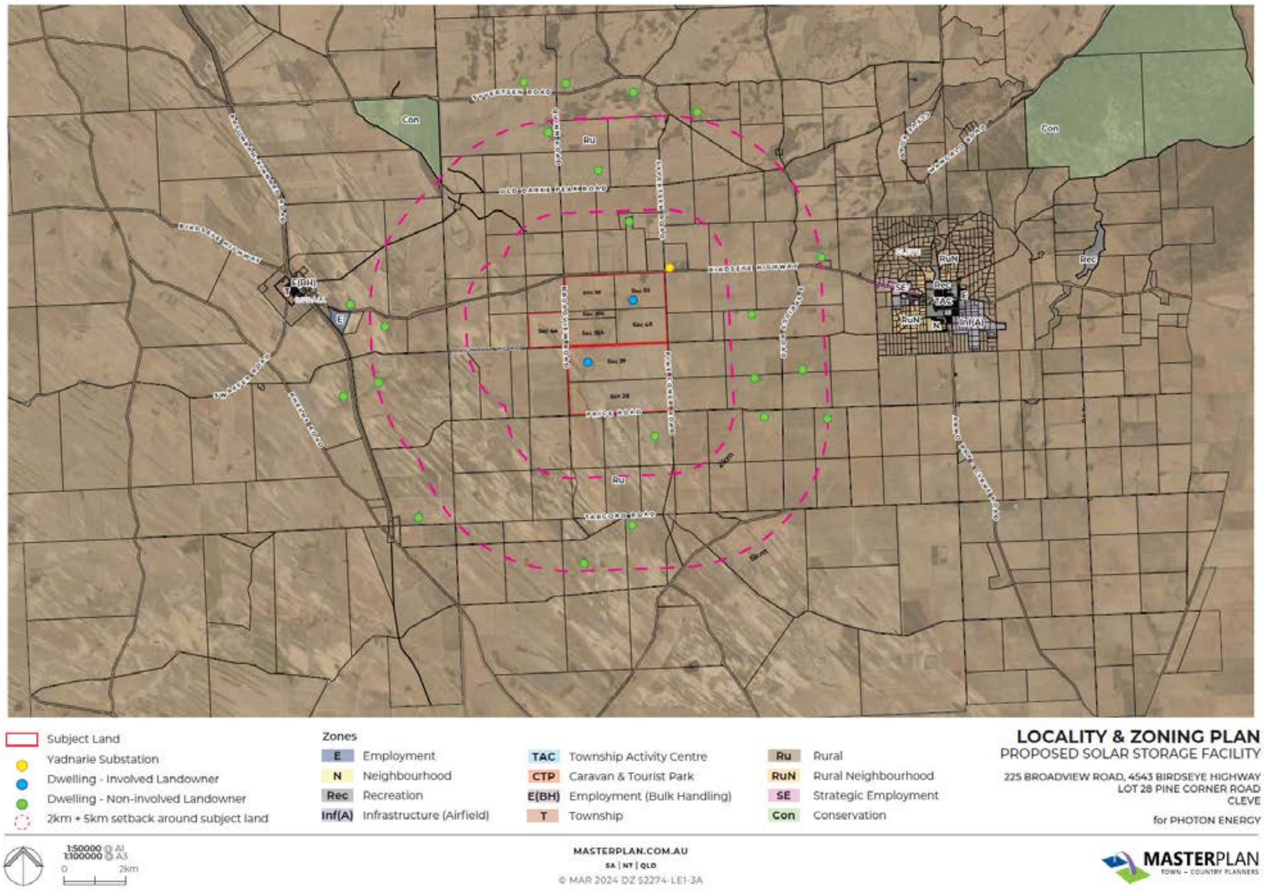


**Figure 8: Locality and Zoning Plan**

In accordance with PO 1.1, 5.1 and 7.1 of the Infrastructure and Renewable Energy Facilities policies, the development has been designed to minimise visual impact through:

- Centrally locating the power plants within the subject land
- Locating the substation and overhead transmission line adjacent to the existing 132kV transmission line that transverse the subject land
- Locating the majority of infrastructure (heliostat fields, receiving towers, power plants and associated buildings) within cropped paddocks
- Minimising clearance of native vegetation to approximately 33.425 ha and five scattered trees

| Infrastructure and Renewable Energy Facilities | |
|---|---|
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **General** | |
| PO 1.1<br>Development is located and designed to minimise hazard or nuisance to adjacent development and land uses. | DTS/DPF 1.1<br>None are applicable. |

| Infrastructure and Renewable Energy Facilities | |
|---|---|
| **Electricity Infrastructure and Battery Storage Facilities** | |
| PO 5.1<br>Electricity infrastructure is located to minimise visual impacts through techniques including:<br>(a) siting utilities and services:<br>(i) on areas already cleared of native vegetation<br>(ii) where there is minimal interference or disturbance to existing native vegetation or biodiversity<br>(b) grouping utility buildings and structures with non-residential development, where practicable. | DTS/DPF 5.1<br>None are applicable. |
| **Renewable Energy Facilities** | |
| PO 7.1<br>Renewable energy facilities are located as close as practicable to existing transmission infrastructure to facilitate connections and minimise environmental impacts as a result of extending transmission infrastructure. | DTS/DPF 7.1<br>None are applicable. |

Within the Infrastructure and Renewable Energy Facilities policies there are specific policies relating to siting of solar power facilities. The subject land is a farming property within an agricultural landscape with current infrastructure intrusions such as the existing transmission line and substation within the locality. The subject land and locality are not one of high environmental, scenic or cultural value and does not contain intact native vegetation. Based on the intent of PO 9.1, the subject land is an appropriate site for solar power renewable energy facilities.

In accord with intent of PO 9.2 the heliostat fields are typically located within paddocks of the property which have been cropped for generations and generally devoid of native vegetation.

| Infrastructure and Renewable Energy Facilities | |
|---|---|
| **Renewable Energy Facilities (Solar Power)** | |
| PO 9.1<br>Ground mounted solar power facilities generating 5MW or more are not located on land requiring the clearance of areas of intact native vegetation or on land of high environmental, scenic or cultural value. | DTS/DPF 9.1<br>None are applicable. |
| PO 9.2<br>Ground mounted solar power facilities allow for movement of wildlife by:<br>(a) incorporating wildlife corridors and habitat refuges | DTS/DPF 9.2<br>None are applicable. |

| Infrastructure and Renewable Energy Facilities | |
|---|---|
| (b) avoiding the use of extensive security or perimeter fencing or incorporating fencing that enables the passage of small animals without unreasonably compromising the security of the facility. | |

Perimeter fencing is proposed for security purposes around the boundary of the subject land on which infrastructure is to be sited. The perimeter fence is proposed inside of existing (and proposed) vegetation adjacent the boundary to minimise its visual impact, whilst providing suitable vehicle access and perimeter access for emergency firefighting vehicles.

Performance Outcome 9.3 and the setbacks established in DPF 9.3 for solar power facilities (as quoted below) are suitable and adequately satisfied by the proposed development for a facility exceeding 50MW, in the following manner:

- Setbacks from the heliostat fields exceed 30 metres, with the closest boundary setback being 69 metres to Price Road.
- There are no conservation areas within 500 metres of the boundary of the subject land.
- Setbacks to Cleve and Rudall are approximately 7km from the boundary of the subject land and well in excess of the 2km sought.

| Infrastructure and Renewable Energy Facilities | |
|---|---|
| **Renewable Energy Facilities (Solar Power)** | |
| PO 9.3<br>Amenity impacts of solar power facilities are minimised through separation from conservation areas and sensitive receivers in other ownership. | DTS/DPF 9.3<br>Ground mounted solar power facilities are set back from land boundaries, conservation areas and relevant zones in accordance with the following criteria : |

| Generation Capacity | Approximate size of array | Setback from adjoining land boundary | Setback from conservation areas | Setback from Township, Rural Settlement, Rural Neighbourhood, and Rural Living Zones[1] |
|---|---|---|---|---|
| **50MW >** | 80ha + | 30m | 500m | 2km |
| **10MW < 50MW** | 16ha to < 80ha | 25m | 500m | 1.5km |
| **5MW < 10MW** | 8ha to < 16ha | 20m | 500m | 1km |
| **1MW < 5MW** | 1.6ha to < 8ha | 15m | 500m | 500m |
| **100kW < 1MW** | 0.5ha < 1.6ha | 10m | 500m | 100m |
| **< 100kW** | < 0.5ha | 5m | 500m | 25m |

Notes: 1. Does not apply when the site of the proposed ground mounted solar power facility is located within one of these zones.

| Infrastructure and Renewable Energy Facilities | |
|---|---|
| PO 9.4<br>Ground mounted solar power facilities incorporate landscaping within setbacks from adjacent road frontages and boundaries of adjacent allotments accommodating non-host dwellings, where balanced with infrastructure access and bushfire safety considerations. | DTS/DPF 9.4<br>None are applicable. |

Inclusion of a new form of infrastructure in a rural environment will result in some visual impacts, however, the locality is one that incorporates a range of infrastructure such as the Yadnarie substation, the existing 132kV transmission lines (with 65 metre towers) and large-scale bulk handling facilities. The landscape is predominantly rural agricultural and is not one of high natural landscape value.

The technology to be employed in this development, by design, reflects and concentrates light from the sun onto centralised solar receivers located on towers. The solar receiving towers are a distinct visual element of the proposed development. The modules atop RayGen's receivers convert sunlight to power, so that the tower looks similar to a light tower on a sporting field which is on during the day. The solar receivers on the top of the tower emit a glare in a southerly direction. The visibility of this light has been the subject of consideration in the visual assessment (Landscape Character and Probable Visual Effect Assessment (LVIA) by Wax Design and BGLA), the Traffic Impact Assessment report by MFY and the Aviation Impact Assessment by Aviation Projects, to assess the potential impacts of glare from the receiving towers on the locality generally and specifically on road users and aircraft operations.

A detailed assessment of the potential visual impacts of the proposed development have been considered by Wax Design and Dr Brett Grimm in the LVIA report, which is contained within Volume 2 - Technical Reports of the application documents. Wax describes the heliostats and receiving towers in Section 1 of the LVIA report based on their observations of RayGen's Carwarp (Victoria) commercial demonstration facility, as follows:

> *Heliostat*
>
> *The development form of the site is created by the heliostat fields, which create a fragmented visual effect with numerous individual panels facing towards the receivers. The varied orientation of the panels and the underlying topography create a fragmented and somewhat pixelated visual character.*
>
> *While visually recognisable as infrastructure elements in the landscape, the visual effect has a non-rectilinear representation due to the way the panels respond to the underlying topography. The irregularity of the development form reduces the overall visual effect associated with the site.*
>
> *The reflected dark blue and pale blue sky colours associated with the front surface of the solar panels are complementary to the dark vegetation colours of the existing landscape character.*

*During the summer months, it is anticipated that the contrast in visual character between the heliostats and the surrounding landscape will increase as the heliostats remain a deep blue colour and the landscape turns a lighter brown.*

*During the winter, the blue hues will complement the green arable landscape character of the rural land use, reducing the visual contrast.*

*The recessive light grey colour of the back of the heliostats will remain consistent all year round.*

*Solar Receiver*

*The solar receiver towers form notable visual elements within the landscape due to their height and level of brightness produced by the receivers.*

*The degree of visibility varies depending on the viewpoint and the orientation of the view relative to the development, noting that the receiver towers are located north of the heliostats and that the receivers face south.*

*Immediately north, there is very little reflected light, and the visibility is focused on the lattice tower and the power block infrastructure, which is similar to a transmission tower or telephone tower. From locations to the northeast and northwest of the development, the visual impact is produced by low levels of reflected light which spill from the receiver's shields.*

*The visibility and associated visual impact of the receiver towers increase to the east and west due to the level of reflection and the light spill from the sides of the receivers.*

*From locations south of the development, the visibility of the lattice tower relative to the receiver reduces, and the glare and brightness reflected from the receivers within the wider landscape increases.*

*Looking south towards the development, the glare and degree of brightness are experienced relative to the prevailing weather conditions. The brightness of the receiver is reciprocal to the sun's intensity and the sunlight being reflected.*

*In this regard, the brightness is experienced as part of the broader visual context that is generated by different weather conditions during the day and throughout the year.*

*While the receivers appear as bright points of light low in the sky, the brightness and intensity are relative to the sun, sun angle, weather, time of day and the location of the viewpoint.*

The solar receiving towers in operation at the Carwarp demonstration facility are shown in the photographs below:

**Figure 9: Photograph of all four solar receiving tower and heliostats in operation at Carwarp demonstration facility, Victoria.**

The visual impact assessment undertaken by Wax incorporated detailed discussion of the landscape character of the locality, determining the zone of theoretical visual influence (ZTVI), the selection of 5 viewpoints typical of various aspects within the locality (local 0-3km, sub-regional 3-10km and regional 10km) and the production of photomontages from the selected viewpoints. Each of these aspects are discussed in detail in the LVIA report by Wax (Volume 2 of the application documentation) and summarised in Section 5.5 of the Volume 1 – Project Summary report. As stated in the conclusion of the LVIA report (quoted below), the visual impact of the development will have moderate impacts on the immediate locality but can be accommodated in the regional landscape.

The landscape and visual impact assessment indicates that the Yadnarie Renewable Energy Project will be developed in a modified rural landscape with a defined visual character. The topography of the Poolalalie Hill, Mount Priscilla and the local ridge line along Pine Corner Road create a visual envelope to the north, east and southeast of the project. To the west and southwest, the inland dunal system and the associated remnant vegetation create a distinct visual and landscape character that fragments the visibility of the project.

The landscape character of the locality, coupled with woodland areas and pockets of vegetation, creates a defined visual character. At distances greater than 5 kilometres, the visibility of the project is reduced, and the visual impacts across the broader rural effects become limited.

The potential visual effects are likely to be most notable from the northeast and southwest within the local to sub-regional locality. The number and spread of solar receivers and heliostats are likely to produce a moderate visual effect within the sub-regional locality with notable areas within the local 1-3 km distance, increasing to a substantial visual effect. The infrastructure associated with the project has the potential to appear in the landscape as prominent visual elements spread across the undulating landform of the project site.

To the northwest and southeast, the visual effects are reduced slightly, and the ridgeline along Pine Corner Road and vegetation screening to the west mitigate potential visual effects. However, the sensitivity of the underlying landscape to change is low due to the agricultural character.

Across the sub-regional landscape, local ridgelines, inland dunal systems and tree belts create defined visual screens that reduce and remove the visual effects of the project. The combination of topography and vegetation provides additional visual mitigation, and the degree of visual change is reduced, described as slight.

At distances of over ten kilometres within the regional locality, the degree of visual change reduces significantly and is described as negligible.

The associated infrastructure, power blocks, substations, and transmission lines will provide localised impacts to their immediate site localities. These visual effects will be limited to shorter distances (contained viewsheds). There will be no visual effect on the townships of Cleve and Rudall. Transient visual impacts will be experienced along the Birdseye Highway.

The visual assessment and visual effect interpolation mapping illustrate the relationship between distance and visual effect, the contained locality and the effect of local ridgelines and vegetation in reducing the visibility of the project in the wider locality. The visual effect is represented as bands of visual change radiating from the project. The existing landscape character means that topography and distance are the dominant variables in mitigating the visual effect.

Although the visual impact is likely to be moderate, the visual effects are contained within a defined locality. Consequently, the LVIA concludes that the Yadnarie Renewable Energy Project can be accommodated within the existing regional landscape character with moderate impacts on the immediate locality.

An illustration of the visual impact of the development from Birdseye Highway, Quinn Road and Broadview Road is shown below.  This viewpoint is immediately adjacent the subject land within an area that has minimal roadside vegetation or native vegetation within the boundaries of the site.  As described by Wax, the visual impact associated with the project will be created by the heliostat fields located across the ground plain of the site, the numerous solar receivers that form vertical visual elements and the infrastructure form of the three power blocks.

**Figure 10: Photomontages – Viewpoint 5 - Intersection of Birdseye Highway, Quinn Road and Broadview Road**

This viewpoint and photomontage have been selected as a 'worst case' demonstration of the potential visual impact without screen landscaping in a location immediately adjacent to boundary of the subject land. As noted by Wax, the retention of established vegetation on the project site and adjacent the boundaries aids in visually fragmenting the infrastructure elements of the project, reducing the visual effect. Wax have identified opportunities to increase tree planting along the property boundaries and supplement the dunal system landscape pattern to assist in visual integration of development. Recommendations for supplementary and additional landscaping are illustrated on the Landscape Screening Plan (by Worley) which is part of the application documentation. Supplementary screen landscaping to a height of up to approximately 8-10 metres is proposed with local native indigenous species adjacent boundaries, (in locations determined following detailed visual survey and assessment). In addition, an area of revegetation to the southwest of the inland dunal system adjacent Price Road and Broadview Road is proposed.

In combination, siting of infrastructure with suitable boundary setbacks, the retention of native vegetation within the site, supplementary screen landscaping around the boundaries and an area of revegetation, is appropriate to minimise the visual impact of the development in an already modified rural landscape and satisfy the intent of policies of the Infrastructure and Renewable Energy Facilities General Development policies that relate to minimising visual impacts.

### 4.3.3 Glare

As previously stated, by design, the proposed development reflects and concentrates light. The three major sources of reflected light for the proposed development will be:

- Concentrated light from a heliostat
- Glint and glare from a heliostat (non-concentrated)
- Glare from the solar receiver

Several factors will determine the intensity and extent of each source of reflected light, including:

- The intensity of the sunlight.
- The distance and orientation of the heliostat or receiver aperture relative to the recipients viewing point.
- Time of day and seasonal variations defining position and angle of sunlight.
- Cloud cover.
- The level of particulate matter in the atmosphere (moisture, dust, smoke etc).
- The presence of screening (vegetation, buildings, fences etc.) relative to recipient locations.

Direct reflected light from the front mirror face of a heliostat is concentrated due to the curvature of its mirrors. This curvature is important to achieving the required light concentration at the receiver for the system to operate efficiently. The level of concentration of reflected light varies depending on the distance away from the heliostat. Within a range of twice the focal length of a particular heliostat, a recipient would be subject to some degree of concentrated light. The intensity of this concentrated light drops off dramatically when the recipient moves away from the focal length.

The General Development Policies – Interface between Land Uses seek to mitigate adverse effects of development on neighbouring and proximate land uses, including glare, as stated in PO 7.1.

| **Interface Between Land Uses**<br>**Desired Outcome** | |
|---|---|
| DO 1<br>Development is located and designed to mitigate adverse effects on or from neighbouring and proximate land uses. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **General Land Use Compatibility** | |
| PO 1.2<br>Development adjacent to a site containing a sensitive receiver (or lawfully approved sensitive receiver) or zone primarily intended to accommodate sensitive receivers is designed to minimise adverse impacts. | DTS/DPF 1.2<br>None are applicable. |

| Interface Between Land Uses | |
|---|---|
| **Light Spill** | |
| PO 6.1<br>External lighting is positioned and designed to not cause unreasonable light spill impact on adjacent sensitive receivers (or lawfully approved sensitive receivers). | DTS/DPF 6.1<br>None are applicable. |
| PO 6.2<br>External lighting is not hazardous to motorists and cyclists. | DTS/DPF 6.2<br>None are applicable. |
| **Solar Reflectivity/Glare** | |
| PO 7.1<br>Development is designed and comprised of materials and finishes that do not unreasonably cause a distraction to adjacent road users and pedestrian areas or unreasonably cause heat loading and micro-climatic impacts on adjacent buildings and land uses as a result of reflective solar glare. | DTS/DPF 7.1<br>None are applicable. |

A detailed description of the potential for and impacts of glare are discussed in Sections 2 and 5.6 of Volume 1 - Summary Report.

Glare from the proposed RayGen technology has the potential for an after-image effect and glance blindness if an observer at ground level glances at the receiver for a duration of 0.15 seconds when they are within the following distances:

- Up to 280 m from the receiver, directly in front.
- Up to 240 m if viewing from a 25-degree angle offset (left or right side) from directly in front of the receiver.
- Up to 125 m if viewing from a 75-degree angle offset (left or right side) from directly in front of the receiver.

The assessed glare is characterised into three categories:

- Low potential for after image (temporary after image), also referred as green glare.
- Potential for after image (flash blindness), also referred as yellow glare.
- Potential for permanent eye damage (retinal burn), also referred as red glare.

The map of ocular safety zones developed for the technology is shown in **Figure 11**.

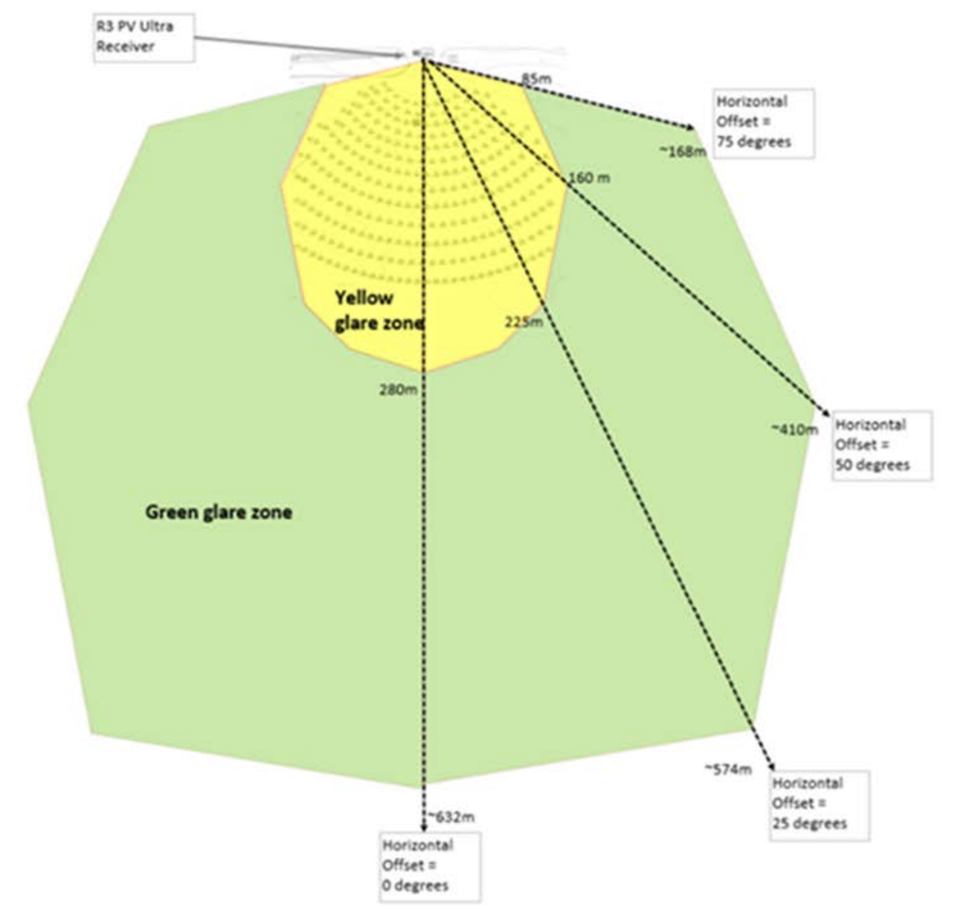


**Figure 11: Map of ocular safety zone for glare from a receiver. Source RayGen.**

The ocular safety zones have been incorporated into the design of the project, with all areas within the "yellow glare" zone being within the boundaries of the property.

As part of the Traffic Impact Assessment, MFY undertook an assessment of the potential impact of glare on road users. The assessment identified that all the heliostats adjacent the Birdseye Highway are outside the ocular safety zone for drivers on the Birdseye Highway. This is important as this route presents the highest risk for drivers associated with the proposal. Some of the heliostats and receivers on local roads (parts of Pine Corner Road, Price Road and Broadview Road) are in locations where there is a low potential for after-image from glare (that is, within the green ocular safety zone), thus identifying a risk of distraction or the potential for an after image for drivers.

MFY identified that an effective method to mitigate the risk of the after image or ocular damage is to ensure the driver does not have line of sight to the receiver by providing an effective screen (mound/vegetation or similar). Whilst Pine Corner Road, Price Road and Broadview Road contain areas of roadside vegetation, additional or supplementary screen landscaping is proposed along these local roads to minimise risk to drivers. The specific locations for supplementary screen landscaping will be determined following further visual survey and assessment. The further detailed assessment would incorporate a review of distance to infrastructure in combination with height and density of existing vegetation and topography for various locations along the public roads.

Aviation Projects Aviation Impact assessment considered the potential impact of glare on aircraft operations in the locality of the project. In summary, the assessment notes that:

- The Project is not within the boundary of a certified aerodrome and CASA does not require an assessment of the Project for glare impacts.
- The FAA Final Policy on the review of solar installations does not affect the Project.
- The Project is located more than 6 km from any certified aerodrome and is not located where glare will impact on any air route or airway, and therefore is not affected by Civil Aviation Regulations Part 94.
- Aircraft operations in the immediate vicinity of the solar farm are anticipated to be infrequent and limited to aircraft potentially conducting low-level aerial application operations on neighbouring properties.
- Glare from receiving towers is geometrically possible for aircraft approaching the Project from the south, however the glare experienced from the Project is not anticipated to inhibit or endanger VFR aircraft operations in the vicinity of the project and could be mitigated by the use of sunglasses and/or sun visors. There are no aircraft operations likely to be conducted within the yellow glare zone of any receiving tower anywhere in the Project Area.

Based on the technical assessments undertaken to inform the design of the project, it is considered that the proposed development is designed:

- With adequate boundary setbacks and/or control systems to ensure no concentrated light can leave the boundary of the site and therefore impact on any neighbouring land, sensitive receivers or road users.
- That the potential for glare to road users is low, but additional screen landscaping along parts of Pine Corner Road, Price Road and Broadview Road will assist the further minimisation after-image from glare.
- Glare is not anticipated to inhibit or endanger VFR aircraft operations in the vicinity of the project.

#### *4.3.4 The development adequately addresses PO 7.1 of the Interface Between Land Uses policy in relation to reflective solar glare. Design and Siting*

In addition to the policies discussed above, the Rural Zone and Design - General Development Policies, comprise policy regarding building siting and design. These policies, as quoted below, are discussed in the context of elements of the project that are not the infrastructure (heliostats, receiving tower, substation and power plants) discussed above. The intent of the policies of the Rural Zone and those relevant for the Design - General Development Policies are satisfied, as discussed below and particularly in the context of the form of development and its rural setting:

As sought by DO1 - Design, the development is appropriately contextual, as it has been designed to take account of the natural features of the site, utilises cropping land for principal infrastructure, retaining areas of vegetated inland dunes, retaining and supplementing native vegetation on the boundaries and siting buildings and infrastructure with appropriate setbacks to boundaries, the nearest sensitive receivers and road users.

The development proposes an architecturally designed office building adjacent the principal site entrance to provide a strong entrance statement to the renewable energy facility. This office building is directly related to the operations of the renewable energy facility, as sought by PO 7.1, providing a control centre, office and site amenities for the development. In addition to the office, the administration and control area of the site comprises storage, maintenance and machinery buildings that provide the key operational hub for the development. The administration and control area satisfies a wide range of policy in the following manner:

- The office is an attractive and functional building with a form and mix of materials that are complementary to the rural setting.
- The office is sited with a setback of approximately 47 metres from Pine Corner Road, which aligns with the 50 metre setback for buildings, albeit agricultural buildings, within the Rural Zone.
- The storage and maintenance buildings are sited behind the office building and are a size and form typical of a rural landscape. These buildings are proposed to be constructed using low-reflective materials and finishes that blend with the surrounding landscape.
- The area has suitable access via the principal site access from Pine Corner Road.
- Provides for suitable staff and visitor car parking.
- Incorporates landscaping to Pine Corner Road and adjacent the office building.
- Incorporates appropriate rainwater storage for reuse and suitable wastewater treatment facilities.

| Rural Zone | |
|---|---|
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Siting and Design** | |
| PO 2.1<br>Development is provided with suitable vehicle access. | DTS/DPF 2.1<br>Development is serviced by an all-weather trafficable public road. |
| PO 2.2<br>Buildings are generally located on flat land to minimise cut and fill and the associated visual impacts. | DTS/DPF 2.2<br>Buildings:<br>(a) are located on sites with a slope not greater than 10% (1-in-10)<br>(b) do not result in excavation and/or filling of land greater than 1.5m from natural ground level. |
| **Offices** | |
| PO 7.1<br>Offices are directly related to and associated | DTS/DPF 7.1<br>Offices:<br>(a) are ancillary to and located on the same allotment or an adjoining allotment used for primary production or primary production related value adding industry |

| Rural Zone | |
|---|---|
| with the primary use of the land for primary production or primary production related value adding industry. | (b) have a gross leasable floor area not exceeding 100m2. |
| **Built Form and Character** | |
| PO 10.1<br>Large buildings are designed and sited to reduce impacts on scenic and rural vistas by:<br>(a) having substantial setbacks from boundaries and adjacent public roads<br>(b) using low-reflective materials and finishes that blend with the surrounding landscape<br>(c) being located below ridgelines. | DTS/DPF 10.1<br>None are applicable. |
| **Agricultural Buildings** | |
| PO 12.1<br>Agricultural buildings and associated activities are sited, designed and of a scale that maintains a | DTS/DPF 12.1<br>Agricultural buildings:<br>(a) are located on an allotment having an area of at least 10ha<br>(b) are set back at least 50m from an allotment boundary<br>(c) have a building height not exceeding 10m above natural ground level<br>(d) do not exceed 500m2 in total floor area |

| Rural Zone | |
|---|---|
| pleasant rural character and function. | (e) incorporate the loading and unloading of vehicles within the confines of the allotment. |

| Design<br>Desired Outcome | |
|---|---|
| DO1<br>Development is:<br>(a) contextual - by considering, recognising and carefully responding to its natural surroundings or built environment and positively contributes to the character of the immediate area<br>(b) durable - fit for purpose, adaptable and long lasting<br>(c) inclusive - by integrating landscape design to optimise pedestrian and cyclist usability, privacy and equitable access, and promoting the provision of quality spaces integrated with the public realm that can be used for access and recreation and help optimise security and safety both internally and within the public realm, for occupants and visitors<br>(d) sustainable - by integrating sustainable techniques into the design and siting of development and landscaping to improve community health, urban heat, water management, environmental performance, biodiversity and local amenity and to minimise energy consumption. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **All Development** | |
| **External Appearance** | |
| PO 1.1<br>Buildings reinforce corners through changes in setback, articulation, materials, colour and massing (including height, width, bulk, roof form and slope). | DTS/DPF 1.1<br>None are applicable. |
| PO 1.3<br>Building elevations facing the primary street (other than ancillary buildings) are designed and detailed to convey purpose, identify main access points and complement the streetscape. | DTS/DPF 1.3<br>None are applicable. |
| **Landscaping** | |
| PO 3.1<br>Soft landscaping and tree planting is incorporated to:<br>(a) minimise heat absorption and reflection<br>(b) maximise shade and shelter<br>(c) maximise stormwater infiltration<br>(d) enhance the appearance of land and streetscapes<br>(e) contribute to biodiversity. | DTS/DPF 3.1<br>None are applicable. |

<table>
<tr><th colspan="2">Design</th></tr>
<tr><td colspan="2"><b>On-Site Waste Treatment Systems</b></td></tr>
<tr><td>PO 6.1<br>Dedicated on-site effluent disposal areas do not include any areas to be used for, or could be reasonably foreseen to be used for, private open space, driveways or car parking</td><td>DTS/DPF 6.1<br>Effluent disposal drainage areas do not:<br>(a) encroach within an area used as private open space or result in less private open space than that specified in Design Table 1 - Private Open Space<br>(b) use an area also used as a driveway<br>(c) encroach within an area used for on-site car parking or result in less on-site car parking than that specified in Transport, Access and Parking Table 1 - General Off-Street Car Parking Requirements or Table 2 - Off-Street Car Parking Requirements in Designated Areas.</td></tr>
<tr><td colspan="2"><b>Car Parking Appearance</b></td></tr>
<tr><td>PO 7.2<br>Vehicle parking areas are appropriately located, designed and constructed to minimise impacts on adjacent sensitive receivers through measures such as ensuring they are attractively developed and landscaped, screen fenced and the like.</td><td>DTS/DPF 7.2<br>None are applicable.</td></tr>
<tr><td>PO 7.3<br>Safe, legible, direct and accessible pedestrian connections are provided between parking areas and the development.</td><td>DTS/DPF 7.3<br>None are applicable.</td></tr>
<tr><td colspan="2"><b>Earthworks and Sloping Land</b></td></tr>
<tr><td>PO 8.1<br>Development, including any associated driveways and access tracks, minimises the need for earthworks to limit disturbance to natural topography.</td><td>DTS/DPF 8.1<br>Development does not involve any of the following:<br>(a) excavation exceeding a vertical height of 1m<br>(b) filling exceeding a vertical height of 1m<br>(c) a total combined excavation and filling vertical height of 2m or more.</td></tr>
<tr><td>PO 8.2<br>Driveways and access tracks are designed and constructed to allow safe and convenient access on sloping land (with a gradient exceeding 1 in 8).</td><td>DTS/DPF 8.2<br>Driveways and access tracks on sloping land (with a gradient exceeding 1 in 8) satisfy (a) and (b):<br>(a) do not have a gradient exceeding 25% (1-in-4) at any point along the driveway<br>(b) are constructed with an all-weather trafficable surface.</td></tr>
</table>

Vehicle access is proposed from Pine Corner Road in two locations for construction and operation of the renewable energy facility. Access for emergency vehicles is provided via other existing access points, including Bagnell Road and Broadview Road. A pattern of internal driveways is proposed within the subject land to service the development in a design which caters for all anticipated vehicles for both the construction and operational phases.

MFY (traffic and transport consultants) have considered site access and vehicle movements in the Traffic Impact Assessment report included in Volume 2 of the development application documentation. The report notes that whilst the forecast traffic volumes are not predicted to impact the existing capacity on Pine Corner Road, it is proposed to provide an intersection treatment at the Pine Corner Road and Birdseye Highway intersection to provide improved traffic safety for existing road users and construction drivers accessing the development site. This treatment will continue to provide the improved safety following completion of construction.

PO 8.1 of the Design policies seek to minimise the need for earthworks. The development involves excavation as part of the technology applied to the energy storage, that is, the construction of the hot and cold water pits. Material excavated to form the pits is used to create the walls of the pits, minimising the need for movement of large volumes of materials. Whilst the development incorporates a change to the natural topography of the site, it is limited to the pits associated with the power plants. There is no requirement for bulk earthworks associated with the siting of the heliostat fields, driveways or sites for buildings within the development site.

Buildings and ancillary elements of the proposed renewable energy facility are considered appropriate in the context of the site of development and its rural locality, particularly in terms of design, siting and materials, thereby satisfying the design policies quoted above.

### *4.3.5 Cultural Heritage*

The Desired Outcome of the General Development Policies – Infrastructure and Renewable Energy Facilities seeks to ensure that renewable energy facilities are culturally sensitive.

| **Infrastructure and Renewable Energy Facilities**<br>**Desired Outcome** |
|---|
| DO 1<br>Efficient provision of infrastructure networks and services, renewable energy facilities and ancillary development in a manner that minimises hazard, is environmentally and culturally sensitive and manages adverse visual impacts on natural and rural landscapes and residential amenity. |

A search of the AARD database has indicated that the Register of Aboriginal Sites and Objects (the Register) has no entries for Aboriginal sites within the project area. A desktop heritage assessment has been undertaken by Independent Heritage Consultants (IHC) (refer Volume 2 of the development application documents for IHC Desktop Heritage Assessment summary report by IHC). The heritage assessment determined that there were no known Aboriginal heritage sites within the project area. Considering the

Aboriginal heritage context for the area, the environmental landforms, and the level of previous development, it was assessed that there is a low risk of works encountering unknown Aboriginal sites and objects in previously developed/ploughed areas, and a moderate risk in undeveloped/unploughed areas (i.e., seasonal creeks, creek margins, elevated sandy areas).

Based on the information available to inform the development application, it is considered that the proposal is unlikely to impact areas that are culturally sensitive, as sought by DO1. Photon Energy have commenced engagement with Barngarla Determination Aboriginal Corporation (BDAC) in parallel with the development application in relation to the preparation of a cultural heritage survey.

### *4.3.6 Noise*

Policies of the Planning and Design Code seek to manage and mitigate adverse impact on residential amenity, as stated in the Desired Outcome of the Infrastructure and Renewable Energy Facilities and Interface between Land Uses.

Noise sources associated with the development include chillers, condensing units, pumps, turbines, turboexpander generators and electrical equipment such as, transformers and inverters. Environmental noise emissions from the development should comply with the Environment Protection (Noise) Policy 2007 (Noise Policy) as sought by Interface Between Land Uses PO 4.1 and DPF 4.1.

A detailed Environmental Noise Assessment has been undertaken by Resonate (refer technical reports contained in Volume 2 of the development application documents).

The highest predicted operational noise level at each receptor is presented in Table 4 with respect to the relevant noise criteria and also indicates the distance from the closest subject land boundary to the noise sensitive receivers. The Resonate assessment demonstrates that operation of the Yadnarie Renewable Energy Facility is predicted to comply with the continuous noise requirements of the Noise Policy at all noise sensitive receptors surrounding the development.

**Table 4: Predicted Operational Noise Levels and applicable Noise Policy Criteria**

| Prediction Location | Distance (km) | Predicted Noise Level – $L_{aeq}$ (dB) | | Noise Policy Criteria - $L_{aeq}$ (dB) | |
|---|---|---|---|---|---|
| Noise Sensitive Receptor | Closest distance to Subject land | Scenario 1 | Scenario 2 | Day (7 am to 10 pm) | Night (10 pm to 7 am) |
| **NSR1** | 4.9 | 19 | 26 | 52 | 45 |
| **NSR2** | 1.7 | 33 | 39 | 52 | 45 |
| **NSR3** | 3.3 | 26 | 32 | 52 | 45 |
| **NSR4** | 4.6 | 20 | 27 | 52 | 45 |
| **NSR5** | 6.2 | 14 | 23 | 52 | 45 |
| **NSR6** | 6.1 | 15 | 23 | 52 | 45 |

| Prediction Location | Distance (km) | Predicted Noise Level – $L_{aeq}$ (dB) | | Noise Policy Criteria - $L_{aeq}$ (dB) | |
|---|---|---|---|---|---|
| **NSR7** | 5.7 | 16 | 24 | 52 | 45 |
| **NSR8** | 8.1 | 6 | 15 | 52 | 45 |
| **NSR9** | 5.0 | 18 | 25 | 52 | 45 |
| **NSR10** | 4.2 | 22 | 29 | 52 | 45 |
| **NSR11** | 5.0 | 18 | 25 | 52 | 45 |
| **NSR12** | 3.1 | 25 | 31 | 52 | 45 |
| **NSR13** | 3.5 | 23 | 30 | 52 | 45 |
| **NSR14** | 4.7 | 18 | 25 | 52 | 45 |
| **NSR15** | 5.9 | 12 | 21 | 52 | 45 |
| **NSR16** | 5.0 | 15 | 23 | 52 | 45 |
| **NSR17** | 6.0 | 12 | 21 | 52 | 45 |
| **NSR18** | 4.4 | 17 | 24 | 52 | 45 |
| **NSR19** | 5.7 | 13 | 22 | 52 | 45 |
| **NSR20** | 2.9 | 27 | 33 | 52 | 45 |
| **NSR21** | 2.2 | 31 | 37 | 52 | 45 |
| **NSR22 – Representative receptor in Township Zone (Rudall)** | 7.3 | 6 | 16 | 52 | 45 |
| **NSR23 – Representative receptor in Township Zone (Cleve)** | 7.2 | 13 | 21 | 52 | 45 |
| **NSR24 – Most affected receptor in Rural Zone** | 1.1 | 35 | 40 | 52 | 45 |

The assessment by Resonate demonstrates that operation of the proposed development complies with the relevant environmental noise criteria of the Noise Environmental Protection (Noise) Policy at the nearest noise sensitive receptors surrounding the development. Resonate conclude that “ the proposed Yadnarie Renewable Energy Facility will be able to operate within the relevant noise provisions in the Planning & Design Code and Environmental Protection (Noise) Policy”.

| Infrastructure and Renewable Energy Facilities |
|---|
| **Desired Outcome** |

| Infrastructure and Renewable Energy Facilities |
|---|
| DO 1<br>Efficient provision of infrastructure networks and services, renewable energy facilities and ancillary development in a manner that minimises hazard, is environmentally and culturally sensitive and manages adverse visual impacts on natural and rural landscapes and residential amenity. |

| Interface Between Land Use<br>Desired Outcome | |
|---|---|
| DO 1<br>Development is located and designed to mitigate adverse effects on or from neighbouring and proximate land uses. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **General Land Use Compatibility** | |
| PO 1.2<br>Development adjacent to a site containing a sensitive receiver (or lawfully approved sensitive receiver) or zone primarily intended to accommodate sensitive receivers is designed to minimise adverse impacts. | DTS/DPF 1.2<br>None are applicable. |
| **Activities Generating Noise or Vibration** | |
| PO 4.1<br>Development that emits noise (other than music) does not unreasonably impact the amenity of sensitive receivers (or lawfully approved sensitive receivers). | DTS/DPF 4.1<br>Noise that affects sensitive receivers achieves the relevant Environment Protection (Noise) Policy criteria. |
| PO 4.2<br>Areas for the on-site manoeuvring of service and delivery vehicles, plant and equipment, outdoor work spaces (and the like) are designed and sited to not unreasonably impact the amenity of adjacent sensitive receivers (or lawfully approved sensitive receivers) and zones primarily intended to accommodate sensitive receivers due to noise and vibration by adopting techniques including:<br>(a) locating openings of buildings and associated services away from the interface with the adjacent sensitive receivers and zones primarily intended to accommodate sensitive receivers<br>(b) when sited outdoors, locating such areas as far as practicable from adjacent sensitive receivers and zones primarily intended to accommodate sensitive receivers<br>(c) housing plant and equipment within an enclosed structure or acoustic enclosure<br>(d) providing a suitable acoustic barrier between the plant and / or equipment and the adjacent sensitive receiver boundary or zone. | DTS/DPF 4.2<br>None are applicable. |

| Interface Between Land Use | |
|---|---|
| PO 4.4<br>External noise into bedrooms is minimised by separating or shielding these rooms from service equipment areas and fixed noise sources located on the same or an adjoining allotment. | DTS/DPF 4.4<br>Adjacent land is used for residential purposes. |

Given the technical nature of an acoustic assessment, we defer to the Resonate report and conclude that the proposed Yadnarie renewable energy facility will satisfy the relevant provisions of each of Planning and Design Code regarding noise.

### 4.3.7 Ecology & Native Vegetation

A detailed assessment of flora and fauna within the site of the development has been undertaken by EBS Ecology (EBS). Volume 1 of the development application documentation contains a detailed assessment and description of the flora and fauna characteristics of the subject land.

Volume 2 of the development application documentation comprises three reports by EBS which relate to flora and fauna and native vegetation. A detailed assessment of the impacts of the development on native vegetation are contained in the Native Vegetation Data Report.

The EBS assessment of flora and fauna describes the locality as one consisting of cropping land, with scattered patches of native vegetation. A total of nine vegetation associations (VAs) totalling 149.816 hectares (ha) in varying condition (poor to good) along with 11 scattered trees (of five different species) were mapped across the subject land. In addition to the vegetation associations, EBS observed the following across the subject land:

- No threatened flora or fauna
- 36 fauna species, consisting of 32 bird species, three mammals, and one reptile. Six of these species were introduced.
- 144 plant species, of which 33 were introduced.
- Seven introduced plant species are declared plants under the *Landscape SA Act*.

As illustrated on the plans for the project, the majority of infrastructure is located within cropped paddocks and areas of native vegetation retained, thereby minimising vegetation clearance. Vegetation of the inland dunal areas of the site have been retained, as have various scattered patches of vegetation and extensive areas of boundary (and roadside) vegetation. Protection of areas of native vegetation and minimising impacts on flora and fauna was part to the evolution of the site layout. Developing an efficient layout to satisfy the technical requirements of the development has meant that some vegetation is proposed to be removed. A total of 33.425 ha of native vegetation and five scattered trees will be impact based on the site layout. The Native Vegetation Data Report classifies this clearance as Level 4.

Performance Outcome 1.1 of the Native Vegetation Overly seeks development avoid, or where it cannot be practically avoided, minimises the clearance of native vegetation. The policies of Infrastructure and Renewable Energy Facilities also seek to protect native vegetation as stated in PO 5.1. Performance Outcome 1.2 of the Native Vegetation Overlay is more prescriptive in relation to areas of vegetation to be retained. The proposed development is within an area that has been subject to extensive clearance for agricultural purposes, The vegetation within the subject property has not been assessed as being intact or significant vegetation in terms of wildlife habitat and movement corridors and does not contain rare, vulnerable or endangered plants species. Within the subject land there are networks of contiguous vegetation corridors along fence lines that allow for the movement of animals without exposure in cleared paddocks.

A detailed assessment of the project evolution and the minimisation of impact on native vegetation is discussed in Volume 1 - Project Summary, with reference to the native vegetation mitigation hierarchy (principles for clearance). This assessment notes that 116.391 ha of remnant vegetation and six scattered trees have been retained by positioning infrastructure in cropped paddocks and that the entirety of Vegetation Association 7 (*Eucalyptus gracilis and E. incrassata Mallee* over *Callitris gracilis* +/- *Triodia irritans*) has been retained. Further, the current development has been designed to have infrastructure placed in areas of more disturbed vegetation (Vegetation Associations 2 and 4) or vegetation with few habitat resources. Creation of vehicle access points has been micro-sited to select areas that are more disturbed or that contain vegetation in the poorest condition.

Areas of the subject land are also proposed to be revegetated with native species. The area to the south-west of the site adjacent Price Road and Broadview Road provides an area of approximately 50 hectares adjacent to the existing vegetated inland dunes to be revegetated with native species. In addition, supplementary landscaping screening along boundaries with local native species will assist with ongoing restoration of vegetation.

In addition to the assessment by EBS for native vegetation clearance, an assessment of Matters of National Environmental Significance (MNES) was also undertaken (refer EPBC Self-assessment report - Volume 2 of the development application documentation). This EPBC Self-assessment report was undertaken to determine if a referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) pursuant to the *Environment Protection and Biodiversity Act 1999* (EPBC referral). The ecological and vegetation assessment works undertaken for the Project determined that of the MNES identified in the desktop, two flora species (Greencomb Spider-orchid and Nodding Rufous Hood) and five fauna species (Southern Whiteface, Malleefowl, Blue-winged Parrot, Diamond Firetail and Sandhill Dunnart) were assessed as possible or likely to occur in the Project Area, due to records and suitable habitat. EBS assessed these species as per the EPBC Act guidelines and criteria to determine if the proposed works would significantly impact on them. The EPBC Act Self-assessment found that there will be no significant impact to any MNES resulting from the development.

Based on the endeavours to locate infrastructure within cropped paddocks or within areas of disturbed vegetation, it is considered that the development satisfied the intent of the policies to minimise clearance of native vegetation.

| **Native Vegetation Overlay** | |
|---|---|
| **Desired Outcome** | |
| DO 1<br>Areas of native vegetation are protected, retained and restored in order to sustain biodiversity, threatened species and vegetation communities, fauna habitat, ecosystem services, carbon storage and amenity values. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| PO 1.1<br>Development avoids, or where it cannot be practically avoided, minimises the clearance of native vegetation taking into account the siting of buildings, access points, bushfire protection measures and building maintenance. | DTS/DPF 1.1<br>An application is accompanied by:<br>(a) a declaration stating that the proposal will not, or would not, involve clearance of native vegetation under the Native Vegetation Act 1991, including any clearance that may occur:<br>(i) in connection with a relevant access point and / or driveway<br>(ii) within 10m of a building (other than a residential building or tourist accommodation)<br>(iii) within 20m of a dwelling or addition to an existing dwelling for fire prevention and control<br>(iv) within 50m of residential or tourist accommodation in connection with a requirement under a relevant overlay to establish an asset protection zone in a bushfire prone area<br>or<br>(b) a report prepared in accordance with Regulation 18(2)(a) of the Native Vegetation Regulations 2017 that establishes that the clearance is categorised as 'Level 1 clearance'. |
| PO 1.2<br>Native vegetation clearance in association with development avoids the following:<br>(a) significant wildlife habitat and movement corridors<br>(b) rare, vulnerable or endangered plants species<br>(c) native vegetation that is significant because it is located in an area which has been extensively cleared<br>(d) native vegetation that is growing in, or in association with, a wetland environment. | DTS/DPF 1.2<br>None are applicable. |

| **Infrastructure and Renewable Energy Facilities** | |
|---|---|
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |

| Infrastructure and Renewable Energy Facilities | |
|---|---|
| **General** | |
| **Electricity Infrastructure and Battery Storage Facilities** | |
| PO 5.1<br>Electricity infrastructure is located to minimise visual impacts through techniques including:<br>(a) siting utilities and services:<br>(i) on areas already cleared of native vegetation<br>(ii) where there is minimal interference or disturbance to existing native vegetation or biodiversity<br>(b) grouping utility buildings and structures with non-residential development, where practicable. | DTS/DPF 5.1<br>None are applicable. |

### *4.3.8 Traffic*

Traffic movement associated with the development have been assessed by MFY and discussed in the Traffic Impact Assessment (contained in Volume 2 of the development application documents).

As previously outlined, portion of the site of the development, namely the properties adjacent to Birdseye Highway are within the Key Outback and Rural Routes Overlay, which seeks to ensure safe and efficient movement of vehicles and freight traffic. In addition to the policies of the Key Outback and Rural Routes Overlay which informs safe location of access from State maintained roads, there are several General Development Policies – Transport, Access and Parking which guide vehicle movements, access and parking, some of which are quoted below.

Vehicle access for the proposed development is from Pine Corner Road in two locations for construction and operation of the renewable energy facility with additional emergency vehicle access being provided on other roads. The development will result in an existing vehicle access to Birdseye Highway being closed and an upgrade of the intersection treatment at the Pine Corner Road and Birdseye Highway to provide improved traffic safety for existing road users and construction drivers accessing the development site. This treatment will continue to provide the improved safety following completion of construction. These changes will ensure the development has safe vehicle entry/exit points and not impact the safe and efficient movement of vehicles on Birdseye Highway, as sought by the policies of the Key Outback and Rural Route Overlay.

| Key Outback and Rural Routes Overlay<br>Desired Outcome |
|---|
| DO 1<br>Safe and efficient movement of vehicle and freight traffic on Key Outback and Rural Routes. |
| DO2<br>Provision of safe and efficient vehicular access to and from Key Outback and Rural Routes. |

| Key Outback and Rural Routes Overlay | |
|---|---|
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| PO 1.1<br>Access is designed to allow safe entry and exit to and from a site to meet the needs of development and minimise traffic flow interference associated with access movements along adjacent State maintained roads. | DTS/DPF 1.1<br>An access point satisfies (a), (b) or (c):<br>(a) where servicing a single dwelling / residential allotment:...<br>(b) where the development will result in 2 and up to 6 dwellings:...<br>(c) where the development will result in 7 or more dwellings, or is a non-residential land use:<br>(i) it will not result in more than one access point servicing the development site<br>(ii) where on a road with a speed limit of 80 km/h or greater vehicles can enter and exit the site using left turn only movements<br>(iii) vehicles can enter and exit the site in a forward direction<br>(iv) vehicles can cross the property boundary at an angle between 70 degrees and 90 degrees<br>(v) it will have a width of between 6m and 7m (measured at the site boundary), where the development is expected to accommodate vehicles with a length of 6.4m or less<br>(vi) it will have a width of between 6m and 9m (measured at the site boundary), where the development is expected to accommodate vehicles with a length from 6.4m to 8.8m<br>(vii) it will have a width of between 9m and 12m (measured at the site boundary), where the development is expected to accommodate vehicles with a length from 8.8m to 12.5m<br>(viii) it provides for simultaneous two-way vehicle movements at the access:<br>A.with entry and exit movements for vehicles with a length up to 5.2m vehicles being fully within the kerbside lane of the road<br>and<br>B with entry movements of 8.8m vehicles (where relevant) being fully within the kerbside lane of the road and the exit movements of 8.8m vehicles do not cross the centreline of the road. |

The General Development - Transport, Access and Parking policies provide comprehensive set of guidelines which would be applicable to the development. The key issue regarding traffic and transport relate to the additional vehicles accessing the proposed development during construction.  MFY have considered site access and vehicle movements in the Traffic Impact Assessment report for a staged development of the project.

Stage 1 of the project will include the construction of Power Block 1 and associated infrastructure. Stage 1 will be constructed in 24 months and the following number of vehicles are estimated to access the site during the construction period:

- Approximately 32,000 light vehicles.
- Approximately 900 rigid vehicles.
- Approximately 1,000 semi-trailer vehicles.
- Approximately 30 Over-sized Over-mass (OSOM) vehicles.

Based on a five-day work week, the average daily traffic generated by the development will equate to approximately 130 trips per day. It is estimated that there could be approximately or 40 trips in one hour when drivers are travelling to and from work.

Stage 2 of the project will include the construction of Power Block 2 and 3 and associated infrastructure. Stage 2 will be constructed in 24 months and, therefore, will potentially generate twice the volume of traffic generated in Stage 1. Accordingly, Stage 2 of the construction could generate approximately 260 trips per day or 80 trips in one hour.

The forecast volumes will have no impact on the existing capacity on Pine Corner Road and will not change its nature or function. Notwithstanding this, it is proposed to provide an intersection treatment at the Pine Corner Road/Birdseye Highway intersection to provide improved traffic safety for existing road users and construction drivers accessing the development site.

During the operational phase of the project, typical vehicles such as utility vehicles or vans, along with the occasional large vehicle (up to 19.0m semi-trailer) would utilise the site entrance on Pine Corner Road. Within the site, the principal internal driveways are typically 7 metres wide with a 10-metre clear width. Driveways which will provide access to specific equipment such as the heliostats and towers will have a 4 m wide carriageway within a 7 m wide clear width, although wider areas will be available to facilitate turning of vehicles where required.  Emergency vehicle access is anticipated from Broadview Road and Bagnell Road.

Based on the assessment undertaken in the Traffic Impact Assessment, it is considered that the proposed development suitability and adequately address the policy intent of the Transport, Access and Parking policies, as it:

- Incorporates an upgrade of the intersection of Birdseye Highway and Pine Corner Road
- Creates vehicle access points on Pine Corner Road which are suitably separated from the arterial road

- The new vehicle access points have suitable sightlines
- The new vehicle access points are designed to cater for the construction traffic and would therefore be suitable for the operation stage of the development, thereby providing safe and convenient access which minimises impact or interruption on the operation of public roads.
- On-site vehicle driveways cater for the nature and volume of movements anticipated during construction and operation
- Parking for construction vehicles would occur throughout the site as required and be concentrated in the central construction compound.
- On-site parking is provided adjacent to the office and control building to cater for the number of staff and visitors anticipated onsite during the operational phase of the project.

| **General Development Policies – Transport, Access and Parking** | |
|---|---|
| **Desired Outcome** | |
| DO 1<br>A comprehensive, integrated and connected transport system that is safe, sustainable, efficient, convenient and accessible to all users. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Movement Systems** | |
| PO 1.1<br>Development is integrated with the existing transport system and designed to minimise its potential impact on the functional performance of the transport system. | DTS/DPF 1.1<br>None are applicable. |
| PO 1.2<br>Development is designed to discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive receivers. | DTS/DPF 1.2<br>None are applicable. |
| PO 1.3<br>Industrial, commercial and service vehicle movements, loading areas and designated parking spaces are separated from passenger vehicle car parking areas to ensure efficient and safe movement and minimise potential conflict. | DTS/DPF 1.3<br>None are applicable. |
| PO 1.4<br>Development is sited and designed so that loading, unloading and turning of all traffic avoids interrupting the operation of and queuing on public roads and pedestrian paths. | DTS/DPF 1.4<br>All vehicle manoeuvring occurs onsite. |
| **Sightlines** | |
| PO 2.1<br>Sightlines at intersections, pedestrian and cycle crossings, and crossovers to allotments for | DTS/DPF 2.1<br>None are applicable. |

| General Development Policies – Transport, Access and Parking | |
|---|---|
| motorists, cyclists and pedestrians are maintained or enhanced to ensure safety for all road users and pedestrians. | |
| **Vehicle Access** | |
| PO 3.1<br>Safe and convenient access minimises impact or interruption on the operation of public roads. | DTS/DPF 3.1<br>The access is:<br>(a) provided via a lawfully existing or authorised driveway or access point or an access point for which consent has been granted as part of an application for the division of land<br>or<br>(b) not located within 6m of an intersection of 2 or more roads or a pedestrian activated crossing. |
| PO 3.3<br>Access points are sited and designed to accommodate the type and volume of traffic likely to be generated by the development or land use. | DTS/DPF 3.3<br>None are applicable. |
| PO 3.4<br>Access points are sited and designed to minimise any adverse impacts on neighbouring properties. | DTS/DPF 3.4<br>None are applicable. |
| PO 3.8<br>Driveways, access points, access tracks and parking areas are designed and constructed to allow adequate movement and manoeuvrability having regard to the types of vehicles that are reasonably anticipated. | DTS/DPF 3.8<br>None are applicable. |
| PO 3.9<br>Development is designed to ensure vehicle circulation between activity areas occurs within the site without the need to use public roads. | DTS/DPF 3.9<br>None are applicable. |
| **Access for People with Disabilities** | |
| PO 4.1<br>Development is sited and designed to provide safe, dignified and convenient access for people with a disability. | DTS/DPF 4.1<br>None are applicable. |
| **Vehicle Parking Rates** | |
| PO 5.1<br>Sufficient on-site vehicle parking and specifically marked accessible car parking places are provided to meet the needs of the development or land use having regard to factors that may support a reduced on-site rate such as:<br>(a) availability of on-street car parking<br>(b) shared use of other parking areas<br>(c) in relation to a mixed-use development, where the hours of operation of commercial activities | DTS/DPF 5.1<br>Development provides a number of car parking spaces on-site at a rate no less than the amount calculated using one of the following, whichever is relevant:<br>(a) Transport, Access and Parking Table 2 - Off-Street Vehicle Parking Requirements in Designated Areas if the development is a class of development listed in Table 2 and the site is in a Designated Area |

| General Development Policies – Transport, Access and Parking | |
|---|---|
| complement the residential use of the site, the provision of vehicle parking may be shared<br>(d) the adaptive reuse of a State or Local Heritage Place. | (b) Transport, Access and Parking Table 1 - General Off-Street Car Parking Requirements where (a) does not apply<br>(c) if located in an area where a lawfully established carparking fund operates, the number of spaces calculated under (a) or (b) less the number of spaces offset by contribution to the fund. |
| **Vehicle Parking Areas** | |
| PO 6.1<br>Vehicle parking areas are sited and designed to minimise impact on the operation of public roads by avoiding the use of public roads when moving from one part of a parking area to another. | DTS/DPF 6.1<br>Movement between vehicle parking areas within the site can occur without the need to use a public road. |
| PO 6.2<br>Vehicle parking areas are appropriately located, designed and constructed to minimise impacts on adjacent sensitive receivers through measures such as ensuring they are attractively developed and landscaped, screen fenced, and the like. | DTS/DPF 6.2<br>None are applicable. |
| PO 6.6<br>Loading areas and designated parking spaces for service vehicles are provided within the boundary of the site. | DTS/DPF 6.6<br>Loading areas and designated parking spaces are wholly located within the site. |

In addition to the assessment of the nature and movement of vehicles associated with the development, the Traffic Impact Assessment report also comprised a traffic safety assessment. As previously discussed, the technology proposed to be employed in the development will reflect light. MFY have undertaken an assessment of the glare from this reflection of light to understand if it would present a distraction to drivers. The assessment has been completed based on the principles in Austroads “Guide to Road Design – Part 6: Roadside Design, Safety and Barriers” (AGRD06) and “Guide to Road Design - Part 6B: Roadside Environment” (AGRD06B). This assessment is referred to as a ‘cone of vision assessment’.

The Traffic Impact Assessment report notes that the cone of vision assessment considers the location of the heliostats and the receivers with respect to a driver’s general field of vision while driving. The assessment identified that the receivers and heliostat fields will be located clear of drivers’ cone of vision throughout the entirety of the development.

In addition to the cone of vision assessment, MFY have considered the impacts of ocular glare and the potential impact to a driver’s vision. MFY assessed and identified areas where the glare zone could encroach into the cone of vision of drivers, albeit the risk of impact associated with the green glare zone is significantly lower than those associated with the yellow glare zone. Further the risk associated with the green glare zone decreases as the distance from the receiving towers and the angle to the driver increases.

MFY identified areas that some heliostats and receivers on local roads are in locations where the ocular safety zone extends into the cone of vision, thus identifying a risk of distraction or the potential for an after image for drivers. The potential intrusions were only identified at the extremity of the low risk of after image (green) zone where the risk of any impact is low.

As previously discussed, having identified the areas of potential intrusion, Photon Energy and MFY discussed methods to mitigate the risk of the after image or ocular damage. The effective method is to ensure the driver does not have line of sight to the receiver in those locations where the ocular safety zone extends into the cone of vision would be to provide an effective screen (mound/vegetation or similar) and this screening has been incorporated into the design of the development.

Based on the technical assessment undertaken by MFY, the safety of drivers around the site of the development can be suitably managed, albeit the risk of ocular glare is low, and satisfies the PO 7.1 Interface between Land Uses regarding potential distraction to road users.

| General Development Policies – Interface Between Land Uses | |
|---|---|
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| PO 7.1<br>Development is designed and comprised of materials and finishes that do not unreasonably cause a distraction to adjacent road users and pedestrian areas or unreasonably cause heat loading and micro-climatic impacts on adjacent buildings and land uses as a result of reflective solar glare. | DTS/DPF 7.1<br>None are applicable. |

In accordance with the conclusions of the Traffic Impact Assessment it is considered that the relevant policies of the Planning and Design Code, as they relate to traffic matters, are appropriately satisfied.  The further detailed assessment of the development prior to construction as part of a Traffic Management Plan will further assist in managing the potential impacts of the development during the construction phase.

### *4.3.9 Hydrology*

The Hazards (Flooding-Evidence Required) Overlay and Water Resources Overlay both apply to the subject land. A hydrological assessment was undertaken by Worley to inform the design and siting of the development. The assessment noted that there was limited information available on hydraulic behaviours and streamflow in the locality, with the main creek systems of the area being the Yadnarie Creek and Mangalo Creek. The Yadnarie Creek on the subject land has no defined channel which provides potential for water to flow through a wide area.

Infrastructure that is proposed within the undefined wide flow path of Yadnarie Creek on the subject land does not comprise habitable buildings, rather these areas comprise heliostat fields and receiving towers that would not be impacted by water flows in flooding events, thereby satisfying PO 1.1 of Hazards (Flooding Evidence Required) Overlay.

PO 1.2 of Hazards (Flooding Evidence Required) Overlay seeks to ensure that hazard materials are designed to prevent spills or leaks. The development utilises Anhydrous ammonia within the power plants for the organic rankine cycle (ORC). Ammonia will be stored in accordance with relevant regulations (South Australian Dangerous Substances Act 1979 and South Australian Dangerous Substances (General) Regulation 2017) and be subject to the necessary assessment and controls by SafeWork SA. In addition to appropriate storage and labelling, the development will also incorporate an ammonia leak detection and alarm system. These techniques are considered appropriate to address PO 2.1.

| **Hazards (Flooding-Evidence Required) Overlay<br>Desired Outcome** | |
|---|---|
| DO 1<br>Development adopts a precautionary approach to mitigate potential impacts on people, property, infrastructure and the environment from potential flood risk through the appropriate siting and design of development. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Flood Resilience** | |
| PO 1.1<br>Development is sited, designed and constructed to minimise the risk of entry of potential floodwaters where the entry of flood waters is likely to result in undue damage to or compromise ongoing activities within buildings. | DTS/DPF 1.1<br>Habitable buildings, commercial and industrial buildings, and buildings used for animal keeping incorporate a finished floor level at least 300mm above:<br>(a) the highest point of top of kerb of the primary street<br>or<br>(b) the highest point of natural ground level at the primary street boundary where there is no kerb |
| **Environmental Protection** | |

| Hazards (Flooding-Evidence Required) Overlay<br>Desired Outcome | |
|---|---|
| PO 2.1<br>Buildings and structures used either partly or wholly to contain or store hazardous materials are designed to prevent spills or leaks leaving the confines of the building. | DTS/DPF 2.1<br>Development does not involve the storage of hazardous materials. |

Once operational, the proposed renewable energy facility is unlikely to have adverse impacts on the watercourses within or downstream of the site of the development. The nature of the development does not require extraction of water, nor create waste in a manner that would adversely affect the natural systems of the watercourses. The exclusion to this is the office and operation/maintenance facilities that will require collection, use and disposal of wastewater. The plans which accompany the development application show an indicative layout of the operations and maintenance facilities, which includes on-site stormwater disposal. It is anticipated that these facilities will be self-sufficient and not generate off-site impacts. The final design and layout, including on-site water collection and disposal, will be subject to further design. Detailed design of these facilities will be undertaken in accordance with the principles of water sensitive design and in accordance with the Construction Environmental Management Plan, a draft of which forms part of the application documents (refer Volume 4).

During construction there is potential to create impacts on watercourses and groundwater by erosion and landslip, through the earthworks associated with constructing the hot and cold water pits, construction of access tracks, footings for the receiving towers, and site development for both temporary and permanent operation, and maintenance facilities. The draft Construction Environmental Management Plan comprises measures to mitigate the potential impacts during construction.

Water utilised during the construction phase will principally be from existing onsite infrastructure (SA Water mains), but may be sourced from the aquifer. Any water from the aquifer would however be subject to approval through other legislation. The option also exists to obtain water from an external source, and transport and store it within the construction facilities.

| Water Resources Overlay<br>Desired Outcome | |
|---|---|
| DO 1<br>Protection of the quality of surface waters considering adverse water quality impacts associated with projected reductions in rainfall and warmer air temperatures as a result of climate change. | |
| DO2<br>Maintain the conveyance function and natural flow paths of watercourses to assist in the management of flood waters and stormwater runoff. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Water Catchment** | |

| Water Resources Overlay | |
|---|---|
| PO 1.1<br>Watercourses and their beds, banks, wetlands and floodplains (1% AEP flood extent) are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes. | DTS/DPF 1.1<br>None are applicable. |
| PO 1.5<br>Development that increases surface water run-off includes a suitably sized strip of vegetated land on each side of a watercourse to filter runoff to:<br>(a) reduce the impacts on native aquatic ecosystems<br>(b) minimise soil loss eroding into the watercourse. | DTS/DPF 1.5<br>A strip of land 20m or more wide measured from the top of existing banks on each side of the watercourse is free from development, livestock use and revegetated with locally indigenous vegetation |
| PO 1.6<br>Development resulting in the depositing or placing of an object or solid material in a watercourse or lake occurs only where it involves any of the following:<br>(a) the construction of an erosion control structure<br>(b) devices or structures used to extract or regulate water flowing in a watercourse<br>(c) devices used for scientific purposes<br>(d) the rehabilitation of watercourses. | DTS/DPF 1.6<br>None are applicable. |
| PO 1.7<br>Watercourses, floodplains (1% AEP flood extent) and wetlands protected and enhanced by retaining and protecting existing native vegetation. | DTS/DPF 1.7<br>None are applicable. |
| PO 1.8<br>Watercourses, floodplains (1% AEP flood extent) and wetlands are protected and enhanced by stabilising watercourse banks and reducing sediments and nutrients entering the watercourse. | DTS/DPF 1.8<br>None are applicable. |
| PO 1.9<br>Dams, water tanks and diversion drains are located and constructed to maintain the quality and quantity of flows required to meet environmental and downstream needs. | DTS/DPF 1.9<br>None are applicable. |

During construction, there is a potential for soil erosion and sedimentation. Measure to mitigate potential impacts are incorporated in the draft Construction Environmental Management Plan (Volume 4 of the development application). These measures include:

- Utilising existing access tracks wherever practical;
- Minimising vegetation clearance;
- Retention of all contaminated stormwater and process wastewater on-site;
- Locate stockpiles away from drainage lines and in areas least susceptible to wind erosion;
- Effectively control surface runoff entering and leaving the site;

- Design of crossing of watercourses in consultation with relevant authorities;
- Truck and wheel wash facilities to be provided at exit points;
- All equipment wash-down to be undertaken within an identified wash down area and contained within that area;
- The refuelling of vehicles or equipment shall not be conducted within 30 metres of a water body, watercourse or drainage channel; and
- All construction activities to be undertaken in accordance with the EPA Environment Protection (Water Quality) Policy 2015.

There will be a low risk of detrimental effect on water quality during construction, provided that work complies with a Construction Environment Management Plan (CEMP) incorporating a Soil Erosion and Drainage Management Plan for each element of the development. Potential impacts on natural features due to erosion and landslip can be minimised through appropriate management, utilising techniques already outlined in the draft CEMP.

Amenities developed as part of the office and operations/maintenance facilities of the Project will incorporate appropriately designed and sited waste water management systems, in accord with PO 12.1 and DTS/DPF 12.1 of the Infrastructure and Renewable Energy Facilities policies.

| **Infrastructure and Renewable Energy Facilities** | |
|---|---|
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Wastewater Services** | |
| PO 12.1<br>Development is connected to an approved common wastewater disposal service with the capacity to meet the requirements of the intended use. Where this is not available an appropriate on-site service is provided to meet the ongoing requirements of the intended use in accordance with the following:<br>(a) it is wholly located and contained within the allotment of the development it will service<br>(b) in areas where there is a high risk of contamination of surface, ground, or marine water resources from on-site disposal of liquid wastes, disposal systems are included to minimise the risk of pollution to those water resources<br>(c) septic tank effluent drainage fields and other wastewater disposal areas are located away from watercourses and flood prone, sloping, saline or poorly drained land to minimise environmental harm. | DTS/DPF 12.1<br>Development is connected, or will be connected, to an approved common wastewater disposal service with the capacity to meet the requirements of the development. Where this is not available it is instead capable of being serviced by an on-site waste water treatment system in accordance with the following:<br>(a) the system is wholly located and contained within the allotment of development it will service; and<br>(b) the system will comply with the requirements of the South Australian Public Health Act 2011. |

### 4.3.10 *Hazards and Bushfire*

Volume 1 – Project Summary provides a detailed summary of the methodology to be addressed to manage hazards, including fire and bushfire. As previously outlined the subject land is sited within the Hazards (Bushfire -Regional Risk) Overlay, which seek to mitigate the threat and impact of bushfires on life and property. In addition, the Performance Outcomes 4.2 and 4.3 of the Infrastructure and Renewable Energy Facilities policies address bushfire hazard management. PO 4.3 seeks development provides appropriate access tracks, safety equipment and water tanks and establishing cleared areas around substations, battery storage and operations compounds.

| **Hazards (Bushfire – Regional Risk) Overlay**<br>**Desired Outcome** | |
|---|---|
| DO 1<br>Development, including land division responds to the relevant level of bushfire risk and is sited and designed to mitigate the threat and impact of bushfires on life and property taking into account the increased frequency and intensity of bushfires as a result of climate change. | |
| DO2<br>To facilitate access for emergency service vehicles to aid the protection of lives and assets from bushfire danger. | |
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Siting** | |
| PO 1.1<br>Buildings and structures are located away from areas that pose an unacceptable bushfire risk as a result of vegetation cover and type, and terrain. | DTS/DPF 1.1<br>None are applicable. |
| **Built Form** | |
| PO 2.1<br>Buildings and structures are designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against or underneath the building or structure, or between the ground and building floor level in the case of transportable buildings and buildings on stilts. | DTS/DPF 2.1<br>None are applicable. |
| **Vehicle Access -Roads and Driveways** | |
| PO 5.1<br>Roads are designed and constructed to facilitate the safe and effective:<br>(a) access, operation and evacuation of fire-fighting vehicles and emergency personnel | DTS/DPF 5.1<br>Roads:<br>(a) are constructed with a formed, all-weather surface<br>(b) have a gradient of not more than 16 degrees (1-in-3.5) at any point along the road |

| Hazards (Bushfire – Regional Risk) Overlay | |
|---|---|
| (b) evacuation of residents, occupants and visitors. | (c) have a cross fall of not more than 6 degrees (1-in-9.5) at any point along the road<br>(d) have a minimum formed road width of 6m<br>(e) provide overhead clearance of not less than 4.0m between the road surface and overhanging branches or other obstructions including buildings and/or structures (Figure 1)<br>(f) allow fire-fighting services (personnel and vehicles) to travel in a continuous forward movement around road curves by constructing the curves with a minimum external radius of 12.5m (Figure 2)<br>(g) incorporating cul-de-sac endings or dead end roads do not exceed 200m in length and the end of the road has either:<br>(i) a turning area with a minimum formed surface radius of 12.5m (Figure 3)<br>or<br>(ii) a 'T' or 'Y' shaped turning area with a minimum formed surface length of 11m and minimum internal radii of 9.5m (Figure 4)<br>(h) incorporate solid, all-weather crossings over any watercourse that support fire-fighting vehicles with a gross vehicle mass (GVM) of 21 tonnes. |
| PO 5.3<br>Development does not rely on fire tracks as means of evacuation or access for fire-fighting purposes unless there are no safe alternatives available. | DTS/DPF 5.3<br>None are applicable. |

| Infrastructure And Renewable Energy Facilities | |
|---|---|
| **Performance Outcome** | **Deemed-to-Satisfy Criteria / Designated Performance Feature** |
| **Hazard Management** | |
| PO 4.2<br>Facilities for energy generation, power storage and transmission are separated as far as practicable from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms / lookouts) to reduce risks to public safety from fire or equipment malfunction. | DTS/DPF 4.2<br>None are applicable. |
| PO 4.3<br>Bushfire hazard risk is minimised for renewable energy facilities by providing appropriate access tracks, safety equipment and water tanks and establishing cleared areas around substations, battery storage and operations compounds. | DTS/DPF 4.3<br>None are applicable. |

A Bushfire Protection Assessment has been undertaken by consultants AJL Solutions as part of the project planning, so that the project can incorporate measures to reduce the frequency, spread and impact of bushfires (refer Volume 2 – Technical Reports of the development application documentation). This assessment has utilised the Victorian Country Fire Authority Guidelines - Design Guidelines and Model Requirements - Renewable Energy Facilities V4 (CFS Guidelines) in lieu of a specific South Australian standard or guideline for assessment of fire risk for renewable energy projects.

A range of the applicable design features are included in the development to minimise fire, including:

- Fire breaks around boundaries of the site
- Static water storage at the principal site entrance and adjacent each of the power blocks
- All weather internal driveways that would cater for emergency service vehicles
- Control of ground cover vegetation during high fire danger periods
- Construction of infrastructure such as the power plants, substation and operations and maintenance areas on a hard stand surface
- A control systems that disallows heliostats to focus concentrated light in any location other than the solar receiver
- 
- Specific management techniques in relation to dangerous goods, including:
  - All materials that are flammable and combustible should be stored in a secure and enclosed area away from the site office or any electrical infrastructure.
  - An area of cleared land of all vegetation including grasses of no less than 20m shall be maintained surrounding the storage enclosure.
  - All fuels and hazardous materials must be identifiable as required by the South Australian Dangerous Substances Act 1979 and South Australian Dangerous Substances (General) Regulation 2017 for storage and labelling.
  - Storage and handling of Anhydrous ammonia to be carried out in accordance with AS 2022 Anydrous Ammonia - Storage and Handling.
  - Ammonia leak detection and alarm system to be implemented in the relevant building(s) storing ammonia.

Mitigation controls in relation to fire will be incorporated into the Fire Management Plan, as outlined in Volume 1 - Project Summary. The Fire Management Plan and/or Emergency Management Plan will be prepared prior to construction, in consultation with the SA CFS. The current design features and the commitment to prepare a detailed Fire Management Plan adequately minimise the potential of bushfire risk from the proposed renewable energy facility as sought by PO 4.3 of the Infrastructure and Renewable Energy Facilities policies and the intent of the Hazards (Bushfire -Regional Risk) Overlay.

Performance Outcome 4.2 of the Infrastructure and Renewable Energy Facilities policies seeks to incorporate practical separation between energy generation, storage and transmission infrastructure to dwellings, tourist accommodation and frequently visited public places. Whilst the policies do not specify the separation distance, it is noted that separation of the development from both Cleve and Rudall is approximately 7km respectively. Furthermore, there is substantial separation of the proposed infrastructure from the nearest sensitive receivers, with the closest dwelling being approximately 1km south of the southern boundary of the property and the majority of dwellings being 2km or more from the subject land. The separation distances are further increased with the central location of significant infrastructure such as the power plants and substation centrally within the site. The transmission infrastructure will be constructed adjacent to the existing transmission infrastructure and within the easement corridor and in accordance with the necessary standards. With the separation distances and in combination with the fire management techniques, it is considered the development achieves the intent of this policy.

### *4.3.11 Summary of Planning and Design Code Assessment*

Development of the proposed PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) technologies at Yadnarie is a renewable energy facility which is appropriate land use within the Rural Zone and has substantial planning merit, including:

- The development is of significant benefit to the State via the generation of sustainable and stable electricity.
- The development will benefit the state by providing storage of renewable energy for distribution into the national electricity grid at peak periods.
- Renewable energy facilities are an envisaged land use within the Rural Zone.
- The site of the development is not located within a designated area of landscape character.
- The development will allow the retention of the principal and underlying land use of the locality, that is, primary production in the form of grazing and cropping on adjoining land and co-located grazing activities on the subject land.
- The proposal is unlikely to adversely impact on aerial agriculture application or aerial firefighting within the locality, as both of these activities are manageable around the proposed infrastructure.
- The development does not adversely affect aviation safety.
- The low risk of ocular glare to road users on local roads can be appropriately managed via supplementary screen landscaping to site boundaries (as required).
- Visual impact of the infrastructure is moderate at a local level and can be suitably minimised by the incorporation of screen landscaping.
- The development minimises native vegetation clearance and incorporates revegetation and screen landscaping.
- The development incorporates substantial separation from townships and all non-associated (non-stakeholder) dwellings or other sensitive receivers.
- The development is designed to be compliant with EPA noise criteria.
- The development results in improved road conditions via the upgrade of the intersection of Birdseye Highway and Pine Corner Road.
- The development can be designed to suitably manage potential impacts such as traffic movements, dust, noise during the construction phase.

# 5 Conclusion

This report has undertaken an assessment of the proposed development against the relevant provisions of the Planning and Design Code. Renewable energy facilities are an envisaged land use within the Rural Zone. The proposed Yadnarie PV Ultra (solar cogeneration) and Thermal Hydro (electro-thermal storage) project adequately and appropriately addresses potential effects, particularly those associated with visual, ecology/native vegetation, noise, Aboriginal heritage, aviation, and traffic movements in a manner sought by the Planning and Design Code.

On balance, the proposed Yadnarie Renewable Energy Facility is a suitable form of development within the Rural Zone and applicable Overlays that suitably addresses potential effects, it is not seriously at variance with the Planning and Design Code and warrants the granting of development authorisation.

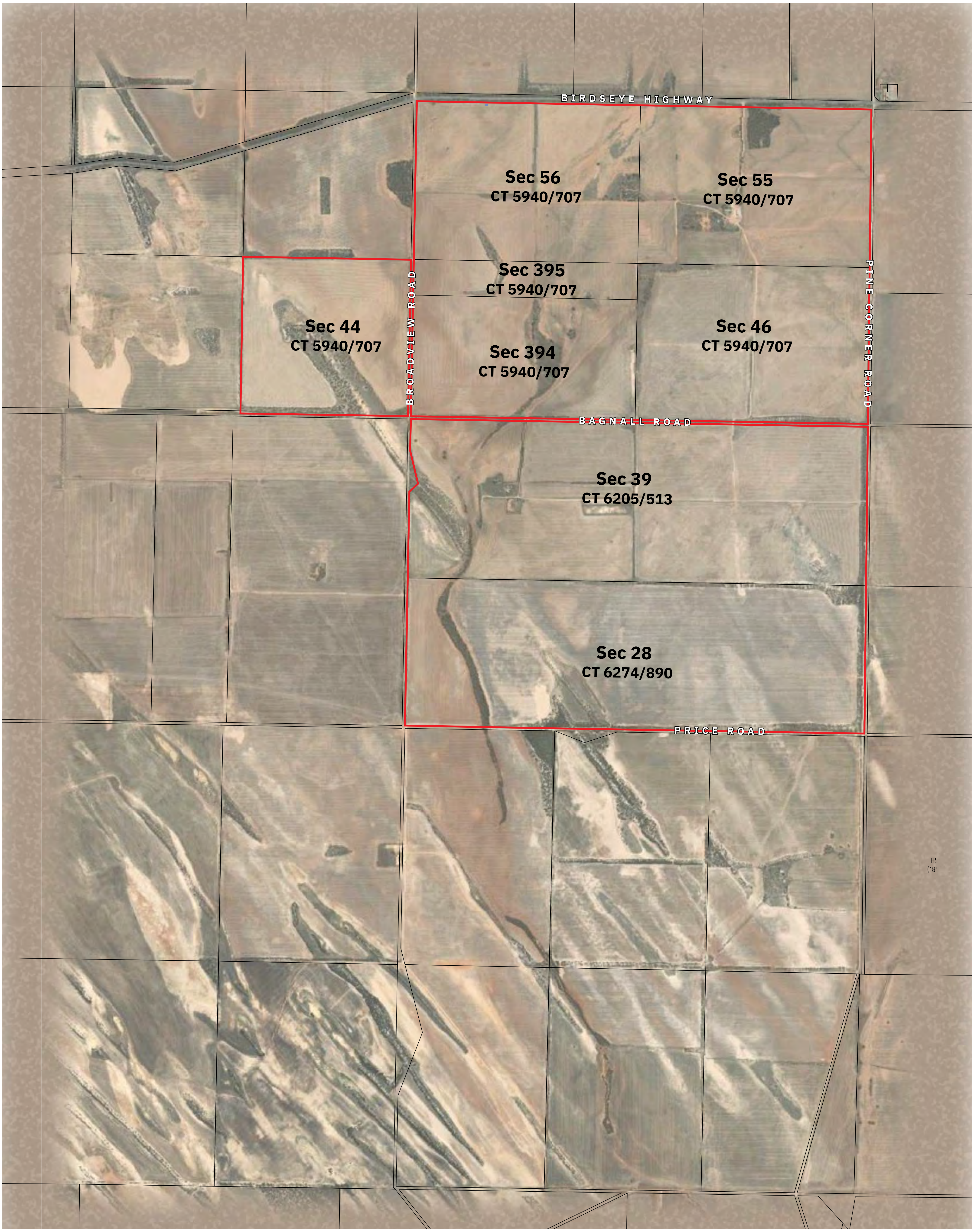
Julie Jansen
RPIA (Fellow), Level 1 Accredited Planner
BA, BA(Hons), GDURP

28 October 2024

**Attachment A** – Site Plan

**Attachment B** – Locality Plan

# **A.** Site Plan



🟥 Subject Land

# SITE PLAN

## PROPOSED SOLAR STORAGE FACILITY

225 BROADVIEW ROAD, 4543 BIRDSEYE HIGHWAY,
LOT 28 PINE CORNER ROAD
CLEVE

for PHOTON ENERGY

1:25000 @ A3
0 500

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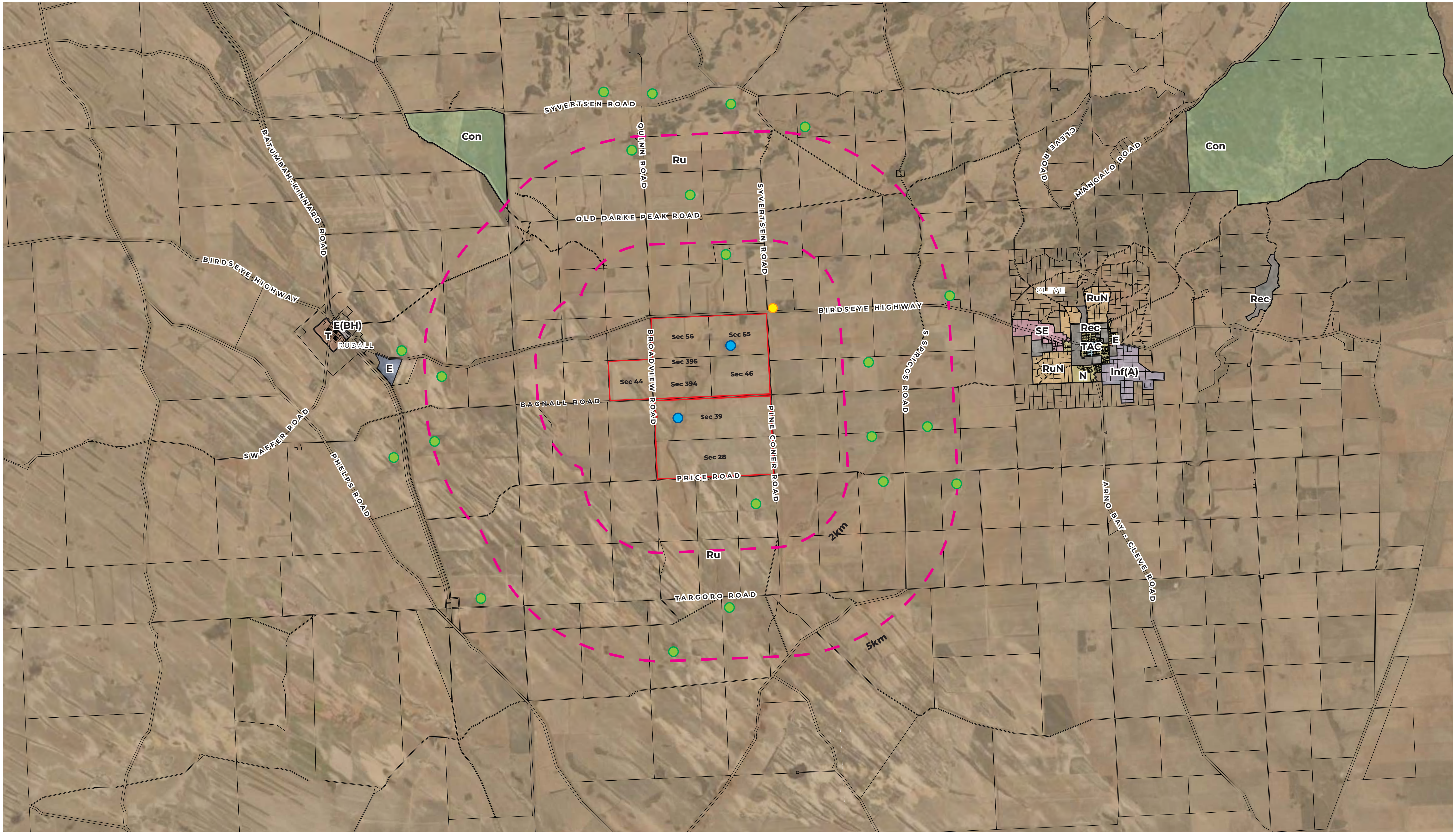
# B. Locality Plan



▭ Subject Land

● Yadnarie Substation

● Dwelling - Involved Landowner

● Dwelling - Non-involved Landowner

◌ 2km + 5km setback around subject land

**Zones**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E** | Employment | **TAC** | Township Activity Centre | **Ru** | Rural | | |
| **N** | Neighbourhood | **CTP** | Caravan & Tourist Park | **RuN** | Rural Neighbourhood | | |
| **Rec** | Recreation | **E(BH)** | Employment (Bulk Handling) | **SE** | Strategic Employment | | |
| **Inf(A)** | Infrastructure (Airfield) | **T** | Township | **Con** | Conservation | | |

# LOCALITY & ZONING PLAN

## PROPOSED SOLAR STORAGE FACILITY

225 BROADVIEW ROAD, 4543 BIRDSEYE HIGHWAY
LOT 28 PINE CORNER ROAD
CLEVE

for PHOTON ENERGY

1:50000 @ A1
1:100000 @ A3
0 2km

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