(e) the need to avoid significantly impeding natural flow and drainage;

(f) the need to maintain fish passage, where known to exist;

(g) the need to avoid land filling of wetlands;

(h) the need to group new facilities with existing facilities, where reasonably practical;

(i) minimising cut and fill;

(j) building design that responds to the particular size, shape, contours or slope of the land;

(k) minimising impacts on coastal processes, including sand movement and wave action;

(l) minimising the need for future works for the protection of natural assets, infrastructure and property;

(m) the environmental best practice guidelines in the Wetlands and Waterways Works Manual; and

(n) the guidelines in the Tasmanian Coastal Works Manual.

Response: In relation to the proposed transmission easement, impacts within the waterway protection overlay will be limited to vegetation clearing to establish and maintain the transmission line easement and construction of access tracks within the easement, including creek crossings where necessary. Footings and poles will be located outside the waterway protection areas.

In relation to the solar farm, some infrastructure may be required within waterway protection areas, which include minor drainage lines in cleared paddocks and strips of remnant riparian vegetation.

Infrastructure will be designed to avoid or minimise impacts on streambed, streambank instream habitat and riparian vegetation. Works will be in accordance with a construction environmental management plan, following guidelines in the Wetlands and Waterways Works Manual ,to ensure controls are in place to minimise impacts including erosion and sedimentation. In addition, any access tracks will meet the Forest Practices Code for Class 4 tracks as a minimum.

C7.6.2 Clearance within a priority vegetation area

As the acceptable solutions cannot be met, the performance criteria within C7.6.2 Development Standards must be addressed.

P1.1 Clearance of native vegetation within a priority vegetation area must be for:

(a) an existing use on the site, provided any clearance is contained within the minimum area necessary to be cleared to provide adequate bushfire protection, as recommended by the Tasmania Fire Service or an accredited person;

(b) buildings and works associated with the construction of a single dwelling or an associated outbuilding;

(c) subdivision in the General Residential Zone or Low Density Residential Zone;

(d) use or development that will result in significant long term social and economic benefits and there is no feasible alternative location or design;

(e) clearance of native vegetation where it is demonstrated that on-going pre-existing management cannot ensure the survival of the priority vegetation and there is little potential for long-term persistence; or

(f) the clearance of native vegetation that is of limited scale relative to the extent of priority vegetation on the site.

**Response:** The project meets criteria P1.1(d) and (f). The proposal is a major infrastructure project to provide renewable energy, which will have long-term economic benefits for the municipality and the State. The proposed transmission corridor intersects 2.1 km of priority vegetation area, totalling around 50 ha out of a priority vegetation area covering thousands of hectares. The actual footprint of the development will be smaller since it will be limited to an easement within the broader corridor.

P1.2 Clearance of native vegetation within a priority vegetation area must minimise adverse impacts on priority vegetation, having regard to:

(a) the design and location of buildings and works and any constraints such as topography or land hazards;

(b) any particular requirements for the buildings and works;

(c) minimising impacts resulting from bushfire hazard management measures through siting and fire-resistant design of habitable buildings;

(d) any mitigation measures implemented to minimise the residual impacts on priority vegetation;

(e) any on-site biodiversity offsets; and

(f) any existing cleared areas on the site.

**Response:** The proposed transmission easement is designed to avoid threatened vegetation communities and is the shortest practical alignment considering constraints of land tenure, existing infrastructure, and threatened vegetation. This design and location minimise impacts on priority vegetation.

The area which falls under the Priority Vegetation overlay was surveyed and was found to be comprised of regenerating DAC and DAD. Neither of these vegetation types are listed as threatened under the NCA. Around half of the footprint within the priority vegetation overlay is recently logged regrowth forest.

There were no threatened species or habitats (flora or fauna) identified within this overlay. The disturbance of the vegetation within these small areas would not have an undue impact on the surrounding area. There will be no impact to any threatened vegetation communities.

No habitable buildings (c) are included in the project area.

Works, including vegetation clearing, will be contained to within the easement footprint and in accordance with a construction environmental management plan to minimise adverse impacts, such as biosecurity measures to reduce weed invasion risk.

The proposed impacts do not warrant any on site biodiversity offsets. No cleared areas occur in or near the proposed route, so impacts on forest are unavoidable.

# 6 Conclusion and Recommendations

The natural values of the land within the proposed solar farm and transmission line corridor were assessed.

There are two vegetation communities on the site which are listed as threatened under the NCA: *Eucalyptus ovata* forest and *Melaleuca ericifolia* swamp forest (DOV and NME). Both these communities are very small patches and will not be impacted as the proponent has made a commitment to protect these areas. One threatened flora species was observed (*Gratiola pubescens*) and there is habitat for two threatened fauna species (wedge-tailed eagle and the bandicoot) within the study area.

The following recommendations are provided regarding the development:

- An additional eagle nest survey will be conducted prior to construction if determined necessary in consultation with NRE. If any new eagle nests are detected within 500 m or 1 km line of sight of the development proposal, an assessment of potential impacts of works on these nests will be undertaken.
- *Gratiola pubescens* (TSPA – rare) will avoid being impacted by exclusion zones which will be erected around the population.
- Large habitat trees should be retained where possible.
- Minimise vegetation clearance and disturbance as much as possible within the transmission easement.
- Works within waterway and coastal protection areas will follow guidelines in the NRE Wetlands and Waterways Works Manual.
- Any access tracks will be constructed or upgraded to Forest Practices Code 2020 Class 4 track requirements as a minimum.
- Weed hygiene should be undertaken as outlined in *Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania* (DPIPWE, Stewart and Askey-Doran, 2015).
- All declared weeds should be managed in accordance with the Tasmanian *Biosecurity Act 2019.*
- Any soil or gravel imported to the site for construction or landscaping purposes should be from a weed and disease free source to prevent the establishment of further introduced species or disease on the site.

# 7 References

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Threatened Species Section (2023). *hairy brooklime (Gratiola pubescens): Species Management Profile for Tasmania's Threatened Species* Link. https://www.threatenedspecieslink.tas.gov.au/Pages/Gratiola-pubescens.aspx Department of Natural Resources and Environment Tasmania. Accessed on 5/7/2023.

NRE *Threatened Species Note Sheets, Listing Statements and Recovery Plans*
Available at https://www.threatenedspecieslink.tas.gov.au/

*Nature Conservation Act 2002.*
Available at https://www.legislation.tas.gov.au/view/html/inforce/current/act-2002-063

*Threatened Species Protection Act 1995.*
Available at https://www.legislation.tas.gov.au/view/html/inforce/current/act-1995-083

# Appendix 1 – Threatened flora and fauna records within 5km

Verified threatened flora records within 5 km of the project area; SS = Tasmanian *Threatened Species Protection Act 1995*, NS = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

## Threatened flora within 5000 metres

Verified Records

| Species | Common Name | SS | NS | Bio | Observation Count | Last Recorded |
|---|---|---|---|---|---|---|
| Acacia ulicifolia | juniper wattle | r | | n | 26 | 11-Nov-2013 |
| Aphelia gracilis | slender fanwort | r | | n | 53 | 01-Apr-2022 |
| Aphelia pumilio | dwarf fanwort | r | | n | 28 | 05-Jan-2022 |
| Asperula minima | mossy woodruff | r | | n | 11 | 02-Nov-2006 |
| Baumea articulata | jointed twigsedge | r | | n | 2 | 15-Oct-1978 |
| Bolboschoenus caldwellii | sea clubsedge | r | | n | 3 | 04-Apr-2023 |
| Caladenia caudata | tailed spider-orchid | v | VU | e | 49 | 23-Oct-2016 |
| Caladenia congesta | blacktongue finger-orchid | e | | n | 1 | 01-Jan-1804 |
| Caladenia lindleyana | lindleys spider-orchid | e | CR | e | 1 | 01-Oct-1842 |
| Caladenia patersonii | patersons spider-orchid | v | | n | 30 | 23-Oct-2016 |
| Callitriche sonderi | matted waterstarwort | r | | n | 1 | 02-Feb-2008 |
| Calocephalus lacteus | milky beautyheads | r | | n | 22 | 03-Aug-2022 |
| Carex gunniana | mountain sedge | r | | n | 3 | 06-Dec-2021 |
| Carex longebrachiata | drooping sedge | r | | n | 1 | 25-Feb-2008 |
| Chorizandra enodis | black bristlesedge | e | | n | 89 | 03-Aug-2022 |
| Craspedia paludicola | swamp billybuttons | fr | | n | 4 | 11-Oct-2001 |
| Deyeuxia minor | small bentgrass | r | | n | 1 | 25-Dec-1970 |
| Diuris lanceolata | large golden moths | e | EN | e | 2 | 29-Sep-1992 |
| Epacris virgata | pretty heath | v | EN | e | 2 | 01-Nov-1951 |
| Euphrasia scabra | yellow eyebright | e | | n | 2 | 01-Jan-1837 |
| Glycine latrobeana | clover glycine | v | VU | n | 2 | 21-Nov-2005 |
| Glycine microphylla | small-leaf glycine | v | | n | 8 | 09-Dec-2020 |
| Hibbertia virgata | twiggy guineaflower | r | | n | 2 | 11-Oct-2001 |
| Hydrorchis orbicularis | swamp onion-orchid | r | | n | 6 | 13-Jan-2005 |
| Isoetes drummondii subsp. drummondii | plain quillwort | r | | n | 1 | 19-Dec-1955 |
| Isolepis stellata | star clubsedge | r | | n | 1 | 03-Jan-1955 |
| Lepidosperma viscidum | sticky swordsedge | r | | n | 53 | 08-Dec-2021 |
| Limonium australe var. australe | yellow sea-lavender | r | | n | 2 | 25-Sep-2000 |
| Lythrum salicaria | purple loosestrife | v | | n | 1 | 01-Jan-1911 |
| Microtidium atratum | yellow onion-orchid | r | | n | 12 | 13-Jan-2005 |
| Myriophyllum integrifolium | tiny watermilfoil | v | | n | 7 | 21-Nov-2005 |
| Phyllangium distylis | tiny mitrewort | r | | n | 21 | 01-Jun-2022 |
| Phyllangium divergens | wiry mitrewort | v | | n | 10 | 11-Nov-2021 |
| Phylloglossum drummondii | pygmy clubmoss | r | | n | 1 | 01-Jan-1990 |
| Pimelea flava subsp. flava | yellow riceflower | r | | n | 750 | 24-Nov-2022 |
| Pomaderris intermedia | lemon dogwood | r | | n | 1 | 01-Aug-2008 |
| Pomaderris paniculosa subsp. paralia | shining dogwood | r | | n | 1 | 26-Feb-2007 |
| Prasophyllum secutum | northern leek-orchid | e | EN | e | 1 | 19-Nov-1971 |
| Pterostylis cucullata subsp. cucullata | leafy greenhood | e | VU | n | 2 | 23-Oct-1844 |
| Pultenaea mollis | soft bushpea | v | | n | 3 | 21-Oct-1842 |
| Rumex bidens | mud dock | v | | n | 1 | 19-Dec-1955 |
| Schenkia australis | spike centaury | r | | n | 2 | 05-Mar-2001 |
| Scutellaria humilis | dwarf skullcap | r | | n | 19 | 10-Dec-2020 |
| Senecio squarrosus | leafy fireweed | r | | n | 1 | 24-Feb-2017 |
| Siloxerus multiflorus | small wrinklewort | r | | n | 1 | 01-Dec-1897 |
| Solanum opacum | greenberry nightshade | e | | n | 3 | 01-Jan-1861 |
| Spyridium parvifolium var. parvifolium | coast dustymiller | r | | n | 31 | 26-Oct-2015 |
| Stylidium beaugleholei | blushing triggerplant | r | | n | 3 | 27-Sep-2005 |
| Stylidium despectum | small triggerplant | r | | n | 48 | 08-Dec-2021 |
| Stylidium perpusillum | tiny triggerplant | r | | n | 3 | 06-Dec-1955 |
| Tetratheca ciliata | northern pinkbells | r | | n | 1 | 20-Oct-1844 |
| Thelymitra antennifera | rabbit ears | e | | n | 6 | 01-Jan-1912 |
| Thelymitra bracteata | leafy sun-orchid | e | | n | 1 | 01-Nov-1987 |
| Thelymitra mucida | plum sun-orchid | e | | n | 3 | 24-Nov-1992 |
| Tricoryne elatior | yellow rushlily | v | | n | 1 | 03-Mar-2005 |
| Triglochin minutissima | tiny arrowgrass | r | | n | 1 | 19-Dec-1955 |
| Veronica plebeia | trailing speedwell | r | | n | 17 | 05-Jan-2022 |
| Xanthorrhoea aff. bracteata | shiny grasstree | pv | PEN | e | 29 | 11-Nov-2013 |
| Xanthorrhoea arenaria | sand grasstree | v | VU | e | 9 | 26-Oct-2005 |
| Xanthorrhoea bracteata | shiny grasstree | v | EN | e | 24 | 30-Jan-2008 |

Verified threatened fauna records within 5 km of the project area; SS = Tasmanian Threatened Species Protection Act 1995, NS = Commonwealth Environment Protection and Biodiversity Conservation Act 1999

## Threatened fauna within 5000 metres

### Verified Records

| Species | Common Name | SS | NS | Bio | Observation Count | Last Recorded |
|---|---|---|---|---|---|---|
| Aquila audax | wedge-tailed eagle | pe | PEN | n | 16 | 23-Oct-2022 |
| Aquila audax subsp. fleayi | tasmanian wedge-tailed eagle | e | EN | e | 21 | 17-Jun-2022 |
| Arctocephalus tropicalis | sub-antarctic fur seal | e | VU | n | 1 | 15-Sep-2016 |
| Calidris canutus | red knot | | EN | n | 2 | 13-Jan-1999 |
| Calidris ferruginea | curlew sandpiper | | CR | n | 8 | 13-Feb-1999 |
| Dasyurus maculatus | spotted-tail quoll | r | VU | n | 7 | 03-Oct-2019 |
| Dasyurus maculatus subsp. maculatus | spotted-tail quoll | r | VU | n | 13 | 04-Aug-1996 |
| Dasyurus viverrinus | eastern quoll | | EN | n | 3 | 23-Nov-2021 |
| Diomedea melanophrys subsp. melanophrys | black-browed albatross | pe | PVU | | 1 | 31-May-1978 |
| Eagle sp. | Eagle | e | EN | n | 3 | 17-Jun-2022 |
| Eubalaena australis | southern right whale | e | EN | m | 8 | 12-Jun-2014 |
| Haliaeetus leucogaster | white-bellied sea-eagle | v | | n | 15 | 04-May-2021 |
| Hirundapus caudacutus | white-throated needletail | | VU | n | 2 | 06-Feb-1980 |
| Lathamus discolor | swift parrot | e | CR | mbe | 3 | 15-Feb-2022 |
| Limnodynastes peronii | striped marsh frog | e | | n | 2 | 12-Dec-2004 |
| Litoria raniformis | green and gold frog | v | VU | n | 37 | 07-Jan-2022 |
| Macronectes giganteus | southern giant-petrel | v | EN | n | 1 | 30-Sep-1979 |
| Macronectes halli | northern giant-petrel | r | VU | n | 1 | 05-Jul-1994 |
| Megaptera novaeangliae | humpback whale | e | | m | 10 | 28-Oct-2018 |
| Numenius madagascariensis | eastern curlew | e | CR | n | 18 | 02-Mar-2019 |
| Pachyptila turtur subantarctica | southern fairy prion | e | VU | | 6 | 26-Oct-1979 |
| Perameles gunnii | eastern barred bandicoot | | VU | n | 9 | 24-Apr-2021 |
| Pseudemoia rawlinsoni | glossy grass skink | r | | n | 1 | 28-Dec-2007 |
| Sarcophilus harrisii | tasmanian devil | e | EN | e | 42 | 10-Mar-2023 |
| Seriolella brama | Blue Warehou | | CD | n | 1 | 17-Dec-1979 |
| Sternula albifrons subsp. sinensis | little tern | e | | n | 2 | 31-Dec-1998 |
| Sternula nereis subsp. nereis | fairy tern | v | VU | n | 16 | 13-Oct-2005 |
| Thinornis cucullatus | hooded plover | | PVU | ae | 9 | 20-Apr-2020 |
| Thinornis rubricollis | hooded plover | | VU | n | 19 | 12-Nov-1998 |
| Tyto novaehollandiae | masked owl | pe | PVU | n | 1 | 01-Jan-1950 |

# Appendix G
## Landscape and Visual Impact

# Cimitiere Plains Solar Farm

# Cimitiere Plains Solar Farm

## Landscape and Visual Impact Assessment

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# Cimitiere Plains Solar Farm

# Landscape and Visual Impact Assessment

**Prepared for**
Envoca on behalf of Sun Spot 9 Pty Ltd

**Issue**
04

**Date**
31.07.2023

**Project Number**
2249

| Revision | Date | Author | Checked | Comment |
|---|---|---|---|---|
| A | 05.05.23 | SW | MED/AR | WIP |
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| C | 15.07.23 | MED | TD | FINAL |
| D | 31.07.23 | MED | MED | FINAL |

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# Contents

# 1.0 Introduction

## 1.1 Background

Moir Landscape Architecture (Moir LA) have been commissioned by Envoca on behalf of Sun Spot 9 Pty Ltd (the Applicant) to prepare a Landscape & Visual Impact Assessment (LVIA) for the proposed Cimitiere Plains Solar Farm (hereafter referred to as 'the Project').

The Project will include the construction and operation of a 288 MW AC solar farm and associated ancillary infrastructure including a substation and transmission line located in northern Tasmania, approximately 5km north-east of George Town. The solar farm is proposed to connect into the existing George Town Substation, located approximately 6km to the south of the Project, via a transmission line (most likely 110kV but could be 220kV). **Figure 01** provides the Project context in relation to the township of George Town.

The purpose of this report is to provide a comprehensive assessment of visibility and potential visual impacts associated with the Project on the landscape character, landscape amenity and any scenic vistas. Survey work was undertaken during October 2022 using key viewpoints and locations that may have potential views towards the Project. The report details the results of the field work, documents the assessment of the landscape character and visual setting, and makes high-level recommendations to assist in the mitigation of any potential impacts resulting from the proposed development, if required.

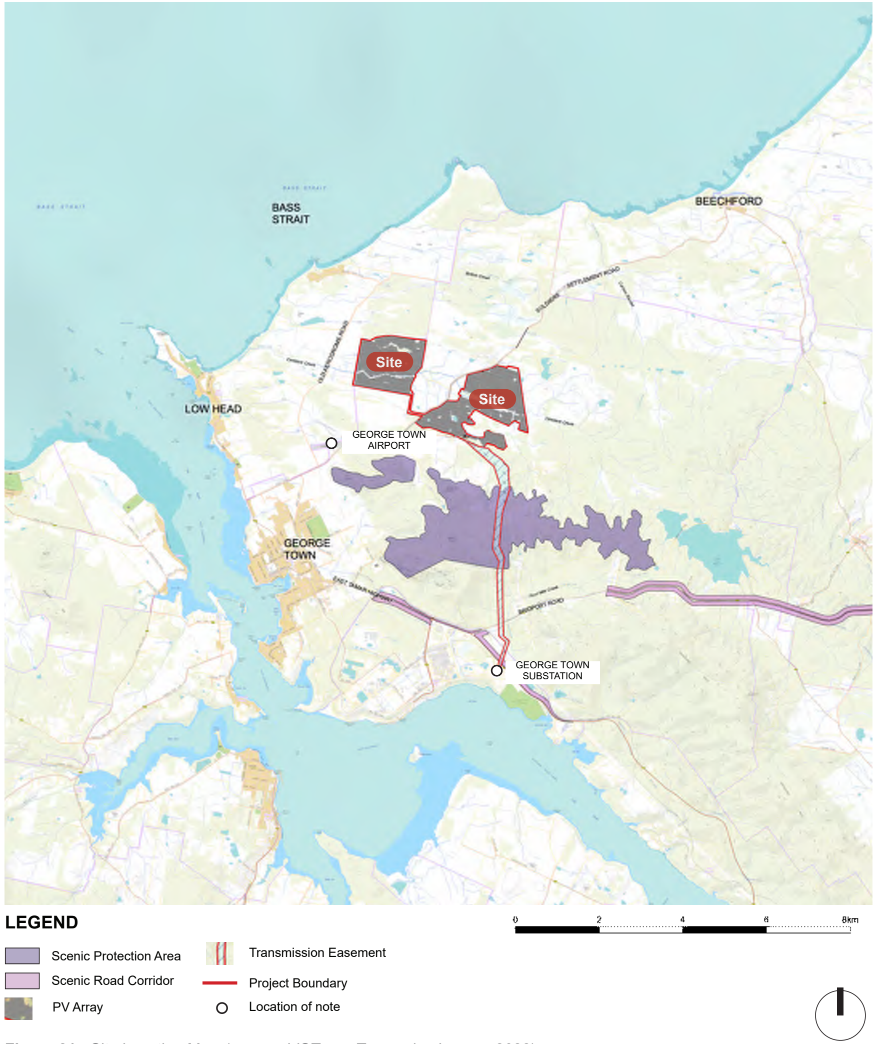



**Figure 01 -** Site Location Map *(source: LISTmap Tasmania, January 2023)*

## 1.2 Report Structure

The following table provides an outline of the report structure and a summary of how these have been addressed in the LVIA. Detailed methodologies for each part of the assessment have been included in the relevant chapters of the report.

| Visual Impact Assessment Report Structure | |
|---|---|
| **Section 2.0: Study Method** | Overview of Study Method utilised for the LVIA |
| **Section 3.0: Project Overview** | Project description and overview of the Project and all components to be assessed within the LVIA |
| **Section 4.0: Existing Landscape Character** | Establish the existing landscape and visual conditions prior to undertaking any visual assessment |
| **Section 5.0: Zone of Visual Influence** | Assessment to identify the potential visual impact |
| **Section 6.0: Viewpoint Analysis** | Assessment of key viewpoints within the visual catchment. Refer to **Appendix A** |
| **Section 7.0: Photomontages** | Preparation of 5 x photomontages to illustrate the appearance of the Project Refer to **Appendix C** |
| **Section 8.0: Visual Impact Assessment** | Overview of the visual impacts resulting from the project from key public and private locations **Appendix A & B** |
| **Section 9.0: Nightlighting** | Overview of potential night lighting sources |
| **Section 10.0: Associated Infrastructure Visual Impact** | Overview of potential visual impact from ancillary infrastructure |
| **Section 11.0: Mitigation Recommendations** | High-level recommendations for mitigation, where required. |
| **Section 12.0: Conclusion** | |

**Table 01 -** Report Structure

# 2.0 Study Method

## 2.1 Overview of the Study Method

The following provides an overview of the study method utilised for undertaking the LVIA. This methodology is based on the relevant policies, frameworks and our experience in undertaking landscape and visual impact assessment for large infrastructure projects. The LVIA was undertaken in the stages as noted below:

**PROJECT OVERVIEW**
Refer to Section 3.0
→
- Detailed project description
- Visual aspects of the Project

**LANDSCAPE CHARACTER ASSESSMENT & CHARACTER ZONES**
Refer to Section 4.0
→
- Overview of the existing landscape character and identification of key landscape features of the Site and surrounds.
- Determine Scenic Quality Ratings of Landscape Character Zones (LCZ)

**ASSESSMENT OF VISUAL IMPACTS**
Refer to Sections 5.0 - 11.0
→
- Assessment of the potential visual impacts with the aid of computer modeling, viewpoint analysis and photomontage development.
- Viewpoint Analysis (Section 6.0)
- Photomontages (Section 7.0)
- Nightlighting (Section 9.0)
- Glint and glare assessment (Section 10.0)
- Cumulative impacts (Section 11.0)

**MITIGATION RECOMMENDATIONS**
Refer to Sections 12.0
→
- Overview of mitigation methods
- Preparation of high-level recommendations for impact mitigation (where practical) to maintain the area's visual quality

## 2.2 Landscape Character Assessment

Landscape character refers to the distinct and recognisable pattern of elements that occur consistently in a particular landscape. The landscape character of an area is generally defined by the most dominant landscape element or unique combination of elements that occur within that landscape. It reflects how particular combinations of geology, landforms, soils, vegetation, land use and human settlements create a particular sense of place for different areas within the landscape (*Landscape Institute, 2013*).

The landscape character of the Study Area has been assessed using a combination of existing topographic maps, site imagery and land use maps.

For the purposes of this report, the Study Area has been defined as all land within five (5) km of the Project.

### 2.2.1 Landscape Character Zones and Scenic Quality

Once the landscape character has been assessed, Landscape Character Zones (LCZ) can be identified within the Study Area. LCZs are classified by slight variations in the landscapes geology, topography, land use and vegetation which create distinct character areas within the Study Area. The LCZs have been informed by land use patterns, vegetation coverage, topographical maps, site images and site inspection.

The Scenic Quality 'Frame of Reference' has been formulated by Moir LA (refer to **Table 02**) utilising *'An Approach to Landscape Sensitivity Assessment'* by *Natural England*, to quantify the sensitivity of the LCZ. Each category of the 'Frame of Reference' has been quantified for each LCZ to determine a 'Scenic Quality' Rating of HIGH, MODERATE or LOW.

Each LCZ will be assigned a 'Scenic Quality' Rating. Visual Sensitivity of a select location can be derived through the combination of 'Receptor Sensitivity' and 'Scenic Quality'.

| SCENIC QUALITY RATING | | | |
|---|---|---|---|
| **DESCRIPTION** | **LOW** | **MODERATE** | **HIGH** |
| **LANDFORMS** | • Flat Topography<br>• Absence of Landscape Features<br>• Open, broad extents of spaces | | • Diversity in Topographical Range<br>• Unique Landscape Features<br>• Intimate spaces |
| **WATERFORM** | • Absence of Water | | • Presence of Water<br>• Visually prominent lakes, reservoirs, rivers streams and swamps. |
| **VEGETATION** | • Absence of vegetation<br>• Lack of diversity<br>• Land cleared of endemic vegetation<br>• Low level of connection between vegetation and landscape / topography | | • Abundant vegetation<br>• High diversity<br>• High retention of endemic vegetation.<br>• High level of connectivity between natural landscape and landforms. |
| **HUMAN INFLUENCE** | • High population<br>• High density in settlement<br>• High presence of Infrastructure<br>• High levels of landscape modification | | • Low / dispersed population<br>• No settlement<br>• Absence of infrastructure<br>• Landscape in natural state |
| **ACTIVITY** | • High levels of traffic movement<br>• Presence of freight and passenger transport networks<br>• Presence of production or industry. | | • Low traffic movement<br>• Absence of freight and passenger transport<br>• Absence of production or industry |
| **RARITY** | • Typical landscape within a local and regional context | | • Unique combination of landscape features in a local and regional context |
| **RELATIONSHIP WITH ADJOINING LANDSCAPES** | • Low visible connection with adjoining landscapes<br>• Low variability between adjoining landscapes.<br>• Landscape features do not contribute to amenity from adjoining landscapes | | • High visibility with adjoining landscapes.<br>• High variability and contrast with adjoining landscapes<br>• Landscape features contribute significantly to amenity of adjoining landscapes |

**Table 02 -** Scenic Quality Rating

### 2.2.2 Receptor Sensitivity Rating

Receptor Sensitivity refers to the scenic concern of a select viewpoint based on the Land Use of that particular location (refer to **Table 03**). The intent is to classify the viewer sensitivity on the LCZ in which the Project is being viewed and assessed.

| RECEPTOR SENSITIVITY RATING | |
|---|---|
| **LOW** | • Interstate and state passenger rail lines with daily daylight services<br>• State Highways, freeways and classified main roads, classified tourist roads<br>• Land management roads with occasional recreation traffic<br>• Walking tracks of moderate local significance or infrequent recreation usage<br>• Other low use and low concern receptors and travel routes<br>• Navigable waterways |
| **MODERATE** | • Rural Dwelling<br>• Tourist and Visitor Accommodation<br>• Recreation, Cultural or Scenic Sites and Receptors of Regional Significance |
| **HIGH** | • Residential areas and rural villages<br>• Recreation, cultural or scenic sites and viewpoints of National or State Significance<br>• Any buildings, historic rural homesteads/residences on the State or local Government Heritage List |

**Table 03 -** Receptor Sensitivity Rating

## 2.3 Visual Impact Assessment

The potential visual impact of the Project is then assessed based on the relationship between the visual sensitivity (refer to **Section 2.3.1**) and visual magnitude (refer to **Section 2.3.2**).

**VISUAL SENSITIVITY RATING** → Viewers have varying levels of concern for scenic quality and integrity of the landscapes they see. **Refer to Section 2.3.1**

\+

**VISUAL MAGNITUDE** → Visual Magnitude is established based on the relative apparent level of visual contrast **Refer to Section 2.3.2**

=

**VISUAL IMPACT RATING** → Visual Impact Ratings (High, Moderate, Low and NIL) are generated **Refer to Table 5**

### 2.3.1 Visual Sensitivity

Sensitivity refers to the qualities of an area, the number and type of receivers and how sensitive the existing character of the setting is to the proposed nature of change (as noted in **Sections 2.2.1 and 2.2.2**). For example a pristine natural environment is likely to be more sensitive to a change of the nature of a four lane motorway than a built up industrial area. The design quality of the proposed development does not make the area less sensitive to change but instead affects the magnitude of the impact as described.

For example, a significant change that is not frequently seen may result in a low visual sensitivity although its impact on a landscape may be high. Generally the following principles apply:

- Visual sensitivity decreases as the viewing time decreases
- Visual sensitivity decreases as the number of potential viewers decreases
- Visual sensitivity can also be related to viewer activity (e.g. A person viewing an affected Site whilst engaged in recreational activities will be more strongly affected by change than someone passing a scene in a car travelling to a desired destination)

Visual Sensitivity ratings are defined as HIGH, MODERATE and LOW based on the Scenic Quality and Receptor Sensitivity.

| VISUAL SENSITIVITY | | SCENIC QUALITY<br>LANDSCAPE CHARACTER ZONE | | |
|---|---|---|---|---|
| | | **HIGH** | **MODERATE** | **LOW** |
| **RECEPTOR SENSITIVITY** | **HIGH** | HIGH | HIGH | MODERATE |
| | **MODERATE** | HIGH | MODERATE | MODERATE |
| | **LOW** | MODERATE | LOW | LOW |

**Table 04 -** Visual Sensitivity Rating Table

### 2.3.2 Visual Magnitude

Visual magnitude refers to the extent of change that will be experienced by receptors. Factors that are considered when assessing the magnitude of change include (*AILA, 2018*):

- the proportion of the view / landscape affected;
- extent of the area over which the change occurs;
- the size and scale of the change;
- the rate and duration of the change;
- the level of contrast and compatibility.

### 2.3.3 Visual Impact

Visual impact refers to the change in appearance of the landscape as a result of development. (*EPHC, 2010*). Visual impact is the combined effect of visual sensitivity and visual magnitude. Various combinations of visual sensitivity and visual magnitude will result in HIGH, MODERATE, LOW and NIL overall visual impacts as suggested in **Table 5** below (Adapted from *Transport for NSW, 2020)*.

### 2.3.4 Visual Impact Analysis

This process involves a qualitative assessment of the conclusions of visual impact ratings for each viewpoint. The analysis takes into consideration other relevant influencing factors not easily addressed through the process of quantitative analysis.

| VISUAL IMPACT RATING | | VISUAL MAGNITUDE | | | |
|---|---|---|---|---|---|
| | | **HIGH** | **MODERATE** | **LOW** | **NIL** |
| **VISUAL SENSITIVITY** | **HIGH** | HIGH | HIGH-MODERATE | MODERATE | NIL |
| | **MODERATE** | HIGH-MODERATE | MODERATE | MODERATE-LOW | NIL |
| | **LOW** | MODERATE | MODERATE-LOW | LOW | NIL |

**Table 05 -** Visual Impact Rating Table

## 2.4 Guidelines and Statutory Framework

The assessment will consider legislation, policies and standards relevant to LVIA, along with specific assessment criteria that have been derived for the purposes of this study. A broad review of the existing Commonwealth and State Legislation suggests that no guidelines are specifically applicable to this study.

The Project is located within the extents of the George Town Council Area (LGA). George Town Council is transitioning to a new planning scheme with a *Draft George Town Local Provisions Schedule (draft LPS)* at the Public Exhibition stage.

### 2.4.1 George Town Draft Local Provisions Schedule (2022) (Draft LPS)

The majority of the Project Area (including the solar panel development area and the northern portion of the transmission planning corridor) is zoned as Rural under the *George Town Draft Local Provisions Schedule (2022)*.

The applicable objectives in relation to visual of Rural zone are as follows:

- *To provide for a range of use or development in a rural location:*
    - *(b) that requires a rural location for operational reasons;*
    - *(c) is compatible with agricultural use if occurring on agricultural land;*
    - *(d) minimises adverse impacts on surrounding uses.*
- *To ensure that use or development is of a scale and intensity that is appropriate for a rural location and does not compromise the function of surrounding settlements.*

The remainder of the southern portion of the transmission planning corridor passes through the General Industrial, Recreation and Utilities zones under the *Draft LPS*.The applicable objectives under each zone that relate to visual are as follows:

General Industrial
- *To provide for use or development that supports and does not adversely impact on industrial activity*

Recreation
- *To provide for complementary uses that do not impact adversely on the recreational use of the land.*

Utilities
- *To provide for other compatible uses where they do not adversely impact on the utility.*

### 2.4.2 Scenic Protection Code

Under the *draft LPS*, the Scenic Protection Code C8.0 recognises and protects landscapes that are identified as important for their scenic values. The following Scenic Protections Areas are located in close proximity to the Project (see **Figure 02**) and are to be considered when defining the Scenic Quality and Visual Impact as detailed in **Section 6.0** and **Appendix A** of this report.

#### 2.4.2.1 GEO-C8.1.3 (The Buffalo) - Scenic Protection Area

Scenic values associated with this overlay highlight the prominent vegetated hilltops with minimal alterations and extensively covered in native vegetation and forms a prominent feature when viewed from Soldiers Settlement Road and George Town. The following Management Objectives apply to these Scenic Protections Areas:

- *To avoid significant landscape change on skylines, hilltops, ridgelines and hill faces when viewed from Soldiers Settlement Road and George Town.*
- *To locate and design development to blend with the landscape and not be obtrusive.*
- *To minimise the removal of native vegetation.*

# Scenic Protection Code Mapping

## George Town Local Provisions Schedule

**LEGEND**

- Scenic Protection Area
- Scenic Road Corridor
- 5000m Study Area
- Key Feature
- Transmission Planning Corridor
- Project Boundary
- PV Array
- Associated Infrastructure
- Location of note
- Water Body
- Park/Recreation Area
- Town Centre Area

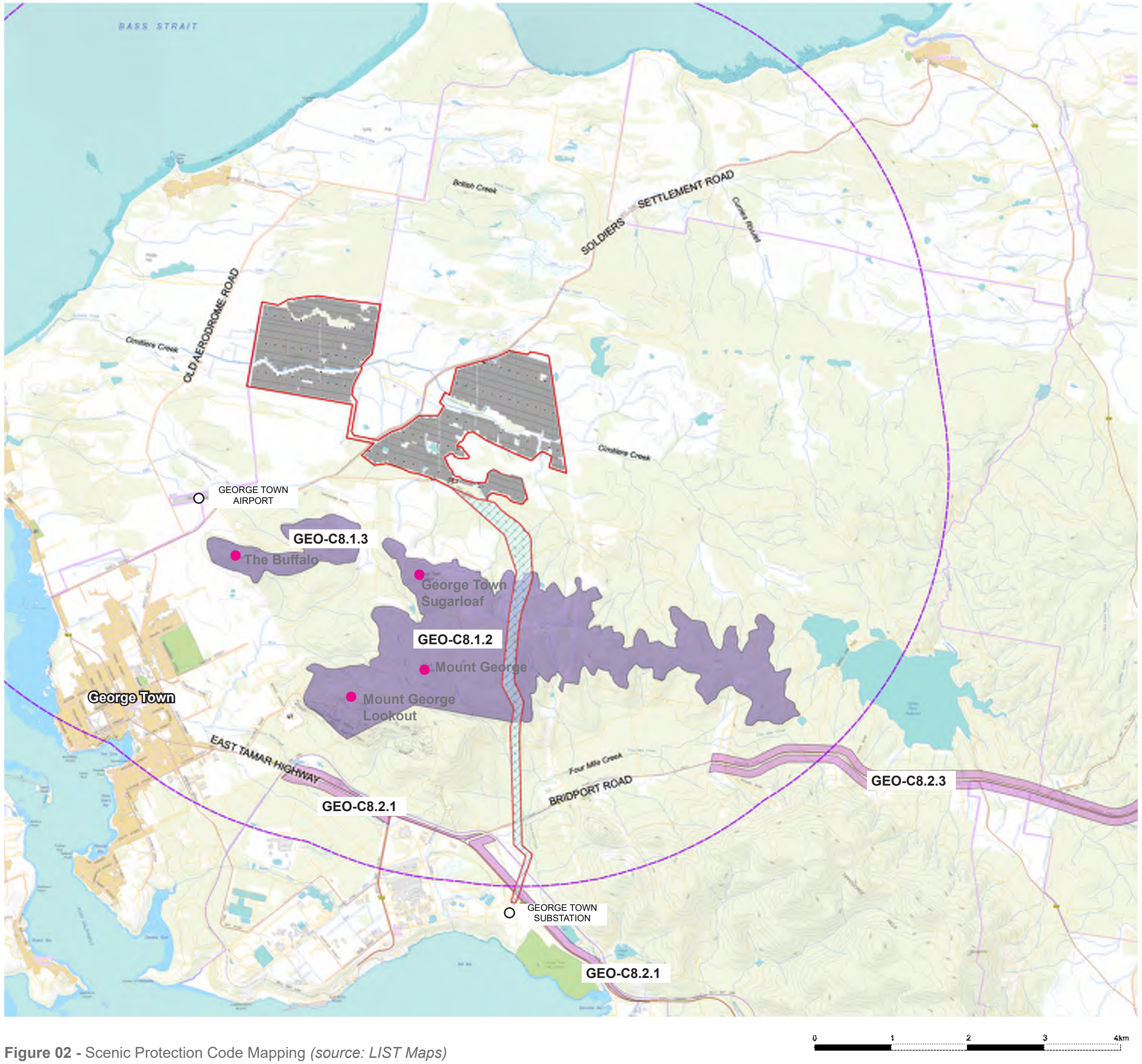



**Figure 02 -** Scenic Protection Code Mapping *(source: LIST Maps)*

#### 2.4.2.2 GEO-C8.1.2 (Mount George and George Town Sugarloaf) - Scenic Protection Area

Scenic values associated with this overlay highlight the prominent vegetated hilltops with minimal alterations and extensively covered in native vegetation and forms a prominent feature when viewed from Bridport Road and East Tamar Highway and forms a scenic backdrop to George Town. The following Management Objectives apply to these Scenic Protections Areas:

- *To avoid significant landscape change on skylines, hilltops, ridgelines and hill faces when viewed from Bridport Road and East Tamar Highway and George Town.*
- *To locate and design development to blend with the landscape and not be obtrusive.*
- *To minimise the removal of native vegetation.*

#### 2.4.2.3 GEO-C8.2.3 (Bridport Road from East Tamar Highway to the eastern municipal boundary) - Scenic Road Corridor

Scenic values associated with these overlays highlight the visual amenity provided by the native vegetation along the highway corridor combined with views across open farmland to the distant hills. The following Management Objectives apply to these Scenic Protections Areas:

- *To minimise the removal of native vegetation.*
- *To avoid the need for vegetation clearance adjacent to the highway by setting development back from the road.*

#### 2.4.2.4 GEO-C8.2.1 (East Tamar Highway from southern municipal boundary to George Town township) - Scenic Road Corridor

Scenic values associated with these overlays highlight the visual amenity provided by the native vegetation along the highway corridor combined with views across open farmland to the Tamar River and distant hills. The following Management Objectives apply to these Scenic Protections Areas:

- *To minimise the removal of native vegetation.*
- *To avoid the need for vegetation clearance adjacent to the highway by setting development back from the road.*

### 2.4.3 Renewable Energy Coordination Framework

The Tasmanian Government's vision is to increase the renewable energy sector within the state and is guided by the Renewable Energy Coordination Framework (RECF). This framework focuses on priority areas, also identified as 'pillars', including: integrated infrastructure, community, environmental and economic. These priority areas have associated actions to achieve the Renewable Energy Target (RET) of an increase in renewable energy output by 200% by 2040 as legislated by the Tasmanian Government. The Renewable Energy Zones (REZ) will assist in the siting of these Projects.
One of the actions within the 'Integrated Infrastructure' priority areas is the need to establish REZ as introduced by the Australian Energy Market Operator (AEMO). Currently there are three (3) onshore REZs proposed for Tasmania including the: North West REZ, Central Highlands (Midlands) REZ and the North East REZ (see **Figure 03**). The Project is located within T1 - North East Tasmania REZ and will connect into the existing George Town Substation along East Tamar Highway.

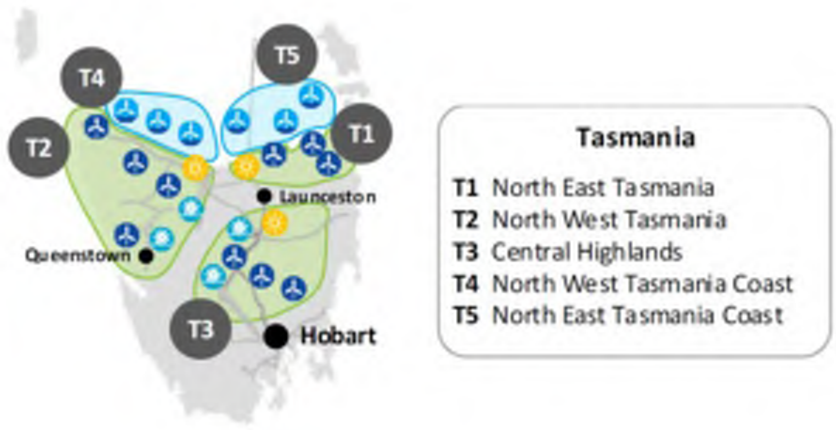



**Figure 03 -** Tasmanian REZ *(source: AEMO 2022)*

# 3.0 Project Overview

## 3.1 Project Overview

The Project includes the construction, operation and eventual decommissioning of a solar farm and associated infrastructure including a substation and transmission line. The planning envelope for the solar farm (excluding the transmission line) is 454 Ha. This includes the creek and other smaller areas that won't be developed. The layout of the Project can be seen in **Figure 04**.

Key infrastructure and assets associated with the Project includes:

- Power Converter Unit (PCU)
- Solar Photo Voltaic Modules
- Single Axis tracking
- Internal Substation
- Internal cabling (33kV) between the PCU and the internal substation
- Transmission line connecting to the George Town Substation to the south (110kV/220kV)
- Security fencing around the solar panel and substation
- Internal gravel access and maintenance roads and car parking
- Operation and Maintenance offices located near the main substation

During the construction phase, temporary facilities would include a lay down area with a secure compound for security, construction site offices and amenities and car and bus parking areas for construction staff. After decommissioning, all above ground infrastructure would be removed and the site returned to its existing land capability, for continued agricultural or alternative appropriate uses.

## 3.2 Solar Panel Design

| ***Solar Panel Components*** | |
|---|---|
| ***Project Component*** | ***Dimensions used in LVIA:*** |
| Module Dimensions (mm) | 2300 x 1150 |
| Width (w) | min. 2.30 m |
| Height (h) | 2.5 m |
| Aisle width (a) | min. 2.3 m |
| Clearance (c) | min. 0.50 m |

**Table 06 -** Solar Photo Voltaic Modules Component

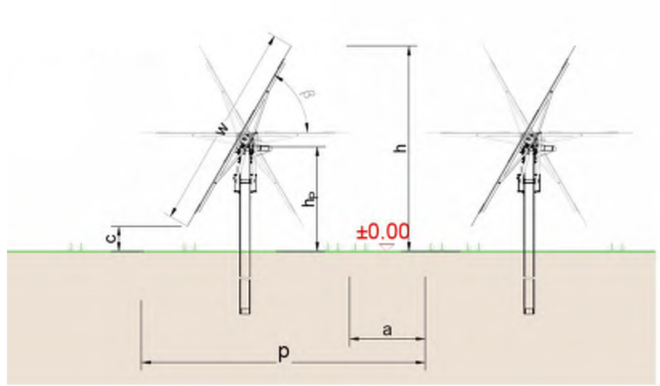
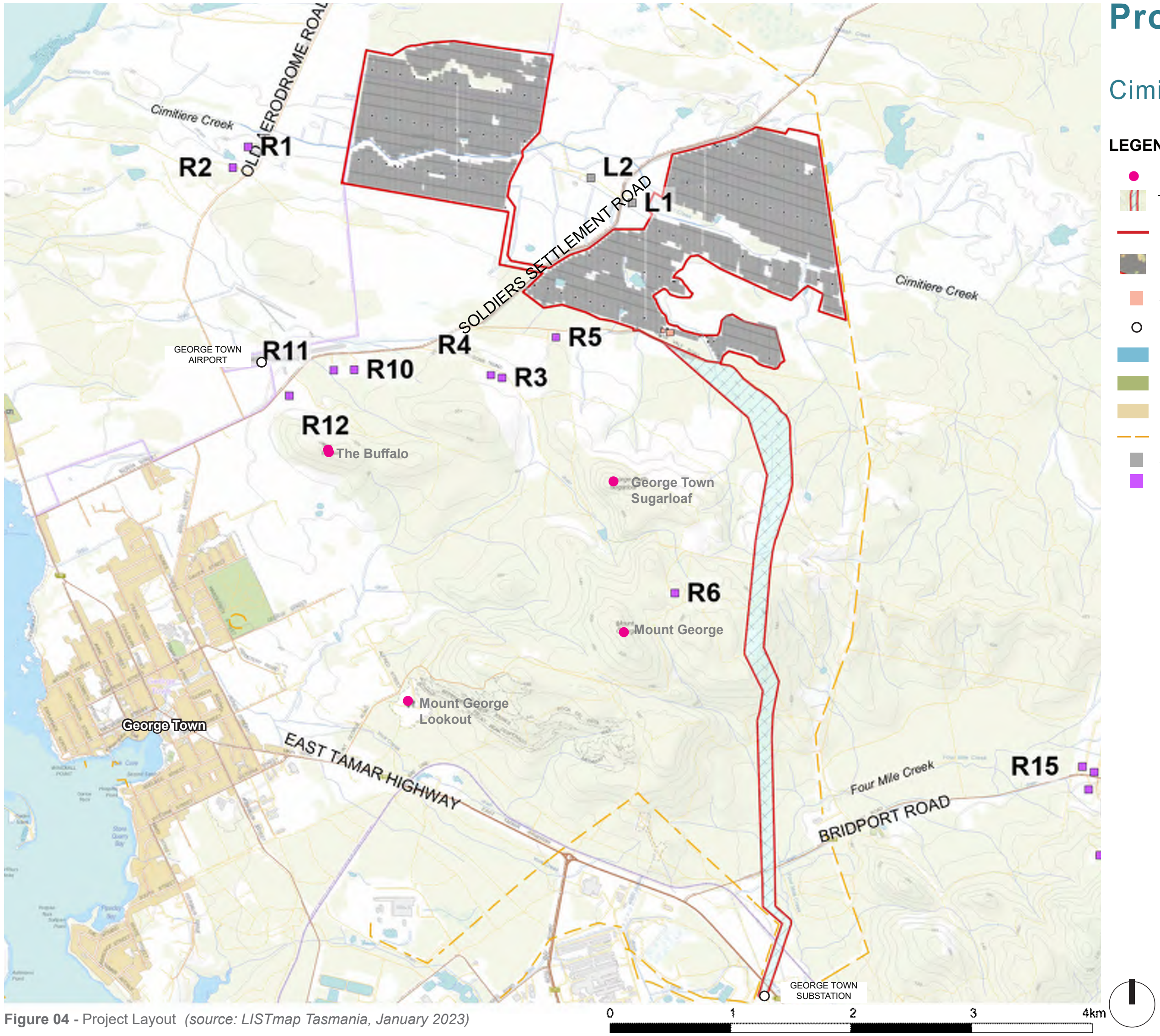



**Image 01 -** Solar Photo Voltaic Modules *(source: provided by the applicant)*




# Project Layout

## Cimitiere Plains Solar Farm

**LEGEND**

- Key Feature
- Transmission Planning Corridor
- Project Boundary
- PV Array
- Associated Infrastructure
- Location of note
- Water Body
- Park/Recreation Area
- Town Centre Area
- Basslink Interconnector
- Associated Dwellings
- Non-Associated Dwellings

**Figure 04 -** Project Layout *(source: LISTmap Tasmania, January 2023)*

# 4.0 Existing Landscape Character

## 4.1 Site Description

The Project is located off Soldier Settlement Road, approximately 6 km north east of George Town and approximately 40km north of Launceston, in the George Town Local Government Area (LGA) in northern Tasmania.

The titles subject to development of the Project include Volume 43381 Folio 1, Volume 107403 Folio 1, Volume 43382 Folio 1, Volume 154906 Folio 1, Volume 154910 Folio 1, and Volume 104543 Folio 3 for the solar farm site and Volume 154906 Folio 1. Volume 139746 Folio 1, Volume 135016 Folio 1, Volume 156738 Folio 4, Volume 154929 Folio 1, Volume 86544 Folio 3, Volume 11369 Folio 23, Volume 30617 Folio 4, Volume 251653 Folio 1, Volume 30617 Folio 8, Volume 154928 Folio 1, CID 1315964, CID 1189737 for the transmission planning corridor.

The majority of the Project Area (including the solar panel development area and the northern portion of the transmission planning corridor) is zoned as Rural under the *George Town Draft Local Provisions Schedule (2022)* (see **Figure 06)**. The Project Site is currently used for agricultural purposes.

Land within the Project Site is relatively flat to gently undulating with cleared areas used for grazing and cropping. Vegetation within the Project Site includes a combination of isolated groups of trees within grazing lots and some scattered vegetation along fence lines and aligning Soldiers Settlement Road. Remnant patches of dense vegetation are visible along more undulating sections of land and adjoining existing waterbodies and Cimiteire Creekline.

Cimitiere Creek runs generally east-west through the Project Site. It is noted that the land including and directly adjoining the creekline is to remain undeveloped as part of the Project.

Land surrounding the Project is flat but gradually becomes increasingly undulating, particularly to the south whereby wide valleys and undulating ranges including The Buffalo, George Town Sugarloaf and Mount George are key features.

An existing transmission line and cleared easement, known as Basslink Interconnector, runs to the east of the Project and connects into the DC/AC Converter Station and George Town Substation located south of the Project. Transmission lines associated with the Basslink Interconnector are approximately 40-60m in height. Infrastructure associated with the Basslink Interconnector are an existing feature within the visual catchment when travelling through the area, particularly along Bridport Road.

For the purposes of this report, references made to the ‘Study Area’ are generally defined as the land up to five (5) km from the solar farm envelope as shown in **Figure 06**.


Figure 05 - Site Context *(source: LISTmap Tasmania, January 2023)*

# Site Context

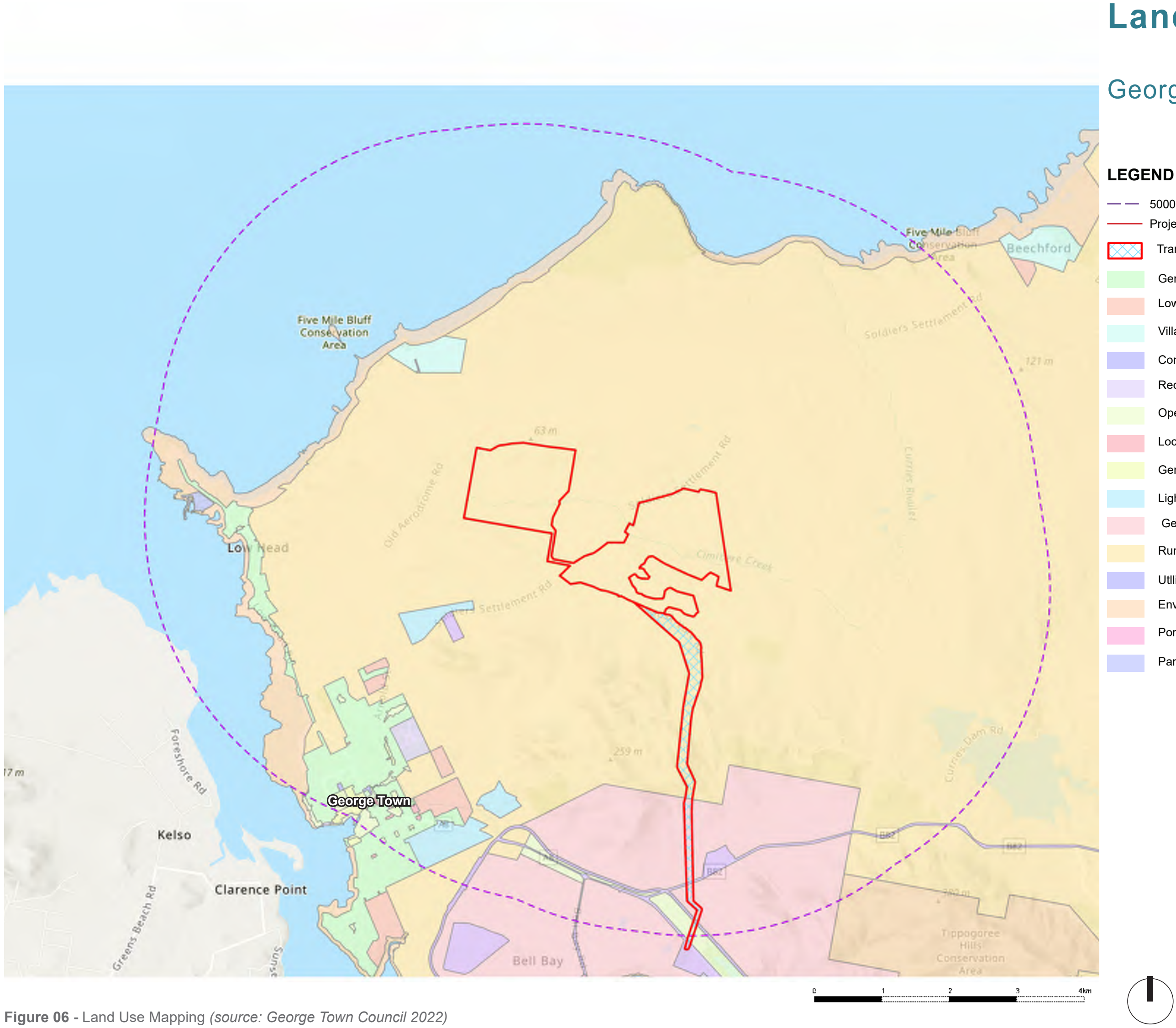
## Cimitiere Plains Solar Farm

**LEGEND**

- Project Boundary
- PV Array
- Associated Infrastructure
- Key Features
- Location of note
- Transmission Planning Corridor
- Scenic Protection Area
- Scenic Road Corridor
- Water Body
- Park/Recreation Area
- Town Centre Area
- Basslink Interconnector

# Land Zones

## George Town Draft LPS (2022)




**LEGEND**

- 5000m Study Area
- Project Boundary
- Transmission Planning Corridor
- General Residential
- Low Density Residential
- Village
- Community Purpose
- Recreation
- Open Space
- Local Business
- General Business
- Light Industrial
- General Industrial
- Rural Resource
- Utlities
- Environmental Management
- Port and Marine
- Particular Purpose

**Figure 06 -** Land Use Mapping *(source: George Town Council 2022)*

## 4.2 Existing Landscape Character

### 4.2.1 Land Use

The existing character within the Study Area can be generally categorised as rural agricultural properties that have been cleared outside of the scenic protection areas to the south. The rural properties include land used to support farming activities such as dryland grazing and forage cropping.

The character to the south of the Study Area is defined by the Environmental Management areas associated with the vegetated undulating ranges of the Buffalo and the George Town Sugarloaf peaks (refer to **Image 02**). This is contrasted by the adjoining Industrial Areas, which includes the George Town Substation, in the areas adjoining the East Tamar Highway at the southern entrance to George Town.

Areas to the west of the Study Area are generally defined by the existing settlements of George Town and Low Head.

### 4.2.2 Topography & Hydrological Character

The terrain within the Study area is typically flat to gently undulating within the agricultural areas surrounding the Project, and becoming undulating to steep to the south and rising to The Buffalo (100 AHD), George Town Sugarloaf (160 AHD) and Mount George (245 AHD). These sites have been identified under the Scenic Protection Code as outlined in **Section 2.4.2** and form a backdrop to views when travelling through a number of locations throughout the Study Area.

The Project lies within the Tamar Estuary Catchment, nearby the mouth of the Tamar River which runs to the west of the Study Area. Cimitiere Creek (refer to **Image 03**) is a seasonal creek that runs east-west through the Project Site. Curry River Reservoir is located to the east of the Study Area.

**Image 02 -** Vegetated George Town Sugar Loaf and The Buffalo visible in the background

**Image 03 -** Vegetation typically associated Cimitiere Creek

**Image 04 -** Existing transmission line viewed in combination with mountain ranges

### 4.2.3 Vegetation

The Site is predominantly cleared of vegetation to support agricultural activities however some isolated groups of trees within grazing lots and some scattered vegetation along fence lines and aligning roads are evident (refer to **Image 05**). Remnant areas of dense vegetation including dry Eucalypt forests and woodlands are visible along more undulating sections of land to the south (refer to **Image 04**).Vegetation adjoins Cimitiere Creek and is typically of a riparian character. Some dense plantation forestry is evident in the area, which contrasts with the existing native vegetation within the Study Area.

### 4.2.4 Infrastructure & Facilities

As previously mentioned, a number of existing infrastructure facilities are located within the Study Area. These include transmission lines associated with the Basslink Interconnector to the east of the Project, the DC/AC Converter Station and George Town Substation located south of the Project as well as Bell Bay Industrial Area in addition to the George Town Airport located approximately 2 km south west of the Project.

### 4.2.5 Roads

The Project is located along Soldier Settlement Road. Soldiers Settlement Road is a sealed road, generally running east-west connecting Beechford to Georgetown. Musk Vale Road is a heavily vegetated low use, unsealed road that connects to Soldiers Settlement Road, providing access to a handful of rural properties. Bridport Road is a sealed road, generally running east-west connecting to the East Tamar Highway located to the south of the Project. The proposed transmission line in proposed to intersect over Bridport Road. Old Aerodrome Road runs generally north-south and connects to Soldiers Settlement Road to the south.

The East Tamar Highway is located to the south of the Project and is a main road running north-south along the River Tamar connecting Launceston to Low Head. Sections of The East Tamar Highway and Bridport Road are recognised as scenic road corridors under the *draft LPS.* (Refer **Figure 02** and **Section 2.4.2**).

**Image 04 -** Typical character along Bridport Road. Transmission infrastructure forms part of the existing visual character.

**Image 05 -** Vegetation following undulating areas and along fence lines.

**Image 06 -** Views from Mount George Lookout towards George Town

### 4.2.6 Towns

The Project is located approximately 6km north east of George Town. Other nearby townships include Low Head and Beechford. Rural properties are evident outside of the town extents and are defined by large lot rural properties typically with surrounding vegetation utilised as windbreaks and adjoining boundaries.

### 4.2.7 Recreational Areas

#### 4.2.7.1 Mount George Lookout

Mount George Lookout is located approximately 4km south of the Project. It is the highest point in the surrounding landscape, and is generally orientated to the west, north-west and allows for views of the mouth of the river and the Bass Strait refer to **Image 06**.

#### 4.2.7.2 Mountain Bike Trails

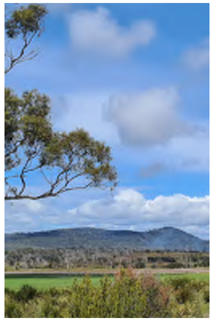
There are two MTB trails in proximity to the Project Area: The Mount George Town MTB Trails and the Tippogoree Hills MTB Trails (see **Figure 05**). The transmission planning corridor associated with the Project passes over the carpark and is close to the trailhead of the Tippogoree Hills MTB Trails. It is noted that transmission lines are an existing character element within the MTB trails. Due to topography and existing vegetation views out of these trails are generally contained.

## 4.3 Landscape Character Zones

Four (4) key LCZ exist within the Study Area as identified using a combination of mapping, desktop analysis and ground-truthing. These are as shown in **Figure 07** and outlined below in **Table 06.**

**Table 07** provides an overview of each LCZs and Scenic Quality Ratings that have been applied using the 'Frame of Reference'. These ratings have been developed to form part of the assessment in determining the Visual Sensitivity as described in (**Section 2.0**).

The potential impacts on the LCZs has been addressed in **Section 8.6.**



LCZ01

LCZ02

LCZ03

LCZ04

**LANDSCAPE CHARACTER ZONES**

| LCZ | NAME | GENERAL CHARACTER | Application of Scenic Quality Rating Frame of Reference: Landform | Waterforms | Vegetation | Human Influence | Activity | Rarity | Relationship with Adjoining Landscapes | SCENIC QUALITY RATING |
|---|---|---|---|---|---|---|---|---|---|---|
| LCZ01 | Vegetated Hills | The vegetated hills are a key landscape feature within the area. The Tippogoree Hills range forms a backdrop to the township and a number of views in the area. The terrain is undulating with dense vegetation consisting of dry eucalyptus woodlands. Prominent features include The Buffalo, George Town Sugarloaf and Mount George which are recognised under the Scenic Protection Zone of the Draft LPS. It is noted that the existing infrastructure associated with the Basslink Interconnector is present within this LCZ. | H | M | H | H-M | H | H | H | HIGH |
| LCZ02 | Waterways and Creeks | This LCZ includes the Cimitiere Creek, British Creek, Four Mile Creek, Curries Rivulet as well as Curries Reservoir. It includes the adjoining riparian and native vegetation. | M | M | M | H | H | L | M | MODERATE |
| LCZ03 | Towns and Settlements | This LCZ includes the highly modified land to support residential settlements located to the west of the Study Area. Vegetation has been cleared or modified as a result of human intervention. Major population centres include, George Town, Low Head and Beechford. The LCZ includes the industrial areas and associated infrastructure located along the East Tamar Highway. | L | M | L | L | L | L | L | LOW |
| LCZ04 | Agricultural Pastures | This LCZ includes the flat to gently undulating land cleared of vegetation to support agriculture and livestock grazing. Vegetation includes isolated groups of trees within grazing lots and some scattered vegetation along fence lines and aligning roads. Evidence of dense patches of plantation forestry.The LCZ includes a the scattered dwellings with a typical rural character with boundary and wind break vegetation. | M | L | L | L | L | L | L | LOW |

**Table 07 -** Landscape Character Zones & Scenic Quality Rating

# Landscape Character Zones


**LEGEND**

- LCZ01 - Vegetated Hills
- LCZ02 - Waterways and Creeks
- LCZ03 - Towns and Settlements
- LCZ04 - Agricultural Pastures
- 5000m Study Area
- Project Boundary
- Basslink Interconnector
- Scenic Protection Area

**Figure 07 -** Landscape Character Zones *(source: Ersi ArcGIS)*

# 5.0 Zone of Visual Influence

## 5.1 Overview of Zone of Visual Influence

An initial visibility assessment was undertaken utilising Zone of Visual Influence (ZVI) mapping (refer to **Figure 08**). This tool assists in defining the theoretical areas from which the Project would have potential visibility and create the 'Visual Catchment'.

The ZVI represents the area over which a development can theoretically be seen, and is based on a Digital Terrain Model (DTM). The ZVI is a desktop tool intended to make the fieldwork more efficient by clearly excluding areas that are screened by topography. Considerable field assessment is then undertaken predominantly within the areas where potential for impact exists.

The ZVI usually presents a bare ground scenario - i.e. a landscape without screening, structures or vegetation, and is usually presented on a base map. It is also referred to as a zone of theoretical visibility (*The Landscape Institute and the institute of Environmental Management and Assessment, 2013*). As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore, this form of mapping should be acknowledged as representing the worst case scenario.

## 5.2 Summary of Zone of Visual Influence

The ZVI was prepared for an 8km radius from the Project (based on the development footprint of the solar panel only), with the maximum assumed height of panels to be 2.5 metres to represent the worst case scenario.

It is noted that the ZVI does not include the transmission lines or associated infrastructure. The potential impacts of these are considered in **Section 11** of this report.

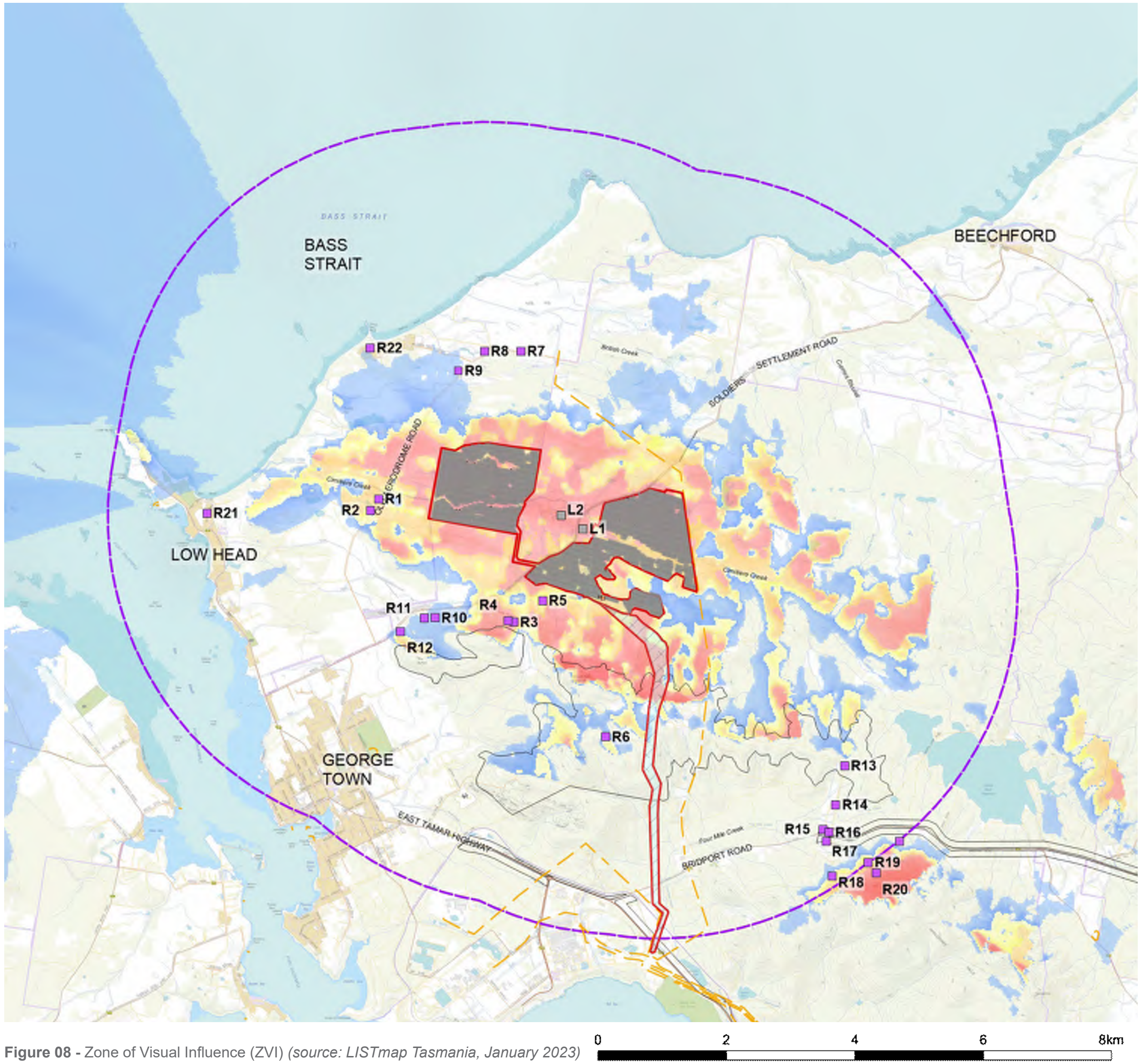
The ZVI indicates the potential to view the Project (higher than 25% potentially visibility) in areas immediately surrounding the Project. Due to the gently undulating terrain surrounding the Project, these views have the potential to be available from elevated positions. particularly to the north, west and southwest of the Project. **It is crucial to note that the ZVI is based solely on topographical information and represents a bare ground scenario** - i.e. a landscape without screening, vegetation or structures.

As the figure illustrates, topography will generally screen views of the Project from beyond 2km of the development footprint. This includes George Town, Low Head, Beechford as well as Mount George Lookout. Views from East Tamar Highway, Bridport Road and sections of Soldiers Settlement Road not directly adjoining the Project Area will also be contained by topography.

The ZVI also shows the following in relation to the surrounding dwellings:

- Dwellings within proximity to the Project may have the potential to view the Project;
- Topography will screen views from eight (8) dwellings within the Study Area located to the south east and north of the Project (R7,R8, R10-14 and 17);
- Three (3) dwellings (R5, R2, R1) were identified as having up to 26-50% of potential visibility;
- Two (2) dwellings (R3, R4) were identified as having views between 75-100% of the Project.
- One (1) dwelling was identified beyond 8km as having 75-100% of views. Further desktop assessment reveals that a combination of distance and vegetation is likely to contain views from this location.

The ZVI has been used to identify areas of potentially high visibility which informed the viewpoint analysis (refer to **Section 6.0** and **Appendix A**) and identify dwellings requiring detailed assessment (refer to **Section 8.0** and **Appendix B**).




# Zone of Visual Influence (ZVI)

**LEGEND**

- Solar Array Extent
- Transmission Planning Corridor
- Study Area (5000m)
- Project Boundary
- Rivers + Creeks
- 1% - 25% Visibility
- 25% - 50% Visibility
- 50% - 75% Visibility
- 75% - 100% Visibility
- Basslink Interconnector
- Associated Dwellings
- Non-Associated Dwellings
- Scenic Protection Area

It is noted that this ZVI is based on the solar panel development footprint only and does not include the transmission line or other associated infrastructure.

The ZVI is a preliminary assessment tool that represents a bare ground scenario - ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

**Figure 08 -** Zone of Visual Influence (ZVI) *(source: LISTmap Tasmania, January 2023)*

# 6.0 Viewpoint Analysis

## 6.1 Viewpoint Analysis Methodology

The viewpoint analysis considers the likely impact of the Project on the existing landscape character and visual amenity by selecting prominent public sites, otherwise referred to as public viewpoints.

Once the viewpoints were selected, panoramic photographs were taken on a level tripod at a height of 150cm (to represent eye level). Photographs were taken with a Canon EOS 5D Mark IV Full Frame digital SLR through a 50mm fixed focal lens which closely represents the central field of vision of the human eye.

The visual impact of the viewpoint was then assessed both on site and with the topographic and aerial information to ensure accuracy. For each viewpoint, the potential visual impact was analysed through the use of a combination of the 3D terrain modelling, topographic maps and on site analysis. Viewpoint photographs and analysis are included in the following pages. The findings of the viewpoint analysis have been quantified and are summarised in **Table 08**.

## 6.2 Viewpoint Selection Process

The locations of the viewpoints have been identified in **Figure 08**. A total of 18 viewpoints from publicly accessible areas have been carefully selected to be representative of the range of views within the study area. The selection of viewpoints are informed by topographical maps, fieldwork observations and other relevant influences such as access, landscape character and the popularity of vantage points.

Viewpoints are selected to illustrate a combination of the following:

- Areas of high landscape or scenic value
- Visual composition (e.g. focused or panoramic views, simple or complex landscape pattern)
- Range of distances
- Varying aspects
- Various elevations
- Various extent of development visibility (full and partial visibility)
- Views from major routes

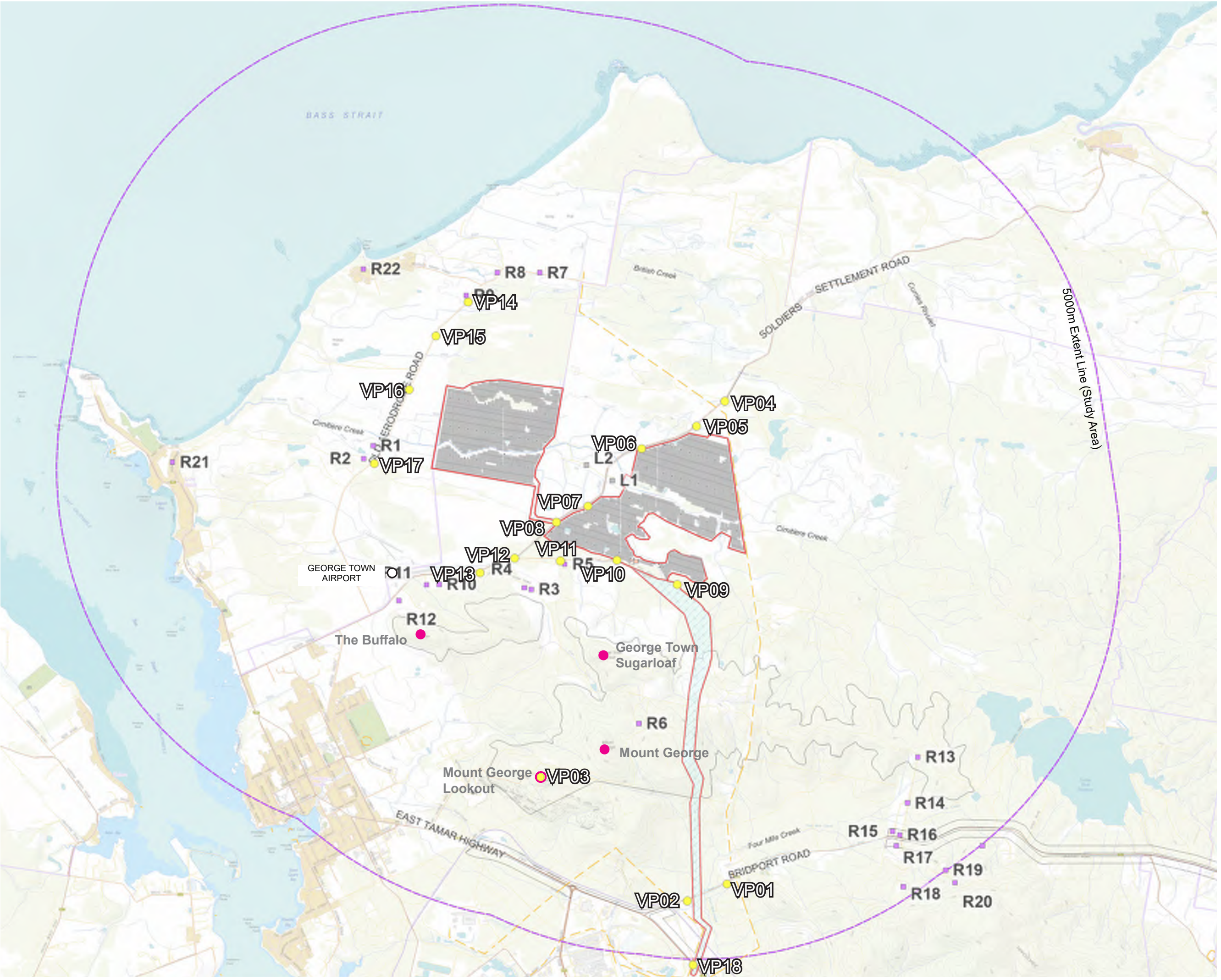



Figure 09 - Public Viewpoint Locations *(source: LISTmap Tasmania, January 2023)*

# Public Viewpoint Locations

**LEGEND**

- Public Viewpoint Locations
- Transmission Planning Corridor
- Solar Array Extent
- Study Area (5000m)
- Project Boundary
- Rivers + Creeks
- Associated Infrastructure
- Key Features
- Location of note
- Basslink Interconnector
- Associated Dwellings
- Non-Associated Dwellings

## 6.3 Overview of Public Viewpoint Analysis

As discussed in the rationale for the viewpoint selection process, these viewpoints are representative of the worst case scenario (refer to **Figure 09**). For each viewpoint, the potential visual impact were analysed through the use of a combination of topographic maps and on site analysis.

The visual sensitivity and visual magnitude of each viewpoint have been assessed which, when combined, results in an overall visual impact for the viewpoint (refer to **Table 08**).

Of the 18 viewpoints assessed as part of this LVIA, the potential visual impact rating for eight (8) viewpoints the visual impact rating was assessed as 'nil', six (6) were rated as low, one (1) was rated as 'moderate-low' and three (3) were rated as 'moderate'.

Generally, the viewpoints rated as having a 'moderate' visual impact were taken in close proximity to the Project. The viewpoints that were rated as 'low' impact had limited views to the Project due to adequate roadside vegetation or other screening factors.

A number of mitigation measures have been outlined in **Section 11** for consideration which aim to avoid, reduce and where possible remedy potential adverse visual impacts arising from the proposed development. The residual visual impact resulting from the implementation of the mitigation measures is documented in **Table 08**. It is found that the residual visual impact is lowered to an acceptable level upon application of the mitigation measures.

For a detailed viewpoint assessment refer to **Appendix A**

| VIEWPOINT | LOCATION | VISUAL SENSITIVITY | VISUAL MAGNITUDE | POTENTIAL VISUAL IMPACT (WITHOUT MITIGATION) | RESIDUAL VISUAL IMPACT (WITH MITIGATION) Refer section 11 |
|---|---|---|---|---|---|
| VP01 | Bridport Road, George Town (Transmission line) | LOW | LOW | LOW | N/A |
| VP02 | Bridport Road, George Town (Transmission line) | LOW | LOW | LOW | N/A |
| VP03 | Mount George Lookout, George Town | HIGH | NIL | NIL | N/A |
| VP04 | Soldiers Settlement Road, George Town | LOW | NIL | NIL | N/A |
| VP05 | Soldiers Settlement Road, George Town | LOW | HIGH | MODERATE | LOW |
| VP06 | Soldiers Settlement Road, George Town | LOW | HIGH | MODERATE | LOW |
| VP07 | Soldiers Settlement Road, George Town | LOW | HIGH | MODERATE | LOW |
| VP08 | Soldiers Settlement Road, George Town | LOW | MODERATE | MODERATE - LOW | LOW |
| VP09 | Musk Vale Road, George Town | LOW | NIL | NIL | N/A |
| VP10 | Musk Vale Road, George Town | LOW | LOW | LOW | N/A |
| VP11 | Musk Vale Road, George Town | LOW | NIL | NIL | N/A |
| VP12 | Intersection of Soldiers Settlement Road and Musk Vale Road | LOW | NIL | NIL | N/A |
| VP13 | Intersection of Soldiers Settlement Road and Davidsons Road | LOW | NIL | NIL | N/A |
| VP14 | Old Aerodrome Road, Low Head | LOW | NIL | NIL | N/A |
| VP15 | Old Aerodrome Road, Low Head | LOW | NIL | NIL | N/A |
| VP16 | Old Aerodrome Road, Low Head | LOW | LOW | LOW | N/A |
| VP17 | Old Aerodrome Road, Low Head | LOW | LOW | LOW | N/A |

*Please note the Viewpoint Visibility Assessment Summary is based on the visibility assessment criteria outlined in Section 2.1 of this report.

**Table 08 -** Viewpoint Visual Impact Summary

# 7.0 Photomontages

## 7.1 Photomontage Development

A photomontage is a visualisation based on the superimposition of an image (i.e. building, road, landscape addition etc.) onto a photograph for the purpose of creating a realistic representation of proposed or potential changes to a view. (Horner and Maclennan et al, 2006). Photomontages have been utilised in this Landscape and Visual Impact Assessment to assist in the impact assessment of the Project.

### 7.1.1 Photomontage Development Process

Photomontages are representations of the Project that are superimposed onto a viewpoint taken while on fieldwork to represent the visual impact of the Project on that select viewpoint location. The process for generating these images involves computer generation of a wire frame perspective view of the Project. This process includes:

- Capturing a viewpoint with a Canon EOS 5D Mark IIII digital SLR through a 50mm fixed focal lens which closely represents the central field of vision of the human eye.
- Build wire frame model of the Project.
- Match wire frame model to viewpoint location using Windpro to superimpose onto viewpoint image.
- Render model into a viewpoint image to create a realistic level illustrating the scale and position of the Project in relation to the reception from that viewpoint location.

The photo simulations based on photography from typical sensitive viewpoints that are included within the following analysis section.

### 7.1.2 Photomontage Selection Process

Five (5) photomontages of the Project within the existing context were selected as key views and represent general visibility of the Project. Photomontages have been prepared for Viewpoint VP06, VP08 and VP16 and from R3 and R1 (refer to **Figure 10**). When undertaking a LVIA, viewpoints selected for the preparation of photomontages are generally those viewpoints determined to have a higher visual impact rating (refer to **Section 06**). The mitigation measures are also demonstrated within the photomontages for PM01, PM02 and PM05, refer to **Appendix C**.

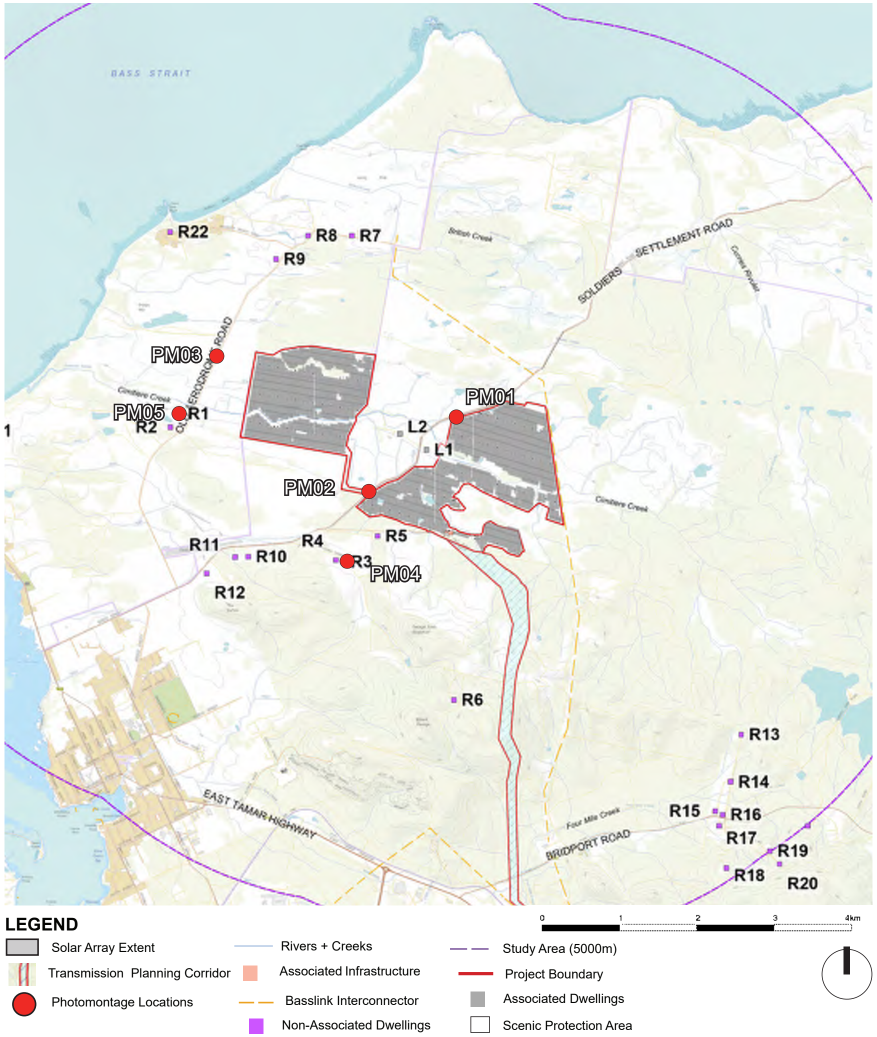



**Figure 10 -** Photomontage Locations *(source: LISTmap Tasmania, January 2023)*

# 8.0 Visual Impact Assessment

## 8.1 Overview of Visual Impacts

In addition to the photographic viewpoint assessment, the following section provides an overview of the potential visibility from areas surrounding the Site and how the requirements of various regulatory frameworks are being met. This is by no means an exhaustive description of the visibility from every locality, it is intended to provide an overall assessment of the potential visual impact on areas potentially affected by the Project.

## 8.2 Overview of Visual Impact on Public Land

Overall the Project will result in a low modification to the existing visual landscape character. The highest visual impact is likely to be experienced from areas at proximity to the Project, along Soldiers Settlement Road. Due to the combination of existing topography, orientation of the roads and existing vegetation views from outside of the immediate Project Area are likely to be limited.

Views toward the associated infrastructure, specifically the transmission line connecting the Project to George Town Substation, will have a low visual impact upon the surrounding landscape. This has been addressed in **Section 10.**

Topography will contain views from nearby George Town and Mount George Lookout.

The potential impacts on the Scenic Protection Areas has been addressed in **Section 8.5.**

## 8.3 Visual Impact Rating Methodology for Residences

Moir LA have developed a framework for defining and rating the level of visual effect from each dwelling.

The framework in **Table 09** has been prepared with regards to the third edition of the *Guidelines for Landscape and Visual Impact Assessment (GLVIA3), Residential Visual Amenity Assessment (RVAA)* and Moir LA's extensive professional experience in undertaking LVIA's. Published in 2013, the GLVIA3 is well established as providing 'best practice guidance' when undertaking LVIA's. RVAA is a stage beyond LVIA and focuses exclusively on private views and private visual amenity. Considerations outlined in the RVVA provide a framework for describing and evaluating the predicted magnitude of visual change and related visual amenity effects, which includes:

- *Distance of property from the proposed development having regard to its size / scale and location relative to the property (e.g. on higher or lower ground);*
- *Type and nature of the available views (e.g. panoramic, open, framed, enclosed, focused etc.) and how they may be affected, having regard to seasonal and diurnal variations;*
- *Direction of view / aspect of property affected, having regard to both the main / primary and peripheral / secondary views from the property;*
- *Extent to which development / landscape changes would be visible from the property (or parts of) having regard to views from principal rooms, the domestic curtilage (i.e. garden) and the private access route, taking into account seasonal and diurnal variations;*
- *Scale of change in views having regard to such factors as the loss or addition of features and compositional changes including the proportion of view occupied by the development, taking account of seasonal and diurnal variations;*
- *Degree of contrast or integration of new features or changes in the landscape compared to the existing situation in terms of form, scale and mass, line, height, colour and texture, having regard to seasonal and diurnal variations;*
- *Duration and nature of the changes, whether temporary or permanent, intermittent or continuous, reversible or irreversible etc. and*
- *Mitigation opportunities – consider implications of both embedded and potential further mitigation.*

(Source: RVVA, 2019)

## 8.4 Overview of Dwellings

In lieu of Energy Infrastructure Guidelines applicable to the assessment of the Project, Moir LA have adopted the method of identifying dwellings which require assesssment required in the NSW Technical Supplement 2022 (DPE) - 'To use the preliminary assessment tools; identify private viewpoints within 4 km of the proposed development.' (DPE, 2022b)

A total of 20 dwellings were identified with 4km in the initial site investigations as part of the scoping phase for the Project.

For the purpose of this LVIA, all dwellings have been assigned an ID (refer to **Figure 11**) and an assessment from each has been outlined in **Appendix B.**

Of the **20** dwellings that have been assessed:

- **thirteen (13)** dwellings have been identified as having a 'nil' visual impact as the Project will not be visible due to a combination of intervening topography or existing vegetation. These dwellings include R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R15, and R16.
- **six (6)** have been identified as having a 'low' visual impact. It is noted that one (1) of these dwellings (R2) is likely to have filtered views of the northern portion of the solar panels only. Two (2) of these dwellings (R19 and R20) may have glimpses of the transmission line and solar panels, however due to distance the solar panels will be difficult to discern. The remaining three (3) dwellings (including R17, R14 and R18) are all located in excess of 3.5km of the solar panels and views towards this portion of the Project will not be available due to a combination of existing vegetation and distance. These dwellings may have glimpses toward portions of the transmission line only and it is noted that the transmission line is located in excess of 2.6km of the dwellings. Existing screening factors relative to each dwelling are detailed in **Appendix B**.
- **one (1)** dwelling (R1) has been identified as having a 'moderate' visual impact as this dwelling is elevated in relation to the Project and lacks intervening vegetation. Views toward the transmission line are not likely to be available.

**DWELLING VISUAL IMPACT RATING**

| | NIL | LOW | MODERATE | HIGH |
|---|---|---|---|---|
| **Distance** | The Project will not be visible. | The Project may be visible in distance or very partially visible in the foreground. | The Project maybe visible in the middle ground or a small extent may be visible in the near ground. | The Project will be highly visible in the foreground. |
| **Type of views** | | Views from the dwelling are not focused on the Project. | Views from the dwelling are not focused entirely on the Project. | Views are focused directly towards the Project. |
| **Direction of view** | | The Project may be visible in peripheral views or form a very minor element in primary views. | The Project may be visible from, yet will not dominate primary views. | The Project will be highly visible and has the potential to be a dominant element in primary views from the property. |
| **Extent of visibility** | | The Project may be partially visible or fragmented. | The Project may be visible from the dwelling yet will not significantly alter the existing visual character. | The Project has the potential to significantly alter the existing visual character when viewed from the dwelling. |
| **Scale of change** | | The Project may be visible yet will not change to the existing visual character. | The Project has the potential to become a noticeable element in the view, yet will not overly diminish the existing visual character. | The Project has the potential to alter the existing visual character. |
| **Degree of contrast** | | The Project will have a low level of contrast with the existing landscape. | The Project will result in a moderate level of contrast with the existing landscape. | The scale of the Project will result in a high level of contrast with the existing landscape. |
| **Duration of change** | | Changes are temporary. | Changes to the landscape have the potential to be reduced over time (with the employment of mitigation methods). | Changes to the landscape are continuous and / or irreversible. |
| **Mitigation Options** | | Existing screening factors contribute to reducing the potential visibility. | Some existing screening factors may contribute to fragmenting the Project or there is opportunity to screen the Project. | Limited opportunities to screen the Project. |

**Table 09 -** Dwelling Visual Impact Rating

# Dwelling Locations

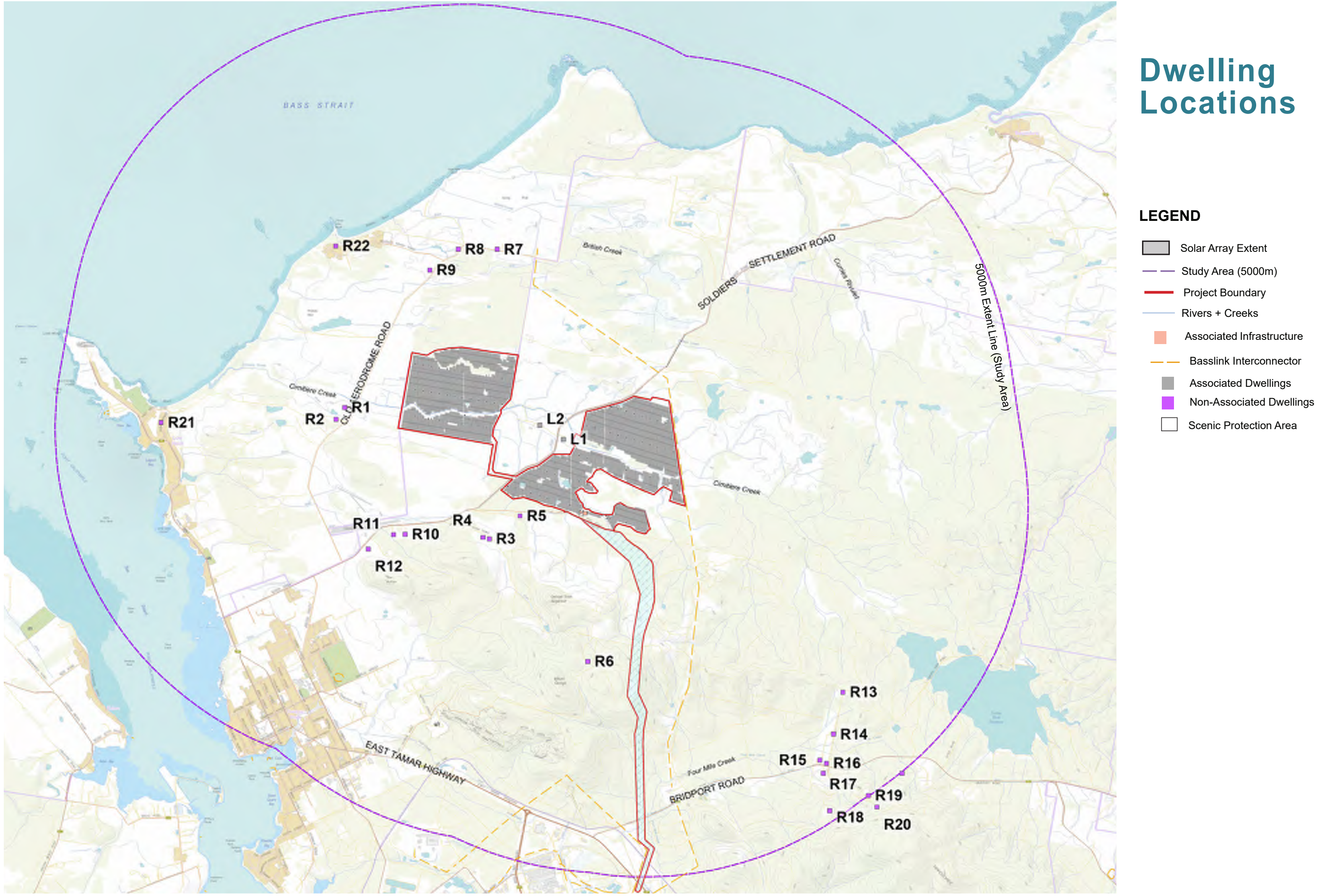



**Figure 11 -** Dwelling Locations *(source: LISTmap Tasmania, January 2023)*

## 8.5 Overview of Potential Impact on the Scenic Protection Areas

| SCENIC PROTECTION CODE | LOCATION | SCENIC VALUE | MANAGEMENT OBJECTIVES | EVALUATION | RECOMMENDATION |
|---|---|---|---|---|---|
| **GEOC8.1.2** | Mount George and George Town Sugarloaf | (a) The prominent, vegetated, hilltops appear in a natural state with minimal development and extensive coverage of native vegetation.<br>(b) Mount George and George Town Sugarloaf together form a prominent natural feature when viewed from Bridport Road and East Tamar Highway and form a scenic backdrop to George Town.<br>(c) Mount George and George Town Sugarloaf are consistent in appearance with most hilltops in the broader Tamar region. | a) To avoid significant landscape change on skylines, hilltops, ridgelines and hill faces when viewed from the Bridport Road and East Tamar Highway and George Town.<br>(b) To locate and design development to blend with the landscape and not be obtrusive.<br>(c) To minimise the removal of native vegetation. | The solar panels will not be visible from Bridport Road, East Tamar Highway or George Town.<br>It may be possible to view some of the transmission towers for a short stretch of Bridport Road and East Tamar Highway however, transmission towers and other existing infrastructure are already an existing feature from these locations and it is likely that the transmission lines will blend into the landscape and not be obtrusive. (Refer **Section 10.0 and VP01, VP02 & VP18 of Appendix A**).<br>Views toward the transmission poles within areas of the hillside are also likely to be available when travelling along Soldiers Settlement Road, in close proximity to the site. These views are likely to be experienced for a short duration when travelling nearby the Project. As a result the elements that contribute to the scenic value of GEOC8.1.2 are not likely to significantly change as a result of the Project. | Wherever practical, the design should retain existing roadside planting where possible along Bridport Road and East Tamar Highway and minimise the removal of native vegetation in the construction of the transmission easement.<br><br>Refer to **Section 11.** |
| **GEOC8.1.3** | The Buffalo | (a) The prominent, vegetated, hilltops appear in a natural state with minimal development and extensive coverage of native vegetation.<br>(b) The Buffalo is a prominent natural feature when viewed from Soldiers Settlement Road and George Town.<br>(c) The Buffalo is consistent in appearance with most hilltops in the broader Tamar region. | (a) To avoid significant landscape change on skylines, hilltops, ridgelines and hill faces when viewed from Soldiers Settlement Road and George Town.<br>(b) To locate and design development to blend with the landscape and not be obtrusive.<br>(c) To minimise the removal of native vegetation. | The Buffalo, Mount George and George Town Sugarloaf form a backdrop to views from Soldiers Settlement Road. The solar panels portion of the Project have the potential to become another feature within these views from areas in close proximity (Refer **to VP05,VP06 & VP07 of Appendix A**). Glimpses toward the transmission lines may be available from breaks in vegetation in some locations, however they are likely to be a minimal element in the overall landscape. It is noted that the Buffalo, Mount George and George Town Sugarloaf will remain a key feature of views from Soldiers Settlement Road. Due to the existing vegetation, undulating terrain and the Buffalo itself, views toward the Project from Soldiers Settlement road are likely to be limited to those at within close proximity and are likely to be experienced for a short duration when travelling nearby the Project. As a result the Project is unlikely to significantly change the elements that contribute to the scenic value of GEOC8.1.3. | Mitigation measures in the form of screen planting will be installed for the eastern side of Soldiers Settlement road.<br><br>Minimise the removal of native vegetation in the construction of the transmission easement.<br><br>Refer to **Section 11.** |

**Table 10 -** Overview of Potential Impact on the Scenic Protection Areas

| | | | | | |
|---|---|---|---|---|---|
| **GEO-C8.2.1** | East Tamar Highway | (a) Native vegetation along the highway corridor provides visual amenity to the traveller experience.<br>(b) Views through the trees and across open farmland to the Tamar River and distant hills are an important element in providing visual amenity to the traveller experience | (a) To minimise the removal of native vegetation. To provide native vegetation screening for any large industrial type developments adjacent to the road.<br>(b) To avoid the need for vegetation clearance adjacent to the highway by setting development back from the road. | The solar panels will not be visible from East Tamar Highway. It may be possible to view some of the transmission poles for a short stretch of East Tamar Highway however, the existing character of the stretch of highway where these views would be available is that of an industrial view with transmission towers associated with the basslink interconnector, the George Town Substation and the single circuit Starwood transmission lines(Refer **VP18 of Appendix A**) already featuring in views.<br>The elements that contribute to the scenic value of GEOC8.2.1 are not likely to significantly change as a result of the Project. | Wherever practical, the design should retain existing roadside planting where possible along East Tamar Highway. Refer to **Section 11.** |
| **GEO-C8.2.3** | Bridport Road | (a) Native vegetation along the highway corridor provides visual amenity to the traveller experience.<br>(b) Views across open farmland to the distant hills are an important element in providing visual amenity to the traveller experience | (a) To minimise the removal of native vegetation.<br>(b) To avoid the need for vegetation clearance adjacent to the highway by setting development back from the road. | The solar panels will not be visible from Bridport Road. It may be possible to view some of the transmission poles for a short stretch of Bridport Road however, transmission towers associated with the Starwood line are already an existing nearby feature in the landscape. (Refer **VP01 & VP02 of Appendix A**).<br>The elements that contribute to the scenic value of GEOC8.2.3 are not likely to significantly change as a result of the Project. | Wherever practical, the design should retain existing roadside planting where possible along Bridport Road and East Tamar Highway. Refer to **Section 11.** |

**Table 10 -** Overview of Potential Impact on the Scenic Protection Areas (contd)

## 8.6 Overview of Potential Impact on the Landscape Character Zones

| LANDSCAPE CHARACTER ZONES | | | | |
|---|---|---|---|---|
| LCZ | NAME | SCENIC QUALITY RATING | KEY FEATURES | OVERVIEW OF IMPACT ON LANDSCAPE CHARACTER |
| **LCZ01** | Vegetated Hills | **HIGH** | The vegetated hills are a key landscape feature within the area. The Tippogoree Hills range forms a backdrop to the township and a number of views in the area. The terrain is undulating with dense vegetation consisting of dry eucalyptus woodlands. Prominent features include The Buffalo, George Town Sugarloaf and Mount George which are recognised under the Scenic Protection Zone of the Draft LPS. It is noted that the existing infrastructure associated with the Basslink Interconnector is present within this LCZ. | The features that contribute to the character of this LCZ will remain unchanged as a result of the Project however it is noted that the vegetated hills form a visual backdrop to views from areas within LCZ04. Therefore, the level to which it has the potential to alter the scenic integrity has been assessed based on the parameters of LCZ04. Whilst the vegetated hills are likely to remain a key feature of views from within the LCZ04 the Project is also likely to become a key feature from areas at close proximity. It is noted that this is likely for a short duration (refer to **VP06, VP07 & VP08 of Appendix A)**. |
| **LCZ02** | Waterways and Creeks | **MODERATE** | This LCZ includes the Cimitiere Creek, British Creek, Four Mile Creek, Curries Rivulet as well as Curries Reservoir. It includes the adjoining riparian and native vegetation. | There is limited public access available within this LCZ. Views will be available from some locations due to the close proximity to the Project, however some views will be contained due to the riparian vegetation typical of the LCZ. The features that contribute to the character of this LCZ are likely to remain unchanged as a result of this Project. The Waterways and Creeks identified are likely to remain the key features from within this LCZ. |
| **LCZ03** | Towns and Settlements | **LOW** | This LCZ includes the highly modified land to support residential settlements located to the west of the Study Area. Vegetation has been cleared or modified as a result of human intervention. Major population centres include, George Town, Low Head and Beechford. The LCZ includes the industrial areas and associated infrastructure located along the East Tamar Highway. | The solar panels will not be visible from the majority of areas within this LCZ. The transmission lines may be visible from select locations along East Tamar Highway however, as an existing industrial area with associated infrastructure, the transmission lines are likely to read as part of the existing features within the LCZ from these select locations. As a result the key features that contribute the character of the LCZ are likely to remain unchanged as a result of the Project. |
| **LCZ04** | Agricultural Pastures | **LOW** | This LCZ includes the flat to gently undulating land cleared of vegetation to support agriculture and livestock grazing. Vegetation includes isolated groups of trees within grazing lots and some scattered vegetation along fence lines and aligning roads. Evidence of dense patches of plantation forestry. The LCZ includes the scattered dwellings with a typical rural character with boundary and wind break vegetation. | Flat to gently undulating and cleared agricultural lands with a backdrop to the surrounding mountains are key features when traversing the landscape within the Study Area. Existing vegetation along fence lines and aligning roads is likely to assist in screening some views from locations within the LCZ. The vegetated hills form a visual backdrop to views from within this LCZ and are likely to remain a key feature of views from this LCZ however the Project is also likely to become a key feature from areas at close proximity. The Project has the potential to become a dominant element from within this LCZ, however it is noted that this is likely to be for a short duration when in close proximity to the Project. |

**Table 11 -** Overview of Potential Impact on the Landscape Character Zone (contd)

# 9.0 Nightlighting

## 9.1 Overview of Potential Night Lighting Sources

Due to the location of the Project, very little existing sources of lighting are present in the night time landscape of the Study Area. Existing lighting associated with homesteads and motor vehicles is dispersed around the Study Area. Isolated receptors within the Study Area experience a dark night sky with minimal light sources. The impact of night lighting is unlikely to be experienced from inside of a dwelling as internal lights reflect on windows and limit views to the exterior at night time.

The requirements for night lighting on Ancillary Infrastructure is generally limited to security lighting to the Substation and within the operations and maintenance facility. The light sources are limited to low-level lighting for security, night time maintenance and emergency purposes. There will be no permanently illuminated lighting installed. The proposed ancillary infrastructure has been carefully sited to minimise visibility from existing residences and publicly accessible viewpoints. It is unlikely the proposed night lighting associated with the ancillary infrastructure would create a noticeable impact on the existing night time landscape.

## 9.2 Design Principles

The following recommendations have been developed with consideration of the principles outlined in relevant best practice guidelines for lighting design. The Dark Sky Planning Guidelines have been developed by the Department of Planning and Environment (June 2016) provide guidelines for lighting practices that support the maintenance of a dark sky and improve lighting practice. The guidelines are related to projects within 200 kilometres of the Siding Spring Observatory, however they provide relevant guidance to reduce potential light pollution can be applied to lighting design for the Ancillary Infrastructure for the Project. *The Australian Government Department of the Environment and Energy, National Light Pollution Guidelines for Wildlife: Including marina turtles, seabirds and migratory shorebirds, January 2020 Version 1.0* may also be considered during the detailed design phase. It is likely there will be limited or no visual impacts resulting from night lighting of Ancillary Structures.

**1. Control the Level of Lighting**
- Only use lighting for areas that require lighting i.e.. paths, building entry points.
- Reduce the duration of lighting:
- Switch off lighting when not required
- Consider the use of sensors to activate lighting and timers to switch off lighting

**2. Lighting Design**
- Use the lowest intensity required for the job
- Use energy efficient bulbs and warm colours
- Direct light downwards to eliminate
- Ensure lights are not directed at reflective surfaces
- Use non-reflective dark coloured surfaces to reduce reflection of lighting (**Figure 12**)
- Keep lights close to the ground and / or directed downwards (**Figure 13**)
- Use light shield fittings to avoid light spill (refer to **Figure 14**).

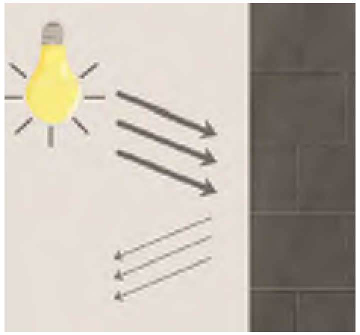


**Figure 12 -** Surface Reflectivity
*(source: Department of Environment and Energy National Light Pollution Guidelines for Wildlife 2020)*

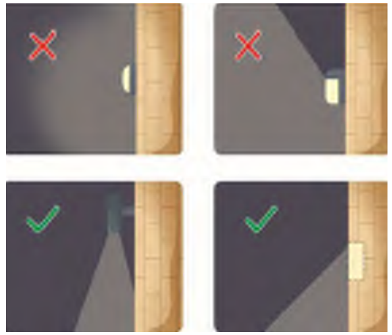


**Figure 13 -** Downward Lighting
*(source: Department of Environment and Energy National Light Pollution Guidelines for Wildlife 2020)*


**Figure 14 -** Light Shielding
*(source: Department of Environment and Energy National Light Pollution Guidelines for Wildlife 2020)*

# 10.0 Associated Infrastructure Visual Impacts

## 10.1 Assessment of Associated Infrastructure

In addition to the proposed PV arrays, the associated infrastructure has the potential to contrast with the existing visual landscape. Due to a relatively low scale and siting of the Project, access roads, transmission lines and other ancillary structures are unlikely to alter the existing visual landscape. An overview of the potential visual impact resulting from associated infrastructure and Project components is provided below.

A summary of the proposed infrastructure associated with the development can be found in **Section 3.0**.

### 10.1.1 Substation

The substation is proposed to be located along Musk Vale Road. If deemed necessary during the detailed design phase, mitigation methods such as screen planting could be employed to reduce any potential visual impacts.

Due to its isolated location of the substation, within the Project Site, the potential visual impact has been rated as **negligible**. Consideration to the colour scheme and materiality of the substation to be keeping with the general character of the area will reduce any potential visual impacts.

### 10.1.2 Transmission lines

A 110kV/220kV double circuit overhead transmission line to George Town Substation is being considered for the Project. They will be approximatively 28 to 36m in height.

Views from a short section of Bridport Road, in proximity to the transmission line may be available however, due to existing vegetation these views are likely to be limited (Refer **VP01** and **VP02** of **Appendix A)**. Views from East Tamar Highway, in close proximity to the transmission lines (Refer **VP18** of **Appendix A)**, are likely however they will be viewed in combination with other existing transmission lines and infrastructure. It is noted that transmission lines and infrastructure are an existing element from both locations and views toward the transmission lines will be in keeping with the existing character of the infrastructure (Refer to **Figure 15**).

Approximately, 1500m north of Bridport Road, a dogleg has been placed in the transmission line to mitigate the visual impact from Bridport Road and any other viewing points to the south. Typically, the preferred design from an engineering perspective would be for the transmission line to extend to the edge of the escarpment. The easement would run directly from that point to Bridport Rd. An observer standing on Bridport Road, could look north along the corridor and see the cleared easement running directly up the escarpment.

By installing two additional turn poles and creating the dogleg, the following benefits have been achieved:

- There will not be a pole silhouetted on the skyline.
- There will not be a cleared easement running directly up the escarpment that will be visible from Bridport Road.
- The southern turn pole in the dogleg will restrict the view along the easement before the easement starts to climb.
- Where the transmission line climbs the escarpment is at least partially screen behind a ridgeline with which it runs parallel.
- The dogleg means that if the line is visible from a residence or other viewing point (Tippogoree Hills Trails), it is likely that they will only be able to see a short section of the easement.

Generally, views from surrounding residences toward the transmission lines are limited due to the densely vegetated character adjoining the proposed transmission line easement and surrounding nearby residences. Instances whereby select, fragmented views may be available are from elevated positions however, further ground-truthing is required to verify the condition of existing vegetation.

As previously noted, the transmission lines and towers are an existing feature within the landscape. As the proposed transmission lines and poles are of a similar scale, but most possibly smaller than, the existing basslink interconnector tower, they are likely to be viewed as in keeping with the existing character of the surrounding landscape. As a result, the proposed transmission lines are likely to have a **low** visual impact.

### 10.1.3 Site Access and Facilities

Site access is proposed off Soldiers Settlement Road. The access routes are proposed to be new tracks. They will appear similar in character to the existing farm roads within the Study Area.

Facilities for the operation of the Project include an operations and maintenance facility including staff office, meeting facilities and amenities, storage facilities, workshops and car parking facilities. The appearance of these facilities are in keeping with existing farms structures within the landscape. Recommendations to minimise any potential visual impacts of these facilities have been included in **Section 11.0.**

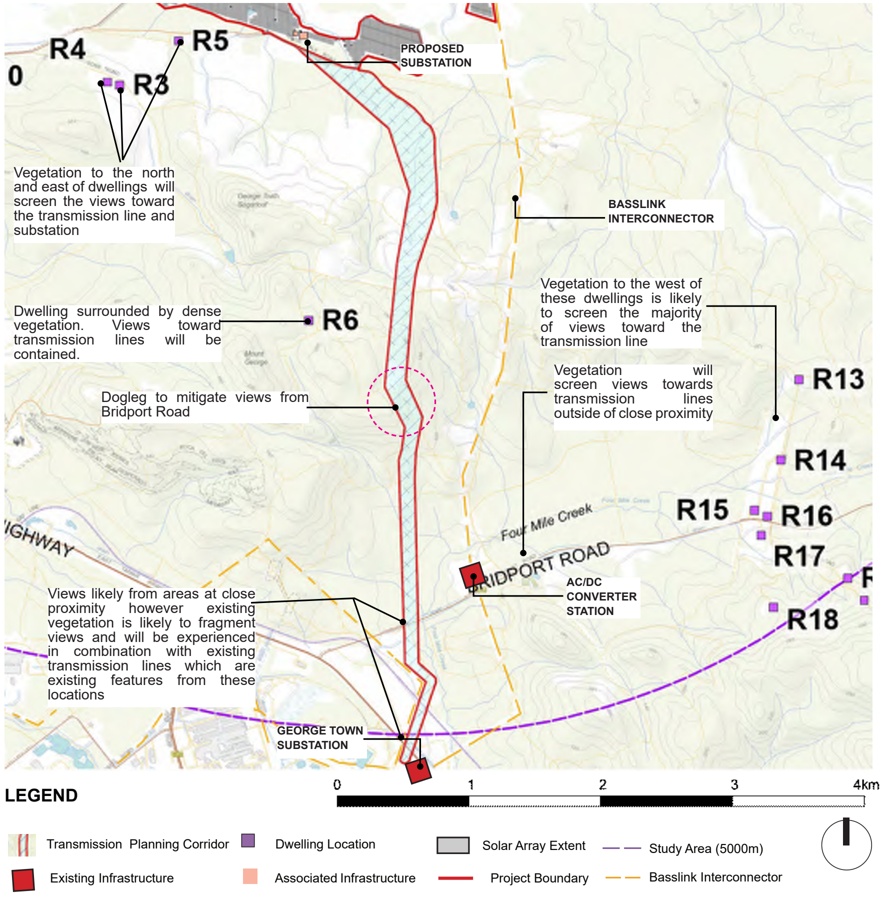



**Figure 15 -** Transmission Lines Potential Visual Impacts *(source: LISTmap Tasmania, January 2023)*

# 11.0 Mitigation Recommendations

## 11.1 Recommended Mitigation Methods

Opportunities to view the Project are limited from within the Study Area. As a result, there are few areas where mitigation may be considered. The following provides an overview of a number of design considerations in the development of the Project moving forward.

### 11.1.1 Design Considerations

Good design principles employed through the Project design phase can significantly reduce the visual impact. These include the siting principles, access, layout and other aspects of the design which directly influence the appearance of the proposed development. The following outlines the design considerations that have been developed in response to the Project:

- The design should retain the existing vegetation within the boundary of the development aligning Settlement Road and Old Aerodrome Road to reduce the overall visual impact.
- As mentioned in **Section 10.1.2** a number of design considerations have been undertaken to reduce the overall visual impact outcomes in relation to the transmission lines. Further to these, it is recommended that transmission poles that interface the East Tamar Highway to the east are sited to retain existing vegetation and blend in with the existing transmission lines
- Consideration should be given to the colours of the PCU's and ancillary structures to ensure minimal contrast and to help blend into the surrounding landscape to the extent practicable (see **Image 7**).
- Existing vegetation generally present around the Site should be retained and protected to maintain the existing level of screening.

**Image 7.** Example of a building colour palette sympathetic to the surroundings

Screen planting along the northern side of the driveway of R1 in addition to interspersing a single row of trees along stretches of the southern side of Soldiers Settlement Road, adjoining the Project (as shown in **Figure 16**) has been proposed and committed to by the applicant (Refer to **PM01, PM02** and **PM05** of **Appendix C**). The photomontages demonstate the effectiveness of this form of screening in reducing the residual visual impacts of the Project to an acceptable level.

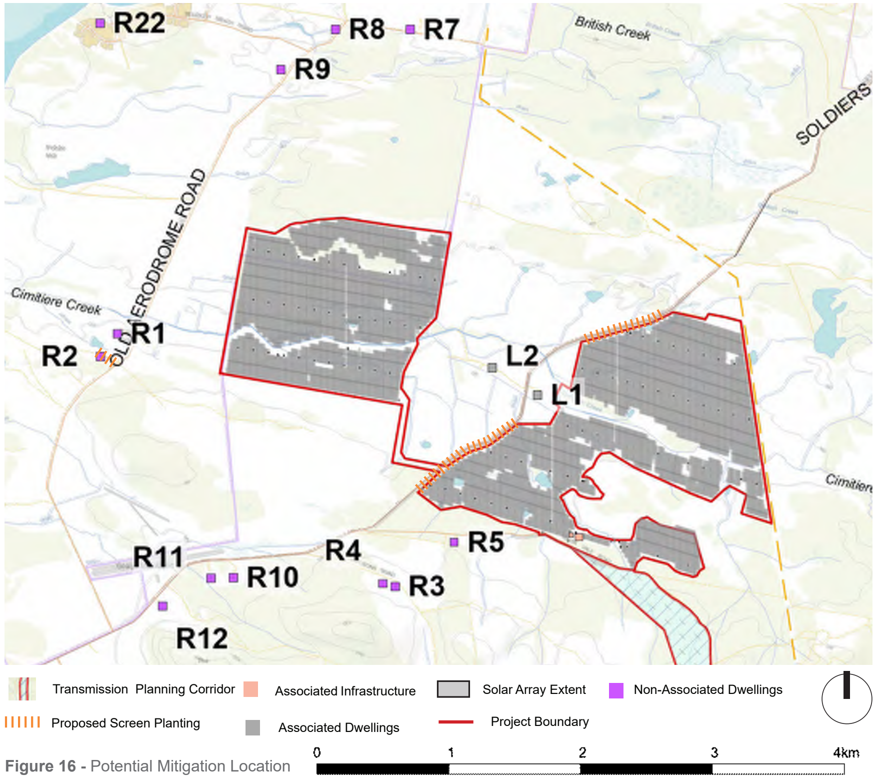



**Figure 16 -** Potential Mitigation Location

### 11.1.2 Landscape Principles

To ensure that the screen planting integrates into the existing landscape character, the bands should be planted with fast growing small trees and bushes, and low lying vegetation to ensure a naturalistic effect. Plant species are to be selected in keeping with existing plant communities generally present at the site.

The existing character of the landscape allows for a variety of methods of landscaping and visual screening which will remain in keeping with the landscape character. General guidelines to adhere to when planning for landscaping and visual screening include:

- Planting is recommended post construction in consultation with the landowner.
- Planting should remain in keeping with existing landscape character.
- Species selection is to be typical of the area.
- Planting layout should avoid screening views of the broader landscape.
- Avoid the clearing of existing vegetation. Where appropriate reinstate any lost vegetation.
- Allow natural vegetation to regrow over any areas of disturbance.

Locally native plant species are preferred, as they help to preserve the landscape character and scenic quality of the area as well as building habitat for local fauna. Native species are also well-suited to local conditions (ie. soil, climate, etc.) and will build on the existing vegetation assemblages in the area.

# 12.0 Conclusion

## 12.1 Conclusion

With all visual impact assessments the objective is not to determine whether the proposal is visible or not, it is to determine how the proposal will impact on existing visual amenity, landscape character and scenic quality. If there is a potential for a negative impact on these factors it must then be investigated and determined how this impact can be mitigated to the extent that the impact is reduced to an acceptable level.

A ZVI was undertaken for the Study Area which helped identify public viewpoint locations to be ground-truthed for public viewpoints through a viewpoint assessment (refer to **Appendix A** and **Section 06**) and private viewpoints using a dwelling assessment (**Appendix B** and **Section 08**).

Of the18 public viewpoints assessed, the potential visual impact rating for eight (8) viewpoints the visual impact rating was assessed as 'nil', six (6) were rated as low, one (1) was rated as 'moderate-low' and three (3) were rated as 'moderate'. It is noted that those rated as having a 'moderate' visual impact were taken in close proximity.

The viewpoint assessment determined that generally, the Project will result in a low modification to the existing visual landscape character from public viewing locations. The highest visual impact is likely to be experienced from areas at proximity to the Project, along Soldiers Settlement Road. Due to the combination of existing topography, orientation of the roads and existing vegetation views from outside of the immediate Project Area are likely to be limited. Due to existing vegetation, views from along Musk Vale Road are contained.

A total of 20 dwellings were identified within 4km of the site investigation area for the Project. Of these, 19 dwellings were determined to have nil-low visual impact due to a combination of intervening topography or existing vegetation and one (1) dwelling (R1) was identified as having a 'moderate' visual impact due to it's elevated position in relation to the Project.

The applicant has proposed and committed to implementing additional screen planting along the edge of the driveway near R1 and along sections of Soldiers Settlement Road (refer **Section 11)**. The mitigation measures reduce the overall visual impacts from both public and private viewpoint locations to a 'low' rating, which is an acceptable level.

A study of the potential impacts on the Scenic Protection Areas was undertaken. It was determined that views towards portions of the Project are likely to be available from locations at close range. The Project will likely to be a minimal element in the overall landscape and will be experienced for a short duration when travelling nearby the Project. As a result the Project is unlikely to significantly change the elements that contribute to the scenic value of the surrounding area.

The existing vegetation and adjoining existing industrial character is likely to assist in integrating the the transmission corridor into the surrounding landscape for the sections of the Bridport Road and Tamar Highway Scenic Road Corridor. As a result the scenic value of the corridors are not likely to significantly change as a result of the Project.

The implementation of the mitigation methods discussed in **Section 11** and as demonstrated in **Appendix C** of this report would reduce the potential visual impacts of the Project to an acceptable level. In doing so, the Project could be undertaken whilst maintaining the core landscape character of the area and ensuring minimal visual impacts to the surrounding area.

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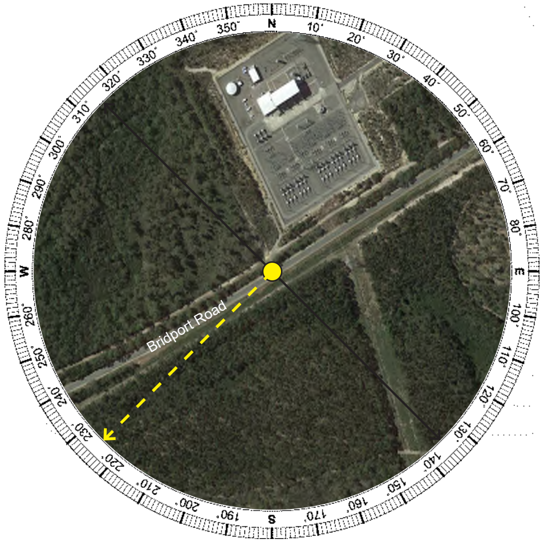
# A
# Viewpoints Analysis

# VP01 Bridport Road, George Town


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP01

**Viewpoint Summary:**

| | |
|---|---|
| Location: | Elevation: |
| Bridport Road, George Town | 44 m |
| Coordinates: | Distance to Project: |
| 41° 6'58.57"S 146°53'29.83"E | Approx. 470m from Transmission Easement |
| Viewing Direction: | |
| Southwest | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Low | |
| Visual Impact: | |
| **Low** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

This viewpoint is taken from Bridport road. Bridport Road is a sealed road, generally running east west connecting to the East Tamar Highway, approx 1km west of the viewpoint.

The viewpoint is taken just west of an existing DC/AC Converter Station and associated cleared easement and existing transmission lines, which are all part of the Basslink Interconnector. Transmission lines associated with the Basslink Interconnector are approximately 40m in height, and, along with the Converter station, are a visible element when viewed from this section of Bridport Road.

The land is flat, with dense vegetation lining the road. The existing vegetation contains views from this location.

The viewpoint is located outside of the Scenic Road Corridor. The visual sensitivity of the viewpoint is Low due to its location along a main road and existing visible industrial elements.

**Potential Visual Impact:**

Existing vegetation will screen views towards the solar panels from this location.

Existing vegetation will screen the majority of views toward the transmission lines from this location. The overhead wires may be visible however, they are likely to be difficult to discern.

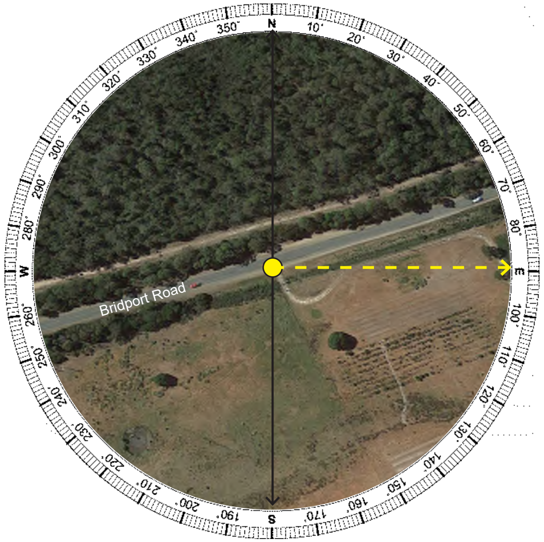
As a result of these factors the likely visual magnitude is Low.

Therefore the potential visual impact is likely to be **Low**.

# VP02 Bridport Road, George Town


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP02

| **Viewpoint Summary:** | |
|---|---|
| Location: | Elevation: |
| Bridport Road, George Town | 37 m |
| Coordinates: | Distance to Project: |
| 41° 7'5.94"S<br>146°53'7.15"E | Approx.100m from Transmission Easement |
| Viewing Direction: | |
| East | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Low | |
| Visual Impact: | |
| **Low** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

This viewpoint is taken from Bridport road. Bridport Road is a sealed road, generally running east-west connecting to the East Tamar Highway, approx 625m west of the viewpoint. The viewpoint is taken just 60m west of an existing DC/AC Converter Station and cleared easement and existing 'Starwood' transmission lines. Transmission lines are slightly shorter than those proposed and, along with the Converter station, are an existing feature when viewed from sections of Bridport Road. The land is flat, with dense vegetation to the northern side of the road, which contains views to the north. A cleared area is visible to the south-east of the view. Existing transmission towers are visible to the south of the view as well as in the distance to the north-east

Views toward Tippogoree Hills are available to the east of the view.

The viewpoint is located outside of the Scenic Road Corridor. The visual sensitivity of the viewpoint is Low due to its location along a main road and existing visible industrial elements.

**Potential Visual Impact:**

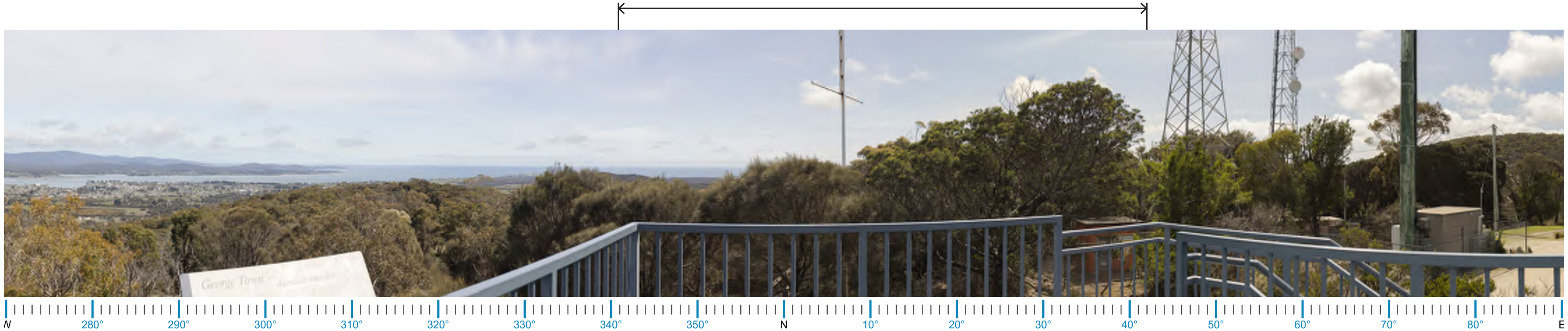
Existing vegetation and topography will screen views toward the solar farm from this location. Existing vegetation is likely to screen views toward the transmission towers to the north of the view. Views toward some transmission towers to the south are likely, however they will be of a similar scale, if not smaller than, the existing transmission towers. It is noted that transmission towers are an existing element within the visual landscape and the proposed transmission towers are likely to be in keeping with that of the existing infrastructure. Views toward the Tippogoree Hills in the background are likely to remain the key features from this viewpoint.

As a result of these factors the likely visual magnitude is Low.

Therefore the potential visual impact is likely to be **Low**.

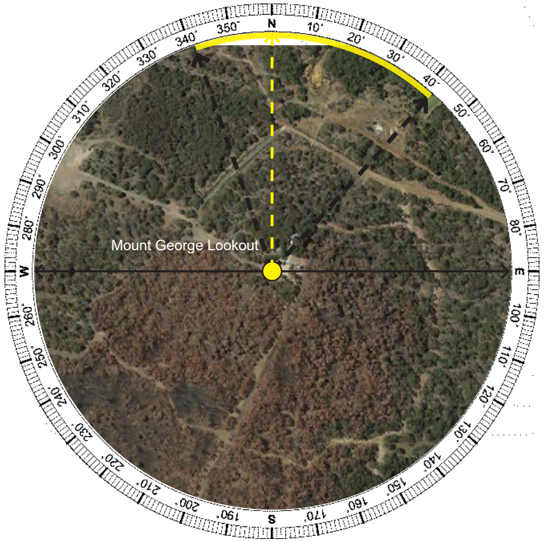
# VP03 Mount George Lookout, George Town

Approximate extent of Project




**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP03

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Mount George Lookout, George Town | 190 m |
| Coordinates: | Distance to Project: |
| 41° 6'12.26"S 146°51'43.31"E | 3.09 km |
| Viewing Direction: | |
| North | |
| Visual Sensitivity: | |
| High | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

This viewpoint is take from the Mount George Lookout. The lookout is generally orientated to the west, north-west and allows for views of the mouth of the river and the Bass Strait.

The land surrounding the view is generally densely vegetated, with the lookout raised to afford views out.

Existing infrastructure and vegetation is visible to the north and north-east of the view and contains views in this direction.

Due to the nature of the viewpoint as a lookout taken from recreational/cultural site of scenic significance as identified in the *Scenic Protection Code: Draft George Town Planning Scheme (draft LPS)* the visual sensitivity of the viewpoint is High.

**Potential Visual Impact:**

Existing vegetation and infrastructure will contain views toward the Project from this location.

As a result of these factors the likely visual magnitude is Nil.

The scenic values as identified within the *Scenic Protection Code: Draft George Town Planning Scheme (draft LPS)* is likely to remain unchanged as a result of the Project.

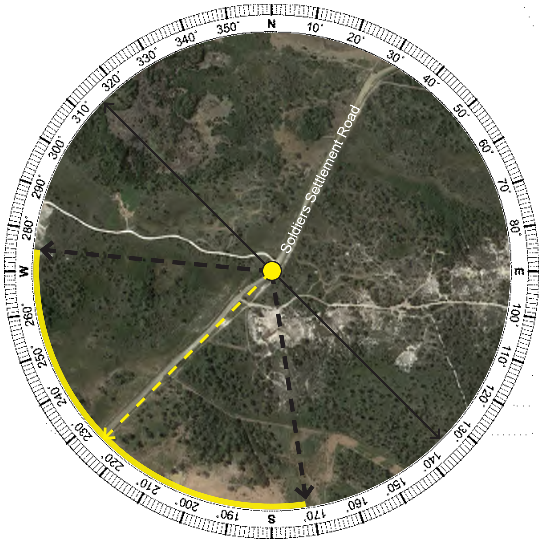
Therefore the potential visual impact is likely to be **Nil**.

# VP04 Soldiers Settlement Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP04

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Soldiers Settlement Road, George Town | 52 m |
| Coordinates: | Distance to Project: |
| 41° 3'29.88"S 146°53'28.93"E | 0.23 km |
| Viewing Direction: | |
| Southwest | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

**Existing Landscape Character Description:**

This viewpoint is taken from Soldiers Settlement Road. Soldiers Settlement Road is a sealed road, generally running east-west connecting Beechford to Georgetown.

Dense, scrubby vegetation is visible in the foreground and lines this section of the Soldiers Settlement Road containing views to the west and south of the view.

The visual sensitivity of the viewpoint is Low due to its location along a low use road.

**Potential Visual Impact:**

Existing vegetation will screen views toward the Project from this location.

As a result of these factors the likely visual magnitude is Nil.

Therefore the potential visual impact is likely to be **Nil**.

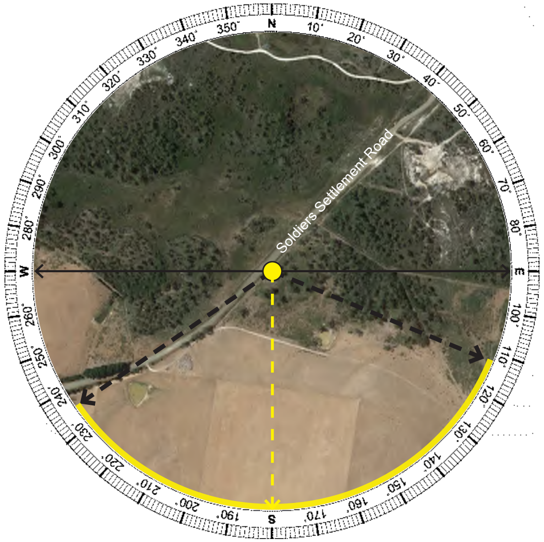
Aerial Image Source: Google Earth (2016)

# VP05 Soldiers Settlement Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP05

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Soldiers Settlement Road, George Town | 47 m |
| Coordinates: | Distance to Project: |
| 41° 3'40.58"S 146°53'12.71"E | 0.11 km |
| Viewing Direction: | |
| South | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| High | |
| Visual Impact: | |
| Moderate | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

This viewpoint is taken from Soldiers Settlement Road. Soldiers Settlement Road is a sealed road, generally running east-west connecting Beechford to Georgetown. Land in the area is flat to gently undulating with cleared agricultural land, associated with the Project, visible to the south of the view.

Dense, scrubby vegetation is visible to the west of Soldiers Settlement Road and contains views to the west. Scattered vegetation is visible to the south-west of the view.

Views towards the George Town Sugar Loaf form a backdrop to the south of the view.

The viewpoint is taken from a road. As a result the Visual Sensitivity has been rated as Low.

**Potential Visual Impact:**

Vegetation is likely to screen views toward solar panels to the south-west. Due to the lack of screening factors to the south and south-east, views towards the solar panels in this direction will be available.

The Project has the potential to become a feature of the view due to the proximity. However, it is noted that George Town Sugar Loaf forms a distinct backdrop to views from this location and this is likely to remain a key feature of views from this location.

Due to the proportion of the view affected and the extent of the area over which the change is to occur the visual magnitude is High.

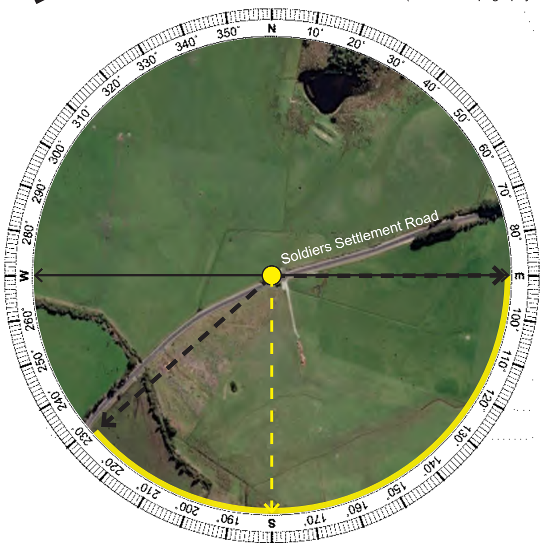
Therefore the potential visual impact is likely to be **Moderate.**

# VP06 Soldiers Settlement Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP06

**Viewpoint Summary:**

| | |
|---|---|
| Location: | Elevation: |
| Soldiers Settlement Road, George Town | 26 m |
| Coordinates: | Distance to Project: |
| 41° 3'50.63"S 146°52'39.59"E | Adjacent to Solar Farm |
| Viewing Direction: | |
| South | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| High | |
| Visual Impact: | |
| **Moderate** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

This viewpoint is taken from Soldiers Settlement Road. Soldiers Settlement Road is a sealed road, generally running east-west connecting Beechford to Georgetown.

Land in the area is flat to gently undulating with cleared agricultural land, associated with the Project, visible to the south of the view.

Scattered vegetation is visible to the south, in the middleground of the view.

Views towards the hills and mountains associated with Mount George and George Town Sugar Loaf are a backdrop to views from this location.

The viewpoint is taken from a road. As a result the Visual Sensitivity has been rated as Low.

**Potential Visual Impact:**

Views toward the Project will be available in the foreground of the view due to proximity and lack of roadside vegetation.

However, it is noted that the vegetation and topography in the middleground of the view may contain views toward the Project located south of Cimitiere Creek.

Due to the proportion of the view affected and the extent of the area over which the change is to occur the visual magnitude is High.

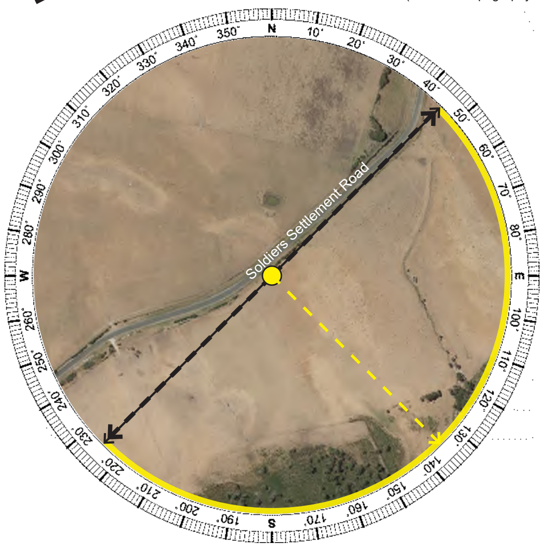
Therefore the potential visual impact is likely to be **Moderate**.

# VP07 Soldiers Settlement Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP07

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| ç, George Town | 28 m |
| Coordinates: | Distance to Project: |
| 41° 4'15.12"S<br>146°52'10.66"E | Adjacent to Solar Farm |
| Viewing Direction: | |
| Southeast | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| High | |
| Visual Impact: | |
| Moderate | |

**Existing Landscape Character Description:**

This viewpoint is taken from Soldiers Settlement Road. Soldiers Settlement Road is a sealed road, generally running east-west connecting Beechford to Georgetown.

Land in the area is flat to gently undulating with cleared agricultural land, associated with the Project, visible to the foreground of the view.

Scattered vegetation is visible in the middleground of the view.

The viewpoint is taken from a road. As a result the Visual Sensitivity has been rated as Low.

**Potential Visual Impact:**

Views toward the Project are likely to be available in the foreground of the view due to proximity and lack of roadside vegetation.

However, it is noted that the vegetation and topography in the middleground of the view is likely to limit views toward the Project located north of Cimitiere Creek.

Due to the close range to the Project, the proportion of the view affected and the extent of the area over which the change is to occur the visual magnitude is High.

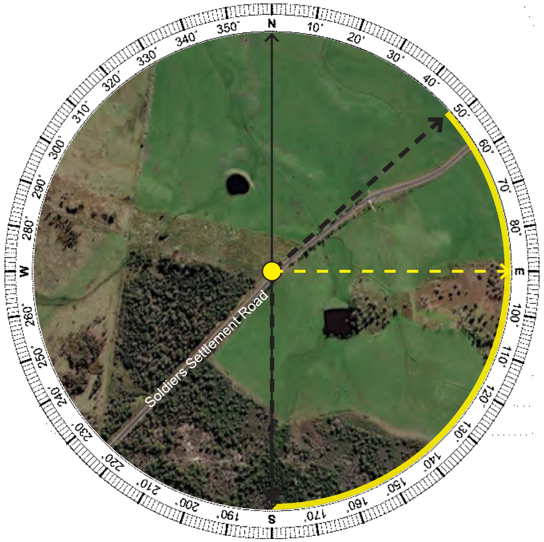
Therefore the potential visual impact is likely to be **Moderate**.

Aerial Image Source: Google Earth (2016)

# VP08 Soldiers Settlement Road, George Town


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP08

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Soldiers Settlement Road, George Town | 37 m |
| Coordinates: | Distance to Project: |
| 41° 4'22.06"S 146°51'52.60"E | Adjacent to Solar Farm |
| Viewing Direction: | |
| East | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Moderate | |
| Visual Impact: | |
| **Moderate-Low** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

This viewpoint is taken from Soldiers Settlement Road. Soldiers Settlement Road is a sealed road, generally running east-west connecting Beechford to Georgetown.

Land in the area is flat to gently undulating with cleared agricultural land, associated with the Project, visible to the east of the view.

Roadside vegetation is visible to the north-east of the view. Scattered vegetation is visible to the east, in the middleground of the view.

Views towards the hills and mountains associated with George Sugar Loaf are a backdrop to views from this location.

The viewpoint is taken from a road. As a result the Visual Sensitivity has been rated as Low.

**Potential Visual Impact:**

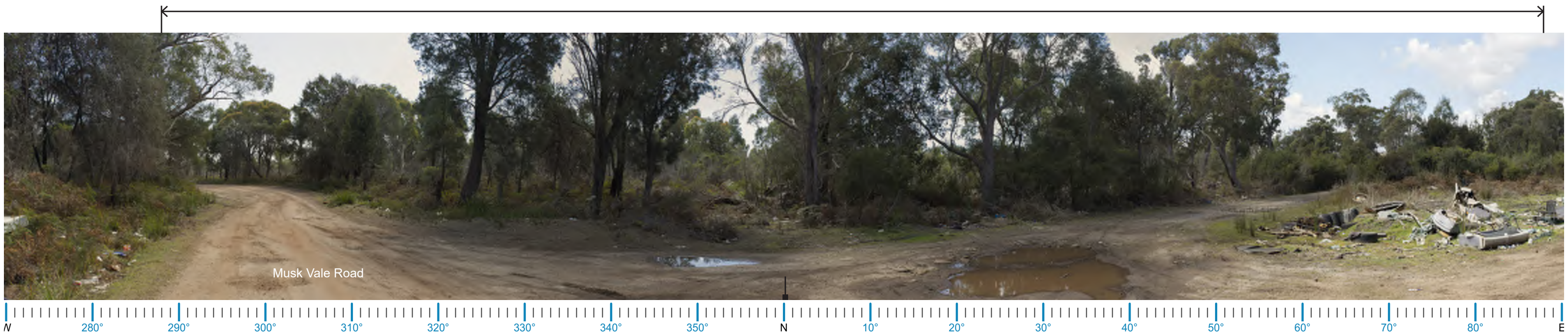
Vegetation is likely to screen views toward solar panels to the east and north-east. Due to the lack of screening factors to the south-east, views towards the solar panels in this direction will be available.

The Project has the potential to become a feature of the view due to the proximity. However, it is noted that George Town Sugar Loaf forms a distinct backdrop to views from this location and this is likely to remain a key feature of views from this location.

Due to the proportion of the view affected and the extent of the area over which the change is to occur the visual magnitude is Moderate.

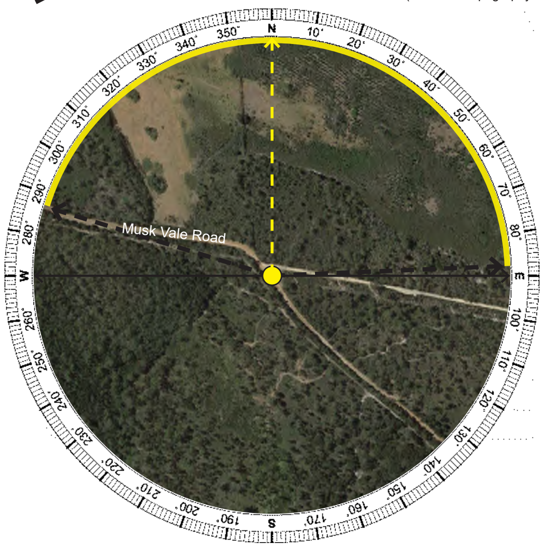
Therefore the potential visual impact is likely to be **Moderate-Low.**

# VP09 Musk Vale Road, George Town




**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP09

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Musk Vale Road, George Town | 59 m |
| Coordinates: | Distance to Project: |
| 41° 4'49.13"S 146°53'1.63"E | 0.14 km |
| Viewing Direction: | |
| North | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

The viewpoint is taken from Musk Vale Road, which is a low use, unsealed road.

The surrounding land is generally flat to gently undulating.

Vegetation surrounding the viewpoint includes dense, remnant areas of native vegetation.

Dense vegetation is visible in the foreground and contains views from this location.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

**Potential Visual Impact:**

Due to the existing native vegetation surrounding the view, views toward the Project will be contained from this location.

As a result the likely visual magnitude is Nil.

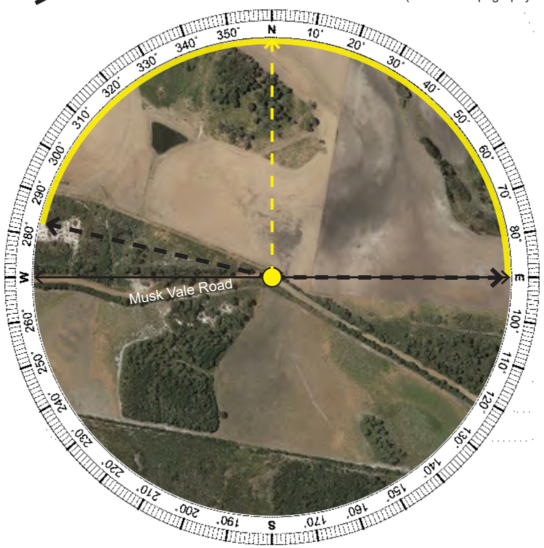
Therefore the potential visual impact is likely to be **Nil**.

# VP10 Musk Vale Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP10

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Musk Vale Road, George Town | 44 m |
| Coordinates: | Distance to Project: |
| 41° 4'38.53"S 146°52'27.18"E | Adjacent to Solar Farm |
| Viewing Direction: | |
| North | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Low | |
| Visual Impact: | |
| **Low** | |

**Existing Landscape Character Description:**

The viewpoint is taken from Musk Vale Road, which is a low use, unsealed road.

The surrounding land is generally flat to gently undulating.

Cleared land associated with the Project is visible in the background of the view.

A dense band of roadside vegetation is visible in the foreground and fragments views from this location.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

**Potential Visual Impact:**

Existing vegetation is likely to fragment views toward the Project from this location.

Due to the small proportion of the view affected the visual magnitude is Low.

Therefore the potential visual impact is likely to be **Low**.

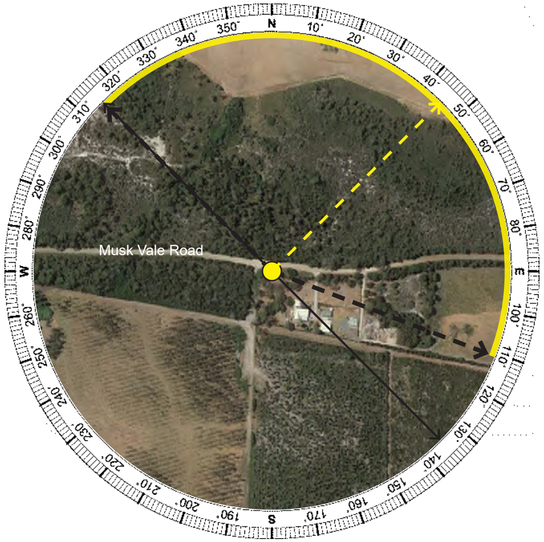
Aerial Image Source: Google Earth (2016)

# VP11 Musk Vale Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP11

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Musk Vale Road, George Town | 57 m |
| Coordinates: | Distance to Project: |
| 41° 4'38.81"S 146°51'54.87"E | 0.20 km |
| Viewing Direction: | |
| Northeast | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

**Existing Landscape Character Description:**

The viewpoint is taken from Musk Vale Road, which is a low use, unsealed road. R5 is located to the east of the view.

The surrounding land is generally flat to gently undulating.

Vegetation surrounding the viewpoint includes dense, remnant areas of native vegetation.

Dense vegetation is visible in the foreground and contains views from this location.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

**Potential Visual Impact:**

Due to the existing native vegetation surrounding the view, views toward the Project will be contained from this location.

As a result the likely visual magnitude is Nil.

Therefore the potential visual impact is likely to be **Nil**.

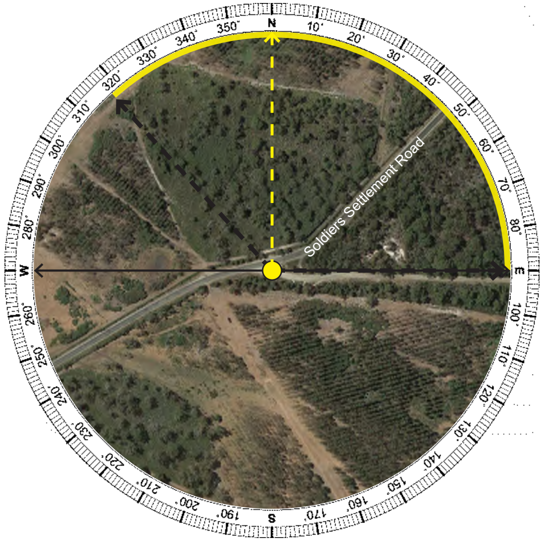
Aerial Image Source: Google Earth (2016)

# VP12 Intersection of Soldiers Settlement Road and Musk Vale Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP12

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Intersection of Soldiers Settlement Road and Musk Vale Road, George Town | 58 m |
| Coordinates: | Distance to Project: |
| 41° 4'37.63"S 146°51'28.63"E | 0.50 km |
| Viewing Direction: | |
| North | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

The viewpoint is taken from the corner of Musk Vale Road and Soldiers Settlement Road.

The surrounding land is generally flat to gently undulating.

Vegetation surrounding the viewpoint includes dense, remnant areas of native vegetation.

Dense vegetation is visible in the foreground and contains views from this location.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

**Potential Visual Impact:**

Due to the existing native vegetation surrounding the view, views toward the Project will be contained from this location.

As a result the likely visual magnitude is Nil.

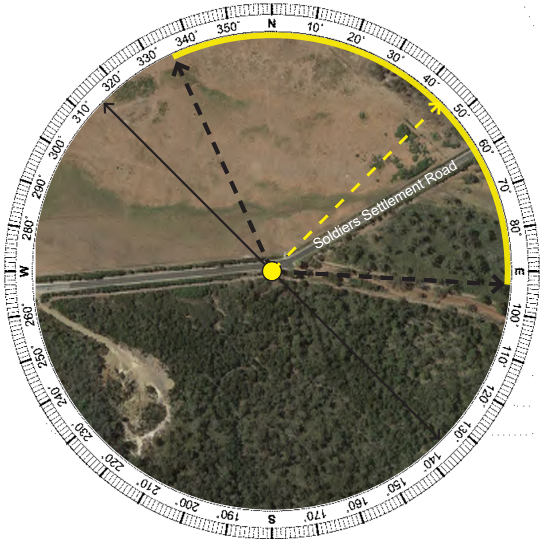
Therefore the potential visual impact is likely to be **Nil**.

# VP13 Intersection of Soldiers Settlement Road and Davidsons Road, George Town

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP13

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Intersection of Soldiers Settlement Road and Davidsons Road, George Town | 52 m |
| Coordinates: | Distance to Project: |
| 41° 4'43.90"S 146°51'8.92"E | 1.00 km |
| Viewing Direction: | |
| Northeast | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

The viewpoint is taken from the corner of Soldiers Settlement Road and Davidson Road.

The surrounding land is generally flat, gradually undulating to the east of the view.

Land surrounding the viewpoint is cleared and used for agricultural purposes. Dense remnant native vegetation is visible in the foreground to the east of the view. Vegetation is also visible in the background of the view to the north.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

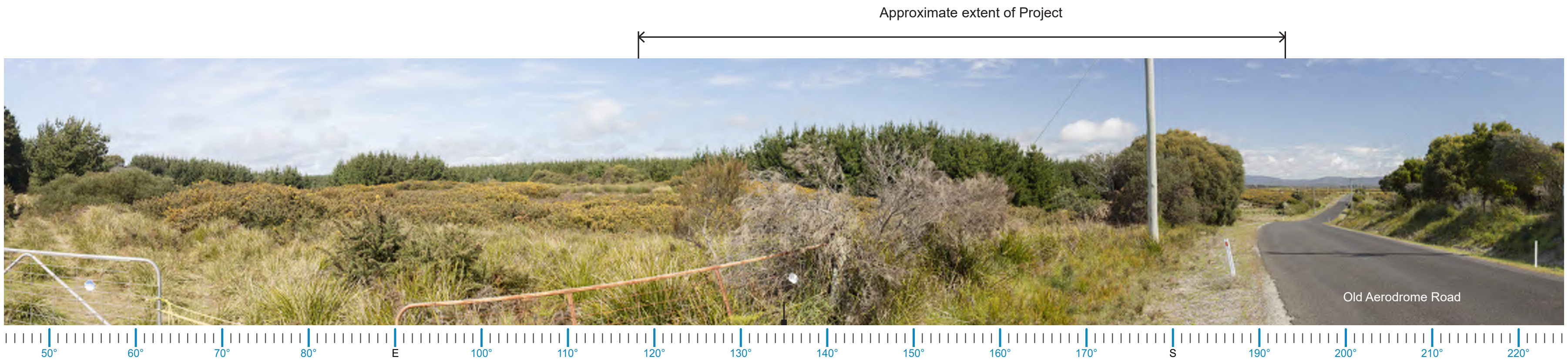
**Potential Visual Impact:**

A combination of existing vegetation and topography will contain views toward the Project from this location.

As a result the visual magnitude is Nil.

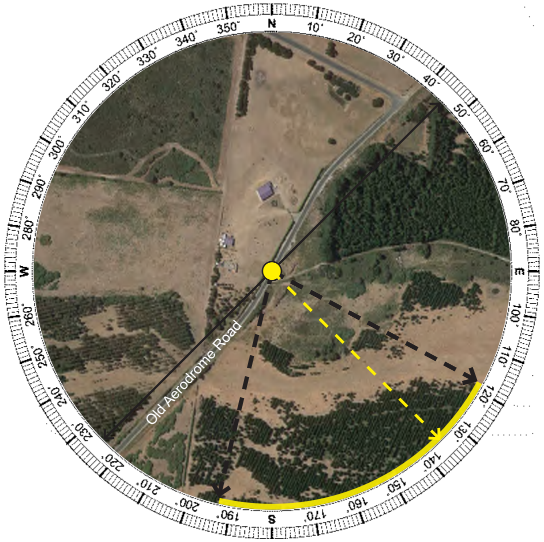
Therefore the potential visual impact is **Nil**.

# VP14 Old Aerodrome Road, Low Head




**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP14

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Old Aerodrome Road, Low Head | 44 m |
| Coordinates: | Distance to Project: |
| 41° 2'46.76"S 146°51'2.32"E | 1.08 km |
| Viewing Direction: | |
| Southeast | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

**Existing Landscape Character Description:**

The viewpoint is taken from Old Aerodrome Road.

The surrounding land is generally gently undulating.

Land surrounding the viewpoint includes cleared areas used for agricultural purposes, in addition to forestry plantations. This is visible in the foreground of the view and contains views from this location.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

**Potential Visual Impact:**

A combination of existing vegetation and topography will contain views toward the Project from this location.

As a result the visual magnitude is Nil.

Therefore the potential visual impact is **Nil**.

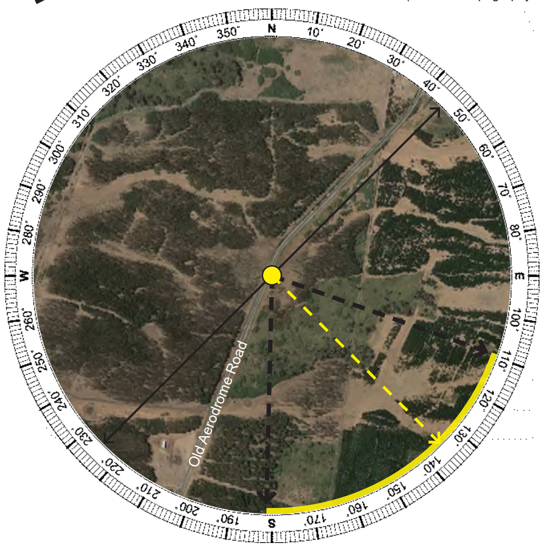
Aerial Image Source: Google Earth (2016)

# VP15 Old Aerodrome Road, Low Head

Approximate extent of Project


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP15

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Old Aerodrome Road, Low Head | 37 m |
| Coordinates: | Distance to Project: |
| 41° 3'1.42"S 146°50'43.88"E | 0.68 km |
| Viewing Direction: | |
| Southeast | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Nil | |
| Visual Impact: | |
| **Nil** | |

**Existing Landscape Character Description:**

The viewpoint is taken from Old Aerodrome Road.

The surrounding land is generally gently undulating, with a local rise limits most views toward the south-east.

Land surrounding the viewpoint includes cleared areas used for agricultural purposes, in addition to forestry plantations. This is visible in the background of the view.

Remnant roadside vegetation is visible in the foreground of the view.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

**Potential Visual Impact:**

A combination of existing roadside vegetation and topographywill screen views toward the Project from this location.

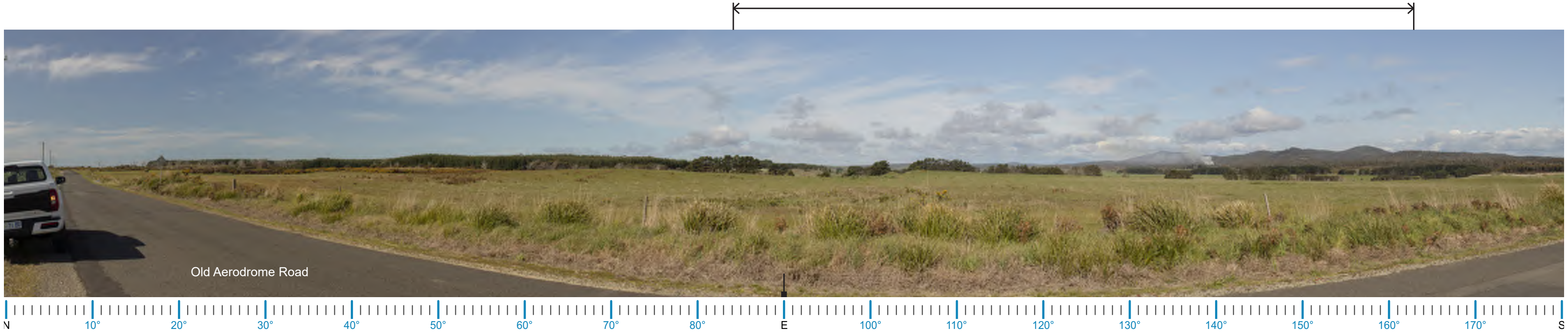
As a result the visual magnitude is Nil.

Therefore the potential visual impact is **Nil**.

Aerial Image Source: Google Earth (2016)

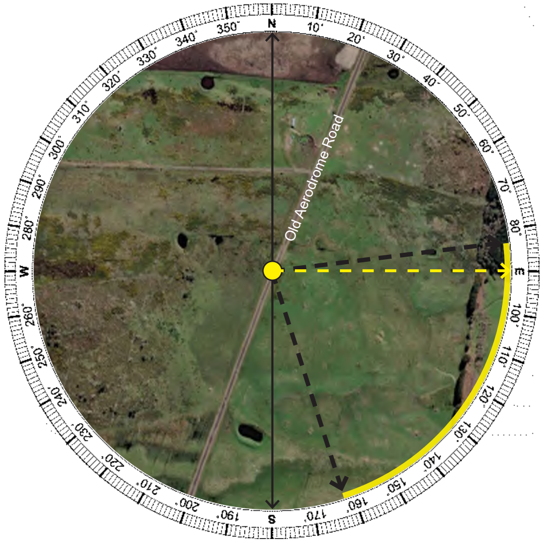
# VP16 Old Aerodrome Road, Low Head

Approximate extent of Project




**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP16

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Old Aerodrome Road, Low Head | 35 m |
| Coordinates: | Distance to Project: |
| 41° 3'24.66"S 146°50'28.65"E | 0.50 km |
| Viewing Direction: | |
| East | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Low | |
| Visual Impact: | |
| **Low** | |

**Existing Landscape Character Description:**

The viewpoint is taken from Old Aerodrome Road.

The surrounding land is flat to gently undulating.

Land surrounding the viewpoint includes cleared areas which are used for agricultural purposes, in addition to areas used for forestry plantations.

Vegetation lining lot boundaries are visible in the middleground and background of the view.

The visual sensitivity of this viewpoint has been rated as low due to its use as a low use road.

**Potential Visual Impact:**

Vegetation lining lot boundaries in the middleground and background of the view are likely to fragment views toward a large proportion of the Project from this location.

The scale of change as a result of the Project and proportion of the view the Project is likely to occupy is likely to result in a Low visual magnitude.

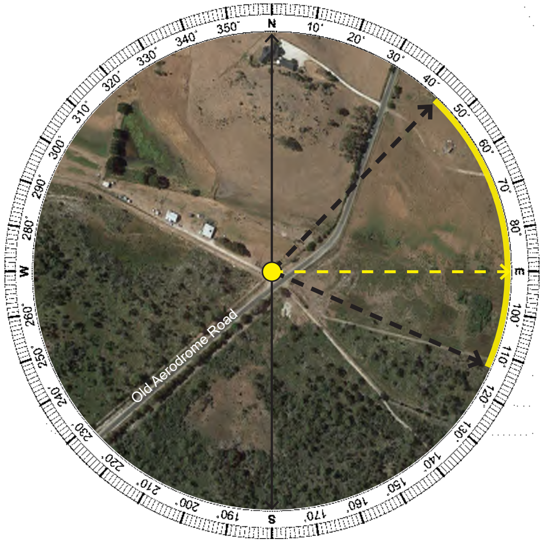
As a result the potential visual impact is **Low**.

Aerial Image Source: Google Earth (2016)

# VP17 Old Aerodrome Road, Low Head


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP17

| Viewpoint Summary: | |
|---|---|
| Location: | Elevation: |
| Old Aerodrome Road, Low Head | 29 m |
| Coordinates: | Distance to Project: |
| 41° 3'56.57"S 146°50'8.58"E | 0.77 km |
| Viewing Direction: | |
| East | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Low | |
| Visual Impact: | |
| Low | |

**Existing Landscape Character Description:**

The viewpoint is taken from Old Aerodrome Road at the driveway to R2.

The surrounding land is gently undulating.

Land surrounding the viewpoint includes cleared areas which are used for agricultural purposes, in addition to areas used for forestry plantations.

Remnant dense native vegetation is visible in the middleground, to the east of the view and contains views in this direction.

Vegetation lining lot boundaries are visible in the background of the view.

**Potential Visual Impact:**

Remnant dense native vegetation and the patch of forestry plantation in the middleground is likely to contain views toward the Project in this direction.

Vegetation lining lot boundaries in the background of the view are likely to fragment views toward a large proportion of the Project from this location.

A combination of the distance to the Project, the scale of change as a result of the Project and the proportion of the view the Project is likely to occupy is likely to result in a Low visual magnitude.

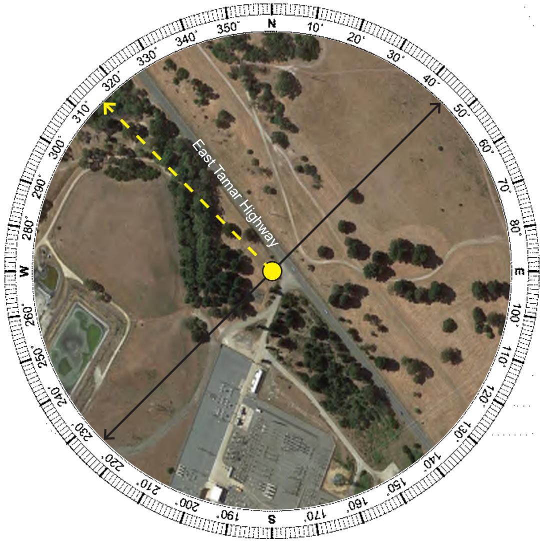
As a result the potential visual impact is **Low**.

Aerial Image Source: Google Earth (2016)

# VP18 East Tamar Highway, Bell Bay


**LEGEND**

- Viewing direction and centre of panorama
- Direction of Project
- Extent of panorama
- Extent of visible Project (Based on topography alone)




## VIEWPOINT VP18

| **Viewpoint Summary:** | |
|---|---|
| Location: | Elevation: |
| East Tamar Highway, Bell Bay | 43 m |
| Coordinates: | Distance to Project: |
| 41° 7'33.61"S 146°53'10.32"E | Under Transmission Easement |
| Viewing Direction: | |
| Northwest | |
| Visual Sensitivity: | |
| Low | |
| Visual Magnitude: | |
| Low | |
| Visual Impact: | |
| **Low** | |

Aerial Image Source: Google Earth (2016)

**Existing Landscape Character Description:**

This viewpoint is taken from the East Tamar Highway, at the entry to the George Town Substation.

East Tamar Highway is a main road running north-south along the River Tamar connecting Launceston to Low Head.

Land surrounding the viewpoint is characterised as flat, generally cleared land used for both agriculture and energy infrastructure.

Remnant native vegetation is visible in the foreground and middleground of the view to the west and north.

Existing transmission towers are existing features and are visible to the north of the view.

The section of road in which the viewpoint is taken is identified within the *Scenic Protection Code: Draft George Town Planning Scheme (draft LPS)* as a *Scenic Road Corridor.* However it is our opinion that although this is taken from a scenic road corridor, the quality of the view is low due to the existing industrial elements.

Therefore the visual sensitivity is rated as Low.

**Potential Visual Impact:**

Existing vegetation and topography will screen views toward the Solar Farm from this location.

Views towards one of the proposed transmission towers may be available from this location to the north east of the view.

It is noted that transmission towers are an existing element within the visual landscape and the proposed transmission towers or poles are likely to be in keeping with that of the existing infrastructure.

The scenic values of views from this location are likely to remain intact as a result of the Project.

As a result of these factors the likely visual magnitude is Low.

Therefore the potential visual impact is likely to be **Low**.

# B

# Dwelling Assessment

## DWELLING ASSESSMENT TABLE

| I.D | STREET NAME & COORDINATES | ELEVATION | DISTANCE TO PROJECT | VISUAL ASSESSMENT | Dwelling Visual Impact Rating: Distance | Views | Direction | Visibility | Scale | Contrast | Duration | Mitigation | VISUAL IMPACT RATING (without mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R1 | Old Aerodrome Road<br>41° 3'48.84"S<br>146°50'7.98"E | 23 m | 840m | The Project is located to the east of the dwelling, with the dwelling slightly elevated and orientated to the north east. An aerial image suggests that primary views from this dwelling are likely to be out to the north west. A shed is situated to the south east of the dwelling, containing views in this direction. There is limited vegetation to the north and east. The Project is located 840m from the dwelling and it is likely that vegetation in the background of the view will partially fragment views toward the Project. Although views will be available, they are likely to occupy a small portion of views (approx 40 degrees) and will not diminish the existing visual character from this location. Refer **PM05.** | L | M | L | M | M | M | M | M | MODERATE |
| R2 | Old Aerodrome Road<br>41° 3'54.48"S<br>146°50'2.60"E | 34 m | 900m | The Project is located to the east of the dwelling, with the dwelling slightly elevated. A localised rise is located to the north east and a shed, chook shed and tank located to the east. These elements are likely to contain views toward the Project in these directions. Due to a combination of these factors and vegetation the Project is likely to be partially visible. Although views are likely to be available, they are likely to occupy a small portion of views. | L | M | L | L | L | L | M | L | LOW |
| R3 | Davidsons Road<br>41° 4'51.10"S<br>146°51'38.12"E | 72 m | 650m Approx 1.5km to transmission line | The Project is located to the north of the dwelling, and the transmission lines to the east. The dwelling orientated to the northeast. The dwelling is located within a cleared, slightly elevated position. A site inspection confirms that scattered vegetation is situated in the foreground of the primary views of the dwelling. Dense vegetation is situated beyond the curtilage, to the north of the dwelling. The solar panels and transmission lines will not be visible, due to the distance and the vegetation between the receptor and the Project. Refer **PM04.** | N | N | N | N | N | N | N | N | NIL |
| R4 | Davidsons Road<br>41° 4'50.39"S<br>146°51'34.23"E | 68 m | 700m Approx 1.6km to transmission line | The Project is located to the north of the dwelling, and the transmission lines to the east. The dwelling is located within a cleared, slightly elevated position. Dense vegetation is situated to the north of the dwelling. The solar panels and transmission lines will not be visible, due to vegetation between the receptor and the Project. | N | N | N | N | N | N | N | N | NIL |
| R5 | Musk Vale Road<br>41° 4'40.26"S<br>146°51'57.35"E | 56 m | 250m Approx 900m to transmission line | The Project is located to the north of the dwelling with the transmission line located to the east. The dwelling orientated to north-south. The dwelling is surrounded by vegetation. Sheds are located to the east of the dwelling. The solar panels and transmission lines will not be visible, due to the vegetation and the existing shed between the receptor and the Project. | N | N | N | N | N | N | N | N | NIL |
| R9 | Old Aerodrome Road<br>41° 2'43.97"S<br>146°51'1.33"E | 45 m | 1200m | The Project is located to the south of the dwelling. Vegetation lines the south eastern boundary of the dwelling with dense vegetation located beyond. A combination of vegetation and topography will screen views toward the Project from this location. | N | N | N | N | N | N | N | N | NIL |

## DWELLING ASSESSMENT TABLE

| I.D | STREET NAME & COORDINATES | ELEVATION | DISTANCE TO PROJECT | VISUAL ASSESSMENT | Dwelling Visual Impact Rating | | | | | | | | VISUAL IMPACT RATING (without mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance | Views | Direction | Visibility | Scale | Contrast | Duration | Mitigation | |
| R8 | Old Aerodrome Road<br>41° 2'34.14"S<br>146°51'18.99"E | 47 m | 1400m | The Project is located to the south of the dwelling. The Project will not be visible, due to topography. | N | N | N | N | N | N | N | N | NIL |
| R7 | Old Aerodrome Road<br>41° 2'34.19"S<br>146°51'43.30"E | 38 m | 1500m | The Project is located to the south of the dwelling. The Project will not be visible, due to topography. | N | N | N | N | N | N | N | N | NIL |
| R10 | Soldiers Settlement Road<br>41° 4'48.83"S<br>146°50'45.58"E | 53 m | 1500m | The Project is located to the notth-east of the dwelling. The Project will not be visible, due to a combination of topography and vegetation. | N | N | N | N | N | N | N | N | NIL |
| R11 | Soldiers Settlement Road<br>41° 4'48.98"S<br>146°50'38.33"E | 48 m | 1700m | The Project is located to the notth-east of the dwelling. The Project will not be visible, due to a combination of topography, existing structures and vegetation. | N | N | N | N | N | N | N | N | NIL |
| R12 | Soldiers Settlement Road<br>41° 4'55.85"S<br>146°50'22.50"E | 47 m | 2100m | The Project is located to the notth-east of the dwelling. The Project will not be visible, due to a combination of topography and vegetation. | N | N | N | N | N | N | N | N | NIL |

## DWELLING ASSESSMENT TABLE

| I.D | STREET NAME & COORDINATES | ELEVATION | DISTANCE TO PROJECT | VISUAL ASSESSMENT | Dwelling Visual Impact Rating: Distance | Views | Direction | Visibility | Scale | Contrast | Duration | Mitigation | VISUAL IMPACT RATING (without mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R6 | 41° 5'49.11"S<br>146°52'39.51"E | 186 m | 2 km Approx 600m to transmission line | The transmission line is located to the east of the dwelling. Dwelling is surrounded by dense vegetation will contain views toward the solar panels and transmission line front his location. | N | N | N | N | N | N | N | N | NIL |
| R15 | Bridport Road<br>41° 6'35.99"S<br>146°55'4.46"E | 73 m | 4 km Approx 2.6km to transmission line | The transmission line is located to the west of the dwelling. Dwelling located in a partially cleared land, however vegetation is visible to the west within the curtilage of the dwelling. Dense native vegetation is also visible to the west. Vegetation will screen views toward the transmission line from this dwelling. The solar farm will not be visible from this location. | N | N | N | N | N | N | N | N | NIL |
| R16 | Bridport Road<br>41° 6'37.50"S<br>146°55'8.61"E | 75 m | 4 km Approx 2.7km to transmission line | The transmission line is located to the west of the dwelling, with the dwelling orientated to the south. Dwelling located in a partially cleared land, however vegetation is visible to the west within the curtilage of the dwelling. Dense native vegetation is also visible to the west. Vegetation will screen views toward the transmission line from this dwelling. The solar farm will not be visible from this location. | N | N | N | N | N | N | N | N | NIL |
| R17 | Bridport Road<br>41° 6'42.14"S<br>146°55'6.67"E | 86 m | 4.1 km Approx 2.6km to transmission line | The transmission line is located to the west of the dwelling. Dwelling located in a partially cleared land, however scattered vegetation is visible to the west within the curtilage of the dwelling. Dense native vegetation is also visible to the west. Vegetation is likely to screen the majority of views toward the transmission line from this dwelling. The solar farm will not be visible from this location. | L | L | L | L | L | L | M | L | LOW |
| R14 | Bridport Road<br>41° 6'23.66"S<br>146°55'13.08"E | 79 m | 3.6 km Approx 2.7km to transmission line | The transmission line is located to the west of the dwelling, with the dwelling orientated to the north. Dwelling located in a partially cleared land, slightly elevated position however vegetation is visible to the west within the curtilage of the dwelling. Vegetation will screen the majority of views toward the transmission line from this dwelling. The solar farm will not be visible from this location. | L | L | L | L | L | L | M | L | LOW |
| R13 | Bridport Road<br>41° 6'3.86"S<br>146°55'18.98"E | 128 m | 14.33 km Approx 3km to transmission line | The transmission line is located to the west of the dwelling. Dwelling is surrounded by vegetation. Views toward the solar farm and transmission line will be contained due to a combination of vegetation and topography. | N | N | N | N | N | N | N | N | NIL |
| R18 | Bridport Road<br>41° 6'59.79"S<br>146°55'10.68"E | 172 m | 4.5 km Approx 2.6Km to transmission line | The transmission line is located to the west of the dwelling, Dwelling located in a partially cleared land, elevated position. however dense vegetation is visible to the west. Vegetation is likely to fragment views toward the transmission line from this dwelling. The solar farm will not be visible from this location. | L | L | L | L | L | L | M | L | LOW |

## DWELLING ASSESSMENT TABLE

| I.D | STREET NAME & COORDINATES | ELEVATION | DISTANCE TO PROJECT | VISUAL ASSESSMENT | Dwelling Visual Impact Rating: Distance | Views | Direction | Visibility | Scale | Contrast | Duration | Mitigation | VISUAL IMPACT RATING (without mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **R19** | Aitkins Road<br>41° 6'52.74"S<br>146°55'34.82"E | 183 m | 5 km<br>Approx. 3.2 km to transmission line | The transmission line is located to the west of the dwelling, with the dwelling located in an elevated position and orientated to the north-south.The dwelling is surrounded by vegetation. Due to distance and existing vegetation the the majority of Project is likely to be screened, however glimpses of the transmission line may be available to the west. These views are likely to occupy a small portion of views at any given time and will be a minor element in the visual landscape. | L | L | L | L | L | L | M | L | **LOW** |
| **R20** | Aitkins Road<br>41° 6'58.14"S<br>146°55'40.15"E | 207 m | 5 km<br>Approx. 3.6 km to transmission line | The transmission line is located to the west of the dwelling, with the dwelling located in an elevated position. The dwelling is surrounded by dense vegetation. Due to distance and existing vegetation the the majority of Project is likely to be screened, however glimpses of the transmission line may be available to the west. These views are likely to occupy a small portion of views at any given time and will be a minor element in the visual landscape. | L | L | L | L | L | L | M | L | **LOW** |

# Photomontage 01 Soldiers Settlement Rd, George Town

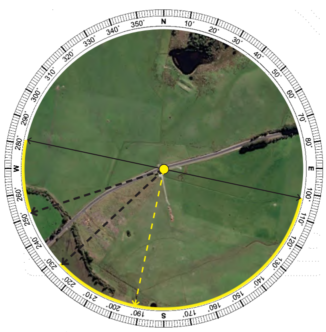

## Existing view - 180° Baseline panorama


## Proposed view - 180° Photomontage


## Proposed view - 180° Photomontage with fence and proposed mitigation

**LEGEND**

- Viewing direction and centre of panorama
- Extent of panorama
- Extent of solar farm (based on topography alone)



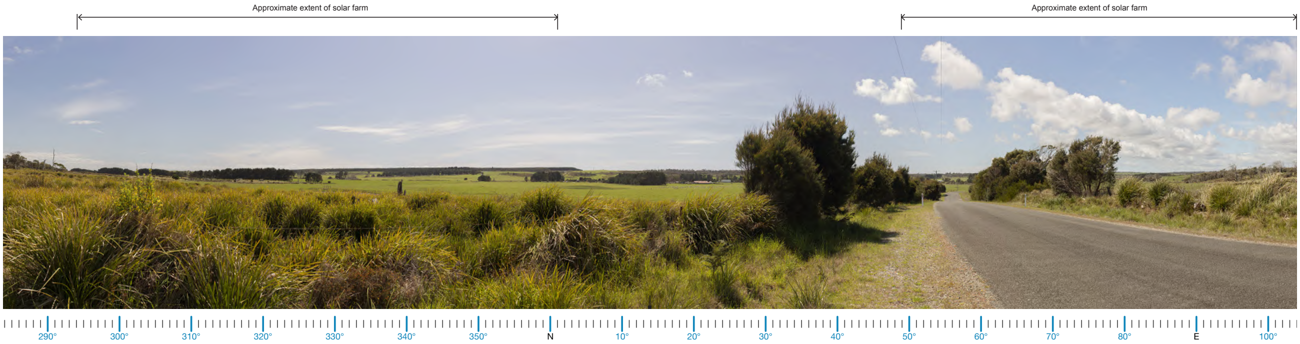
Aerial image. Source: Esri

**Photomontage 01**

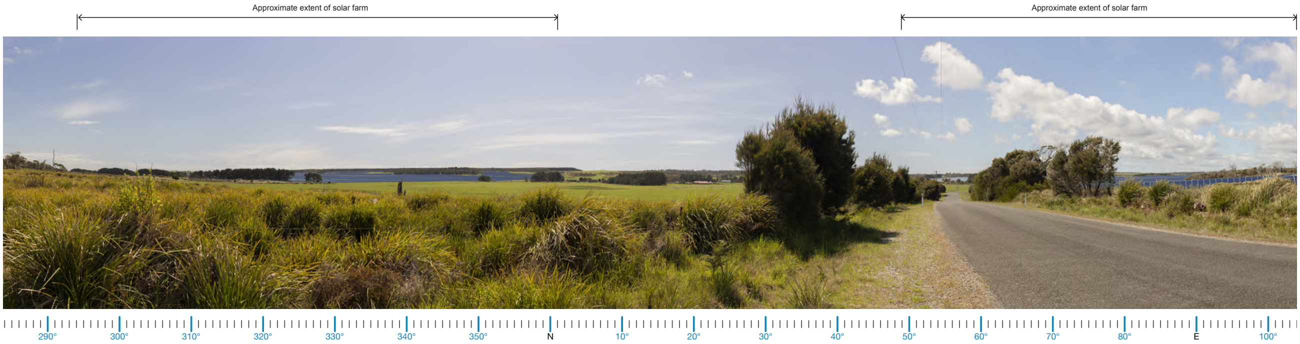
| |
|---|
| Location: |
| Soldiers Settlement Road, George Town |
| Photograph Date and Time: |
| 10th October 2022 12:38pm |
| Coordinates: |
| 41° 3'50.32"S 146°52'41.34"E |
| Distance to Nearest Solar Panel: |
| 0.029 km |
| Viewing Direction: |
| South |
| Elevation: |
| 30m |

Appendix C. Photomontages

# Photomontage 02 Soldiers Settlement Rd, George Town




Existing view - 180° Baseline panorama

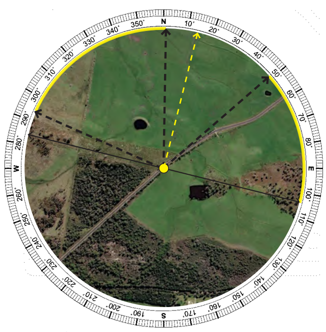



Proposed view - 180° Photomontage


Proposed view - 180° Photomontage - with proposed mitigation

**LEGEND**

- Viewing direction and centre of panorama
- Extent of panorama
- Extent of potentially visible turbines (based on topography alone)



Aerial image. Source: Esri

**Photomontage 02**

| | |
|---|---|
| Location: | Soldiers Settlement Road, George Town |
| Photograph Date and Time: | 10th October 2022 1:05pm |
| Coordinates: | 41° 4'22.06"S 146°51'52.60"E |
| Distance to Nearest Solar Panel: | 0.04 km |
| Viewing Direction: | North |
| Elevation: | 38m |

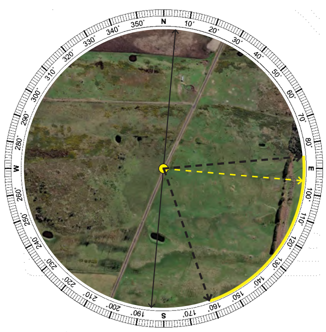
# Photomontage 03 Old Aerodrome Rd, George Town


Existing view - 180° Baseline panorama


Proposed view - 180° Photomontage

**LEGEND**

- Viewing direction and centre of panorama
- Extent of panorama
- Extent of solar farm (based on topography alone)

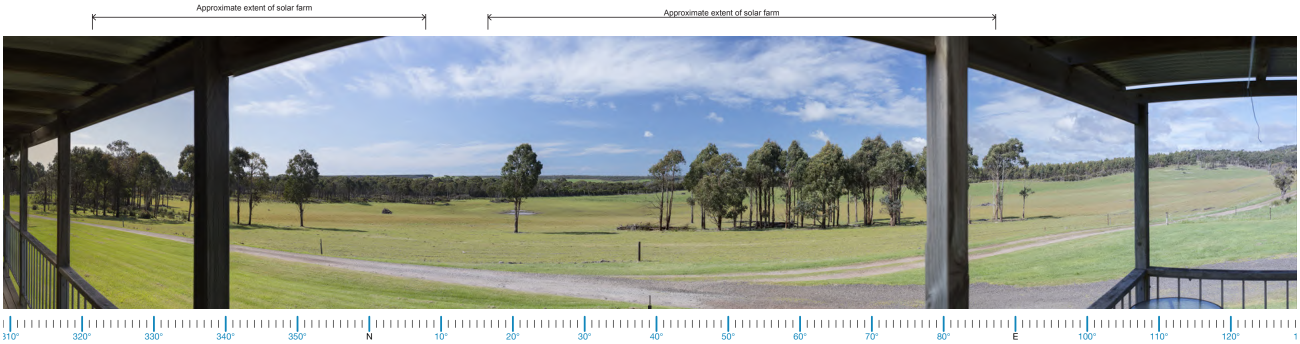


Aerial image. Source: Esri

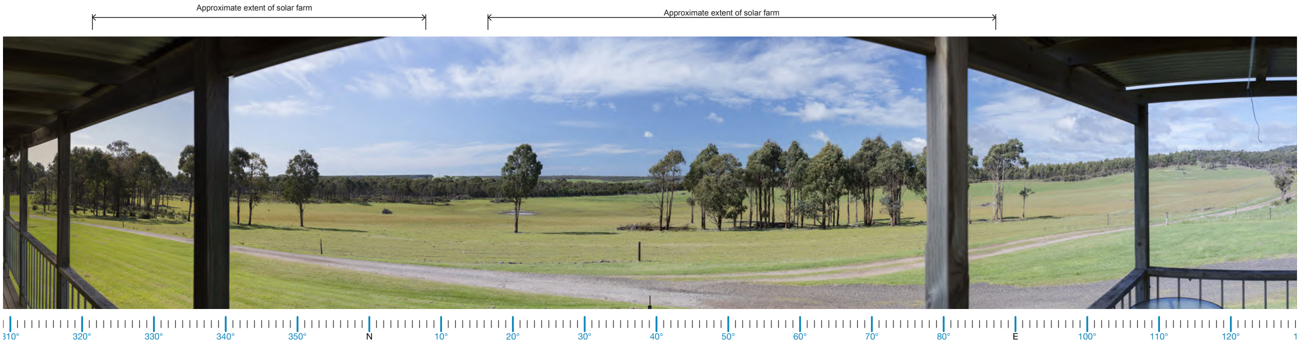
**Photomontage 03**

| |
|---|
| Location: |
| Old Aerodrome Road, George Town |
| Photograph Date and Time: |
| 10th October 2022 3:50pm |
| Coordinates: |
| 41° 3'24.66"S 146°50'28.65"E |
| Distance to Nearest Solar Panel: |
| 0.51km |
| Viewing Direction: |
| East |
| Elevation: |
| 35m |

# Photomontage 04 Davidsons Rd, George Town



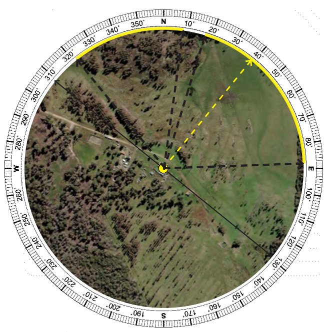

Existing view - 180° Baseline panorama




Proposed view - 180° Photomontage

**LEGEND**

- Viewing direction and centre of panorama
- Extent of panorama
- Extent of potentially visible turbines (based on topography alone)



Aerial image. Source: Esri

**Photomontage 03**

| |
|---|
| Location: |
| Davidsons Road, George Town |
| Photograph Date and Time: |
| 10th October 2022 3:20pm |
| Coordinates: |
| 41° 4'50.93"S 146°51'38.22"E |
| Distance to Nearest Solar Panel: |
| 0.69km |
| Viewing Direction: |
| Northeast |
| Elevation: |
| 72m |

# Photomontage 05 Old Aerodrome Rd, George Town

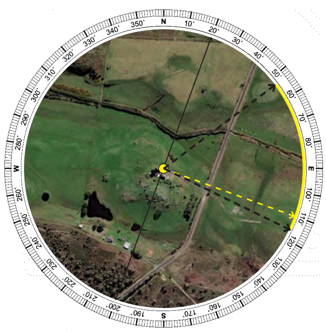

Existing view - 180° Baseline panorama


Proposed view - 180° Photomontage


Proposed view - 180° Photomontage - with proposed mitigation

**LEGEND**

- Viewing direction and centre of panorama
- Extent of panorama
- Extent of solar farm (based on topography alone)




Aerial image. Source: Esri

**Photomontage 04**

| |
|---|
| Location: |
| Old Aerodrome Road, George Town |
| Photograph Date and Time: |
| 10th October 2022 3:35pm |
| Coordinates: |
| 41° 3'48.46"S 146°50'9.04"E |
| Distance to Nearest Solar Panel: |
| 0.84km |
| Viewing Direction: |
| East |
| Elevation: |
| 23m |

# Appendix H
## PV Glint and Glare Study

# Cimitiere Plains Solar Farm

PAGERPOWER
Urban & Renewables

# Solar Photovoltaic Glint and Glare Study

Envoca Environmental Consultancy

George Town Solar Farm

September 2023

# ADMINISTRATION PAGE

| | |
|---|---|
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| Issue | Date | Detail of Changes |
|---|---|---|
| 1 | 29th August 2023 | Initial issue |
| 2 | 11th September 2023 | Administrative amendments |



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# EXECUTIVE SUMMARY

## Report Purpose

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) development located north-east of George Town, Tasmania, Australia. This glint and glare assessment concerns the potential impact on surrounding road safety and residential amenity. Commentary on the potential impacts at George Town Airport has also been included.

## Conclusions

No significant impacts are predicted on surrounding road safety and residential amenity. Mitigation is not recommended.

## Guidance and Studies

There is no existing planning guidance for the assessment of solar reflections from solar panels towards roads and nearby dwellings. Pager Power has however produced guidance for glint and glare and solar photovoltaic developments, which was published in early 2017, with the fourth edition published in 2022[1]. The guidance document sets out the methodology for assessing roads and dwellings with respect to solar reflections from solar panels.

Pager Power's approach is to undertake geometric reflection calculations and, where a solar reflection is predicted, consider the screening (existing and/or proposed) between the receptor and the reflecting solar panels. The scenario in which a solar reflection can occur for all receptors is then identified and discussed, and a comparison is made against the available solar panel reflection studies to determine the overall impact.

The available studies have measured the intensity of reflections from solar panels with respect to other naturally occurring and manmade surfaces. The results show that the reflections produced are of intensity similar to or less than those produced from still water and significantly less than reflections from glass and steel[2].

## Assessment Results

**Roads**

The modelling predicts that solar reflections are possible (without consideration of screening) towards a 1.3km section and a 1.1km section of Soldiers Settlement Road.

No significant impacts are predicted on any of the modelled road sections, because there are significant mitigating factors from the following:

---

[1] Pager Power Glint and Glare Guidance, Fourth Edition, September 2022.
[2] Source: SunPower, 2009, SunPower Solar Module Glare and Reflectance (appendix to Solargen Energy, 2010).

- Solar reflections are possible from panels **<u>outside</u>** of a road user's primary horizontal field of view (50 degrees either side of the direction of travel);
- There is significant screening such that views of reflecting panels are not expected to be possible in practice;
- There is screening such that reflections will be filtered and only marginal/fleeting views of reflecting panels are expected to be possible;
- Reflections coinciding with direct sunlight;
- There is a significant clearance distance between road user and closest reflecting panel.

**Dwellings**

The modelling predicts that solar reflections are possible (without consideration of screening) towards five of the seven assessed dwelling locations.

No significant impacts are predicted on the assessed dwellings, because there are significant mitigating factors from the following:

- Solar reflections are possible for **<u>less</u>** than 60 minutes on any given day and for **<u>less</u>** than 3 months of the year;
- There is significant screening such that views of reflecting panels are not expected to be possible in practice;
- There is screening such that reflections will be filtered and only marginal views of reflecting panels are expected to be possible;
- Reflections coinciding with direct sunlight;
- There is a significant clearance distance between dwelling observer and closest reflecting panel.

**High-Level Aviation**

George Town Airport is understood to be an unlicensed airstrip where non-commercial aircraft may operate. It is located approximately 1.5km away from the proposed development at its closest point. The George Town Airport has been contacted in relation to the proposal and no concerns have been raised in relation to glint and glare or other matters.

The Civil Aviation Safety Authority (CASA) were also consulted with regards to the proposed development. CASA confirmed that it is not considered a hazard to aircraft operations at George Town Airport based on the lack of an ATC (Air Traffic Control) Tower, and that they have no objection to the proposed development on that basis.

On the basis of the consultation detailed above, technical modelling is not recommended.

## LIST OF CONTENTS

## LIST OF FIGURES

## LIST OF TABLES

## ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 58 countries internationally.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems.

Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

# 1 INTRODUCTION

## 1.1 Overview

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) development located north-east of George Town, Tasmania, Australia. This glint and glare assessment concerns the potential impact on surrounding road safety and residential amenity. Commentary on the potential impacts at George Town Airport has also been included.

This report contains the following:

- Solar development details.
- Explanation of glint and glare.
- Overview of relevant guidance and studies.
- Overview of Sun movement.
- Assessment methodology.
- Identification of receptors.
- Glint and glare assessment for identified receptors.
- Results discussion.

Following this, a summary of findings and overall conclusions and recommendations from the desk-based analysis is presented.

## 1.2 Pager Power's Experience

Pager Power has undertaken over 1,100 Glint and Glare assessments in the UK and internationally. The studies have included assessment of civil and military aerodromes, railway infrastructure and other ground-based receptors including roads and dwellings.

## 1.3 Glint and Glare Definition

The definition of glint and glare is as follows[3]:

- Glint – a momentary flash of bright light typically received by moving receptors or from moving reflectors.
- Glare – a continuous source of bright light typically received by static receptors or from large reflective surfaces.

The term 'solar reflection' is used in this report to refer to both reflection types.

[3] These definitions are aligned with those presented within the UK Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) – published by the Department for Business, Energy & Industrial Strategy in March 2023 and the Federal Aviation Administration in the USA.

# 2 PROPOSED DEVELOPMENT LOCATION AND DETAILS

## 2.1 Site Area Layout Plan

The latest solar PV layout for the Proposed Development is shown in Figure 1[4] below. The blue coloured areas represent the areas where solar PV modules will be located.

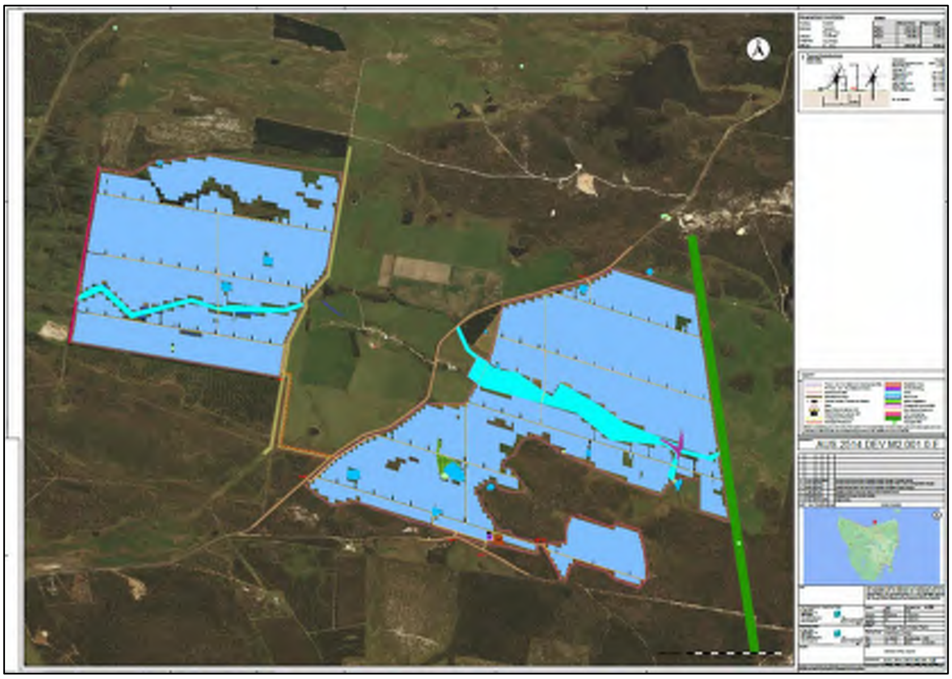

Figure 1 *Site Layout Plan*

[4] Source: AUS.2514.DEV.M2.001.0.E_George_Town_Module_Array_Layout_221014.pdf

## 2.2 Solar Panel Information

The technical characteristics used for the modelling are presented in Table 1 below.

| Solar Panel Technical Information | |
|---|---|
| Assessed centre-height | 1.4m agl (above ground level) |
| Tracking | Horizontal Single Axis tracks Sun East to West |
| Tilt of tracking axis (°) | 0 |
| Orientation of tracking axis (°) | 0 |
| Offset angle of module (°) | 0 |
| Tracker Range of Motion (°) | ±50 |
| Resting angle (°) | 0 |
| Backtracking Method | Instant (for modelling purposes) |
| Surface material | Smooth glass with ARC (anti-reflective coating) |

Table 1 *Solar panel technical information*

### 2.2.1 Solar Panel Backtracking

Shading considerations dictate the panel tilt. This is affected by:

- The elevation angle of the Sun;
- The vertical tilt of the panels;
- The spacing between the panel rows.

This means that early in the morning and late in the evening, the panels will not be directed exactly towards the Sun, as the loss from shading of the panels (caused by facing the sun directly when the Sun is low in the horizon), would be greater than the loss from lowering the panels to a less direct angle in order to avoid the shading. Figure 2[5] on the following page illustrates this.

[5] Note the graphics in Figure 2 and Figure 3 show two lines illustrating the paths of light from the Sun towards the solar panels. In reality, the lines from the Sun to each panel would be effectively parallel due to the large separation distance. The figure is for illustrative purposes only.

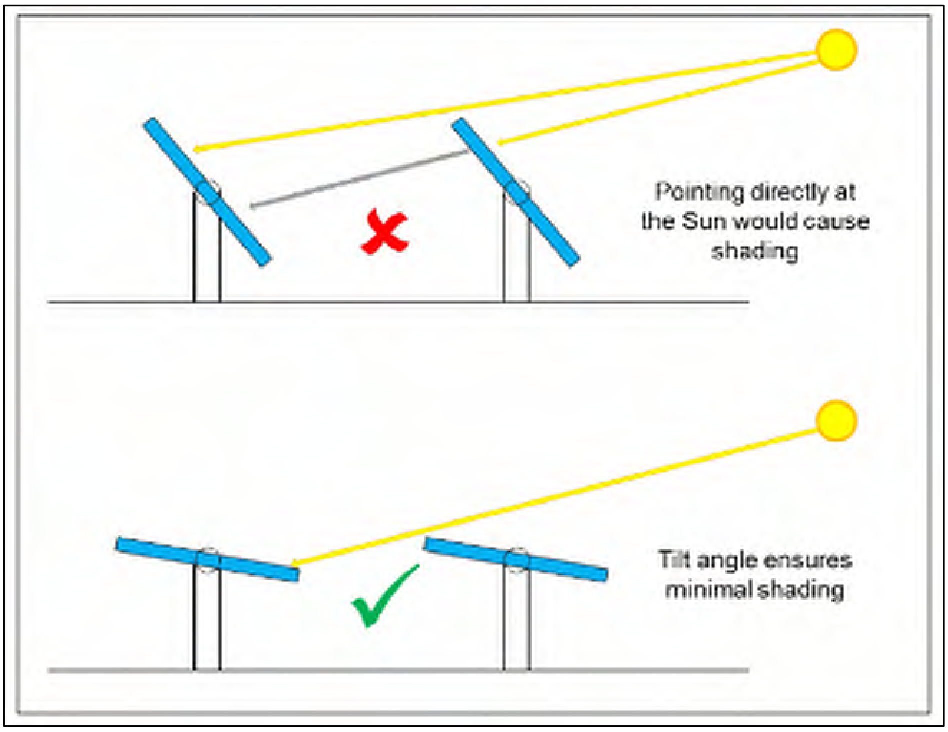


Figure 2 *Shading Considerations*

Later in the day, the panels can be directed towards the Sun without any shading issues. This is illustrated in Figure 3[5] below.

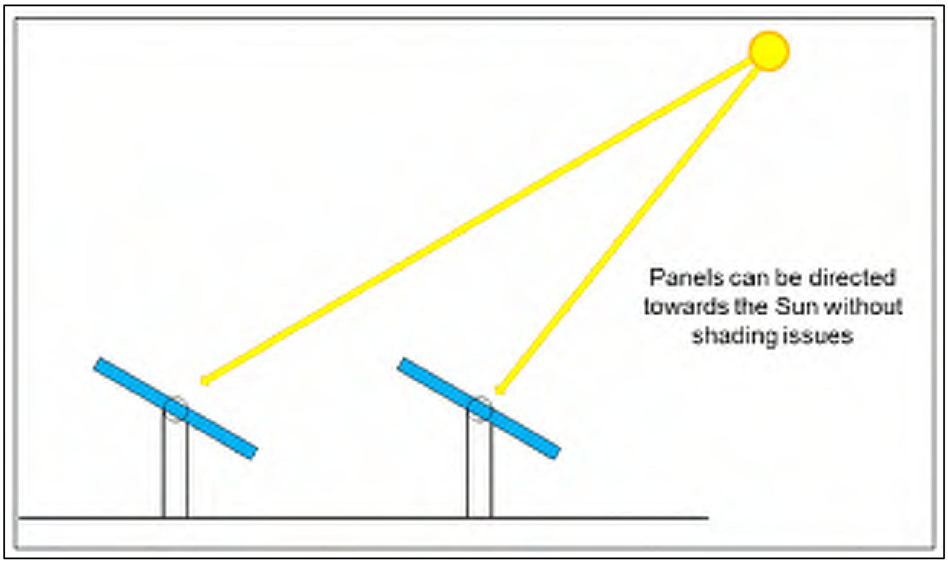


Figure 3 *Panel alignment at high solar angles*

The solar panels backtrack (where the panel angle gradually declines to prevent shading) by reverting to 0 degrees (flat), once the maximum elevation angle of the panels (50 degrees) becomes ineffective due to the low height of the Sun above the horizon and to avoid shading.

# 3 GLINT AND GLARE ASSESSMENT METHODOLOGY

## 3.1 Guidance and Studies

Appendices A and B present a review of relevant guidance and independent studies with regard to glint and glare issues from solar panels. The overall conclusions from the available studies are as follows:

- Specular reflections of the Sun from solar panels are possible.
- The measured intensity of a reflection from solar panels can vary from 2% to 30% depending on the angle of incidence.
- Published guidance shows that the intensity of solar reflections from solar panels are equal to or less than those from water. It also shows that reflections from solar panels are significantly less intense than many other reflective surfaces, which are common in an outdoor environment.

## 3.2 Background

Details of the Sun's movements and solar reflections are presented in Appendix C.

## 3.3 Methodology

### 3.3.1 Pager Power's Methodology

The glint and glare assessment methodology has been derived from the information provided to Pager Power through consultation with stakeholders and by reviewing the available guidance and studies. The methodology for a glint and glare assessments is as follows:

- Identify receptors in the area surrounding the solar development.
- Consider direct solar reflections from the solar development towards the identified receptors by undertaking geometric calculations and intensity calculations where required.
- Consider the visibility of the panels from the receptor's location. If the panels are not visible from the receptor then no reflection can occur.
- Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur.
- Assess the glare intensity if applicable.
- Consider both the solar reflection from the solar development and the location of the direct sunlight with respect to the receptor's position.
- Consider the solar reflection with respect to the published studies and guidance.
- Determine whether a significant detrimental impact is expected in line with the process presented in Appendix D.

Within the Pager Power model, the solar development area is defined, as well as the relevant receptor locations. The result is a chart that states whether a reflection can occur, the duration and the panels that can produce the solar reflection towards the receptor.

#### 3.3.2 Sandia National Laboratories' Methodology

Sandia National Laboratories developed the Solar Glare Hazard Analysis Tool (SGHAT) which is no longer freely available however it is now developed by Forge Solar. Pager Power uses this model where required for aviation receptors. Whilst strictly applicable in the USA and to solar photovoltaic developments only, the methodology is widely used by aviation stakeholders internationally.

Pager Power has undertaken many glint and glare assessments with both models (SGHAT and Pager Power's) producing similar results. In this study the Forge model (based on the SGHAT) was used exclusively.

## 3.4 Assessment Limitations

Further technical details regarding the methodology of the geometric calculations and limitations are presented in Appendix E and Appendix F.

# 4 IDENTIFICATION OF RECEPTORS

## 4.1 Ground-Based Receptors Overview

There is no formal guidance with regard to the maximum distance at which glint and glare should be assessed. From a technical perspective, there is no maximum distance for potential reflections. The significance of a reflection, however, decreases with distance because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increases. Terrain and shielding by vegetation are also more likely to obstruct an observer's view at longer distances.

The above parameters and extensive experience over a significant number of glint and glare assessments undertaken show that consideration of receptors within 1km of solar PV module areas is appropriate for glint and glare effects on roads and dwellings. Therefore, the study area has been designed accordingly as a 1km boundary from solar PV module areas.

Potential receptors are identified based on mapping and aerial photography of the region. The initial judgement is made based on a high-level consideration of aerial photography and mapping i.e. receptors are excluded if it is clear from the outset that no visibility would be possible. A more detailed assessment is made if the modelling reveals a reflection would be geometrically possible.

Receptor details can be found in Appendix G.

## 4.2 Road Receptors

### 4.2.1 Overview

Road types can generally be categorised as:

- Major National – Typically a road with a minimum of two carriageways and fast-moving vehicles with busy traffic.
- National – Typically a road with a one or more carriageways and fast-moving vehicles with moderate to busy traffic density.
- Regional – Typically a single carriageway with a typical traffic density of low to moderate; and
- Local - Typically roads and lanes with the lowest traffic densities. Speed limits vary.

Technical modelling is not recommended for local roads, where traffic densities are likely to be relatively low. Any solar reflections from the Proposed Development that are experienced by a road user along a local road would be considered low impact in the worst case in accordance with the guidance presented in Appendix D.

The analysis considers any major national, national, and regional roads that:

- are within the one-kilometre study area; and
- have a potential view of the panels.

A height of 1.5 metres above ground level has been taken as a typical eye level for a road user[6]. This height has therefore been added to the ground height at each receptor location. Visibility and direction of travel is considered in the assessment of all receptors.

#### 4.2.2 Identification

A 4.64km section of Soldiers Settlement Road was taken forward for technical modelling. In total, 48 road receptor locations have been identified distanced circa 100m apart. These are shown in Figure 4 on the following page.

[6]This height is chosen for modelling purposes, elevated drivers are considered in the results discussion where appropriate.


Figure 4 *Overview of road receptors*

## 4.3 Dwelling Receptors

### 4.3.1 Overview

The analysis has considered dwellings that:

- are within the one-kilometre study area; and
- have a potential view of the panels.

A height of 1.8 metres above ground level has been taken as typical eye level for an observer on the ground floor[7] of the dwelling since this is typically the most occupied floor of a dwelling throughout the day.

### 4.3.2 Identification

In total, seven dwellings[8] were identified for assessment, as shown in Figure 5 on the following page. These are shown in more detail in Figure 6 to Figure 8 on the following pages.

[7] This fixed height for the dwelling receptors is for modelling purposes. Small changes to the modelling height by a few metres is not expected to significantly change the modelling results. Views above ground floor are considered in the results discussion where necessary.
[8] L1 and L2 are financially involved properties.


Figure 5 *Overview of dwelling receptors*


Figure 6 *Dwelling receptors R1-R2*


Figure 7 *Dwelling receptors R3-R5*


Figure 8 *Dwelling receptors L1-L2*

# 5 GEOMETRIC ASSESSMENT RESULTS AND DISCUSSION

## 5.1 Overview

The following sub-sections present the modelling results as well as the significance of any predicted impact in the context of existing screening, as well as the relevant criteria set out in the next subsection. The criteria are determined by the assessment process for each receptor, which are set out in Appendix D.

When determining the visibility of the reflecting panels for an observer, a conservative review of the available imagery is undertaken, whereby it is assumed views of the panels are possible if it cannot be reliably determined that existing screening will remove effects.

The modelling output showing the precise predicted times and the reflecting panel areas can be provided on request.

## 5.2 Roads

### 5.2.1 Impact Significance Methodology

The key considerations for road users along major national, national, and regional roads are:

- Whether a reflection is predicted to be experienced in practice; and
- The location of the reflecting panel relative to a road user's direction of travel.

Where the reflecting panels are predicted to be significantly obstructed from view, no impact is predicted, and mitigation is not required.

Where solar reflections are not experienced as a sustained source of glare, originate from outside of a road user's primary horizontal field of view (50 degrees either side of the direction of travel), or the closest reflecting panel is over 1km from the road user, the impact significance is low, and mitigation is not recommended.

Where sustained solar reflections are predicted to be experienced from inside of a road user's primary field of view, expert assessment of the following factors is required to determine the impact significance and mitigation requirement:

- Whether the solar reflection originates from directly in front of a road user – a solar reflection that is directly in front of a road user is more hazardous than a solar reflection to one side;
- Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers along dual carriageways and motorways compared to other types of road;
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not.

If following consideration of the relevant factors, the solar reflections do not remain significant, the impact significance is low, and mitigation is not recommended.

If following consideration of the relevant factors, the solar reflections remain significant, then the impact significance is moderate, and mitigation is recommended.

Where solar reflections originate from directly in front of a road user and there are no mitigating factors, the impact significance is high, and mitigation is required.

#### 5.2.2 Geometric Modelling Results

The modelling has shown that solar reflections are geometrically possible (without consideration of screening) towards a 1.3km section and a 1.1km section of Soldiers Settlement Road that are shown in orange in Figure 9 on the following page.

The modelling results for road receptors are presented in Table 2 on page 27.


Figure 9 *Sections of road towards which solar reflections are geometrically possible (orange) – aerial image*

| Receptor | Geometric modelling results (without consideration of screening) | Identified screening and predicted visibility (desk-based review) | Relevant Factors | Predicted Impact Classification | Further Mitigation Recommended/Required? |
|---|---|---|---|---|---|
| 1 – 3 | Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from western panel area only) | Reflecting panels are predicted to be screened by intervening terrain and existing vegetation | N/A | None | No |
| 4 – 10 | Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from both panel areas) | Reflecting panels are predicted to be screened by intervening terrain, existing vegetation, and proposed vegetation planting at 4m high | N/A | None | No |

| Receptor | Geometric modelling results (without consideration of screening) | Identified screening and predicted visibility (desk-based review) | Relevant Factors | Predicted Impact Classification | Further Mitigation Recommended/Required? |
|---|---|---|---|---|---|
| 11 | Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from both panel areas) | Reflecting panel areas within field of view are predicted to be screened by intervening terrain, existing vegetation, and proposed vegetation planting at 4m high | Closest reflecting panels are approximately 400m away<br>All reflections are in early morning or late evening when the Sun is low in the sky, and are therefore predicted to coincide with direct sunlight | Low | No |

| Receptor | Geometric modelling results (without consideration of screening) | Identified screening and predicted visibility (desk-based review) | Relevant Factors | Predicted Impact Classification | Further Mitigation Recommended/Required? |
|---|---|---|---|---|---|
| 12 | Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from both panel areas) | Reflecting panels within the western panel area predicted to be screened by terrain and existing vegetation<br>Reflecting panels within the eastern panel area are predicted to be screened by proposed planting at 4m high | N/A | None | No |
| 13 – 14 | Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from eastern panel area only) | Significant existing screening not identified<br>Reflecting panels are predicted to be screened by proposed planting at 4m high | N/A | None | No |

| Receptor | Geometric modelling results (without consideration of screening) | Identified screening and predicted visibility (desk-based review) | Relevant Factors | Predicted Impact Classification | Further Mitigation Recommended/Required? |
|---|---|---|---|---|---|
| 37 | Solar reflections predicted to originate from **outside** of a road user's primary horizontal field of view (from western panel area only) | All reflecting panel areas are predicted to be screened by intervening terrain and existing vegetation | N/A | None | No |
| 38 – 39 | Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view from eastern panel area, and from **outside** of a road user's primary horizontal field of view from western panel area | Reflecting panel areas within field of view are predicted to be screened by intervening terrain and existing vegetation | N/A | None | No |
| 40 – 48 | Solar reflections predicted to originate from **inside** of a road user's primary horizontal field of view (from eastern panel area only) | Reflecting panel areas within field of view are predicted to be screened by intervening terrain and existing vegetation | N/A | None | No |

Table 2 *Geometric modelling results, assessment of impact significance, and mitigation recommendation/requirement – road receptors*

### 5.2.3 Screening Review


Figure 10 *Proposed screening (red) relative to location of road section 1-14*


Figure 11 *View towards eastern panel area from road receptor 38 (level of screening is representative of receptors 38-48) – streetview image*

#### 5.2.4 Conclusions

No significant impacts are predicted on any of the modelled road sections, because there are significant mitigating factors from the following:

- Solar reflections are possible from panels **outside** of a road user's primary horizontal field of view (50 degrees either side of the direction of travel);
- There is significant screening such that views of reflecting panels are not expected to be possible in practice;
- There is screening such that reflections will be filtered and only marginal/fleeting views of reflecting panels are expected to be possible;
- Reflections coinciding with direct sunlight;
- There is a significant clearance distance between road user and closest reflecting panel.

### 5.3 Dwellings

#### 5.3.1 Impact Significance Methodology

The key considerations for residential dwellings are:

- Whether a reflection is predicted to be experienced in practice;
- The duration of the predicted effects, relative to thresholds of:
  - 3 months per year;
  - 60 minutes on any given day.

Where solar reflections are not geometrically possible or the reflecting panels are predicted to be significantly obstructed from view, no impact is predicted, and mitigation is not required.

Where solar reflections are experienced for less than three months per year and less than 60 minutes on any given day, or the closest reflecting panel is over 1km from the dwelling, the impact significance is low, and mitigation is not recommended.

Where reflections are predicted to be experienced for more than three months per year **and/or** for more than 60 minutes on any given day, expert assessment of the following mitigating factors is required to determine the impact significance and mitigation requirement:

- Whether visibility is likely from all storeys – the ground floor is typically considered the main living space and has a greater significance with respect to residential amenity;
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare;
- Whether the dwelling appears to have windows facing the reflecting area – factors that restrict potential views of a reflecting area reduce the level of impact;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not.

If following consideration of the relevant factors, the solar reflections do not remain significant, the impact significance is low, and mitigation is not recommended. If following consideration of the relevant factors, the solar reflections remain significant, then the impact significance is moderate, and mitigation is recommended.

If effects last for more than three months per year and for more than 60 minutes on any given day, and there are no mitigating factors, the impact significance is high, and mitigation is required.

#### 5.3.2 Geometric Modelling Results

The modelling has shown that solar reflections are geometrically possible (without consideration of screening) towards five (R1 – R5) of the seven assessed dwelling receptors, as shown in Figure 12 on the following page. The modelling results for dwelling receptors are analysed in Table 3 on page 37.

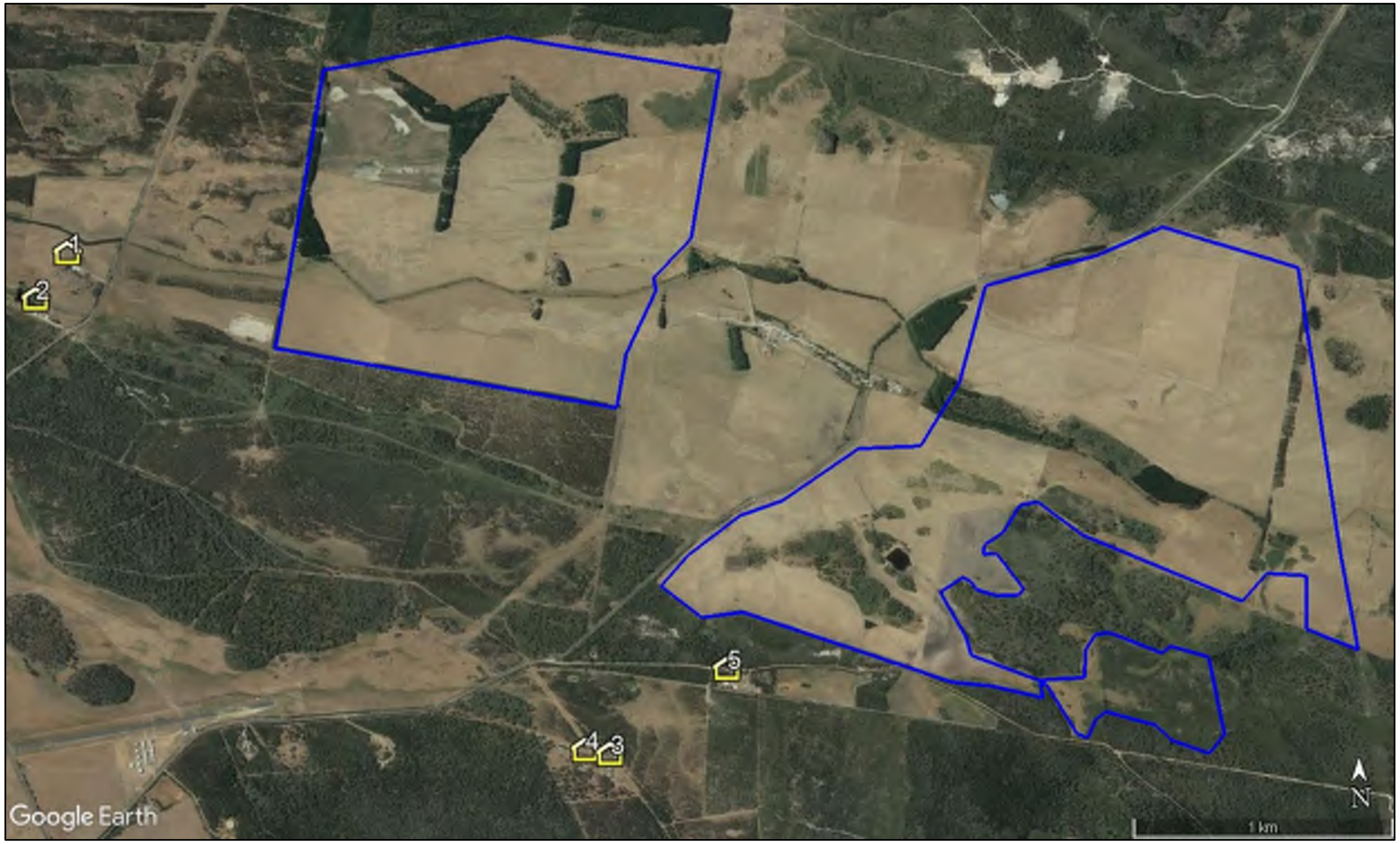


Figure 12 *Dwellings towards which solar reflections are geometrically possible – aerial image*

| Receptor | Geometric modelling results (without consideration of screening) | Identified screening and predicted visibility (desk-based review) | Relevant Factors | Predicted Impact Classification | Further Mitigation Recommended/Required? |
|---|---|---|---|---|---|
| R1 | Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year from both panel areas | Significant existing screening not identified<br>Developer proposing screening at 5-6m high (see Figure 13)<br>Marginal views of reflecting panels may be possible considering the location of the proposed screening | Closest reflecting panels are approximately 840m away, majority of reflecting area is outside of 1km<br>All reflections are in early morning when the Sun is low in the sky and therefore likely to coincide with direct sunlight | Low | No |
| R2 | Solar reflections predicted for **less** than 60 minutes on any given day and for **less** than 3 months of the year from the western panel area only | Some existing screening (terrain, vegetation and buildings)<br>Views of the reflecting panels are predicted | Closest reflecting panels are approximately 950m away, majority of reflecting area is outside of 1km<br>All reflections are in early morning when the Sun is low in the sky and therefore likely to coincide with direct sunlight | Low | No |

| Receptor | Geometric modelling results (without consideration of screening) | Identified screening and predicted visibility (desk-based review) | Relevant Factors | Predicted Impact Classification | Further Mitigation Recommended/Required? |
|---|---|---|---|---|---|
| R3 | Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year from the eastern panel area | All reflecting panels within 1km are expected to be significantly screened by intervening vegetation and terrain (see Figure 14) | N/A | Low | No |
| R4 | Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year from the eastern panel area | All reflecting panels within 1km are expected to be significantly screened by intervening vegetation and terrain (see Figure 14) | N/A | Low | No |
| R5 | Solar reflections predicted for **less** than 60 minutes on any given day and for **more** than 3 months of the year from both panel areas | All reflecting panels are expected to be significantly screened by intervening vegetation and terrain (see Figure 15) | N/A | None | No |

Table 3 *Geometric modelling results, assessment of impact significance, and mitigation recommendation/requirement – dwelling receptors*

#### 5.3.3 Screening Review


Figure 13 *Proposed screening (red) relative to location of R1 (zoomed view outlined in yellow)*


Figure 14 *Photomontage 04 from Landscape and Visual Impact Assessment Appendix C[9] (shows view towards the eastern panel area from R3)*

[9] 2249_Appendix C_RevD_20230831_MED.pdf

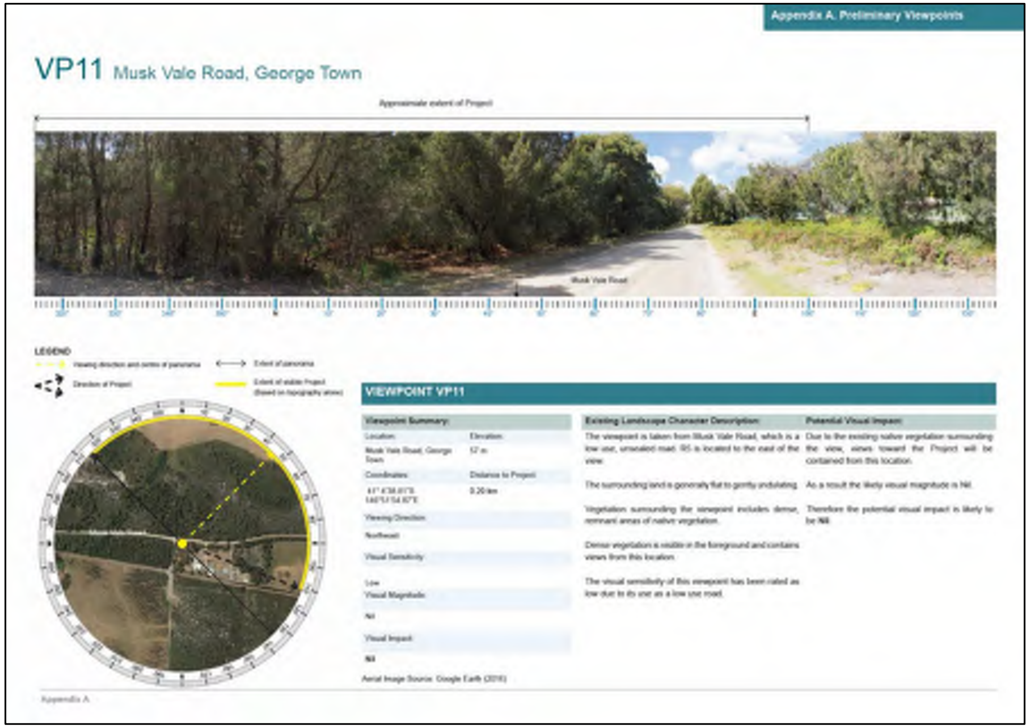


Figure 15 *VP11 Viewpoint analysis from Landscape and Visual Impact Assessment Appendix A*[10] *(shows significant vegetation screening for R5)*

[10] 2249_Appendix A_RevD_20230831_MED.pdf

#### 5.3.4 Conclusions

No significant impacts are predicted on the assessed dwellings, because there are significant mitigating factors from the following:

- Solar reflections are possible for **less** than 60 minutes on any given day and for **less** than 3 months of the year;
- There is significant screening such that views of reflecting panels are not expected to be possible in practice;
- There is screening such that reflections will be filtered and only marginal views of reflecting panels are expected to be possible;
- Reflections coinciding with direct sunlight;
- There is a significant clearance distance between dwelling observer and closest reflecting panel.

# 6 HIGH-LEVEL CONSIDERATION OF AVIATION IMPACTS

## 6.1 Overview

George Town Airport is understood to be an unlicensed airstrip where non-commercial aircraft may operate. It is located approximately 1.5km away from the proposed development at its closest point. The George Town Airport has been contacted in relation to the proposal and no concerns have been raised in relation to glint and glare or other matters.

The Civil Aviation Safety Authority (CASA) were also consulted with regards to the proposed development. Their response was as follows:

*"As we currently do not have any guidance material of our own at this point in time, CASA applies the United States FAA guidelines with regard to solar panel installations near or on airports. They recently updated their guidance to state that the glare from solar panels is insufficient to be a hazard to aircraft on approach or departure from an airport. Their primary focus is now on solar installations near airports with Air Traffic Control Towers (ATCT). Glare from solar panels can prevent the air traffic controllers from seeing aircraft in the circuit area at the airport which can result in a hazardous situation. Airservices controlled ATCT are usually limited to the larger airports such as Hobart and Launceston etc.*

*As Georgetown does not have an Air Traffic Control Tower, CASA does not consider the solar installation near Georgetown Airport, as proposed in your email below to be a hazard to aircraft operations and we have no objection to the proposal as presented."*

On the basis of the consultation detailed above, technical modelling is not recommended.

# 7 CONCLUSIONS

## 7.1 Roads

The modelling predicts that solar reflections are possible (without consideration of screening) towards a 1.3km section and a 1.1km section of Soldiers Settlement Road.

No significant impacts are predicted on any of the modelled road sections, because there are significant mitigating factors from the following:

- Solar reflections are possible from panels **outside** of a road user's primary horizontal field of view (50 degrees either side of the direction of travel);
- There is significant screening such that views of reflecting panels are not expected to be possible in practice;
- There is screening such that reflections will be filtered and only marginal/fleeting views of reflecting panels are expected to be possible;
- Reflections coinciding with direct sunlight;
- There is a significant clearance distance between road user and closest reflecting panel.

## 7.2 Dwellings

The modelling predicts that solar reflections are possible (without consideration of screening) towards five of the seven assessed dwelling locations.

No significant impacts are predicted on the assessed dwellings, because there are significant mitigating factors from the following:

- Solar reflections are possible for **less** than 60 minutes on any given day and for **less** than 3 months of the year;
- There is significant screening such that views of reflecting panels are not expected to be possible in practice;
- There is screening such that reflections will be filtered and only marginal views of reflecting panels are expected to be possible;
- Reflections coinciding with direct sunlight;
- There is a significant clearance distance between dwelling observer and closest reflecting panel.

# APPENDIX A – OVERVIEW OF GLINT AND GLARE GUIDANCE

## Overview

This section presents details regarding the relevant guidance and studies with respect to the considerations and effects of solar reflections from solar panels, known as 'Glint and Glare'.

This is not a comprehensive review of the data sources, rather it is intended to give an overview of the important parameters and considerations that have informed this assessment.

## UK Planning Policy[11]

**Renewable and Low Carbon Energy**

The National Planning Policy Framework under the planning practice guidance for Renewable and Low Carbon Energy[12] (specifically regarding the consideration of solar farms, paragraph 013) states:

*'What are the particular planning considerations that relate to large scale ground-mounted solar photovoltaic Farms?*

*The deployment of large-scale solar farms can have a negative impact on the rural environment, particularly in undulating landscapes. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively.*

*Particular factors a local planning authority will need to consider include:*

…

- *the proposal's visual impact, the effect on landscape of glint and glare (see guidance on landscape assessment) and on **neighbouring uses and aircraft safety**;*
- *the extent to which there may be additional impacts if solar arrays follow the daily movement of the sun;*

…

*The approach to assessing cumulative landscape and visual impact of large scale solar farms is likely to be the same as assessing the impact of wind turbines. However, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero.'*

---

[11] Although this might not be strictly applicable to the proposed development, it has been used as a reference point for developments internationally.

[12] Renewable and low carbon energy, UK Ministry of Housing, Communities & Local Government, date: 18 June 2015, last updated 14 August 2023, accessed on: 29/08/2023

**Draft National Policy Statement for Renewable Energy Infrastructure**

The Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)[13] sets out the primary policy for decisions by the Secretary of State for nationally significant renewable energy infrastructure. Sections 3.10.93-97 state:

*'3.10.93 Solar panels are specifically designed to absorb, not reflect, irradiation.[14] However, solar panels may reflect the sun's rays at certain angles, causing glint and glare. Glint is defined as a momentary flash of light that may be produced as a direct reflection of the sun in the solar panel. Glare is a continuous source of excessive brightness experienced by a stationary observer located in the path of reflected sunlight from the face of the panel. The effect occurs when the solar panel is stationed between or at an angle of the sun and the receptor.*

*3.10.94 Applicants should map receptors to qualitatively identify potential glint and glare issues and determine if a glint and glare assessment is necessary as part of the application.*

*3.10.95 When a quantitative glint and glare assessment is necessary, applicants are expected to consider the geometric possibility of glint and glare affecting nearby receptors and provide an assessment of potential impact and impairment based on the angle and duration of incidence and the intensity of the reflection.*

*3.10.96 The extent of reflectivity analysis required to assess potential impacts will depend on the specific project site and design. This may need to account for 'tracking' panels if they are proposed as these may cause differential diurnal and/or seasonal impacts.*

*3.10.97 When a glint and glare assessment is undertaken, the potential for solar PV panels, frames and supports to have a combined reflective quality may need to be assessed, although the glint and glare of the frames and supports is likely to be significantly less than the panels.'*

The EN-3 does not state which receptors should be considered as part of a quantitative glint and glare assessment. Based on Pager Power's extensive project experience, typical receptors include residential dwellings, road users, aviation infrastructure, and railway infrastructure.

Sections 3.10.125-127 state:

*3.10.125 Applicants should consider using, and in some cases the Secretary of State may require, solar panels to comprise of (or be covered with) anti-glare/anti-reflective coating with a specified angle of maximum reflection attenuation for the lifetime of the permission.*

*3.10.126 Applicants may consider using screening between potentially affected receptors and the reflecting panels to mitigate the effects.*

*3.10.127 Applicants may consider adjusting the azimuth alignment of or changing the elevation tilt angle of a solar panel, within the economically viable range, to alter the angle of incidence. In practice*

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[13] Draft National Policy Statement for Renewable Energy Infrastructure (EN-3), Department for Energy Security & Net Zero, date: March 2023, accessed on: 05/04/2023.

[14] Most commercially available solar panels are designed with anti-reflective glass or are produced with anti-reflective coating and have a reflective capacity that is generally equal to or less hazardous than other objects typically found in the outdoor environment, such as bodies of water or glass buildings.

*this is unlikely to remove the potential impact altogether but in marginal cases may contribute to a mitigation strategy.*

The mitigation strategies listed within the EN-3 are relevant strategies that are frequently utilised to eliminate or reduce glint and glare effects towards surrounding observers. The most common form of mitigation is the implementation of screening along the site boundary.

Sections 3.10.149-150 state:

*3.10.149 Solar PV panels are designed to absorb, not reflect, irradiation. However, the Secretary of State should assess the potential impact of glint and glare on nearby homes, motorists, public rights of way, and aviation infrastructure (including aircraft departure and arrival flight paths).*

*3.10.150 Whilst there is some evidence that glint and glare from solar farms can be experienced by pilots and air traffic controllers in certain conditions, there is no evidence that glint and glare from solar farms results in significant impairment on aircraft safety. Therefore, unless a significant impairment can be demonstrated, the Secretary of State is unlikely to give any more than limited weight to claims of aviation interference because of glint and glare from solar farms.*

The latest version of the draft EN-3 goes some way in referencing that the issue is more complex than presented in the previous issue; though, this is still unlikely to be welcomed by aviation stakeholders, who will still request a glint and glare assessment on the basis that glare may lead to impact upon aviation safety. It is possible that the final issue of the policy will change in light of further consultation responses from aviation stakeholders.

Finally, the EN-3 relates solely to nationally significant renewable energy infrastructure and therefore does not apply to all planning applications for solar farms.

## Assessment Process – Ground-Based Receptors

No process for determining and contextualising the effects of glint and glare has been determined when assessing the impact of solar reflections upon surrounding roads and dwellings. Therefore, the Pager Power approach is to determine whether a reflection from the proposed solar development is geometrically possible and then to compare the results against the relevant guidance/studies to determine whether the reflection is significant.

The Pager Power approach has been informed by the policy presented above, current studies (presented in Appendix B) and stakeholder consultation. Further information can be found in Pager Power's Glint and Glare Guidance document[15] which was produced due to the absence of existing guidance and a specific standardised assessment methodology.

[15] Pager Power Glint and Glare Guidance, Fourth Edition, September 2022.

# APPENDIX B – OVERVIEW OF GLINT AND GLARE STUDIES

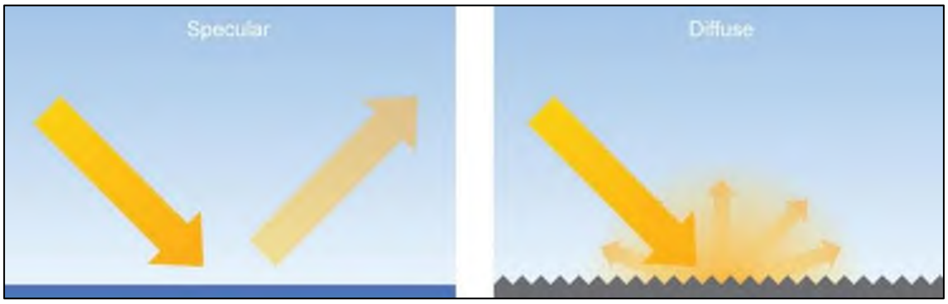
## Overview

Studies have been undertaken assessing the type and intensity of solar reflections from various surfaces including solar panels and glass. An overview of these studies is presented below.

The guidelines presented are related to aviation safety. The results are applicable for the purpose of this analysis.

## Reflection Type from Solar Panels

Based on the surface conditions reflections from light can be specular and diffuse. A specular reflection has a reflection characteristic similar to that of a mirror; a diffuse will reflect the incoming light and scatter it in many directions. The figure below, taken from the FAA guidance[16], illustrates the difference between the two types of reflections. Because solar panels are flat and have a smooth surface most of the light reflected is specular, which means that incident light from a specific direction is reradiated in a specific direction.




*Specular and diffuse reflections*

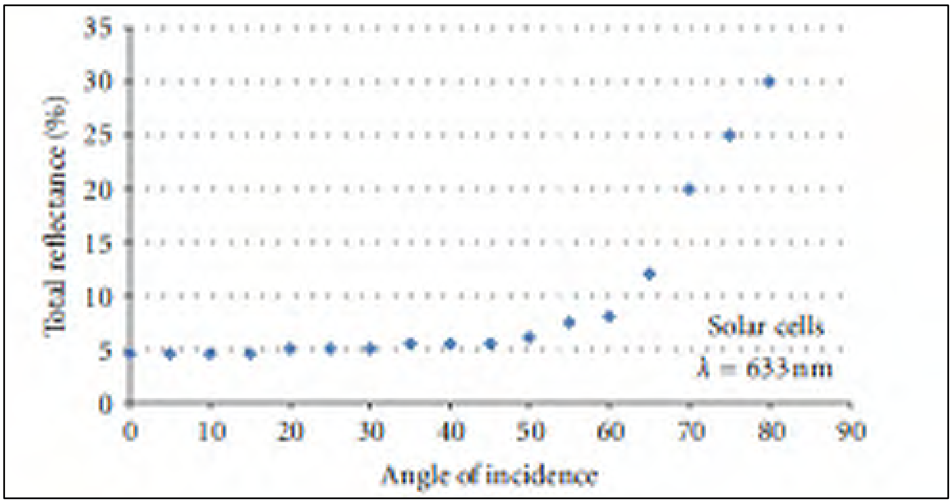
[16] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 08/12/2021.

## Solar Reflection Studies

An overview of content from identified solar panel reflectivity studies is presented in the subsections below.

**Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems"**

Evan Riley and Scott Olson published in 2011 their study titled: *A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems*[17]". They researched the potential glare that a pilot could experience from a 25-degree fixed tilt PV system located outside of Las Vegas, Nevada. The theoretical glare was estimated using published ocular safety metrics which quantify the potential for a postflash glare after-image. This was then compared to the postflash glare after-image caused by smooth water. The study demonstrated that the reflectance of the solar cell varied with angle of incidence, with maximum values occurring at angles close to 90 degrees. The reflectance values varied from approximately 5% to 30%. This is shown on the figure below.




*Total reflectance % when compared to angle of incidence*

The conclusions of the research study were:

- The potential for hazardous glare from flat-plate PV systems is similar to that of smooth water;
- Portland white cement concrete (which is a common concrete for runways), snow, and structural glass all have a reflectivity greater than water and flat plate PV modules.

[17] Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems," ISRN Renewable Energy, vol. 2011, Article ID 651857, 6 pages, 2011. doi:10.5402/2011/651857

**FAA Guidance – "Technical Guidance for Evaluating Selected Solar Technologies on Airports"[18]**

The 2018 FAA Guidance included a diagram which illustrates the relative reflectance of solar panels compared to other surfaces. The figure shows the relative reflectance of solar panels compared to other surfaces. Surfaces in this figure produce reflections which are specular and diffuse. A specular reflection (those made by most solar panels) has a reflection characteristic similar to that of a mirror. A diffuse reflection will reflect the incoming light and scatter it in many directions. A table of reflectivity values, sourced from the figure within the FAA guidance, is presented below.

| Surface | Approximate Percentage of Light Reflected[19] |
|---|---|
| Snow | 80 |
| White Concrete | 77 |
| Bare Aluminium | 74 |
| Vegetation | 50 |
| Bare Soil | 30 |
| Wood Shingle | 17 |
| Water | 5 |
| Solar Panels | 5 |
| Black Asphalt | 2 |

*Relative reflectivity of various surfaces*

Note that the data above does not appear to consider the reflection type (specular or diffuse).

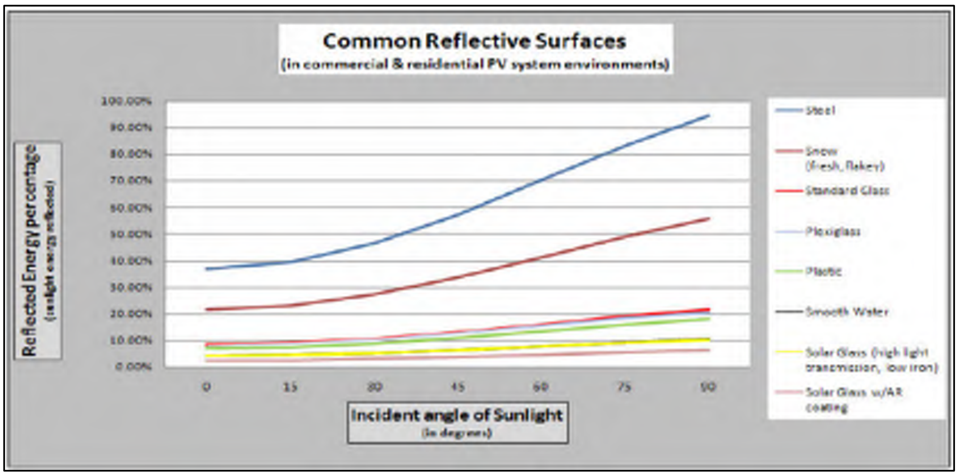
An important comparison in this table is the reflectivity compared to water which will produce a reflection of very similar intensity when compared to that from a solar panel. The study by Riley and Olsen study (2011) also concludes that still water has a very similar reflectivity to solar panels.

[18] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 08/12/2021.
[19] Extrapolated data, baseline of 1,000 W/$m^2$ for incoming sunlight.

### SunPower Technical Notification (2009)

SunPower published a technical notification[20] to '*increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment*'.

The figure presented below shows the relative reflectivity of solar panels compared to other natural and manmade materials including smooth water, standard glass and steel.




*Common reflective surfaces*

The results, similarly to those from Riley and Olsen study (2011) and the FAA (2010), show that solar panels produce a reflection that is less intense than those of '*standard glass and other common reflective surfaces*'.

With respect to aviation and solar reflections observed from the air, SunPower has developed several large installations near airports or on Air Force bases. It is stated that these developments have all passed FAA or Air Force standards with all developments considered "No Hazard to Air Navigation". The note suggests that developers discuss any possible concerns with stakeholders near proposed solar farms.

[20] Source: Technical Support, 2009. SunPower Technical Notification – Solar Module Glare and Reflectance.

# APPENDIX C – OVERVIEW OF SUN MOVEMENTS AND RELATIVE REFLECTIONS

The Sun's position in the sky can be accurately described by its azimuth and elevation. Azimuth is a direction relative to true north (horizontal angle i.e. from left to right) and elevation describes the Sun's angle relative to the horizon (vertical angle i.e. up and down).

The Sun's position can be accurately calculated for a specific location. The following data being used for the calculation:

- Time.
- Date.
- Latitude.
- Longitude.

The following is true at the location of the solar development:

- The Sun rises highest on 21 December (longest day).
- On 21 June, the maximum elevation reached by the Sun is at its lowest (shortest day).

# APPENDIX D – GLINT AND GLARE IMPACT SIGNIFICANCE

## Overview

The significance of glint and glare will vary for different receptors. The following section presents a general overview of the significance criteria with respect to experiencing a solar reflection.

## Impact Significance Definition

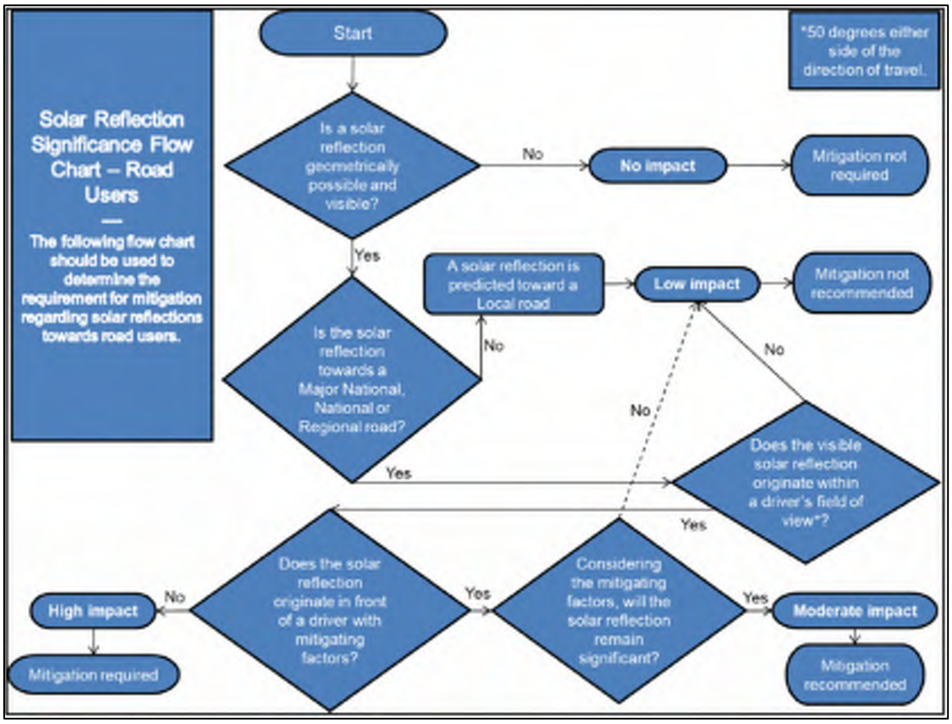
The table below presents the recommended definition of 'impact significance' in glint and glare terms and the requirement for mitigation under each.

| Impact Significance | Definition | Mitigation Requirement |
|---|---|---|
| No Impact | A solar reflection is not geometrically possible or will not be visible from the assessed receptor. | No mitigation required. |
| Low | A solar reflection is geometrically possible however any impact is considered to be small such that mitigation is not required e.g. intervening screening will limit the view of the reflecting solar panels. | No mitigation required. |
| Moderate | A solar reflection is geometrically possible and visible however it occurs under conditions that do not represent a worst-case. | Whilst the impact may be acceptable, consultation and/or further analysis should be undertaken to determine the requirement for mitigation. |
| Major | A solar reflection is geometrically possible and visible under conditions that will produce a significant impact.<br>Mitigation and consultation is recommended. | Mitigation will be required if the proposed solar development is to proceed. |

*Impact significance definition*

## Assessment Process for Road Receptors

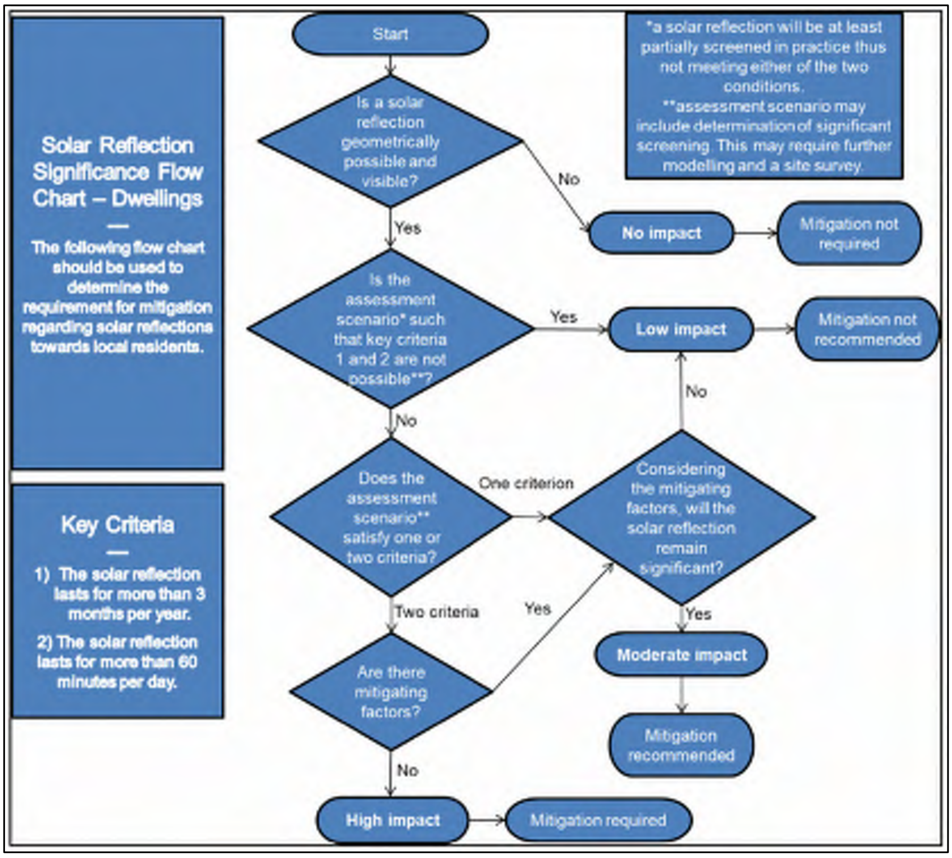
The flow chart presented below has been followed when determining the mitigation requirement for road receptors.




*Road receptor mitigation requirement flow chart*

## Assessment Process for Dwelling Receptors

The flow chart presented below has been followed when determining the mitigation requirement for dwelling receptors.




*Dwelling receptor mitigation requirement flow chart*

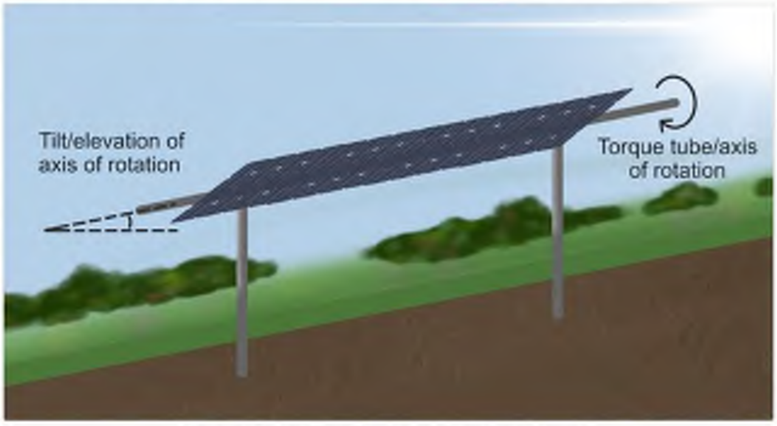
# APPENDIX E – REFLECTION CALCULATIONS METHODOLOGY

## Forge Reflection Calculations Methodology

Extracts taken from the Forge Solar Model.

### Tracking System Parameters

Single-axis module tracking systems are described by a unique set of parameters. These angular inputs model the tracking axis, rotation range and backtracking behavior. Dual-axis module tracking systems are assumed to track the sun at all times.




*Single-axis tracking system with torque tube tilted due to geography*

**Tilt of tracking axis (°)**
Tilt above flat ground of axis over which panels rotate (e.g. torque tube). System on flat, level ground would have axis tilt of 0°.

**Orientation of tracking axis (°)**
Azimuthal angle of axis over which panels rotate. Angle represents the facing of the axis and system. For example, typical tracking system in northern hemisphere has tracking axis oriented north-south with an orientation of 180°, allowing panels to rotate east-west with potential south-facing tilt. Typical tracking system in southern hemisphere runs south-north with axis orientation of 0°, yielding east-west rotation with potential north-facing tilt.

**Offset angle of module (°)**
Additional tilt angle of PV module elevated above tracking axis/torque tube. Offset angle is measured from the torque tube.

**Maximum tracking angle (°)**
Maximum angle of rotation of tracking system in one direction. For example, a typical system with a 120° range of rotation has a *max tracking angle* of 60° (east/west).

**Resting angle (°)**
Angle of rotation of panels when sun is outside tracking range. Used to model backtracking. Panels will revert to the position described by this rotation angle at all times when the sun is outside the rotation range. Setting this equal to the *maximum tracking angle* implies the panels do not backtrack.

ForgeSolar utilizes a simplified model of backtracking which assumes panels instantaneously revert to the *resting angle* whenever the sun is outside the rotation range. For example, panels with *max tracking angle* of 60° and resting angle of 0° would lie flat from sunrise until the sun enters the rotation range, and immediately after the sun leaves the rotation range until sunset daily.

*Tracking System Parameters*

# APPENDIX F – ASSESSMENT LIMITATIONS AND ASSUMPTIONS

## Forge's Sandia National Laboratories' (SGHAT) Model[21]

Summary of assumptions and abstractions required by the SGHAT/ForgeSolar analysis methodology

1. Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
2. Result data files and plots are now retained for two years after analysis completion. Files should be downloaded and saved if additional persistence is required.
3. The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
4. Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects analyses of path receptors.
5. Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
6. The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
7. The algorithm assumes that the PV array is aligned with a plane defined by the total heights of the coordinates outlined in the Google map. For more accuracy, the user should perform runs using minimum and maximum values for the vertex heights to bound the height of the plane containing the solar array. Doing so will expand the range of observed solar glare when compared to results using a single height value.
8. The algorithm does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
9. The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
10. The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
11. The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
12. Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
13. Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
14. Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
15. PV array tracking assumes the modules move instantly when tracking the sun, and when reverting to the rest position.

[21] https://www.forgesolar.com/help/#assumptions

# APPENDIX G – RECEPTOR AND REFLECTOR AREA DETAILS

## Terrain Height

Terrain Height is calculated from SRTM data, based on the coordinates of the point of interest.

## Road Receptor Data

The table below presents the coordinates and altitudes for the assessed road receptors.

| Location | Latitude (°) | Longitude (°) | Assessed Altitude (m) (amsl) |
|---|---|---|---|
| 1 | -41.054629 | 146.894148 | 49.91 |
| 2 | -41.055403 | 146.893539 | 49.04 |
| 3 | -41.056183 | 146.892945 | 49.28 |
| 4 | -41.056974 | 146.892375 | 52.69 |
| 5 | -41.057775 | 146.891833 | 52.89 |
| 6 | -41.058479 | 146.891127 | 52.65 |
| 7 | -41.059008 | 146.890171 | 52.22 |
| 8 | -41.05964 | 146.889323 | 51.27 |
| 9 | -41.060202 | 146.888393 | 44.72 |
| 10 | -41.060796 | 146.887497 | 43.95 |
| 11 | -41.061384 | 146.886594 | 41.69 |
| 12 | -41.061995 | 146.885717 | 41.38 |
| 13 | -41.062449 | 146.88469 | 40.22 |
| 14 | -41.062819 | 146.883604 | 37.59 |
| 15 | -41.063064 | 146.882457 | 36.79 |
| 16 | -41.063279 | 146.881298 | 35.48 |
| 17 | -41.063537 | 146.880155 | 34.17 |
| 18 | -41.063787 | 146.879009 | 31.36 |
| 19 | -41.063989 | 146.877846 | 29.99 |

| Location | Latitude (°) | Longitude (°) | Assessed Altitude (m) (amsl) |
|---|---|---|---|
| 20 | -41.064285 | 146.876721 | 28.26 |
| 21 | -41.064613 | 146.875609 | 27.84 |
| 22 | -41.065135 | 146.874642 | 27.85 |
| 23 | -41.065694 | 146.873707 | 26.67 |
| 24 | -41.066293 | 146.872817 | 26.27 |
| 25 | -41.067163 | 146.872557 | 27.15 |
| 26 | -41.068049 | 146.872354 | 27.21 |
| 27 | -41.068936 | 146.872151 | 29.15 |
| 28 | -41.069689 | 146.871588 | 28.99 |
| 29 | -41.070243 | 146.870648 | 28.57 |
| 30 | -41.070785 | 146.869695 | 29.06 |
| 31 | -41.071237 | 146.868673 | 28.79 |
| 32 | -41.071478 | 146.867523 | 30.64 |
| 33 | -41.071891 | 146.866474 | 33.28 |
| 34 | -41.072408 | 146.865497 | 36.29 |
| 35 | -41.072933 | 146.864529 | 39.41 |
| 36 | -41.073532 | 146.863638 | 41.89 |
| 37 | -41.074131 | 146.862747 | 46.21 |
| 38 | -41.074731 | 146.861856 | 48.41 |
| 39 | -41.07533 | 146.860965 | 51.76 |
| 40 | -41.075928 | 146.860073 | 55.4 |
| 41 | -41.076523 | 146.859178 | 56.97 |
| 42 | -41.077026 | 146.858207 | 59.34 |
| 43 | -41.077228 | 146.857043 | 59.23 |

| Location | Latitude (°) | Longitude (°) | Assessed Altitude (m) (amsl) |
|---|---|---|---|
| 44 | -41.077566 | 146.855941 | 58.8 |
| 45 | -41.077958 | 146.854867 | 56.81 |
| 46 | -41.078364 | 146.853801 | 56.35 |
| 47 | -41.078758 | 146.852729 | 54.31 |
| 48 | -41.078824 | 146.852416 | 53.74 |

*Road Receptor Data*

## Dwelling Receptor Data

The table below presents the coordinates for the assessed dwelling receptors.

| Location | Latitude (°) | Longitude (°) | Assessed Altitude (m) (amsl) |
|---|---|---|---|
| 1 | -41.063563 | 146.835564 | 36.13 |
| 2 | -41.065132 | 146.834076 | 30.18 |
| 3 | -41.080847 | 146.860583 | 74.99 |
| 4 | -41.080686 | 146.859464 | 73.6 |
| 5 | -41.077933 | 146.865932 | 61.17 |
| 6 | -41.067768 | 146.873492 | 30.2 |
| 7 | -41.065907 | 146.869351 | 26.86 |

*Dwelling Receptor Data*

## Modelled Western Panel Area

The boundary coordinates of the modelled western panel area are presented in the table below.

| No. | Latitude (°) | Longitude (°) | No. | Latitude (°) | Longitude (°) |
|---|---|---|---|---|---|
| 1 | -41.066331 | 146.844909 | 6 | -41.062383 | 146.86435 |
| 2 | -41.068337 | 146.86096 | 7 | -41.05672 | 146.865637 |
| 3 | -41.066331 | 146.861389 | 8 | -41.055523 | 146.855338 |
| 4 | -41.06439 | 146.862547 | 9 | -41.05672 | 146.847227 |
| 5 | -41.063807 | 146.862333 | | | |

*Modelled Western Panel Area*

## Modelled Eastern Panel Area

The boundary coordinates of the modelled eastern panel area are presented in the table below.

| No. | Latitude (°) | Longitude (°) | No. | Latitude (°) | Longitude (°) |
|---|---|---|---|---|---|
| 1 | -41.074463 | 146.862655 | 26 | -41.074333 | 146.876474 |
| 2 | -41.07566 | 146.864843 | 27 | -41.074851 | 146.877718 |
| 3 | -41.075401 | 146.866474 | 28 | -41.075045 | 146.879521 |
| 4 | -41.077795 | 146.875916 | 29 | -41.074721 | 146.879821 |
| 5 | -41.078215 | 146.878877 | 30 | -41.073168 | 146.877804 |
| 6 | -41.078409 | 146.880508 | 31 | -41.072715 | 146.878619 |
| 7 | -41.077956 | 146.880164 | 32 | -41.071551 | 146.879778 |
| 8 | -41.077892 | 146.880465 | 33 | -41.072715 | 146.882053 |
| 9 | -41.079768 | 146.881752 | 34 | -41.074463 | 146.88673 |
| 10 | -41.0798 | 146.882353 | 35 | -41.075207 | 146.889477 |
| 11 | -41.078927 | 146.882353 | 36 | -41.074171 | 146.890764 |
| 12 | -41.078895 | 146.883211 | 37 | -41.074074 | 146.89261 |
| 13 | -41.079477 | 146.885529 | 38 | -41.076177 | 146.892738 |
| 14 | -41.080124 | 146.886344 | 39 | -41.076662 | 146.894841 |
| 15 | -41.080415 | 146.888318 | 40 | -41.06343 | 146.891966 |
| 16 | -41.079445 | 146.889477 | 41 | -41.062168 | 146.885915 |
| 17 | -41.077148 | 146.888104 | 42 | -41.063106 | 146.883383 |
| 18 | -41.076598 | 146.886215 | 43 | -41.064141 | 146.877461 |
| 19 | -41.076857 | 146.8857 | 44 | -41.067701 | 146.876645 |
| 20 | -41.076112 | 146.882911 | 45 | -41.069771 | 146.874843 |
| 21 | -41.076598 | 146.882181 | 46 | -41.069739 | 146.871753 |
| 22 | -41.077924 | 146.882181 | 47 | -41.071486 | 146.868706 |
| 23 | -41.077633 | 146.880121 | 48 | -41.071874 | 146.86686 |

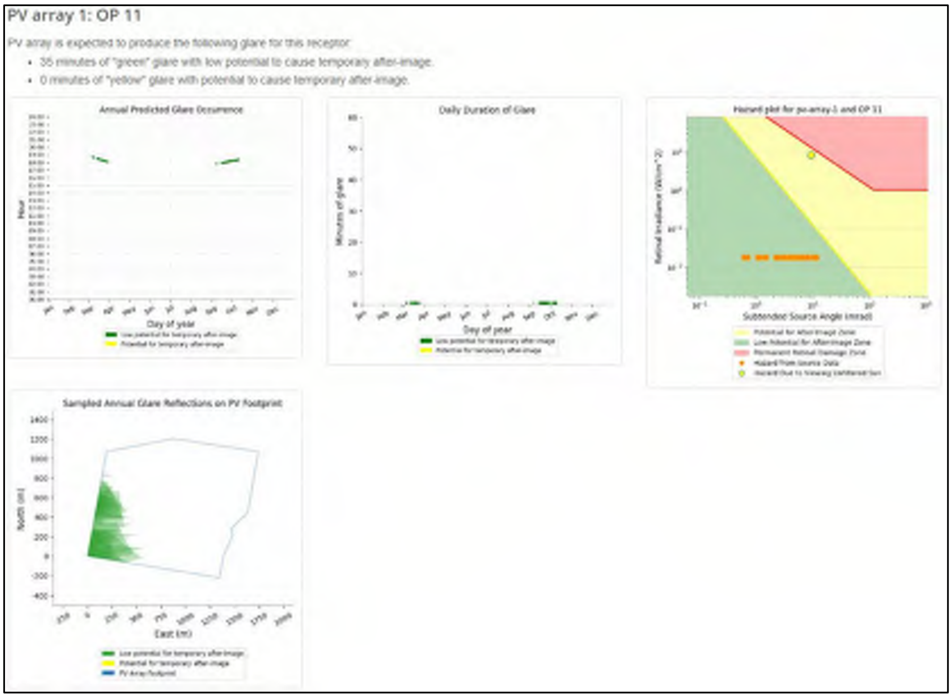
| No. | Latitude (°) | Longitude (°) | No. | Latitude (°) | Longitude (°) |
|---|---|---|---|---|---|
| 24 | -41.076662 | 146.877074 | 49 | -41.073233 | 146.864286 |
| 25 | -41.074592 | 146.876001 | | | |

*Modelled Eastern Panel Area*

# APPENDIX H – MODELLING RESULTS

Full modelling results are available on request.

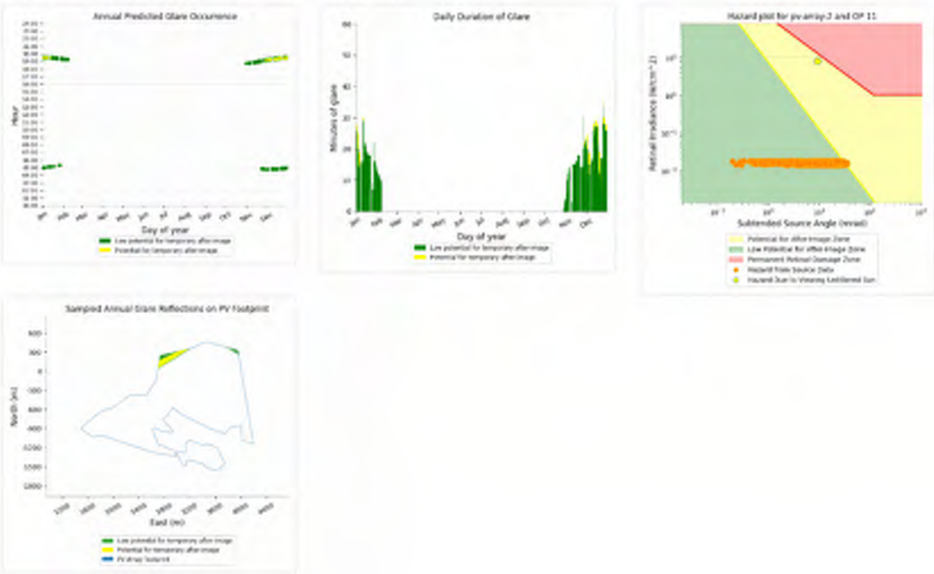
## Roads



## PV array 2: OP 11

PV array is expected to produce the following glare for this receptor:

- 1,641 minutes of "green" glare with low potential to cause temporary after-image.
- 98 minutes of "yellow" glare with potential to cause temporary after-image.

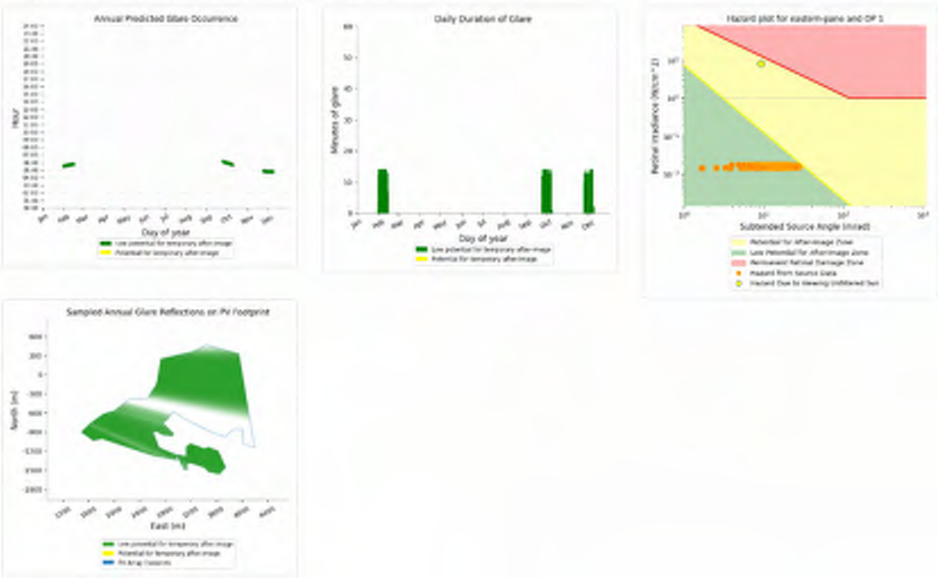


## Dwellings

**Eastern panel area: OP 1**

PV array is expected to produce the following glare for this receptor:

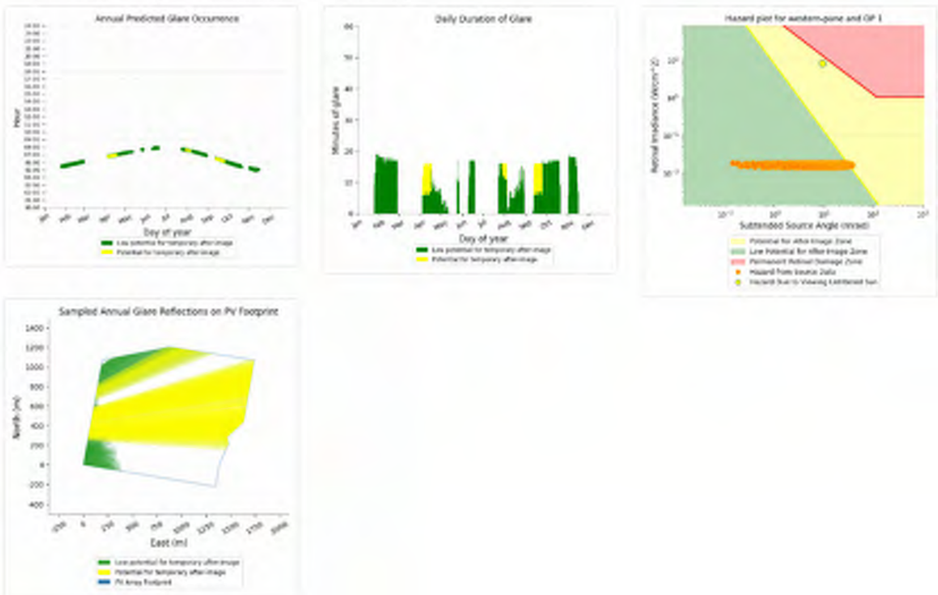
- 623 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.




**Western panel area: OP 1**

PV array is expected to produce the following glare for this receptor:

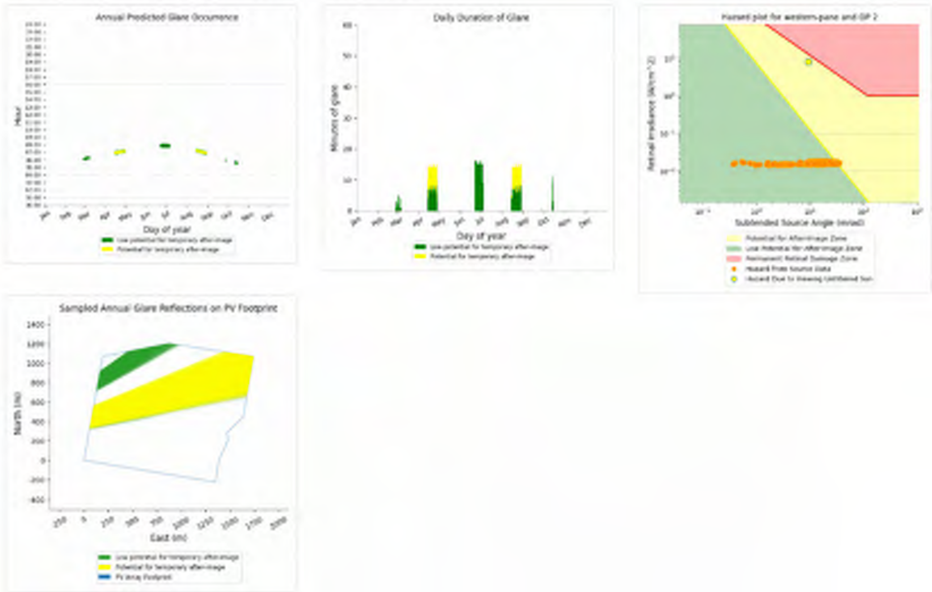
- 2,111 minutes of "green" glare with low potential to cause temporary after-image.
- 276 minutes of "yellow" glare with potential to cause temporary after-image.



### Western panel area: OP 2

PV array is expected to produce the following glare for this receptor:

- 443 minutes of "green" glare with low potential to cause temporary after-image
- 210 minutes of "yellow" glare with potential to cause temporary after-image




### Eastern panel area: OP 3

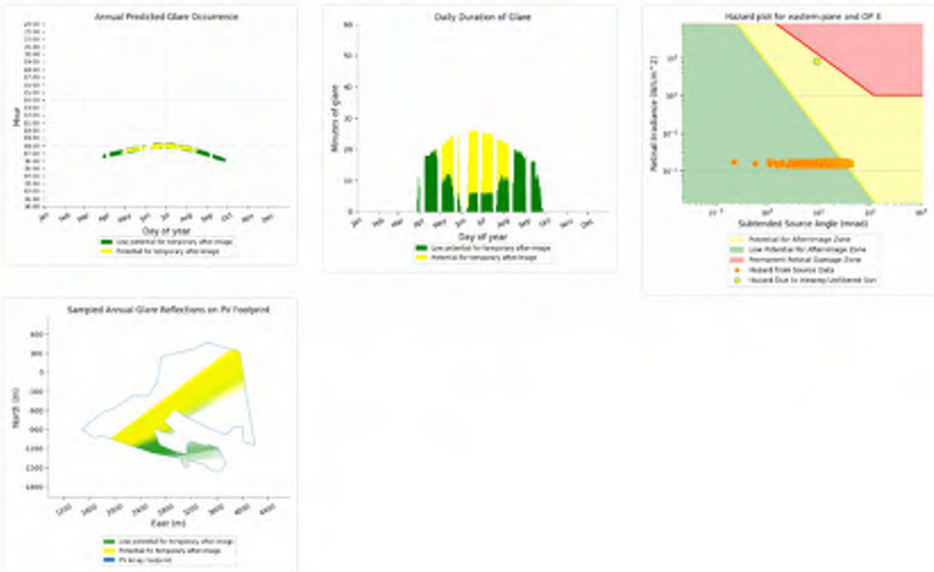
PV array is expected to produce the following glare for this receptor:

- 1,613 minutes of "green" glare with low potential to cause temporary after-image
- 1,125 minutes of "yellow" glare with potential to cause temporary after-image

## Eastern panel area: OP 4

PV array is expected to produce the following glare for this receptor:

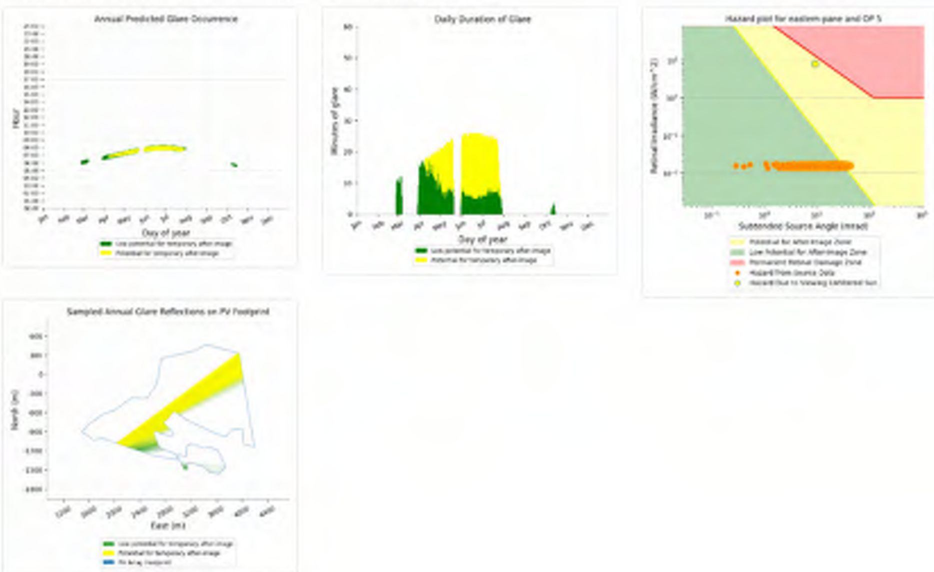
- 1,479 minutes of "green" glare with low potential to cause temporary after-image
- 1,064 minutes of "yellow" glare with potential to cause temporary after-image




## Eastern panel area: OP 5

PV array is expected to produce the following glare for this receptor:

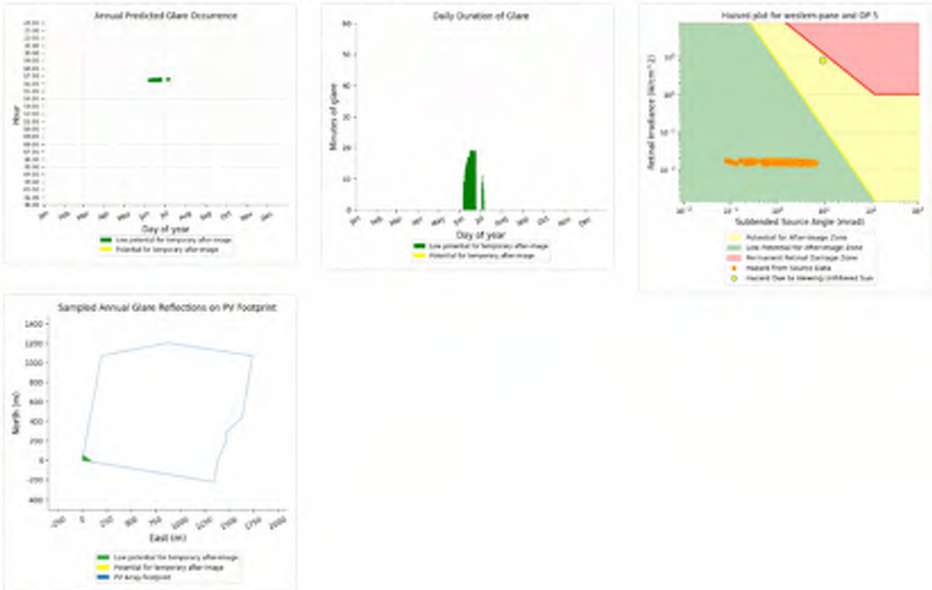
- 1,062 minutes of "green" glare with low potential to cause temporary after-image
- 1,491 minutes of "yellow" glare with potential to cause temporary after-image



### Western panel area: OP 5

PV array is expected to produce the following glare for this receptor:

- 337 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



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# Appendix I
## CASA Email

# Cimitiere Plains Solar Farm

**Daryl Brown**

---

**Subject:** FW: F21/42124-92 Cimitiere Plains Solar Farm - Georgetown Tas - CASA REPLY [SEC=OFFICIAL]

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**From:** Windebank, Matthew <Matthew.Windebank@casa.gov.au>
**Sent:** Friday, June 30, 2023 1:38 PM
**To:** Daryl Brown
**Subject:** F21/42124-92 Cimitiere Plains Solar Farm - Georgetown Tas - CASA REPLY [SEC=OFFICIAL]

**OFFICIAL**

Good afternoon Daryl,

As we currently do not have any guidance material of our own at this point in time, CASA applies the United States FAA guidelines with regard to solar panel installations near or on airports. They recently updated their guidance to state that the glare from solar panels is insufficient to be a hazard to aircraft on approach or departure from an airport. Their primary focus is now on solar installations near airports with Air Traffic Control Towers (ATCT). Glare from solar panels can prevent the air traffic controllers from seeing aircraft in the circuit area at the airport which can result in a hazardous situation. Airservices controlled ATCT are usually limited to the larger airports such as Hobart and Launceston etc.

As Georgetown does not have an Air Traffic Control Tower, CASA does not consider the solar installation near Georgetown Airport, as proposed in your email below to be a hazard to aircraft operations and we have no objection to the proposal as presented.

Regards

Matthew Windebank
Aerodrome Engineer | Airspace Protection
Air Navigation, Airspace & Aerodromes Branch
**CASA\ Aviation Group**
**p:** (02) 6217 1183
**e:** matthew.windebank@casa.gov.au

Australian Government
Civil Aviation Safety Authority

# Appendix J
## Noise Assessment

# Cimitiere Plains Solar Farm

ENVIRONMENTAL CONSULTANCY

# Noise Assessment

## Cimitiere Plains Solar Farm
## George Town, TAS

Prepared for: Sunspot 9 Pty Ltd
C/- Envoca
January 2024
MAC221655-01RP1V5

Muller Acoustic Consulting

# *Document Information*

## Noise Assessment

Cimitiere Plains Solar Farm

George Town, TAS

Prepared for: Sunspot 9 Pty Ltd

c/- Envoca

Level 6, 201 Kent Street

Sydney NSW 2300

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| DOCUMENT ID | DATE | PREPARED | SIGNED | REVIEWED | SIGNED |
|---|---|---|---|---|---|
| MAC221655-01RP1V5 | 18 January 2024 | Rod Linnett | | Oliver Muller | |

CONTENTS

# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Envoca on behalf of Sunspot 9 Pty Ltd (Sunspot 9) to prepare a Noise Assessment (NA) for the proposed Cimitiere Plains Solar Farm 5km northeast of George Town, TAS (the project). This report presents the methodology and findings of the NA for the construction and operation of the project.

## 1.1 Purpose and Objectives

The purpose of the NA is to quantify potential environmental noise emissions associated with the construction and operation of the project. Where impacts are identified, the assessment includes recommendations for potential noise mitigation and management measures.

## 1.2 Scope of the Assessment

The NA includes the following key tasks:

- review construction and operating activities to identify key noise generating plant, equipment, machinery or activities proposed to be undertaken as part of the project;
- identify the closest and/or potentially most affected receivers situated within the area of influence to the project;
- determine project-specific construction and operational noise criteria;
- undertake 3D noise modelling to predict levels that may occur as a result of the construction and operation of the project at the closest and/or potentially most affected receivers;
- provide a comparison of predicted noise levels against relevant construction and operational criteria;
- assess the potential noise impacts associated with construction and operational aspects of the project;
- assess the potential noise impacts associated with road traffic noise during construction; and
- provide feasible and reasonable noise mitigation and management measures, and monitoring options, where criteria may be exceeded.

The assessment has been undertaken in accordance with the following documents:

- TAS Department of State Growth (DSG), Tasmanian State Road Traffic Noise Management Guidelines 2015;
- TAS Department of Environment, Parks, Heritage and the Arts – Environmental Protection Policy (Noise), May 2009;
- Tasmanian Government Environmental Management and Pollution Control (Noise) Regulations 2016;
- Standards Australia AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures;
- Standards Australia AS 2436:2010 - Guide to noise and vibration control on construction, demolition and maintenance sites;
- International Standard ISO 9613:1996 - Acoustics - Attenuation of sound during propagation outdoors;
- German Institute for Standardisation – DIN 4150 (1999-06) Part 2 (DIN4150-2) – Structural Vibration - Human Exposure to Vibration in Buildings; and
- British Standards Institution BS 7385: Part 2-1993 (BS7385.2:1993) - Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration, 1993.

A glossary of terms, definitions and abbreviations used in this report is provided in Appendix A.

# 2 Project Description

## 2.1 Background

Sunspot 9 propose to construct and operate a 288-Megawatt (MW) solar farm using Photovoltaic (PV) technology approximately 5km northeast of George Town, TAS.

## 2.2 Description of Proposed Construction Works

The project includes installation of groups of PV panels on mounting structures of 2.5m to 4.5m in height. Approximately 600,000 PV panels will be installed using a single axis tracking system, tilting from east to west. The PV mounting structure would comprise steel posts driven into the ground using a small pile driver. Additional support structures would be attached to the piles, which would then support the PV panels.

As cabling of each PV array/module to inverters is required to be underground, earthworks will primarily involve trenching. Other minor earthworks would be completed for the preparation of the site. The project site is predominantly cleared agricultural land and relatively flat, so minimal site preparation will be required.

It is anticipated that the solar farm would be constructed in stages, with construction of two to three stages occurring at any one time over a 12-to-18-month period during standard construction hours.

During construction, traffic generated by the project would include employee and delivery vehicles. During the peak construction period, the total daily traffic volume is expected to be up to 208 heavy vehicle movements (rigid vehicles, semi-trailers, truck and dog and shuttle buses) and 246 light commercial vehicle movements (a vehicle driving to site, and back is two movements).

## 2.3 Description of Proposed Operation

PV infrastructure on site will comprise of groups of PV panels installed in rows running north to south. The PV modules will be on a single axis tracker system which will follow the sun and move in an east to west direction. Electrical cabling would be attached beneath the modules and would connect the individual PV modules to each other. Inverters will be located centrally and connected by underground cables. The project will be contained solely within the site as shown in **Figure 1**. Project layout drawings are presented in **Appendix B**.

The project would operate during daylight hours, seven days a week. During operation, the PV panels would generate electricity which would be fed into the power grid via a double circuit transmission line that will connect the solar farm substation to the George Town substation. The total length of the transmission line is approximately 6km. Key noise emissions from the operation of the project are associated with the inverter and transformer(s).

When required, maintenance activities will occur during standard working hours (except for emergencies) and are expected to include:

- panel cleaning;
- repairs, maintenance, and replacement of infrastructure, as required;
- security monitoring; and
- land management including mowing to control vegetation, as required.

Typical noise sources associated with maintenance activities would include light vehicle movements on site and maintenance of equipment.

## 2.4 Receiver Review

Using aerial photography, geospatial information and other project design information, MAC has identified the following potentially sensitive receivers that may be affected by noise from operation or construction activities and project related road traffic. Table 1 presents a summary of receiver identification, type, address, and coordinates. These are reproduced visually in Figure 1.

Table 1 Receiver Locations

| Receiver | Description | Receiver Type | Coordinates (GDA94/MGA55) | |
|---|---|---|---|---|
| | | | Easting | Northing |
| L01 | 382 Soldiers Settlement Road | Project Related | 489371 | 5453709 |
| L02 | 381 Soldiers Settlement Road | Project Related | 489026 | 5453917 |
| R01 | 259 Old Aerodrome Road | Rural Residential | 489371 | 5453709 |
| R02 | 229 Old Aerodrome Road | Rural Residential | 489026 | 5453917 |
| R03 | 160 Soldiers Settlement Road | Rural Residential | 486183 | 5454173 |
| R04 | 160 Soldiers Settlement Road | Rural Residential | 486058 | 5453999 |
| R05 | 70 Musk Vale Road | Rural Residential | 488290 | 5452257 |
| R06 | Unknown Address | Rural Residential | 488199 | 5452279 |
| R07 | 599 Old Aerodrome Road | Rural Residential | 488738 | 5452592 |
| R08 | 549 Old Aerodrome Road | Rural Residential | 489724 | 5450470 |
| R09 | 489 Old Aerodrome Road | Rural Residential | 488404 | 5456479 |
| R10 | 106 Soldiers Settlement Road | Rural Residential | 487836 | 5456480 |
| R11 | 90 Soldiers Settlement Road | Rural Residential | 487425 | 5456176 |
| R12 | 40 Soldiers Settlement Road | Rural Residential | 487064 | 5452325 |
| R13 | 6524 Bridport Road | Rural Residential | 486894 | 5452320 |
| R14 | 6538 Bridport Road | Rural Residential | 486525 | 5452108 |
| R15 | 6542 Bridport Road | Rural Residential | 493445 | 5450020 |
| R16 | 6528 Bridport Road | Rural Residential | 493308 | 5449409 |
| R17 | 6533 Bridport Road | Rural Residential | 493107 | 5449029 |
| R18 | 10 Aitkins Road | Rural Residential | 493204 | 5448982 |
| R19 | 9 Aitkins Road | Rural Residential | 493159 | 5448839 |
| R20 | 11 Aitkins Road | Rural Residential | 493253 | 5448295 |
| R21 | Low Head | Residential | 483505 | 5453954 |
| R22 | BelBouy Beach | Residential | 468051 | 5456528 |

Note: Project related receivers not included in assessment.

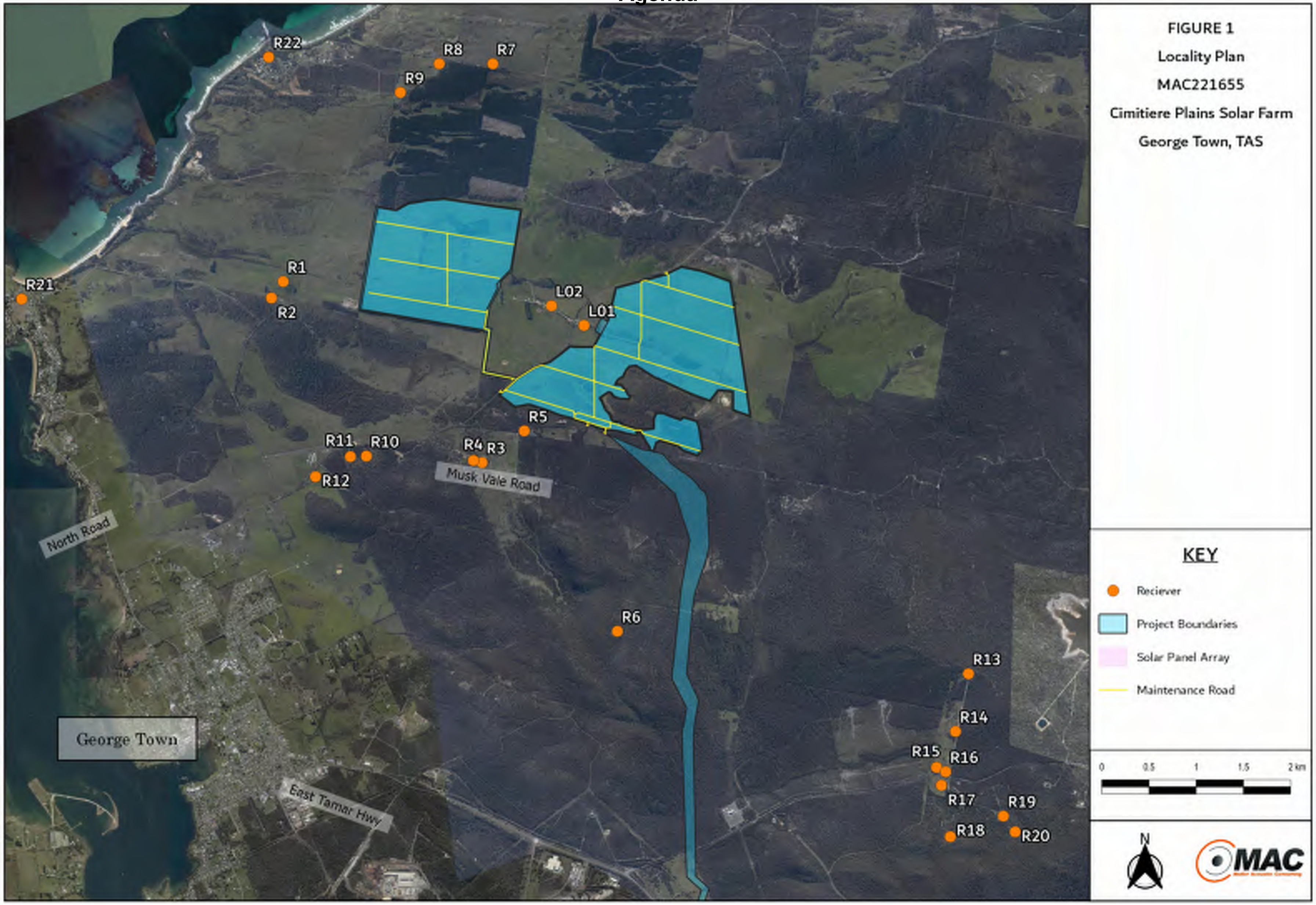
FIGURE 1
Locality Plan
MAC221655
Cimitiere Plains Solar Farm
George Town, TAS
KEY
Reciever
Project Boundaries
Solar Panel Array
Maintenance Road
0
0.5
1
1.5
2 km
N
MAC
R22
R8
R7
R9
R1
R21
R2
L02
L01
R5
R11
R10
R4
R3
R12
Musk Vale Road
North Road
R6
R13
R14
R15
R16
R17
R19
R18
R20
George Town
East Tamar Hwy

# 3 Noise Policy and Guidelines

## 3.1 Tasmanian Legislation

There are currently no specific operational noise criteria for solar farms in Tasmania. However, the Environment Management and Pollution (Noise) Regulations 2016 (the 'Noise Regulations') prescribes noise limits to industry on a case-by-case basis for noise generating activities. In regard to fixed equipment, the following provisions relate generally to received noise levels at a sensitive resident:

*A person must not operate fixed equipment on any premises –*

*(a) from 7.00 a.m. until 10.00 p.m., if the fixed equipment, when so operated, emits noise that is greater than 45dB(A); or*

*(b) from 10.00 p.m. until 7.00 a.m., if the fixed equipment, when so operated, emits noise that is greater than 40dB(A).*

### 3.1.1 The Environment Protection Policy (Noise) 2009 (EPP-Noise)

The Environment Protection Policy (Noise) 2009 (EPP-Noise) refers to *WHO publication Guidelines for Community Noise (Berglund B, Lindvall T and Schwela D H, 1999)* for suitable noise indicator levels as shown in **Table 2** below. However, the noise levels specified below are indicative, non-mandatory noise levels.

Table 2 Acoustic Environment Indicator Levels

| Specific Environment | Critical Health Effects | dB LAeq | Time Base hr | dB LAmax |
|---|---|---|---|---|
| Outdoor Living Area | Serious annoyance, daytime and evening | 55 | 16 | - |
| | Moderate annoyance, daytime and evening | 50 | 16 | - |
| Dwelling, Indoors | Speech intelligibility & moderate annoyance, daytime and evening | 35 | 16 | - |
| Inside Bedrooms | Sleep disturbance, night-time | 30 | 8 | 45 |
| Outside Bedrooms | Sleep disturbance, window open (outdoor values) | 45 | 8 | 60 |

### 3.1.2 Noise Goals for Planning

The project operates between sunrise and sunset, which will be before 7am during spring and summer. The EPP-Noise calls on WHO guidance which aims for an internal noise level of 30dBA. Allowing for a (conservative) loss of 10dB through an open window from outside to inside correlates with the Noise Regulations external night time criteria of 40dBA, which is 5dB lower than the WHO preferred external noise level of 45dBA (refer 'outside bedrooms' in **Table 2**).

Therefore, the project has adopted a conservative external noise goal of 40dBA for the night-time period as it satisfies the requirements of the Noise Regulations and EPP-Noise.

As noise impacts from construction are considered to be of a temporary nature during the daytime over a 12 to 18 month construction period, noise goal of 50dBA has been derived from **Table 2** (moderate annoyance in outdoor living areas) during permissible hours of use. 'Permissible hours of use' have been adopted in accordance with the Tasmanian EPA Noise Regulations for mobile machinery, forklift trucks and industrial motor vehicles and are reproduced below:

- Monday to Friday 7am to 6pm;
- Saturday 8am to 6pm; and
- Sunday and Public Holidays 10am to 6pm.

## 3.2 Traffic Noise Management Guidelines

The road traffic noise criteria are provided in the Tasmanian State Road Traffic Noise Management Guidelines 2015. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts. Road noise criteria relevant to this assessment are presented in detail in **Section 4.3**.

# 4 Assessment Criteria

## 4.1 Operational Noise Goals

As outlined in **Section 3.1.2** conservative noise goals have been adopted for this assessment. Noise goals for the project are presented in **Table 3** and only apply to residential receivers.

Table 3 Operational Noise Goals

| Location | Receiver Type | Assessment Period[1] | Adopted Noise Goal dB $L_{Aeq(15minute)}$[2] |
|---|---|---|---|
| R01-R20 | Residential | Day<br>Evening<br>Night | 40 |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note 2: Noise goal for external façade at residential receivers. Conservatively assuming a 10dB decrease in noise transmission through an open window, internal noise goal is 30dBA.

## 4.2 Construction Noise Goals

The relevant construction noise goals for standard construction hours are presented in **Table 4**.

Table 4 Construction Noise Goals

| Location | Receiver Type | Assessment Period[1] | Adopted Noise Goal dB $L_{Aeq(15minute)}$[2] |
|---|---|---|---|
| R01-R20 | Residential | Permissible use hours | 50 |

Note 1: Refer to **Section 3.1.2** for permissible use hours for construction.

Note 2: Noise goal for external façade at residential receivers.

## 4.3 Traffic Noise Criteria

**Table 5** presents the road traffic noise assessment criteria reproduced from the Tasmanian State Road Traffic Noise Management Guidelines 2015. The design target level of 63dB $L_{A10(18hr)}$ is a commonly used target in Australia on new and upgraded roads. It should be noted that the criteria will not be appropriate for all situations, and will not always be reasonable, practical, or affordable to achieve.

The operational practical upper limit of 68dB $L_{A10(18hr)}$ will be used to trigger mitigation retrofitting considerations when incremental noise increases occur on existing roads, such from traffic growth or maintenance changes to seal type.

Table 5 Target traffic noise criteria for new roads and major road upgrades

| Target Traffic Noise Level dB $L_{A10(18hr)}$ | Application | Comments |
|---|---|---|
| 68 dB(A) | Outside road construction and upgrade projects, where increases in traffic noise levels occur the Department will consider an operational traffic noise level of 68dB $L_{A10(18hr)}$ to be a practical upper limit. | As levels increase above 63dB impacts become less acceptable to more people. A level above 68dB (measured at a building façade) is considered by the Department to be undesirable for sensitive uses. |

## 4.4 Construction Vibration

A qualitative assessment of potential vibration impacts has been completed. Due to the nature of the works proposed and distances to potential vibration sensitive receivers, vibration impacts from the project would be negligible.

The British Standard *Evaluation and measurement for Vibration in Buildings* -Part 2. Guide to Damage Levels from Ground-borne Vibration (BS 7385.2 1993) provides guidance on levels of vibration above which building structures are susceptible to cosmetic damage. The *German Institute for Standardisation – Structural Vibration - Human Exposure to Vibration in Buildings (DIN4150-2)* provides guidance on levels of vibration above which human response can occur. The key vibration generating source proposed to be used would be a small pile driver. For a small pile driver, a minimum safe working distance of 15m is anticipated to prevent cosmetic damage. To achieve the residential human response criteria for continuous vibration, a minimum safe working distance of 50m is recommended. Therefore, as the nearest receivers to the project are greater than 50m, exposure to vibration is anticipated to be minimal. Therefore, vibration impacts are not considered to be a significant issue and have not been considered further in this assessment.

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# 5 Modelling Methodology

A computer model using DGMR (iNoise, Version 2022) noise modelling software was used to quantify noise emissions from the project. iNoise is an intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Where relevant, modifying factors have been applied to calculations.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation' including corrections for meteorological conditions using CONCAWE[1]. The ISO 9613 standard from 1996 is the most used noise prediction method worldwide. Many countries refer to ISO 9613 in their noise legislation. However, the ISO 9613 standard does not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534-3. This quality standard gives clear recommendations for interpreting the ISO 9613 method. iNoise fully supports these recommendations. The models and results for the 19 test cases are included in the software.

## 5.1 Construction Assessment Methodology

Construction activities are proposed to be progressive (trenching, piling and assembly) and will occur at several locations simultaneously. Noise emissions were modelled for the following four scenarios:

- earthworks for internal roads and compound construction including the stripping of topsoil and unsuitable soil and the placement and compaction of road base for internal roads;
- earthworks involving trenching for cabling;
- piling of panel supports; and
- assembly of the panels.

[1] Report no. 4/18, "the propagation of noise from petroleum and petrochemical complexes to neighbouring communities", Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981

It is envisaged that all four construction scenarios have the potential to occur simultaneously at up to four key locations across the site. Although this scenario is unlikely to occur, it provides a conservative 'worst case' assessment of construction noise emissions for the project. Noise emission data used in this assessment was adapted from *AS 2436–2010– Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites* is summarised in Table 6. All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible at any residential receivers.

Table 6 Construction Equipment Sound Power Levels, Lw dBA (re $10^{-12}$ Watts)

| Noise Source/Item | Utilisation % | Quantity | Lw/Item | Total Lw |
|---|---|---|---|---|
| Trenching & Earthworks | | | | |
| Backhoe | 80 | 1 | 104 | 103 |
| Light vehicle | 25 | 2 | 76 | 73 |
| **Total – Trenching & Earthworks** | | | | **103** |
| Piling | | | | |
| Piling Rig (hydraulic) | 80 | 1 | 113 | 112 |
| Tele-handler | 75 | 1 | 106 | 105 |
| Light vehicle | 25 | 2 | 76 | 73 |
| **Total – Piling** | | | | **113** |
| Assembly | | | | |
| Mobile Crane/HIAB | 75 | 1 | 104 | 103 |
| Tele-handler | 75 | 1 | 106 | 105 |
| Light vehicle | 25 | 2 | 76 | 73 |
| Hand tools/Power tools | 50 | 1 | 102 | 99 |
| Welder | 50 | 1 | 105 | 102 |
| **Total – Assembly** | | | | **109** |
| Transport (on site) | | | | |
| Heavy vehicle | 40 | 1 | 104 | 101 |
| Tele-handler | 50 | 1 | 106 | 103 |
| **Total – Transport** | | | | **105** |

## 5.2 Operational Assessment Methodology

The potential for noise emissions from the operation of the project are associated with the inverter and transformer(s). The project operates at full capacity during daylight hours. After sunset, noise emissions are at a lower level as the panels are at rest and inverters are not operating at their full capacity as the project is not generating power. Therefore, noise predictions were modelled for a typical worst-case operational scenario over a 15-minute assessment period based on the assumptions and sound power levels in Table 7. Plant noise emission data used in modelling for this assessment were obtained from manufacturers data or the MAC database.

Table 7 Operational Equipment Sound Power Levels, Lw dBA (re $10^{-12}$ Watts)

| Noise Source/Item | Activity | Quantity | Lw/Item | Total Lw |
|---|---|---|---|---|
| PV Panel Tracking Motor[1, 2] | All tracking motors in operation 1 minute per 15-minute period | 8755 | 78 | 100 |
| 4.5MW Inverter PCU[2,3] | Constant | 80 | 93 | 112 |
| Substation[4] | Constant | 1 | 95 | 95 |

Note 1: Tracking motor is situated underneath the PV panel, -5dB attenuation applied to account for shielding provided by the panel.

Note 2: Modifying factor penalty of +5dB added for low frequency and +5dB added for tonality.

Note 3: Sound power levels for inverters have been assessed at 100% operation, however after daylight hours, the inverters will operate at lower noise levels.

Note 4: Modifying factor penalty of +5dB added for intermittent operation and +5dB added for low frequency.

### 5.2.1 Meteorological Analysis

Noise emissions can be influenced by prevailing weather conditions. Light stable winds (<3m/s) and temperature inversions have the potential to increase noise at a receiver.

A detailed analysis of the significance of noise enhancing conditions has not been undertaken and hence, (worst case) noise enhancing meteorological conditions have been applied to the noise modelling assessment and are presented in Table 8.

Table 8 Modelled Meteorological Parameters

| Assessment Condition[1] | Temperature | Wind Speed[2]/ Direction | Relative Humidity | Stability Class[2] |
|---|---|---|---|---|
| Day | 20°C | 3m/s all directions | 50% | D |
| Evening | 10°C | 3m/s all directions | 50% | D |
| Night | 10°C | 2m/s all directions | 50% | F |

Note 1: Day 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening 6pm to 10pm; Night - the remaining periods.

Note 2: Implemented using CONCAWE meteorological corrections.

## 5.3 Road Traffic Noise Assessment Methodology

During construction, traffic generated by the project include employees/subcontractors and delivery vehicles. The major transport route for the majority of vehicles to the access the project site is via East Tamar Highway through North Street, and then Soldier Settlement Road. Vehicle movements are also expected to occur along Bridport Road via East Tamar Highway for construction of the transmission line, and along Muskvale Vale Road for the construction of the substation and part of the transmission line.

The traffic volume over a typical 18hr period during peak construction is expected to be up to 208 heavy vehicle movements (rigid vehicles, semi-trailers, truck and dog and shuttle buses) and 246 light commercial vehicle movements.

Due to the low traffic volume generated by the project over a typical day during the construction phase, road traffic noise calculation methods such as Calculation of Road Traffic Noise (CRTN - ISBN 0 11 550847 3) by Department of Transport (UK) 1988 or Traffic Noise Model (TNM) by the United States Department of Transport, Federal Highway Administration are not considered appropriate as they are primarily intended to calculate noise emissions from motorways and highways. Whilst each method has a low volume correction, the project traffic volume is out of the scope of these methods.

Therefore, road traffic noise has been modelled using iNoise modelling software using ISO 9613-1 and ISO 9613-2 calculation methods, representing the road traffic as "moving sources" along the transport route using the parameters presented in **Table 9**.

Table 9 Road Traffic Noise Modelling Parameters

| Noise Source/Item | Lw dBA re $10^{-12}$ W | Movements/18hr | Speed, km/h | Source Height, m[1] |
|---|---|---|---|---|
| Heavy Vehicle | 104 | 208 | 50 | 1.5 |
| Light Vehicle | 96 | 246 | 50 | 0.75 |

Note 1: Height above ground level.

# 6 Noise Assessment Results

## 6.1 Construction Noise Assessment

Noise levels were predicted to all identified receivers at 1.5m above ground level for typical construction activities for standard construction hours. Table 10 summarises the predicted noise level range and maximum predicted noise level for each of the construction scenarios (trenching, piling and assembly) at identified receivers. Predicted noise levels are below the Noise Goal at all receivers. Predicted noise levels are presented as contours in Appendix C.

Table 10 Predicted Construction Noise Levels

| Receiver | Description/Address | Predicted Noise Level Range dB LAeq(15min)[1] | Highest Predicted Noise Level dB LAeq(15min) | Noise Goal dB LAeq(15min) | Noise Goal Achieved |
|---|---|---|---|---|---|
| R01 | 259 Old Aerodrome Road | <20 - 34 | 34 | 50 | ✓ |
| R02 | 229 Old Aerodrome Road | <20 - 31 | 31 | 50 | ✓ |
| R03 | 160 Soldiers Settlement Road | 27 - 38 | 38 | 50 | ✓ |
| R04 | 160 Soldiers Settlement Road | <20 - 34 | 34 | 50 | ✓ |
| R05 | 70 Musk Vale Road | 36 - 48 | 48 | 50 | ✓ |
| R06 | Unknown Address | <20 - 20 | 20 | 50 | ✓ |
| R07 | 599 Old Aerodrome Road | <20 - 26 | 26 | 50 | ✓ |
| R08 | 549 Old Aerodrome Road | <20 - 27 | 27 | 50 | ✓ |
| R09 | 489 Old Aerodrome Road | 20 - 30 | 30 | 50 | ✓ |
| R10 | 106 Soldiers Settlement Road | <20 - 26 | 26 | 50 | ✓ |
| R11 | 90 Soldiers Settlement Road | <20 - 26 | 26 | 50 | ✓ |
| R12 | 40 Soldiers Settlement Road | <20 - 24 | 24 | 50 | ✓ |
| R13 | 6524 Bridport Road | <20 | <20 | 50 | ✓ |
| R14 | 6538 Bridport Road | <20 | <20 | 50 | ✓ |
| R15 | 6542 Bridport Road | <20 | <20 | 50 | ✓ |
| R16 | 6528 Bridport Road | <20 | <20 | 50 | ✓ |
| R17 | 6533 Bridport Road | <20 | <20 | 50 | ✓ |
| R18 | 10 Aitkins Road | <20 | <20 | 50 | ✓ |
| R19 | 9 Aitkins Road | <20 | <20 | 50 | ✓ |
| R20 | 11 Aitkins Road | <20 | <20 | 50 | ✓ |
| R21 | Low Head | <20 | <20 | 50 | ✓ |
| R22 | Bellbouy Beach | <20 | <20 | 50 | ✓ |

Note 1: Noise levels from construction activities vary due to their position across the project site with respect to surrounding receivers.

Notwithstanding, noise control recommendations during construction are provided in Section 7.1 for consideration.

## 6.2 Operational Noise Assessment

Noise levels were predicted at all identified receivers at 1.5m above ground level for a typical worst case daylight operational scenario are presented in **Table 11**. Noise levels are expected to satisfy the noise goals at all receivers. Predicted noise levels are presented as contours in **Appendix C**.

Table 11 Predicted Operational Noise Levels

| Receiver | Description/Address | Predicted Noise Level dB LAeq(15min) | Noise Goal dB LAeq(15min) Day/Eve/Night[1] | Noise Goal Achieved |
|---|---|---|---|---|
| R01 | 259 Old Aerodrome Road | <30 | 40 | ✓ |
| R02 | 229 Old Aerodrome Road | <30 | 40 | ✓ |
| R03 | 160 Soldiers Settlement Road | <30 | 40 | ✓ |
| R04 | 160 Soldiers Settlement Road | <30 | 40 | ✓ |
| R05 | 70 Musk Vale Road | 32 | 40 | ✓ |
| R06 | Unknown Address | <30 | 40 | ✓ |
| R07 | 599 Old Aerodrome Road | <30 | 40 | ✓ |
| R08 | 549 Old Aerodrome Road | <30 | 40 | ✓ |
| R09 | 489 Old Aerodrome Road | <30 | 40 | ✓ |
| R10 | 106 Soldiers Settlement Road | <30 | 40 | ✓ |
| R11 | 90 Soldiers Settlement Road | <30 | 40 | ✓ |
| R12 | 40 Soldiers Settlement Road | <30 | 40 | ✓ |
| R13 | 6524 Bridport Road | <30 | 40 | ✓ |
| R14 | 6538 Bridport Road | <30 | 40 | ✓ |
| R15 | 6542 Bridport Road | <30 | 40 | ✓ |
| R16 | 6528 Bridport Road | <30 | 40 | ✓ |
| R17 | 6533 Bridport Road | <30 | 40 | ✓ |
| R18 | 10 Aitkins Road | <30 | 40 | ✓ |
| R19 | 9 Aitkins Road | <30 | 40 | ✓ |
| R20 | 11 Aitkins Road | <30 | 40 | ✓ |
| R21 | Low Head | <30 | 40 | ✓ |
| R22 | Bellbouy Beach | <30 | 40 | ✓ |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

## 6.3 Road Traffic Noise Assessment

For this assessment, noise levels have been calculated at an offset of 15m along the transport route including North Road, Musk Vale Road, Bridport Road and East Tamar Highway to represent a worst-case conservative scenario. Residential receivers on Soldiers Settlement Road have considerable offsets and are typically 50m or more from the road. Predicted noise levels from project related construction traffic has been calculated using the methodology and the most conservative parameters presented in Section 5.3. It is expected that if the predicted noise level associated with peak construction traffic volumes (Table 9) is below the criteria at the closest offset distances, then smaller volumes of traffic at larger offsets will also be below the assessment criteria.

The results presented in Table 12 show the calculated and $LA_{eq(18hr)}$ noise levels to align with the road traffic noise assessment period.

Table 12 Predicted Construction Road Traffic Noise Levels

| Road Name | Offset Distance to Receiver | Predicted Noise Level | Traffic Noise Criteria | Compliance Achieved |
|---|---|---|---|---|
| Musk Vale Road<br>North Road<br>Bridport Road<br>East Tamar Highway | 15m | 50dB LAeq(18hr) | 68dB LAeq(18hr) | ✓ |
| Soldiers Settlement Road | 50m | 42dB LAeq(18hr) | 68dB LAeq(18hr) | ✓ |

Results demonstrate that project construction traffic noise levels would comply with the relevant traffic noise criteria.

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# 7 Recommendations

## 7.1 Construction Noise Recommendations

It is noted that construction noise emissions are anticipated to be below the relevant noise goals at all receivers. Nonetheless, the following noise mitigation measures should be considered during the construction phase to reduce emissions to the surrounding community and be considered for inclusion in the project construction management plan:

- to minimise road traffic noise:
  - schedule heavy vehicle deliveries to avoid bunching of vehicles which may cause short term elevated noise levels;
  - where feasible use minibuses or similar to transport construction personnel to and from the site to avoid excessive noise from light vehicle movements.
- operating plant in a conservative manner (no over-revving), shutdown when not in use, and be parked/started at farthest point from relevant assessment locations;
- selection of the quietest suitable machinery available for each activity;
- minimise noisy plant/machinery working simultaneously where practicable;
- minimise impact noise wherever possible;
- utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm;
- provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities;
- signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site; and
- utilise project related community consultation forums to notify residences within proximity of the site with project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure.

The reduction achieved from the mitigation measures will depend on the specific measures implemented.

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# 8 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Assessment for a proposed Cimitiere Plains Solar Farm 5km northeast of George Town, TAS

The results of the Noise Assessment demonstrate that construction noise is expected to be at levels below the construction noise goals at all receivers. Recommendations have been provided to minimise any potential noise impacts from construction, albeit of a temporary nature during the daytime over a 12-to-18-month construction period.

The results of the Noise Assessment demonstrate that emissions from the project would satisfy the operational noise goals at all identified receivers for a typical worst case daylight operational scenario.

Road noise emissions associated with the project are anticipated to satisfy the relevant traffic noise criteria at all receivers along the proposed transportation route.

Based on the Noise Assessment results, the project satisfies the criteria adopted for operational and construction noise.

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# Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in Table A1.

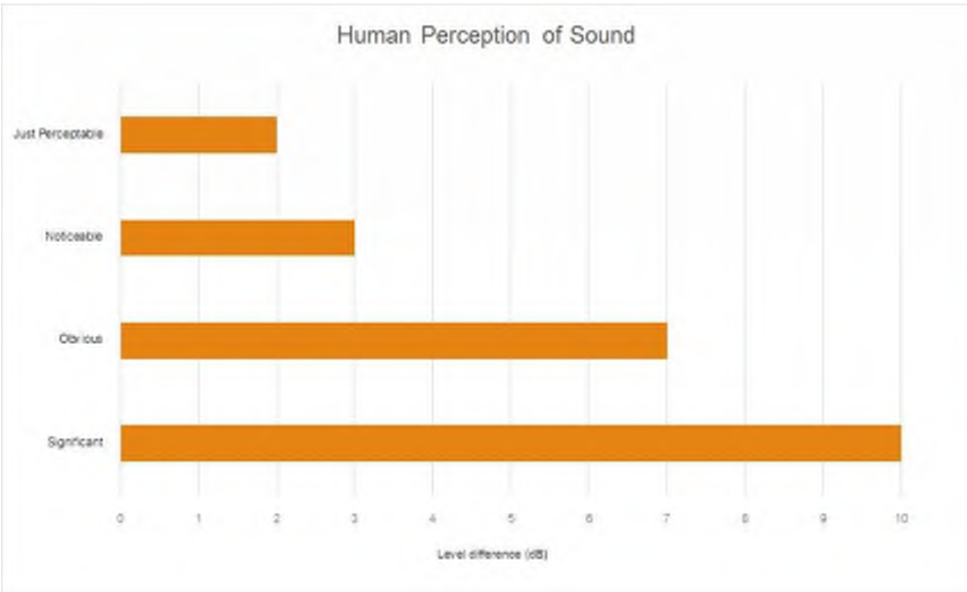
Table A1 Glossary of Acoustical Terms

| Term | Description |
|---|---|
| 1/3 Octave | Single octave bands divided into three parts |
| Octave | A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit. |
| ABL | Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels. |
| Ambient Noise | The total noise associated with a given environment. Typically, a composite of sounds from all sources located both near and far where no particular sound is dominant. |
| A Weighting | A standard weighting of the audible frequencies designed to reflect the response of the human ear to sound. |
| Background Noise | The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor |
| dBA | Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear. |
| dB(Z), dB(L) | Decibels Z-weighted or decibels Linear (unweighted). |
| Extraneous Noise | Sound resulting from activities that are not typical of the area. |
| Hertz (Hz) | The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz. |
| LA10 | A sound level which is exceeded 10% of the time. |
| LA90 | Commonly referred to as the background noise, this is the level exceeded 90% of the time. |
| LAeq | Represents the average noise energy or equivalent sound pressure level over a given period. |
| LAmax | The maximum sound pressure level received at the microphone during a measuring interval. |
| Masking | The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street. |
| RBL | The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period. |
| Sound power level (Lw or SWL) | This is a measure of the total power radiated by a source in the form of sound and is given by 10.log10 (W/Wo). Where W is the sound power in watts to the reference level of $10^{-12}$ watts. |
| Sound pressure level (Lp or SPL) | the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source. |

Table A2 provides a list of common noise sources and their typical sound level.

| Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA | |
|---|---|
| Source | Typical Sound Pressure Level |
| Threshold of pain | 140 |
| Jet engine | 130 |
| Hydraulic hammer | 120 |
| Chainsaw | 110 |
| Industrial workshop | 100 |
| Lawn-mower (operator position) | 90 |
| Heavy traffic (footpath) | 80 |
| Elevated speech | 70 |
| Typical conversation | 60 |
| Ambient suburban environment | 40 |
| Ambient rural environment | 30 |
| Bedroom (night with windows closed) | 20 |
| Threshold of hearing | 0 |

Figure A1 – Human Perception of Sound



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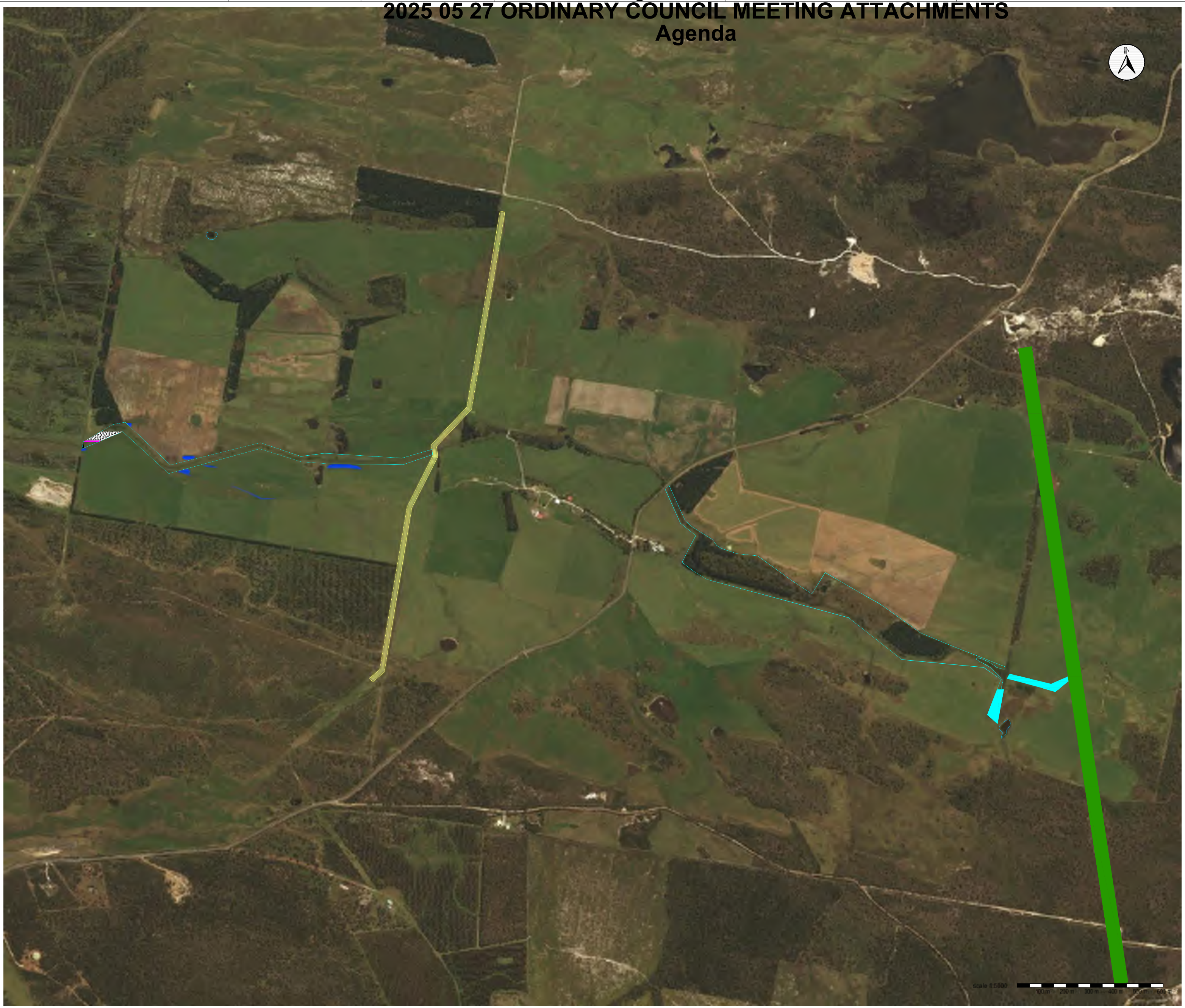
# Appendix B – Project Layout



Geographical Coordinates

| | |
|---|---|
| Country: | Australia |
| Address: | Tasmania |
| | George Town |
| Latitude: | -41.067526 |
| Longitude: | 148.872389 |
| Altitude: | 16 ... 49 m |

Areas

| | Fenced Area | Fence Length |
|---|---|---|
| 1 Field | 1.829.046 m² | 5.398 m |
| 2 Field | 2.339.367 m² | 9.394 m |
| 2 Field | 186.088 m² | 2.050 m |
| | | |
| Total | 4.354.501 m² | 16.843 m |

AUS.2514.DEV.M.2.001.C.E

Client:

new drawing, previous drawings lose their validity and will not be withdrawn.

Project Management / Engineering Design:
ib vogt GmbH
Helmholtzstr. 2-9
10587 Berlin
Tel. +49 30 397440-0
www.ib-vogt.com

| Version | Metric | European Proj. |
|---|---|---|
| | | Date |
| Designed | | |
| Checked | | |
| Approved | | |

Project: George Town Solar Farm
Planning Phase: Preliminary Design
A0_1189x841

Supplier

# Appendix C – Noise Contours

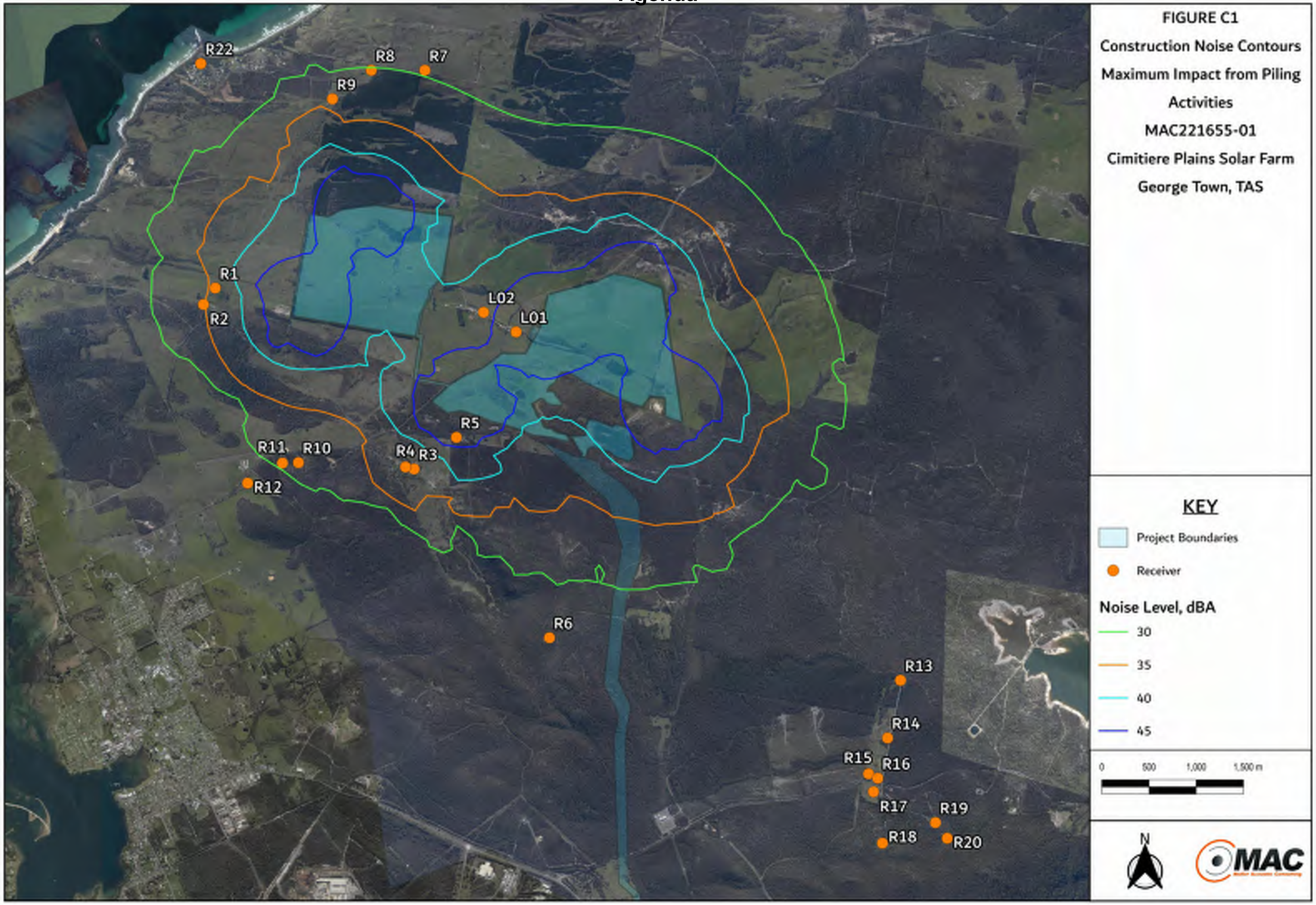


FIGURE C1
Construction Noise Contours
Maximum Impact from Piling
Activities
MAC221655-01
Cimitiere Plains Solar Farm
George Town, TAS
KEY
Project Boundaries
Receiver
Noise Level, dBA
30
35
40
45
0
500
1,000
1,500 m
N
MAC
R22
R8
R7
R9
R1
R2
L02
L01
R5
R11
R10
R4
R3
R12
R6
R13
R14
R15
R16
R17
R19
R18
R20

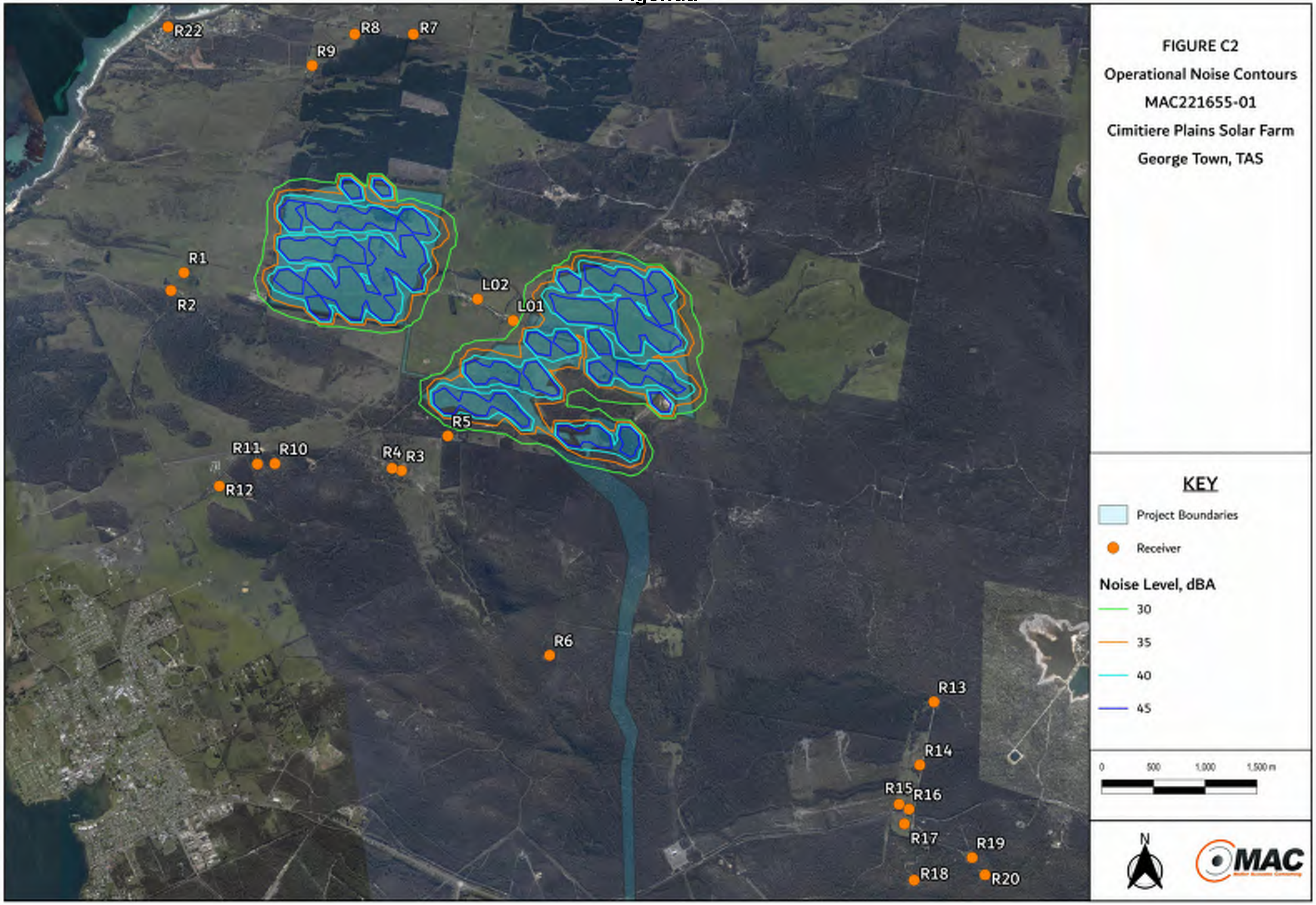


FIGURE C2
Operational Noise Contours
MAC221655-01
Cimitiere Plains Solar Farm
George Town, TAS
KEY
Project Boundaries
Receiver
Noise Level, dBA
30
35
40
45
0
500
1,000
1,500 m
N
MAC
R22
R8
R7
R9
R1
R2
L02
L01
R5
R11
R10
R4
R3
R12
R6
R13
R14
R15
R16
R17
R19
R18
R20

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MAC
Muller Acoustic Consulting

# Appendix K
## Traffic Impact Assessment

# Cimitiere Plains Solar Farm

ENVIRONMENTAL CONSULTANCY


# Cimitiere Plains Solar Farm

## Traffic Impact Assessment

May 2023

Reference: 538 rep 230510 final.docx

# Cimitiere Plains Solar Farm

## Traffic Impact Assessment

Prepared for: Envoca

Status: Final report

Date: 3 May 2023

Reference: 538 rep 230510 final.docx

Contact

Website: www.amberorg.com.au E: info@amberorg.com.au Phone: 1800 022 363

Amber

# Table of Contents

# 1. Background

## 1.1 Background

Amber Organisation Pty Ltd has been engaged by Envoca on behalf of Sunspot 9 Pty Ltd to conduct a review of the traffic implications of the Cimitiere Plains Solar Farm and prepare a Traffic Impact Assessment.

The solar farm is located approximately 4.0km northeast of George Town and is proposed to have a capacity of 288MW. Access to the solar farm is proposed via Soldier Settlement Road and Musk Vale Road in the north, and access to the transmission line is proposed via Bridport Road to the south of the site. The workforce is expected to primarily be located in Launceston, with additional accommodation provided in George Town and Bridport with plant expected to be delivered from Bell Bay, Devonport or Burnie.

Figure 1 shows the proposed layout of the site in relation to the road network, access locations and existing infrastructure.

**Figure 1: Site Layout**


*Source: Envoca*

## 1.2 Purpose of Document

This Traffic Impact Assessment has been prepared to assess the construction and operational traffic impacts, and the access arrangements of the solar farm. The assessment details how road impacts of the project traffic, particularly from heavy vehicle use and oversize and overmass vehicles, will be avoided or managed using road-use management strategies.

More specifically, the report addresses the following key matters:

- Details of both light and heavy vehicle traffic volumes and proposed transport routes;
- An assessment of the potential traffic impacts of the project on road network function and safety;
- An assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the project;
- Details of measures to mitigate and / or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control dust generated by traffic volumes; and
- Details of access roads and how these connect to the existing road network and ongoing operational maintenance.

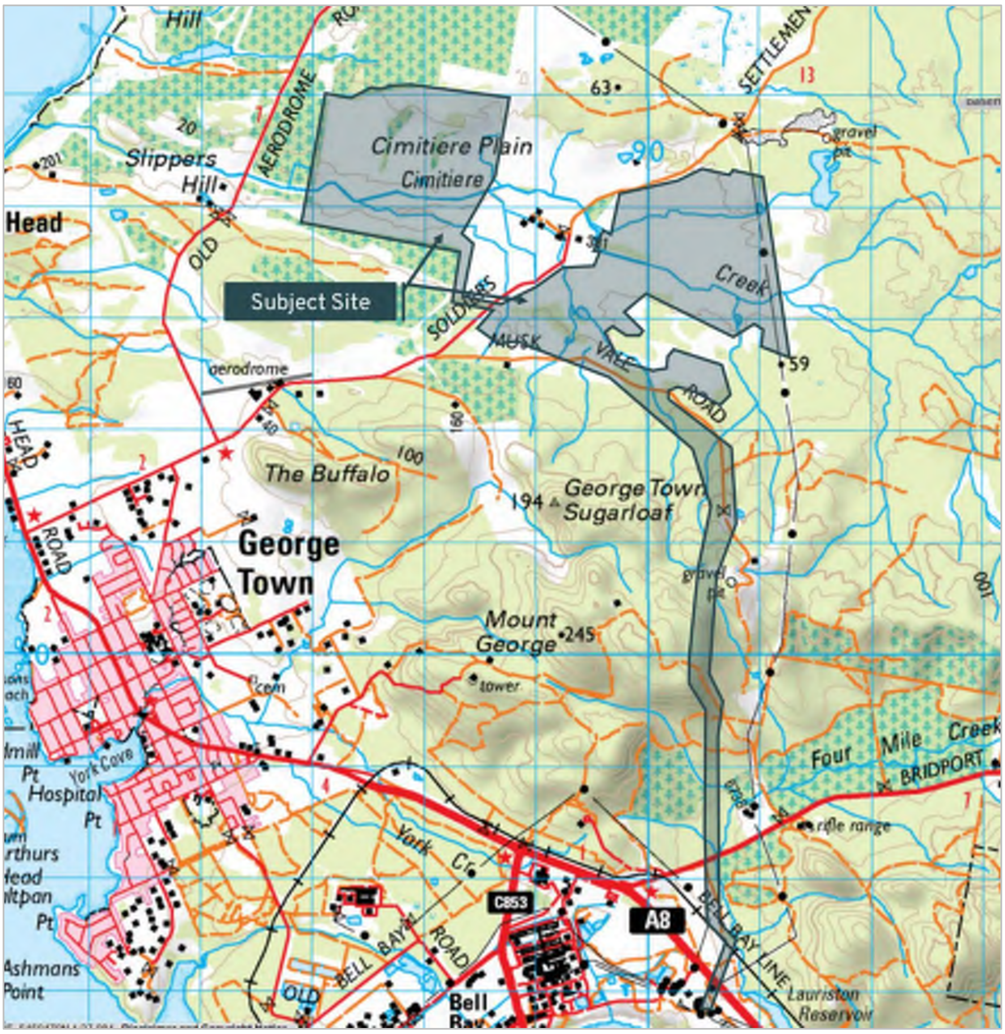
The traffic assessment has been undertaken in conjunction with consultation with Department of State Growth and George Town Council.

# 2. Existing Conditions

## 2.1 Site Location

The site is located at 381 Soldiers Settlement Road approximately 4.0km northeast of George Town, Tasmania, and is bounded by Bridport Road to the south and Soldiers Settlement Road in the northwest. Figure 2 shows the location of the site in relation to the surrounding transport network.

**Figure 2: Site Location**




*Source: TASMAP*

The site is zoned as 26.0 Rural Resource and is generally occupied by native forest and agricultural land uses with few dwellings nearby. Access to the site is currently provided via a number of formalised and non-formalised vehicle crossings on Soldiers Settlement Road, Musk Vale Road, and Bridport Road.

## 2.2 Road Network

**East Tamar Highway** is a Category 1 State Road under the care and management of the Department of State Growth. It runs in a general north-south alignment within the vicinity of the site between George Town and Launceston. It has a two-way carriageway with up to two lanes in each direction with wide shoulders on both sides. East Tamar Highway adopts the default speed limit of 100km/h.

**Bridport Road** is a Category 2 State Road under the care and management of the Department of State Growth. It runs in a general east-west alignment between Bridport and East Tamar Highway south of George Town. Within the vicinity of the site it has a two-way carriageway width of approximately 6.2 metres with unsealed shoulders provided on both sides and a wide vegetation envelope. Bridport Road adopts the default speed limit of 100km/h.

**Soldiers Settlement Road** is a local road under the care and management of George Town Council. It runs southwest-northeast from North Road near George Town to Beechford. Soldiers Settlement Road is a sealed, two-way carriageway between 5.0 and 6.0 metres wide with no central line marking and wide grassed berms on both sides. The road adopts the default speed limit of 100km/h.

**Musk Vale Road** is a minor local road that extends southeast from Soldiers Settlement Road. Musk Vale Road is unsealed and in moderate condition with some rutting and potholes throughout. It has a carriageway width of approximately 4.0 metres with narrow shoulders and overgrown vegetation on the roadside. Although Musk Vale Road adopts the default speed limit of 100km/h, it is more suited to low speed travel.

## 2.3 Traffic Volumes

Traffic data has been provided by the Tasmanian Government for the Category 1 and 2 roads as set out in Table 1.

**Table 1: Traffic Volume Data**

| Road | Location | Years | AADT (vpd) | Heavy Vehicle % |
|---|---|---|---|---|
| East Tamar Highway | 390m south of Bell Bay Road | 2019, 2021 | 5,669 | 17% |
| Bridport Road | 316m east of East Tamar Highway | 2019, 2021 | 1,318 | 29% |

*Tasmanian Government, Department of State Growth – Tasmanian Traffic Data*

No traffic data was available for Soldiers Settlement Road or Musk Vale road which are both estimated to have low vehicle volumes less than 300 and 20 vehicles per day (vpd), respectively. It is expected that the heavy vehicle percentage is similar to that on Bridport Road.

Accordingly, the road network currently accommodates a moderate to low level of traffic which is reflective of the road classifications.

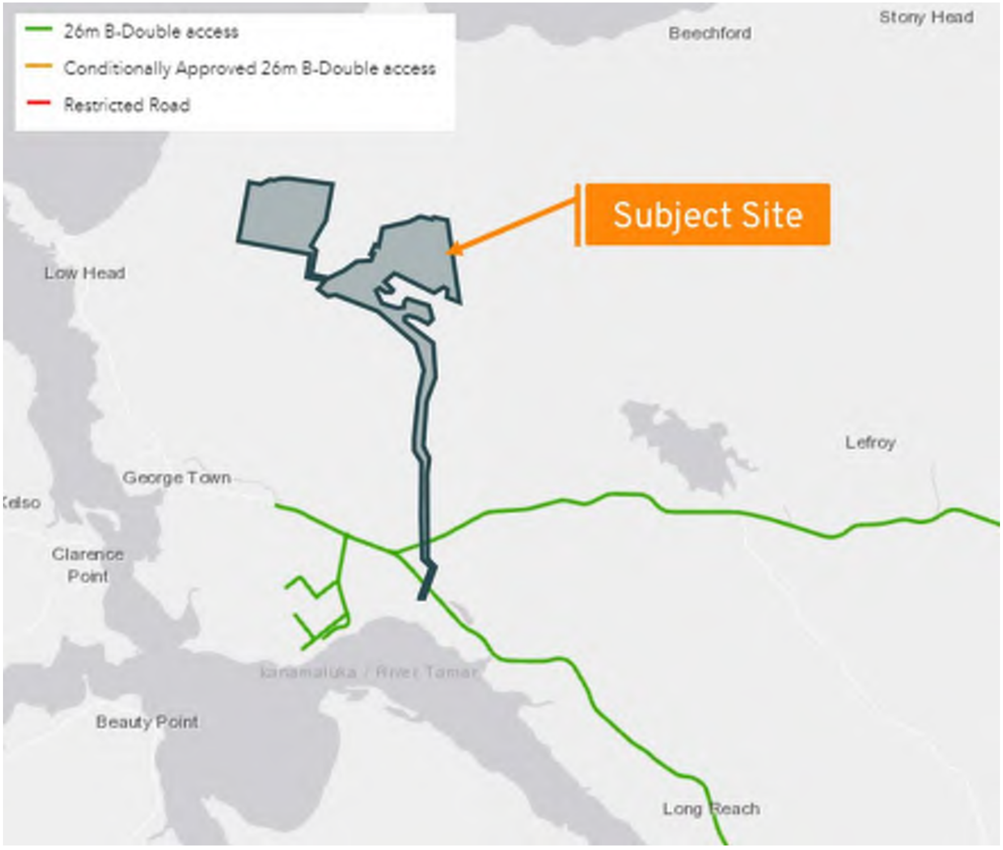
## 2.4 Public Transport Services

No public transport services or school bus services are known to be provided within the vicinity of the site.

## 2.5 Restricted Vehicle Access

The Tasmanian 26.0m B-Double Network map for the surrounding area is provided within Figure 3 with the green lines indicate B-Double declared roads.

**Figure 3: B-Double Network Map**




*Source: Tasmanian 26.0m B-Double Network*

The B-double network map shows that Bridport Road is a B-Double declared road while Soldiers Settlement Road and Musk Vale Road are general access.

## 2.6 Crash History

Amber has conducted a review of the Department of State Growth's crash database for all injury crashes relevant to the site. The crash database provides the location and severity of all injury and fatal crashes for the five-year period from 2017 to 2022. The location of the crashes identified within the search results are shown in Figure 4.

**Figure 4: Crash Locations**


*Source: Department of State Growth*

The crashes are summarised below:

- One serious injury crash located on North Street. The crash occurred in March 2022 in dark conditions and involved a person on the road;
- One minor injury crash at the intersection of North Street and Arnold Street involving a cross-traffic collision;
- One minor injury crash at the intersection of East Tamar Highway and Bridport Road due to a run-off-road incident; and
- One minor injury crash on Bridport Road east of the George Town converter station due to a run-off-road incident.

Given the road classifications and associated traffic volumes, it is concluded that the road network is currently operating in a relatively safe manner and there are no discernible crash trends.

# 3. Traffic Assessment

## 3.1 Traffic Generation

The solar farm construction is expected to take approximately 12 to 18 months, with the peak construction period expected to take up to 5 months. Construction activities would be undertaken during standard daytime construction hours, as follows:

- Monday to Friday: 7am – 6pm;
- Saturday: 8am – 6pm; and
- Sundays and public holidays: 10am – 6pm.

The peak workforce during construction will be approximately 300 people during peak construction periods. Shuttle buses will be provided to reduce the number of light vehicle trips.

Construction traffic generated by the solar farm can broadly be separated into the following categories:

- Light vehicles associated with transporting the workforce to/from the site
- Heavy vehicles which include the following:
  - Shuttle buses that would be provided to transport staff reducing the need for private vehicle use;
  - Medium and Heavy Rigid Trucks would be used to deliver raw materials and smaller plant;
  - Truck and Dog vehicles would be used to transport earthwork material to/from the site; and
  - Articulated Vehicles (19.0m semi-trailers) would be used to transport larger plant.

Restricted Access Vehicles / oversized and overmass (OSOM) vehicles would be required for the delivery of larger plant to the site such as the substation transformer and are subject to separate permit applications and regulations. The impacts of the OSOM vehicles are discussed within Section 5 with the following assessment focusing on the impacts of the light and heavy vehicles which generate the bulk of the traffic and represent the typical traffic impact of the project on a day-to-day basis.

The construction traffic volumes for the project have been provided by the proponent. It is anticipated that during peak construction the site could generate up to 246 light and 208 heavy vehicle movements per day. It is noted that a vehicle movement is classified as a vehicle travelling in one direction (i.e. a truck accessing the site would generate one movement towards the site and one movement away from the site when it departs).

Table 2 summarises the total traffic movements during the construction period of the solar farm by all construction activities.

**Table 2: Traffic Generation During Peak Construction Periods**

| Vehicle Type | Average Construction Period | | Peak Construction Period | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle (car / 4WD) | 207 | 94 | 246 | 115 |
| Shuttle Bus | 14 | 7 | 20 | 10 |
| MRV/HRV | 16 | 6 | 24 | 8 |
| Truck and Dog/AV | 98 | 14 | 164 | 26 |
| **Total** | **335** | **120** | **454** | **159** |

Overall, the site is expected to generate approximately 159 vehicle movements during the morning and evening peak hours during the peak construction period, which will reduce to 120 vehicle movements over the typical construction periods.

## 3.2 Traffic Distribution

Traffic accessing the site will do so via the accesses located on Bridport Road at the southern end of the site and Soldiers Settlement Road near the northern end of the site. Some vehicle traffic will utilise an access on Musk Vale Road to access the transmission line between Bridport Road and Musk Vale Road. Light vehicle traffic to the site is predominantly generated by the workforce accessing and departing the site in the morning and evening peak period, while heavy vehicle traffic is divided between the construction activities listed above. The access routes are shown within Figure 5 and Figure 6.

**Figure 5: Southern Access Routes vis Bridport Road**

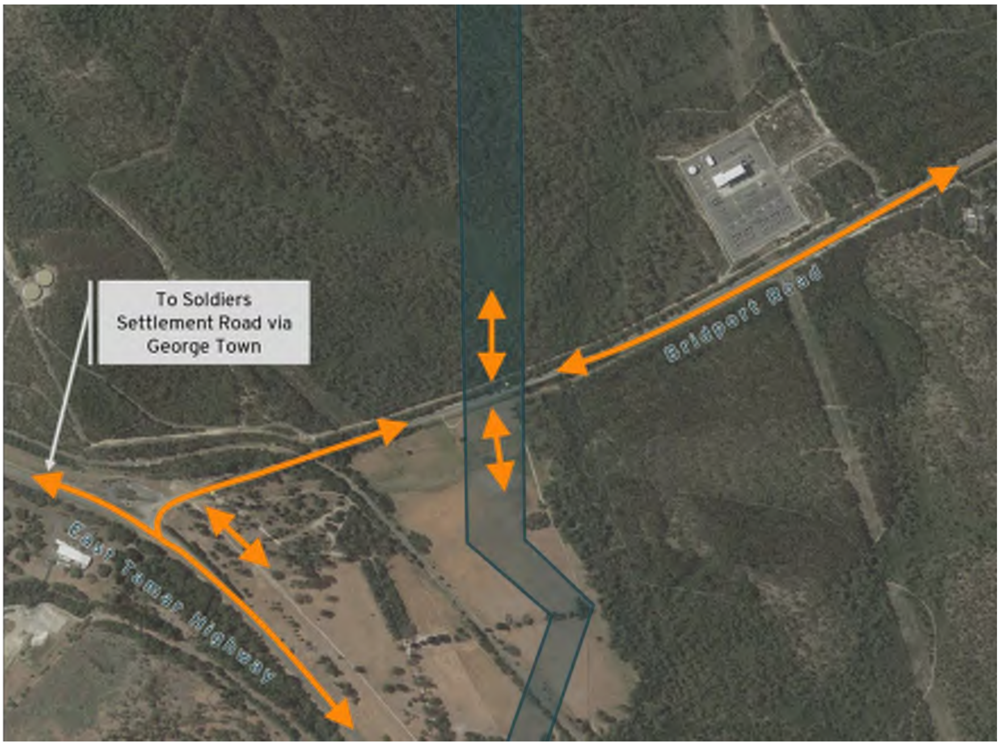
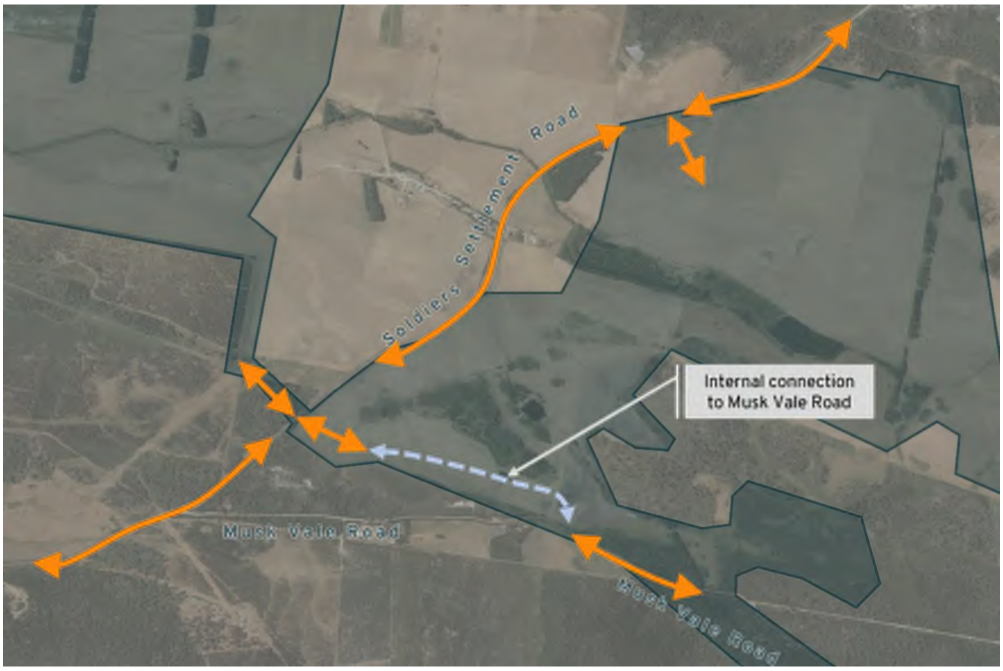


**Figure 6: Northern Access Routes via Soldiers Settlement Road**




The construction of the solar farm can be separated into a number of key activities with each of the activities gaining access via a range of access locations resulting in the traffic movements presented within Table 2 being distributed on the wider road network.

The following construction activities have been identified as part of the proposed solar farm construction:

- Substation construction;
- Transmission line construction – via Soldiers Settlement Road;
- Transmission line construction – via Bridport Road;
- Solar farm quarry traffic; and
- Solar farm personnel traffic and material, plant and equipment delivery.

Traffic volumes expected during the solar farm construction have been supplied by the proponent for each of the construction activities identified above. The traffic volumes have been calculated to a high level of accuracy using forecasted scheduling and origin/destination data for materials and equipment deliveries.

Utilising the information provided by the proponent, the traffic volumes for the various construction activities have been distributed on the road network in order to determine the total traffic movements on the surrounding roads. The analysis of the construction traffic distribution is presented within Appendix A.

The expected traffic distribution for all site traffic in the morning peak hour during the peak construction period is shown in Figure 7.

**Figure 7: Peak Hour Traffic Generation During Peak Construction Period**


The peak hour for construction will occur at the start and end of the day when staff are transported to/from the site. The majority of staff will typically arrive on-site between 6:00am and 7:00am. However, staff generally have staggered finish times which results in the evening peak hour being less pronounced. For the purposes of this assessment, it has been assumed that all staff depart between 5:30pm and 6:30pm and the evening peak traffic volumes are 80% of the morning peak volume. Accordingly, the morning peak hour represents the worst-case scenario.

## 3.3 Traffic Assessment

Level of Service is a qualitative measure used to describe the operating conditions of a section of road or an intersection. Levels of Service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) and represent the perception of the road conditions by motorists including speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety.

Figure 4.1 of the *Austroads Guide to Traffic Management Part 3: Transport Study and Analysis Methods* specifies the Level of Service based on average passenger car speeds and the flow rate (i.e. number of vehicle movements). However, the figure does not allow for variation in the road topography, such as the variation in road performance between flat and mountainous areas, or a variation in the number of heavy vehicles on the road network.

The *RTA Guide to Traffic Generating Developments* (RTA Guide), dated 2022, provides a generally accepted standard for determining the operational level of service for mid-block traffic volumes. Table 4.5 of the guide sets out two-way hourly road capacities for two-lane roads for different levels of service, with a design speed of 100 km/hr, based on different terrain types and varying percentage of heavy vehicles. The table provides an indication of the levels of service based on the expected traffic volumes.

Given the document allows for changes in road topography and heavy vehicle percentages it is considered to provide a more robust and accurate assessment of the Level of Service of a road compared to the Austroads Guide. Therefore, the assessment of Level of Service has been based on Table 4.5 of the RTA Guide. The traffic volumes under existing conditions and peak construction conditions are set out in Table 3 along with the resulting Level of Service.

**Table 3: Peak Hour Flow Level of Service**

| Road Name | Critical Lane Traffic Volume During AM Peak Hour and Peak Construction Period | | | | | |
|---|---|---|---|---|---|---|
| | Existing Traffic (HV%) | Project Traffic | Total Traffic | Total % Heavy Vehicles | Existing Level of Service | Project Level of Service |
| East Tamar Highway | 835* (17%) | 123 | 958 | 18% | B | C |
| Bridport Road | 198* (29%) | 16 | 214 | 29% | A | A |
| North Street/ Soldiers Settlement Road | 45* (30%)˜ | 107 | 152 | 22% | A | A |

* *AM Peak hour traffic estimated as 15% of AADT*
˜ *Assumed heavy vehicle percentage*

East Tamar Highway is estimated to be carrying in the order of 835 vehicles in the peak hour with 17% heavy vehicles. Peak construction traffic is expected in increase the volume by 123 vehicles to approximately 958 vehicles with a resultant heavy vehicle percentage of 18%. Based on the RTA Guide, the existing Level of Service is B which is expected to change to Level of Service C during peak construction.

*Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis* states that Level of Service C is in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. It also suggests that ideally rural roads should not exceed service volumes at Level of Service C. Accordingly, East Tamar Highway is expected to operate with acceptable conditions during peak construction.

Bridport Road is currently estimated to be carrying in the order of 198 vehicles per hour in the peak hour with a heavy vehicle percentage of 29%. During peak construction the traffic volume would increase to approximately 214 vehicles movements per hour, which is captured under level of service A. The traffic volumes can be readily accommodated on the road network and Bridport Road is expected to continue to operate with a good level of service.

North Street and Soldiers Settlement Road are expected to accommodate up to an additional 107 peak hour vehicle movements during the peak construction period. Given the existing road cross sections and condition it is expected that these roads will be able to accommodate the increase in traffic volume and the operating level of service is expected to remain at A.

Accordingly, it is concluded that the road network is able to accommodate the traffic generated by the solar farm during the construction period.

## 3.4 Cumulative Traffic Impacts

A review has been undertaken for any other renewable projects in the surrounding area.

Equis is developing a 42MW wind farm in Low Head, Tasmania. The project has fully secured development approval. Low Head Wind Farm is located to the north of the proposed Cimitiere Solar Farm. The site is understood to be accessed via East Tamar Highway.

The traffic assessment provided within this report demonstrates that the surrounding road network is expected to continue to operate with a good level of service with ample spare capacity. In the event construction for the two projects did overlap the combined increase in traffic generated by the solar farm and the Low Head Wind Farm project is expected to have a minimal cumulative impact on the road network.

## 3.5 Operational Traffic

During operation the solar farm is expected to generate a minimal level of traffic associated with maintenance and operation services. The site is expected to be operated by up to 10 staff resulting in a traffic generation of up to 20 vehicle movements per day spread across the solar farm, transmission lines and substation which would result in a negligible change to the traffic environment.

# 4. Site Access

Access to the solar farm development is proposed via Bridport Road and Soldiers Settlement Road, with an additional access onto Musk Vale Road that provides connectivity to the transmission line area. The Musk Value Road access will be connected internally from Soldiers Settlements Road. The indicative site access locations are shown in Figure 8 and Figure 9.

**Figure 8: Indicative Site Access Locations (North)**


**Figure 9: Indicative Site Access Locations (South)**


The coordinates of each of the site accesses are provided in Table 4.

The accesses have been assessed and designed to accommodate 19.0 metre semi-trailer vehicles, with concept plans provided in Appendix B. An assessment of each of the access locations and intersections is provided below.

**Table 4: Access Locations**

| Access ID | Northing (m S) | Easting (m E) |
|---|---|---|
| SSR1 | 5452991 | 488467 |
| SSR2 | 5453009 | 488447 |
| SSR3 | 5454183 | 489958 |
| MVR1 | 5452583 | 489566 |
| BR1 | 5447958 | 489945 |
| BR2 | 5448139 | 490500 |
| BR3 | 5448166 | 490497 |

### 4.1.1 Bridport Road Access

Access to the site from Bridport Road is proposed via 3 access locations, BR1, BR2, and BR3. All accesses are designed to accommodate 19.0 metre semi-trailer vehicles with swept path assessments provided within Appendix B demonstrating these vehicles are able to access the site.

#### *4.1.1.1 BR1 Access*

BR1 Access is located 100 metres east of the East Tamar Highway/Bridport Road intersection. The access is already established with existing road widening to support turning movements. The access is located in close proximity to the intersection of East Tamar Highway/Bridport Road which results in lower approach vehicle speeds and improved safety for vehicle movements in and out of the access.

#### *4.1.1.2 BR2 Access*

BR2 Access is located on the south side of Bridport Road and supports access to the transmission line area of the development. The access is proposed approximately 130 metres east of an existing access point in order to provide suitable sight distance for exiting vehicles. The new access is intended to replace the existing access and will support 19.0 metre semi-trailer vehicles turning to/from the east and west.

#### *4.1.1.3 BR3 Access*

BR3 Access is located on the north side of Bridport Road, opposite BR2 access. The access is proposed to accommodate access for 19.0 metre semi-trailer vehicles turning to/from the east and west.

### 4.1.2 Soldiers Settlement Road Accesses

Soldiers Settlement Road accommodates 3 access to the site: SSR1 and SSR3 provide access to the eastern part of the site, and SSR2 provides access to the western section of the site. The Soldiers Settlement Road accesses are expected to accommodate in the order of 67 one-way movements each in the peak hour during the peak construction period. Based on the expected traffic volumes the accesses are proposed to be constructed to accommodate up to 19.0 metre semi-trailer vehicle movements with manoeuvring and passing to be managed within the site. The accesses are to be sealed within 25 metres of the road. SSR1 provides an internal connection to MVR1, described in the following section.

### 4.1.3 Musk Vale Road Access

The Musk Vale Road access, MVR1, will be connected internally via Soldiers Settlement Road. With this arrangement, vehicles accessing the transmission line area will enter the site via Soldiers Settlement Road and exit onto Musk Vale Road before continuing south, and no site vehicles will use of the section of Musk Vale Road between Soldiers Settlement Road and this site access.

The access is expected to accommodate up to 21 one-way vehicle movements in each of the peak hours during the peak construction period, with the majority of movements travelling south and exiting the site onto Musk Vale Road in the morning, and the reverse in the afternoon. Based on the traffic volumes Musk Vale Road access is proposed to be constructed to accommodate up to 19.0 metre semi-trailer vehicles with manoeuvring and passing to be managed within the site.

### 4.1.4 George Town Power Substation

The proposed upgrades to the George Town Power Substation will be accessed via East Tamar Highway, and the existing access is suitable for heavy vehicles. The access route will not significantly impact the traffic in the area. However, appropriate traffic management measures will be considered during the construction period to ensure the safety of road users and workers.

## 4.2 Sight Distance

*Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* specifies the Safe Intersection Sight Distance (SISD) as the minimum sight distance which should be provided along the major road at any intersection. Table 3.2 of the guide specifies the SISD required for various design speeds.

The available sight distance at the site access is illustrated within Appendix C and demonstrates that the sight distance meets the Austroads requirements and vehicles are expected to be able to safely enter and exit the site. The required and available sight distance of each access is summarised in Table 5 with design speeds adopted from on-site observations.

**Table 5: Safe Intersection Sight Distance**

| Access | Design Speed | Required Sight Distance | Minimum Available Sight Distance |
|---|---|---|---|
| SSR1 | 100km/h | 248m | +248m |
| SSR2 | 100km/h | 248m | +248m |
| SSR3 | 100km/h | 248m | +248m |
| MVR1 | 50km/h | 97m | >100m |
| BR1 – West Approach | 42km/h* | 78m | 89m |
| BR1 – East Approach | 100km/h | 248m | +248m |
| BR2 | 100km/h | 248m | +248m |
| BR3 | 100km/h | 248m | +248m |

**Based on intersection speed of 20km/h and average acceleration rate for a passenger vehicle of 1.44m/s$^2$.*

As such, it is considered that vehicles are able to safely exit the site onto the surrounding road network.

# 5. Route Assessment

## 5.1 Delivery Port

The ports of Burnie, Devonport and Bell Bay have been identified as the location where the solar farm plant will be imported. The proposed construction traffic access routes from the ports to the site is expected to be via the Bass Highway (Highway 1) and Frankford Road (B71) for trucks over 42 tonnes and under 42 tonnes, respectively. The routes are shown in Figure 10 and Figure 11.

**Figure 10: Proposed Route to Site from Burnie or Devonport for Trucks Under 42 Tonnes**


*Source: Google Maps*

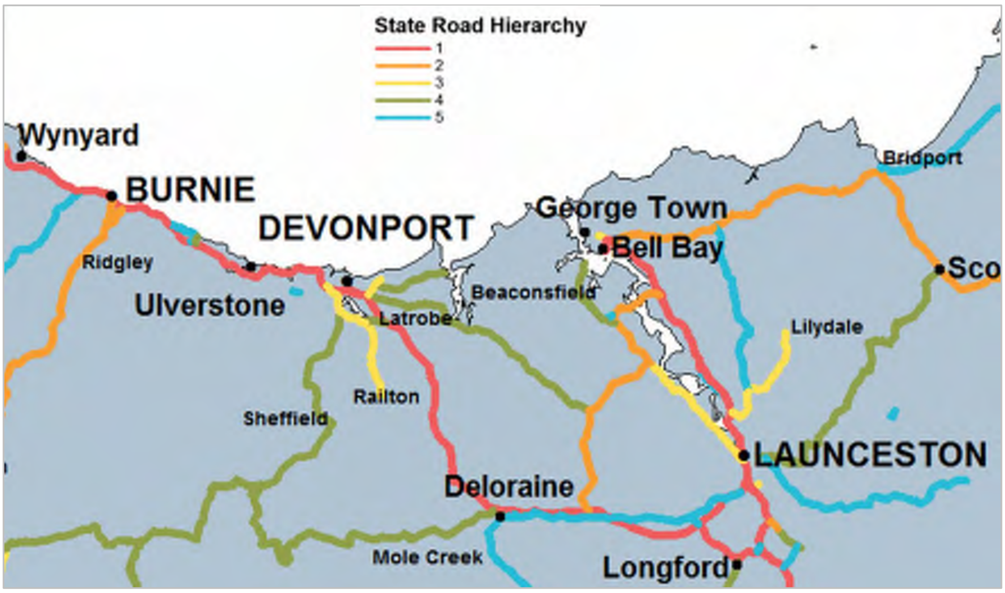
**Figure 11: Proposed Route to Site from Burnie or Devonport for Trucks Over 42 Tonnes**


*Source: Google Maps*

All roads along the proposed routes are classified as state roads under the Tasmanian State Road hierarchy, as shown in Figure 12. Accordingly, the access routes are suitable to accommodate the loads and type of vehicle movement to be generated during construction of the solar farm.

It is also noted that some oversize and overmass vehicles will be required to deliver larger plant to the site such as the sub-station transformer and earthmoving equipment. The vehicles are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known.

**Figure 12: State Road Hierarchy**




*Department of State Growth, Tasmania*

## 5.2 Intersection Assessment

The North Street intersection with East Tamar Highway is recommended to be upgraded to accommodate 19.0m semi-trailer vehicles. A concept plan of the upgrade area is provided in Appendix D which has been based on a swept path assessment for the design vehicle.

## 5.3 Local Road Network

North Street, Soldiers Settlement Road, and Musk Vale Road make up the local road network required to access the site. North Street and Soldiers Settlement Road are sealed roads and their capacity under peak construction traffic has been discussed in Section 3.3 and are considered suitable. Musk Vale Road is an unsealed road and has been assessed under the following criteria.

The *Australian Road Research Board Best Practice Guide for Unsealed Roads 2* (ARRB Guide), dated October 2020, provides a breakdown of the unsealed road classifications based on a functional classification system which is reflective of the approach taken within the Austroads Guidelines. A summary of the classifications outlined within Table 3.9 of the ARRB Guide is provided below.

**Table 6: Unsealed Roads Classification System (ARRB Guide)**

| Road Class | Class Type | Service Function Description | Road Type Description |
|---|---|---|---|
| 4A | Main Road<br>> 150 vpd | This type of road is used for major movements between population centres and connection to adjacent areas. High traffic volumes occur, and the road can carry large vehicles. | • All weather road, predominantly two-lane and unsealed. Can be sealed if economically justified.<br>• Operating speed standard of 50–80 km/h according to terrain.<br>• Minimum carriageway width is 7m. |
| 4B | Minor Road<br>50-150 vpd | This type of road is used for connection between local centres of population and links to the primary network. | • All-weather two-lane road formed and gravelled or single-lane sealed road with gravel shoulders.<br>• Operating speed standard of 30–70 km/h according to terrain.<br>• Minimum carriageway width is 5.5m. |
| 4C | Access Road<br>10-50 vpd | Provides access to low use areas or individual rural property sites and forest areas. Caters for low travel speed and a range of vehicles and may be seasonally closed. | • Substantially a single lane two-way, generally dry weather, formed road.<br>• Operating speeds standard of < 20–40 km/h according to terrain.<br>• Minimum carriageway width is 4m. |
| 4D | Tracks<br>< 10 vpd | Mainly used for fire protection purposes, management access and limited recreational activities. | • Predominantly a single-lane two-way earth track (unformed) at or near the natural surface level.<br>• Predominantly not conforming to any geometric design standards.<br>• Minimum cleared width is 3m. |

During peak construction Musk Vale Road is expected to accommodate up to an additional 95 vehicle movements per day, resulting in a total of up to 115 vehicles per day.

Unsealed roads would typically be considered for sealing when they accommodate between 200 and 500 vehicle movements per day. The ARRB Guide notes that roads may warrant paving when maintenance costs increase to unacceptable levels, in wet climates, or when economic or social benefits are evident. Given the expected traffic volume Musk Vale Road is less than 200 vehicles per day and the increase in traffic is only temporary it is considered acceptable for Musk Vale Road to remain unsealed.

It is recommended that Musk Vale Road is upgraded with a combination of passing bays and road widening to 5.5 metres to suitably accommodate construction vehicle traffic. It is anticipated that appropriate treatments will be determined by onsite investigations prior-to and during the construction period.

## 5.4 Mitigation Measures

A Construction Traffic Management Plan (CTMP) will be prepared prior to construction of the site. It is recommended that the following form part of the CTMP to minimise the impact of construction traffic along the unsealed roads:

- Prior to construction, a pre-condition survey of the relevant sections of the existing road network be undertaken, in consultation with Council. During construction the sections of the road network utilised by the proposal are to be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the solar farm would be rectified. At the end of construction, a post-condition survey would be undertaken to ensure the road network is left in the consistent condition as at the start of construction.

- Vehicles are recommended to drive at slower speeds when travelling on unsealed roads. This can reduce the amount of dust created and the amount of dirt tracked onto the public road network. Standard mitigation measures such as a water trucks to dampen the roads and reduce the amount of dust in the air, can also be considered to reduce dust levels.
- Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.

Therefore, it is concluded that the surface and widths of the roads are suitable to accommodate the future traffic volumes.

# 6. Construction Traffic Management Plan

A Construction Traffic Management Plan (CTMP) will be prepared prior to construction commencing by the appointed contractor. The CTMP will provide additional information regarding the traffic volumes and distribution of construction vehicles that is not available at this time, including:

- Road transport volumes, distribution and vehicle types.
- The origin, destination and routes for:
  - Employee and contractor light traffic.
  - Heavy vehicle traffic.
  - Oversize and overmass traffic.

The following provides recommended measures that should be adopted within the CTMP to minimise the impact of construction traffic along the road network:

- Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.
- Loading and unloading is proposed to occur within the work area. No street or roads will be used for material storage at any time.
- All vehicles will enter and exit the site in a forward direction.
- Management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following is to be implemented as a measure to maintain safety within the site:
  - Utilisation of only the designated transport routes.
  - Establishment of a Driver Code of Conduct.
- Implementation of a proactive erosion and sediment control plan for on-site roads, hardstands and laydown areas.
- All permits for working within the road reserve must be received from the relevant authority prior to works commencing.
- A map of the primary haulage routes.
- An induction process for vehicle operators and regular toolbox meetings.
- A complaint resolution and disciplinary procedure.
- Local climatic conditions that may impact road safety of employees throughout all project phases (e.g. fog, wet and significant dry, dusty weather).

The above recommendations will ensure the construction traffic will create a minimal impact to the capacity and safety of the surrounding road network.

# 7. Conclusion

Amber has assessed the traffic impacts of the 288MW solar farm located approximately 4 kilometres northeast of George Town. Access to the site will be provided via a range of new and existing accesses via Bridport Road, Soldiers Settlement Road, and Musk Vale Road. Construction workers will primarily be located in George Town and Launceston with all plant expected to be delivered from Devonport, Burnie and Bell Bay. The above assessment determined the following:

- The site will generate up to 159 vehicle movements in the peak hour during peak construction times, including 44 heavy vehicle movements;
- The road network is able to accommodate the traffic generated by the development during the construction and operation stages;
- The site accesses have been designed to accommodate 19.0m semitrailer vehicles.
- Intersection widening is proposed for the North Street/ East Tamar Highway intersection in order to accommodate the largest design vehicle expected to access the site.
- A combination of road widening, passing bays, and traffic management is recommended for Musk Vale Road between Soldiers Settlement Road and the site access in order to allow vehicles to safely and efficient access the site. The appropriate treatments will be determined by future on-site investigation.
- The proposed construction traffic access route from Devonport and Burnie to the site is proposed to utilise the State Road Network. The roads are suitable for general access 19.0m semitrailer vehicles and as such, the access route is able to accommodate the loads and type of vehicle movement to be generated during construction of the solar farm;
- It is noted that some oversize and overmass vehicles will be required to deliver larger plant to the site such as the sub-station transformer and earthmoving equipment. The vehicles are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known; and
- In order to mitigate the impacts of the development during construction a CTMP will be prepared which should include the recommendations provided within this document.

Accordingly, based on the assessment above, it is concluded that the proposed access arrangements for the solar farm are suitable to accommodate the expected construction vehicle types and traffic volumes during the construction and operation phase of the project.

# Appendix A

## Construction Activities Traffic Generation

# 1. Traffic Generation

The following construction activities have been identified as part of the proposed solar farm construction:

- Substation construction;
- Transmission line construction
- Solar farm quarry traffic; and
- Solar farm personnel traffic and material, plant and equipment delivery.

Traffic generation for each of the construction activities has been calculated to a high level of accuracy using forecasted scheduling and origin/destination data for materials and equipment deliveries. It is expected that the peak accommodation requirement for the workforce will exceed the accommodation supply in George Town and as such most personnel will stay in Launceston and George Town with some personnel in Bridport and other areas.

It is assumed that the morning peak hour is between 6:00am and 7:00am whereby 95% of traffic flows toward the site and 5% of traffic flows away from the site. Traffic volumes have been rounded to one decimal place to retain representation of movements that occur on a weekly basis.

The overall traffic generation for all construction activities is summarised in Table 1.

**Table 1: Generation During Peak Construction Periods**

| Vehicle Type | Average Construction Period | | Peak Construction Period | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle (car / 4WD) | 207 | 94 | 246 | 115 |
| Shuttle Bus | 14 | 7 | 20 | 10 |
| MRV/HRV | 16 | 6 | 24 | 8 |
| Truck and Dog/AV | 98 | 14 | 164 | 26 |
| **Total** | **335** | **120** | **454** | **159** |

The following sections detail the traffic generation of each construction activity of the solar farm.

# 2. Substation Construction

Traffic generated from the substation construction will access the site via Soldiers Settlement Road, North Street and East Tamar Highway. The traffic is expected to be predominantly light vehicles with regular heavy vehicle movements. Most traffic is expected to travel from the south with truck and dog movements expected to approach from the north. Substation construction traffic is provided in Table 2 with the traffic distribution shown in Figure 1.

**Table 2: Substation Construction Traffic via Musk Vale Road**

| Vehicle Type | Average Construction Period | | Peak Construction Period | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle (car / 4WD) | 25.2 | 11.3 | 24 | 10.8 |
| Shuttle Bus | | | | |
| MRV/HRV | 6.3 | 2.5 | 6 | 1.8 |
| Truck and Dog | 6.7 | 2.2 | 16 | 4.8 |
| AV | 0.2 | 0.07 | 1.2 | 0 |

**Figure 1: Substation Construction Traffic in the Morning Peak Hour During the Peak Construction Period**

# 3. Transmission Line Construction

The transmission line construction will occur from Musk Vale Road in the north and from Bridport Road in the south. Traffic travelling to Musk Vale Road will do so via an access on Soldiers Settlement Road which is connected through to Musk Vale Road via an internal road. Transmission line construction traffic volumes are outlined in Table 3.

**Table 3: Transmission Line Construction Traffic via Musk Vale Road**

| Vehicle Type | Average Construction Period | | Peak Construction Period | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle | 29.8 | 13.4 | 34.8 | 17.4 |
| Shuttle Bus | | | | |
| Rigid Vehicles | 3.6 | 1.3 | 5 | 3 |
| Truck and Dog | 6.3 | 2.5 | 7 | 4.6 |
| AV (19m semi-trailer) | 0.5 | 0.3 | 0.6 | 0.6 |

Transmission line construction traffic accessing the site via Bridport Road is expected to do so via East Tamar Highway from the south. Transmission line construction traffic volumes accessing the site via Bridport Road are outlined in Table 4.

**Table 4: Transmission Line Construction Traffic via Bridport Road**

| Vehicle Type | Average Construction Period | | Peak Construction Period | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle | 19.8 | 8.9 | 23.2 | 11.6 |
| Shuttle Bus | | | | |
| Rigid Vehicles | 2.4 | 0.9 | 3.4 | 2 |
| Truck and Dog | 4.2 | 1.6 | 4.6 | 3 |
| AV (19m semi-trailer) | 0.3 | 0.2 | 0.4 | 0.4 |

The combined transmission line construction traffic distribution for the morning peak hour during the peak construction period is shown in Figure 2.

**Figure 2: Combined Transmission Line Construction Traffic Distribution for the Morning Peak Hour During the Peak Construction Period**

# 4. Quarry Traffic

The solar farm construction is expected to source materials from nearby quarries, generally from the north and northeast of the site. Quarry vehicles will access the site from the north down Soldiers Settlement Road. The quarry traffic volumes are set out in Table 5 with the expected traffic distribution for the morning peak hour during the peak construction period shown in Figure 3.

**Table 5: Quarry Traffic for Solar Farm Construction**

| Vehicle Type | Average Construction Period | | Peak Construction Period | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle | 12 | 6 | 24 | 12 |
| Shuttle Bus | | | | |
| Rigid Vehicles | | | | |
| Truck and Dog | 60 | 6 | 80 | 8 |
| AV (19m semi-trailer) | | | | |

**Figure 3: Quarry Construction Traffic in the Morning Peak Hour During the Peak Construction Period**

# 5. Solar Farm Traffic

Solar farm traffic is generated from workforce personnel trips to site and from material, plant, and equipment deliveries. Buses will be provided to minimise personnel trips, which are expected to access the site via Soldiers Settlement Road, via North Street and East Tamar Highway. Material, plant and equipment deliveries are expected to arrive from Bell Bay, Devonport or Burnie and access the site via East Tamar Highway, North Street, and Soldiers Settlement Road.

The solar farm construction traffic volumes are provided in Table 6 with the morning peak hour traffic volume during the peak construction period distribution shown in Figure 4.

**Table 6: Solar Farm Construction Traffic - Workforce Trips and Deliveries of Material, Plant and Equipment**

| Vehicle Type | Average Construction Period | | Peak Construction Period | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle | 120 | 54 | 140 | 63 |
| Shuttle Bus | 14 | 7 | 20 | 10 |
| Rigid Vehicles | 4 | 1 | 10 | 1 |
| Truck and Dog | | | | |
| AV (19m semi-trailer) | 20 | 1 | 54 | 5 |

**Figure 4: Solar Farm Construction Traffic Distribution for the Morning Peak Hour During the Peak Construction Period**

# Appendix B

## Site Access Design

Entry Manoeuvre

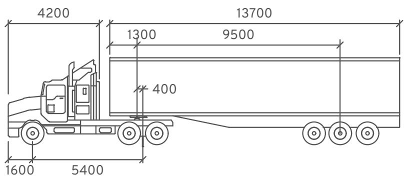
Exit Manoeuvre

Vehicle Envelope

300mm Clearance

Reverse Manoevure

AV




| | | |
|---|---|---|
| | | mm |
| Tractor Width | : | 2500 |
| Trailer Width | : | 2500 |
| Tractor Track | : | 2500 |
| Trailer Track | : | 2500 |
| Lock to Lock | : | 6.0s |
| Steering Angle | : | 28.3 |
| Articulating Angle | | 70.0 |

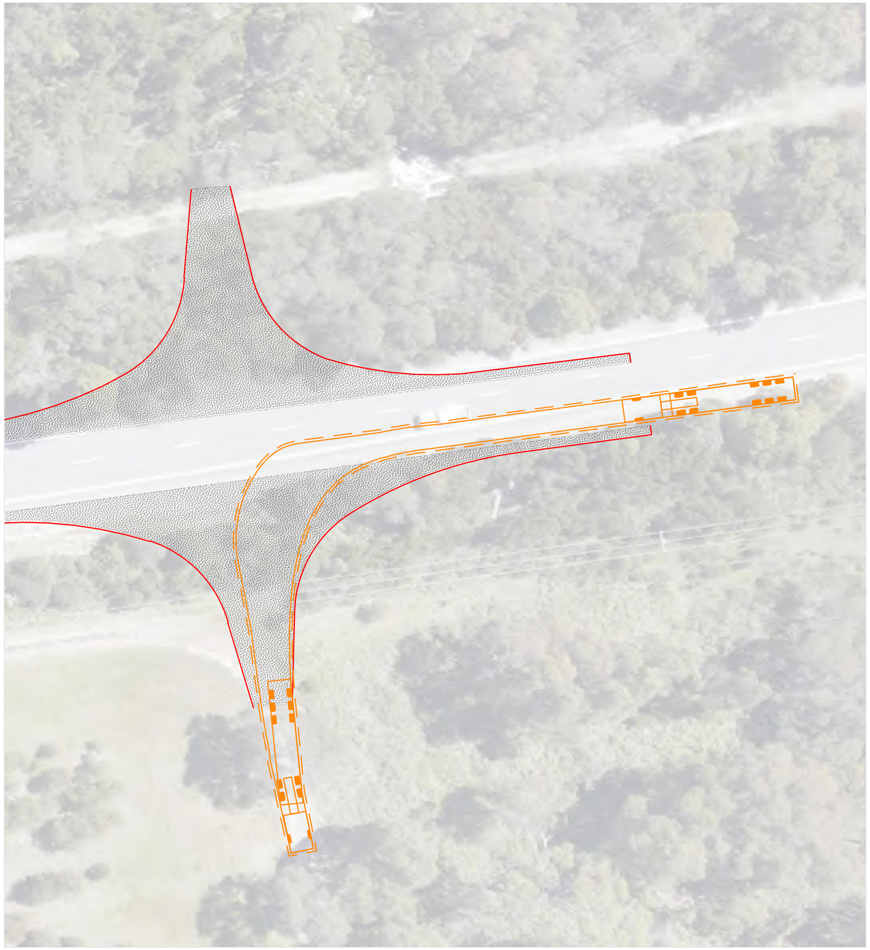
Cimitiere Solar Farm

Bridport Road Site Access - BR1

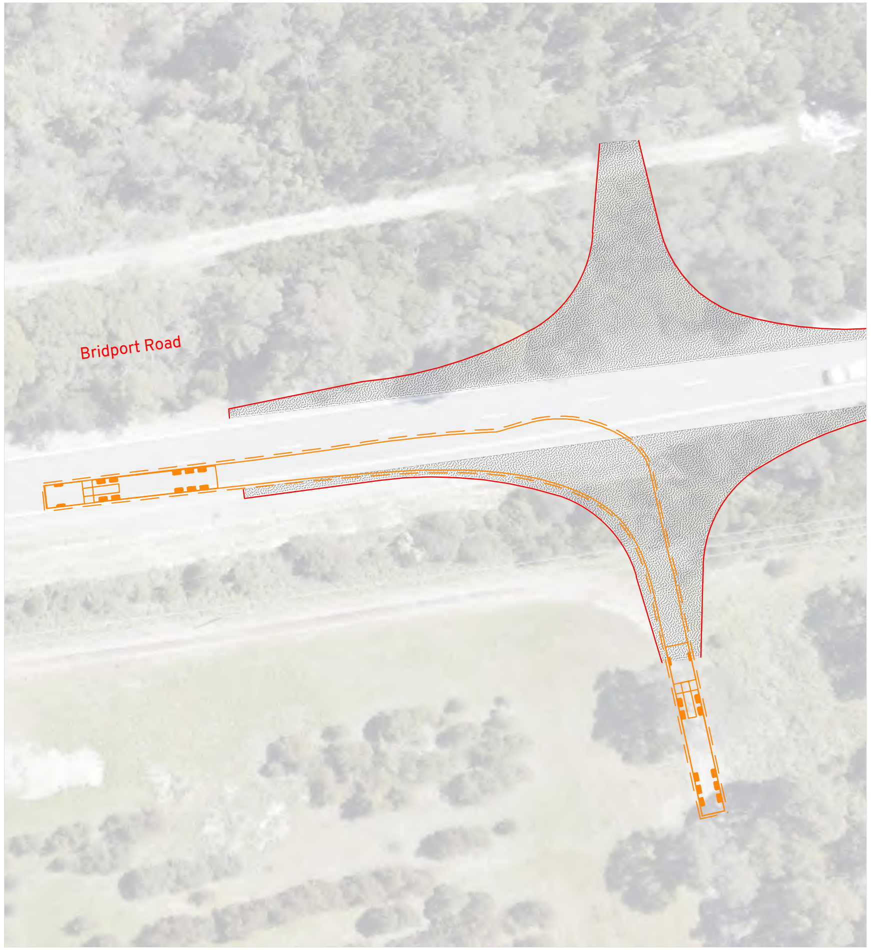
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

Amber 001



Entry Manoeuvre



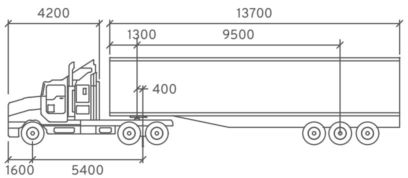

Exit Manoeuvre

Vehicle Envelope

300mm Clearance

Reverse Manoevure

AV




| | mm |
|---|---|
| Tractor Width | : 2500 |
| Trailer Width | : 2500 |
| Tractor Track | : 2500 |
| Trailer Track | : 2500 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 28.3 |
| Articulating Angle | 70.0 |

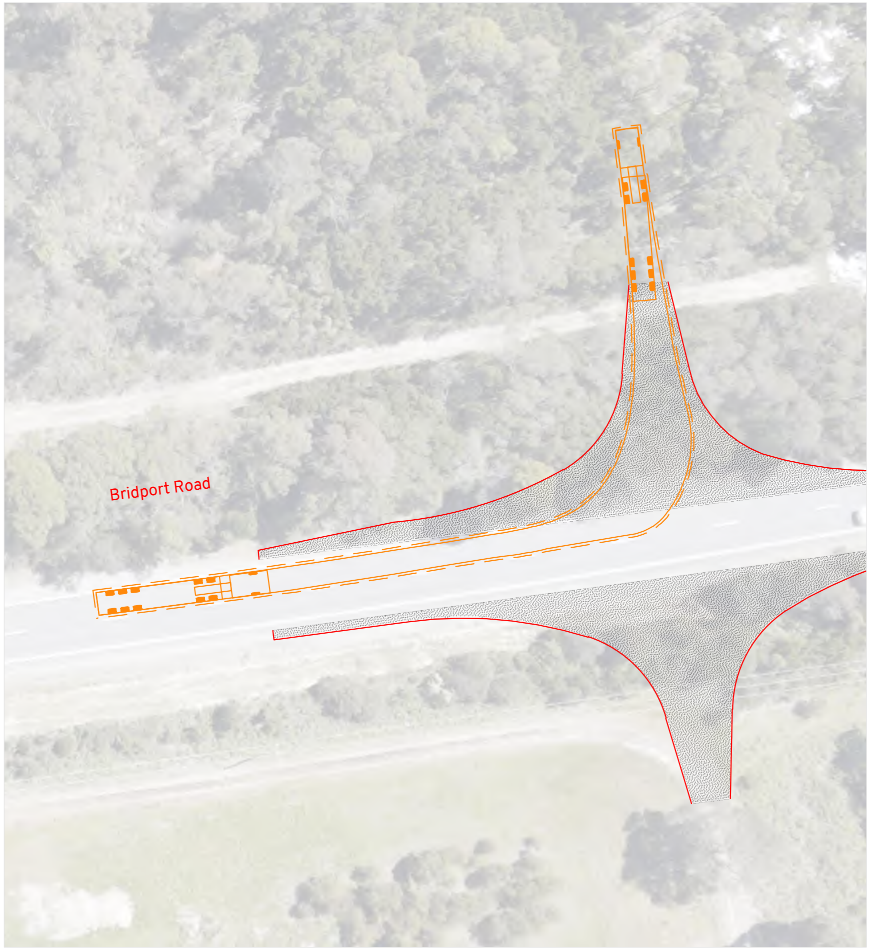
Cimitiere Solar Farm

Bridport Road South Site Access - BR2

Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

Amber 002




Entry Manoeuvre

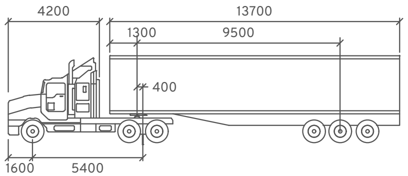
Exit Manoeuvre

Vehicle Envelope

300mm Clearance

Reverse Manoevure

AV




| | mm |
|---|---|
| Tractor Width | : 2500 |
| Trailer Width | : 2500 |
| Tractor Track | : 2500 |
| Trailer Track | : 2500 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 28.3 |
| Articulating Angle | 70.0 |

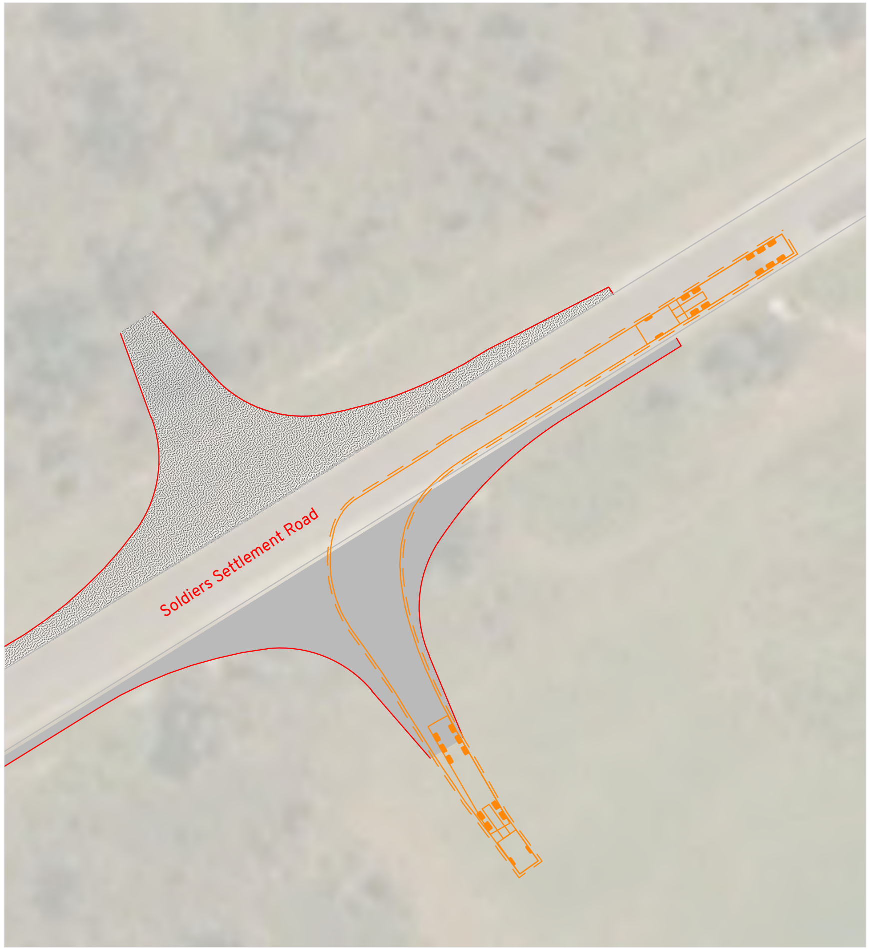
Cimitiere Solar Farm

Bridport Road North Site Access - BR3

Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

Amber 003

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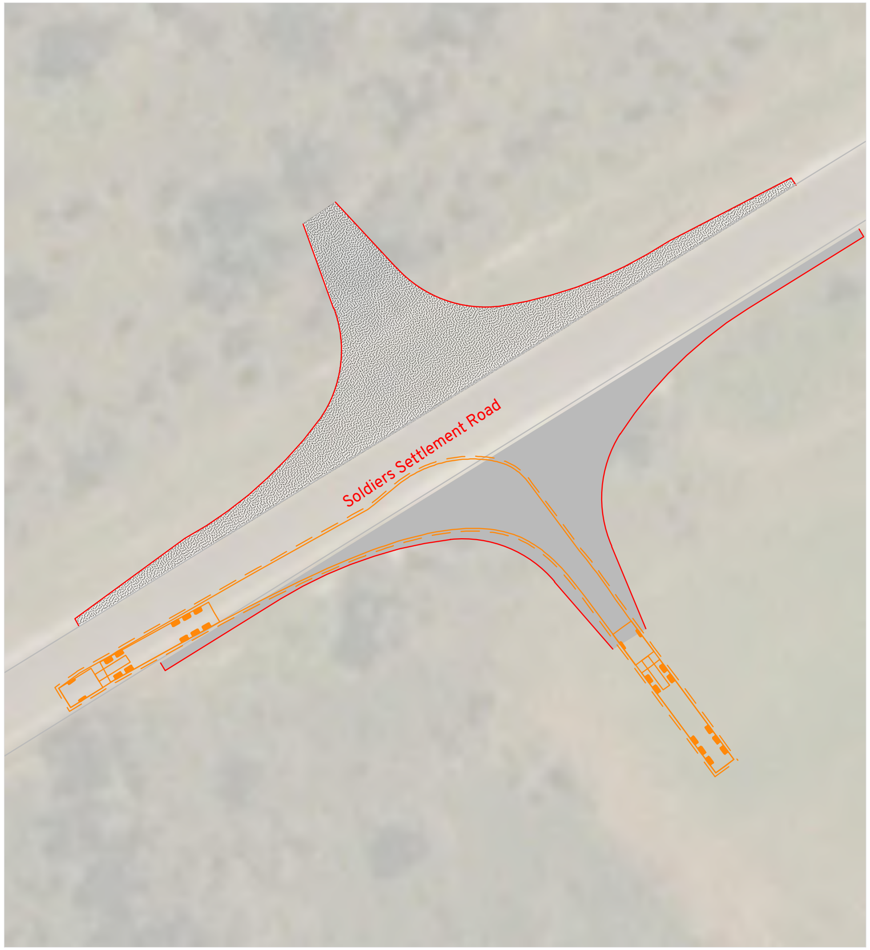


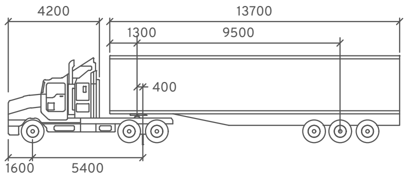

Exit Manoeuvre

Vehicle Envelope

300mm Clearance

Reverse Manoevure

AV

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|---|---|
| Tractor Width | : 2500 |
| Trailer Width | : 2500 |
| Tractor Track | : 2500 |
| Trailer Track | : 2500 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 28.3 |
| Articulating Angle | 70.0 |

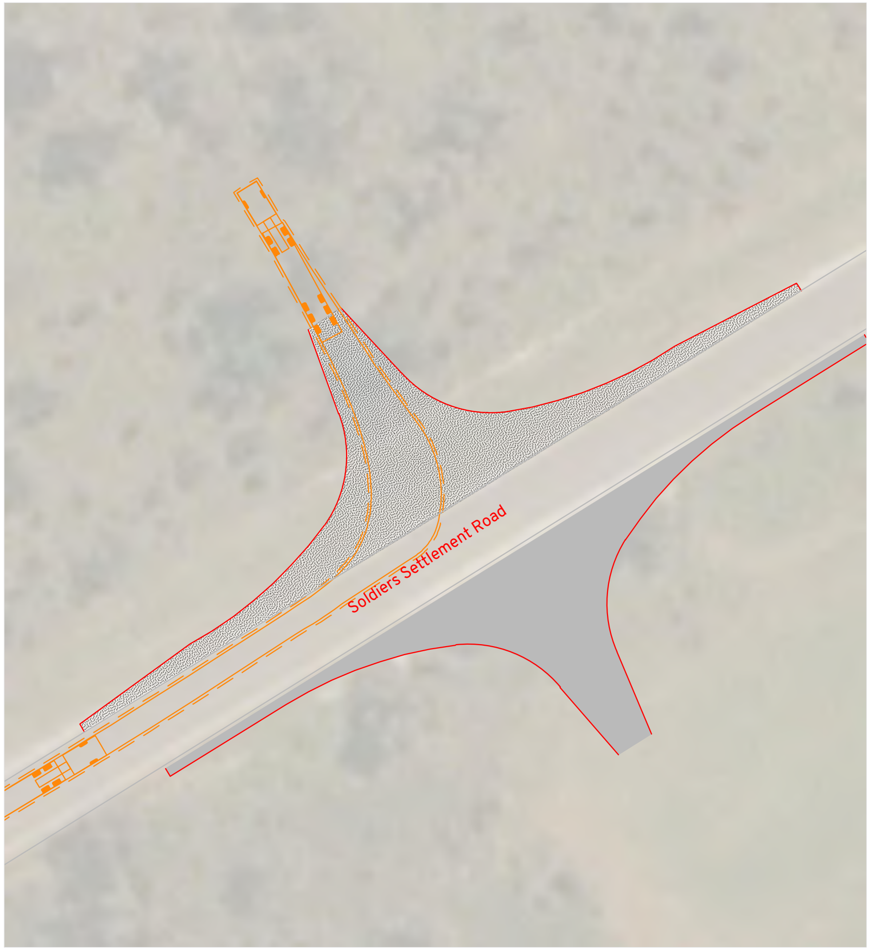
Cimitiere Solar Farm

Soldiers Settlement Road South Site Access - SSR1

Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

Amber 004



Entry Manoeuvre

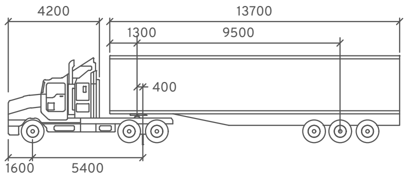
Exit Manoeuvre

Vehicle Envelope

300mm Clearance

Reverse Manoeuvre

AV




| | mm |
|---|---|
| Tractor Width | : 2500 |
| Trailer Width | : 2500 |
| Tractor Track | : 2500 |
| Trailer Track | : 2500 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 28.3 |
| Articulating Angle | 70.0 |

Cimitiere Solar Farm
Soldiers Settlement Road North Site Access - SSR2
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

005


Entry Manoeuvre

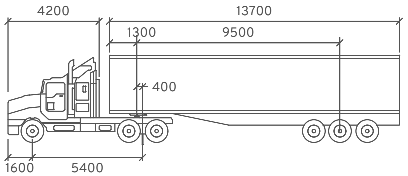

Exit Manoeuvre

Vehicle Envelope

300mm Clearance

Reverse Manoeuvre

AV

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| Trailer Width | : | 2500 |
| Tractor Track | : | 2500 |
| Trailer Track | : | 2500 |
| Lock to Lock | : | 6.0s |
| Steering Angle | : | 28.3 |
| Articulating Angle | | 70.0 |

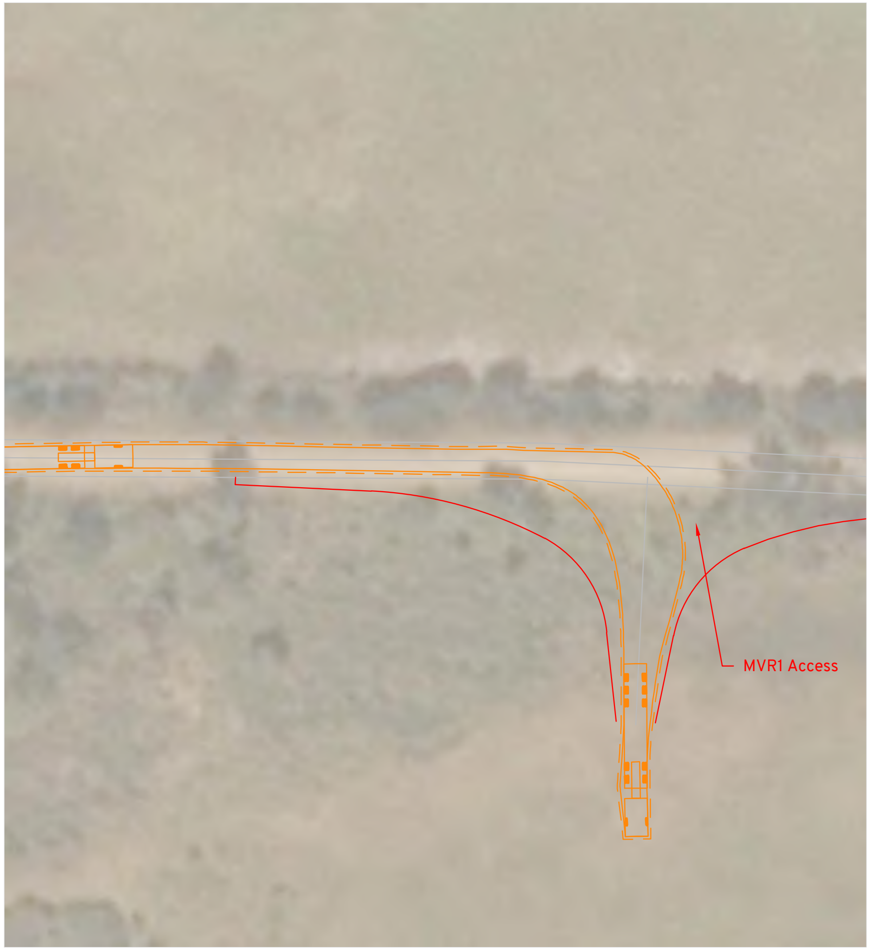
Cimitiere Solar Farm

Soldiers Settlement Road South Site Access - SSR3

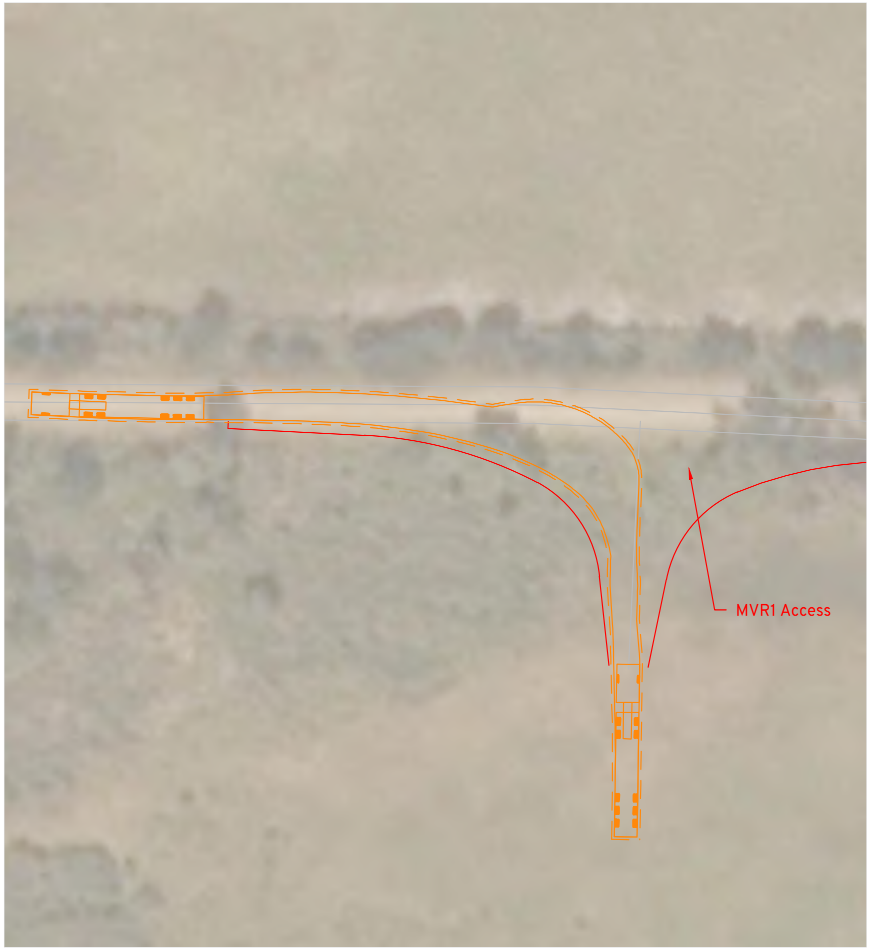
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

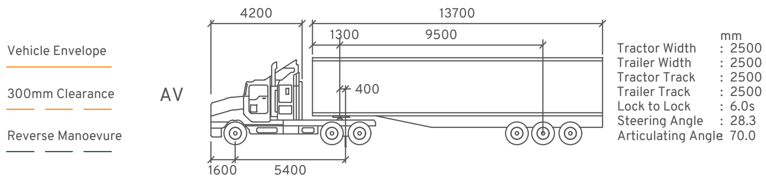
Amber 006




Entry Manoeuvre



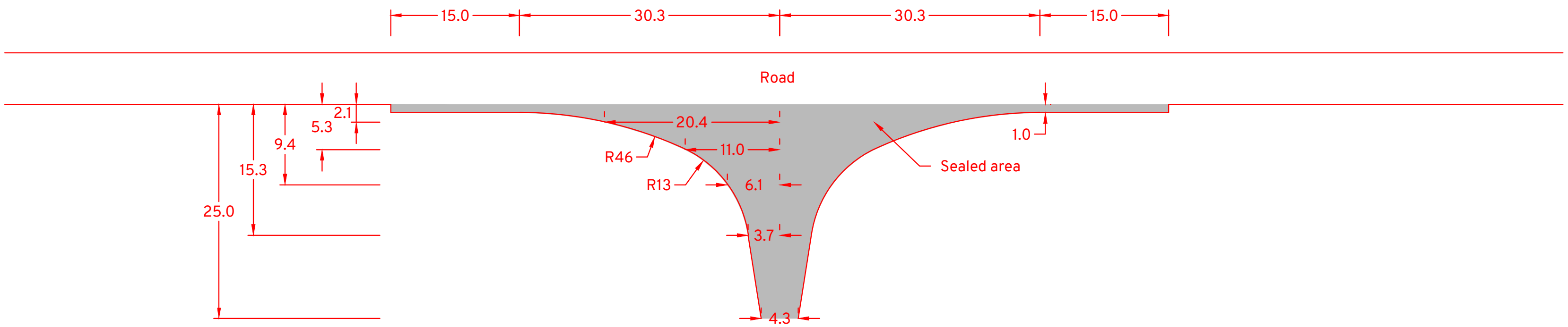

Exit Manoeuvre




Cimitiere Solar Farm
Musk Vale Road Site Access - MVR2
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

Amber 007




Notes

1. The diagram is a guide for a typical layout of a driveway access for a rural property.
2. Slight variations may occur after site inspection, analysis and approval of the location.
3. Pavement materials and earthwork layers need to be in accordance with local government specification requirements.
4. A traffic management plan must comply with the road management act and applicable codes in relation to any works undertaken within the road reserve.
5. Truck warning signs & guide posts should be installed in accordance with Austroads Guide to Traffic Management.
6. The driveway access construction and maintenance is the responsibility of the property owner. Maintenance also includes associated drainage works.

Typical vehicle access setout dimensions

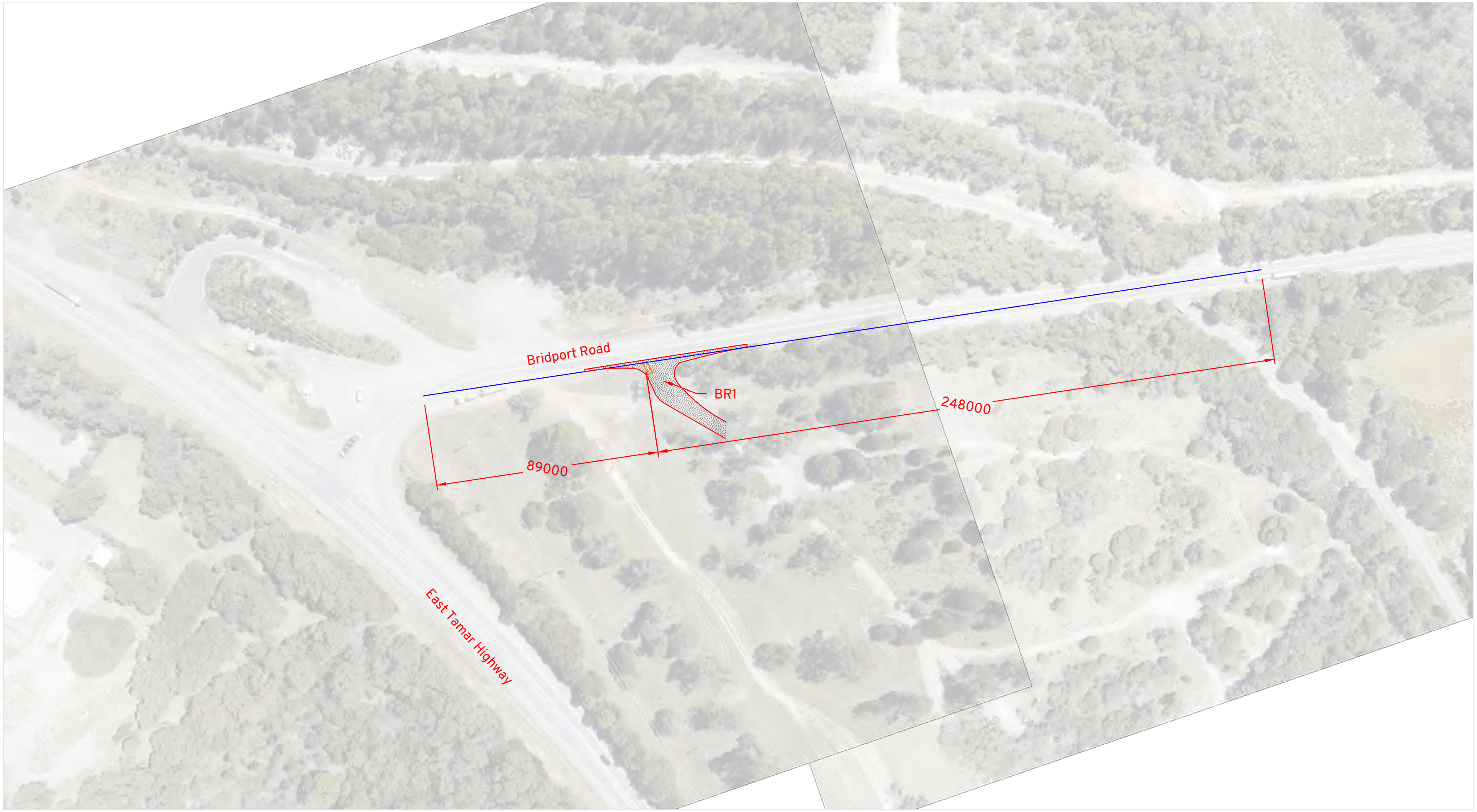
Cimitiere Solar Farm
Typical Site Access
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

Amber 010

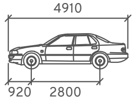
# Appendix C

## Sight Distance Assessment




Sight Line

B85




| | mm |
|---|---|
| Width | : 1870 |
| Track | : 1770 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 34.1 |
| Height | : 2100 |

Cimitiere Solar Farm

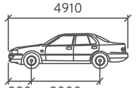
Bridport Road Road Site Access - BR1

Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:1500

Amber 101


Sight Line

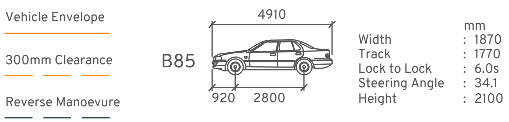



| | mm |
|---|---|
| Width | : 1870 |
| Track | : 1770 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 34.1 |
| Height | : 2100 |

Cimitiere Solar Farm
Soldiers Settlement Road South Site Access
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:1500

Amber 102


Cimitiere Solar Farm
Soldiers Settlement Road North Site Access
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:1500

Amber 103


Sight Line

B85

4910

920 2800

| | mm |
|---|---|
| Width | : 1870 |
| Track | : 1770 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 34.1 |
| Height | : 2100 |

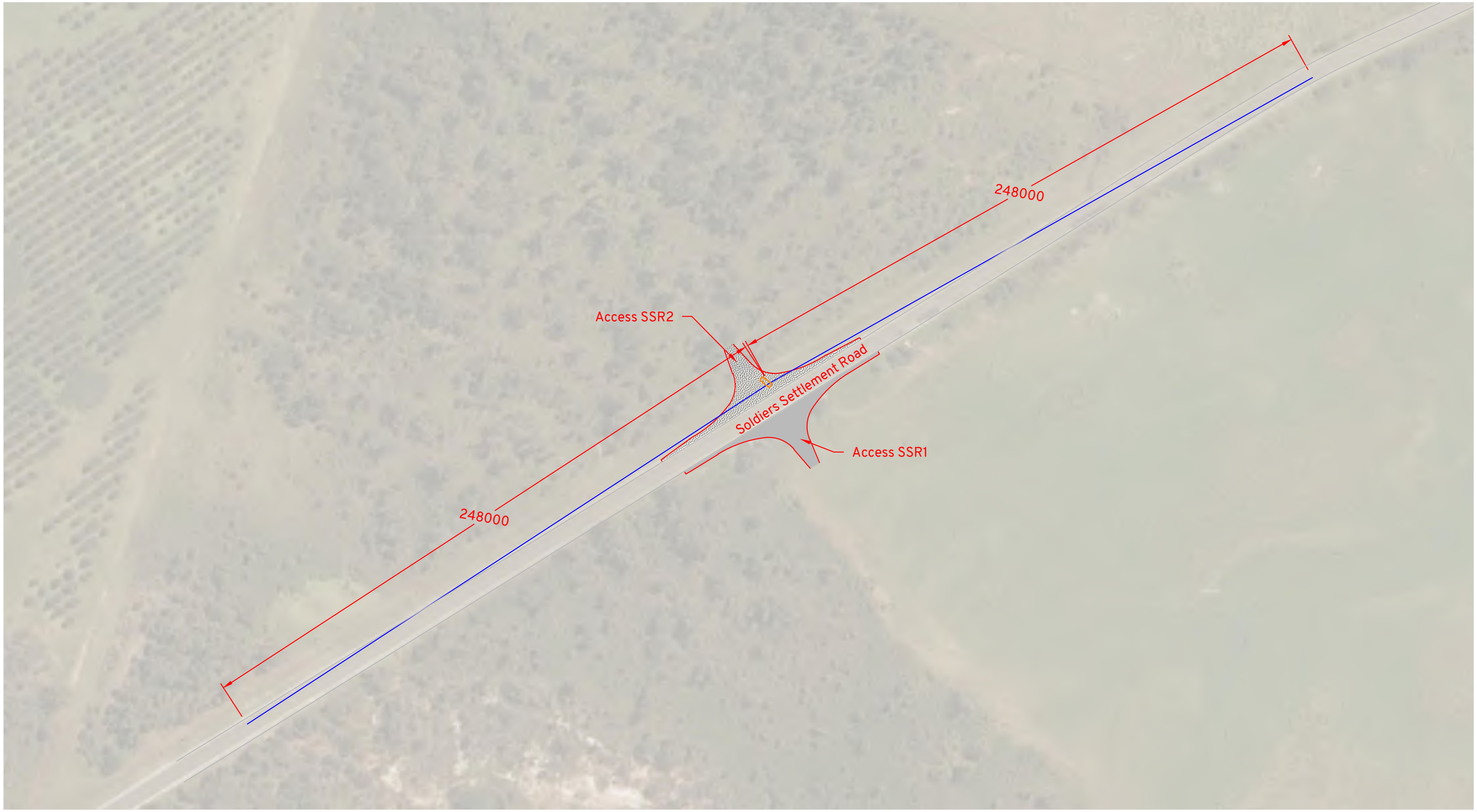
Cimitiere Solar Farm

Soldiers Settlement Road South Site Access

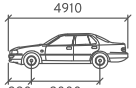
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:1500

Amber 104




Vehicle Envelope
300mm Clearance
Reverse Manoevure



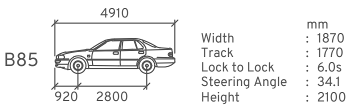

| | mm |
|---|---|
| Width | : 1870 |
| Track | : 1770 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 34.1 |
| Height | : 2100 |

Cimitiere Solar Farm
Soldiers Settlement Road North Site Access
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:1500

Amber 105


Sight Line




Cimitiere Solar Farm
Soldiers Settlement Road South Site Access
Access Assessment

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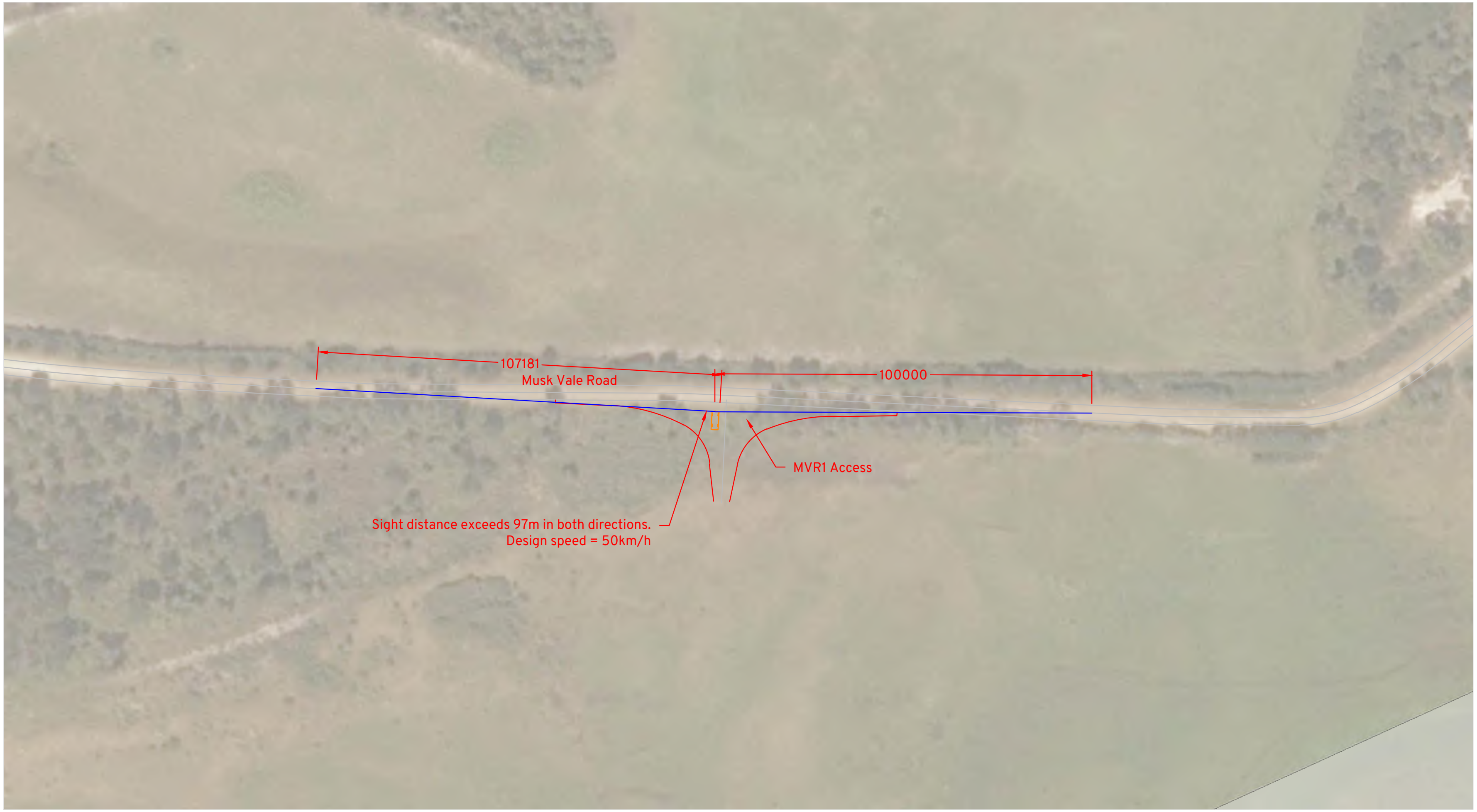
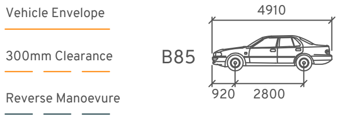
Amber 106




| | mm |
|---|---|
| Width | : 1870 |
| Track | : 1770 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 34.1 |
| Height | : 2100 |

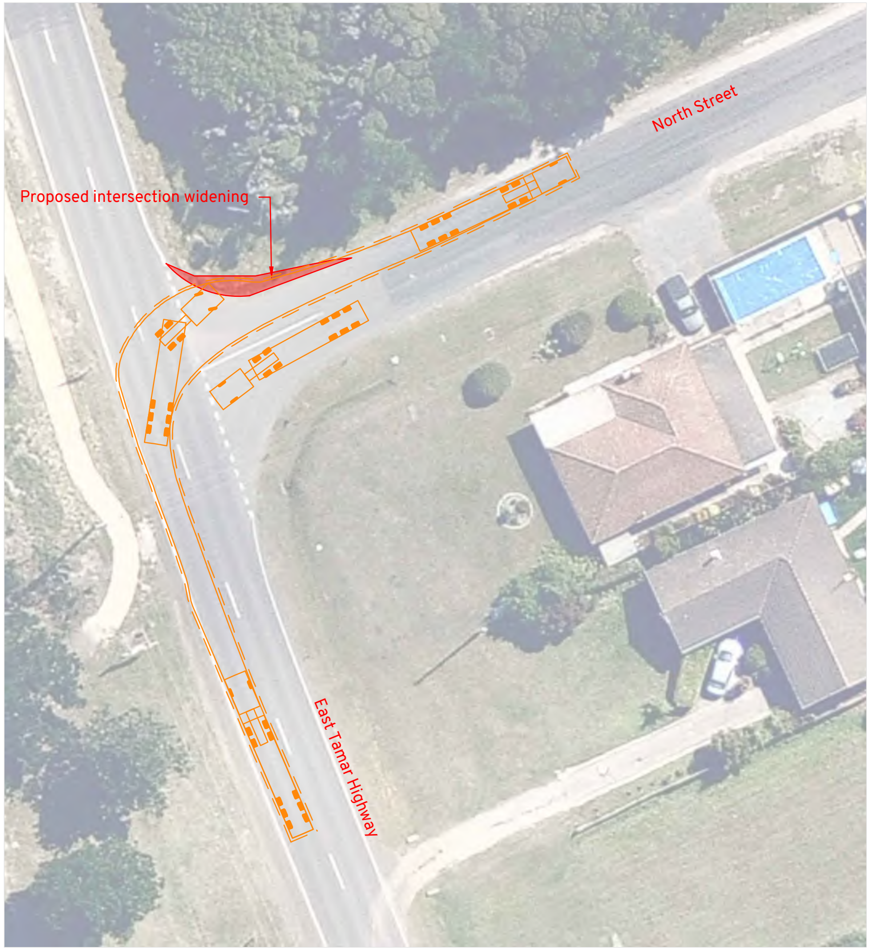
Cimitiere Solar Farm
Musk Vale Road Site Access
Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:1000

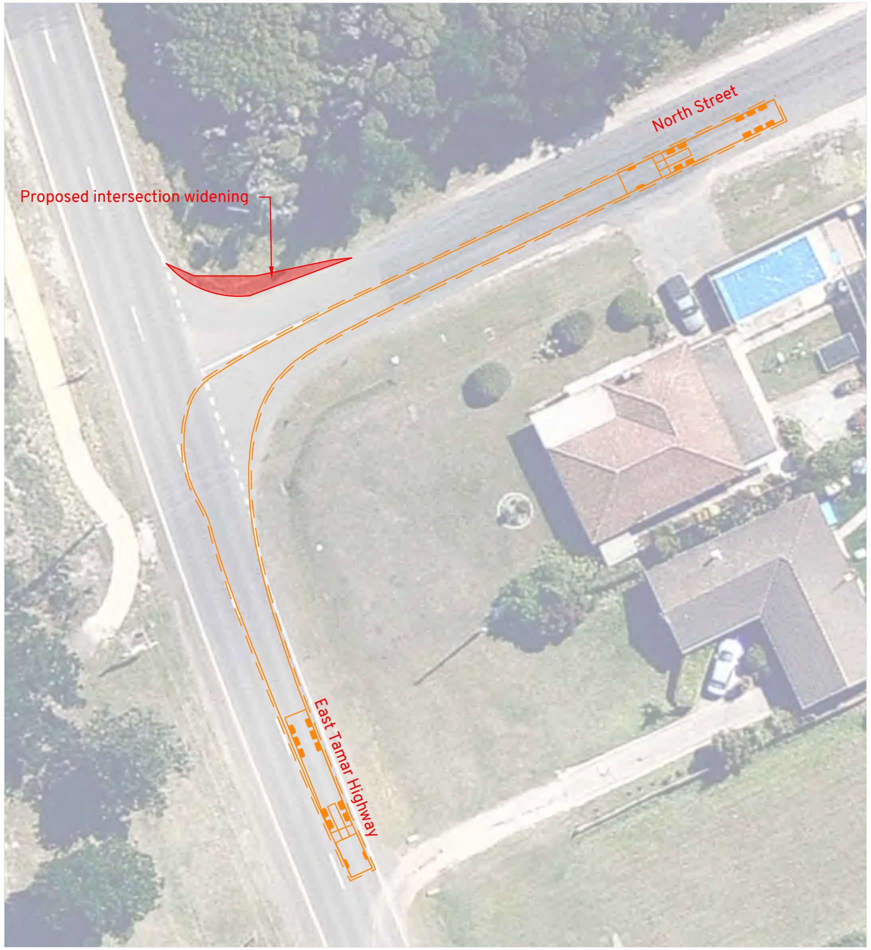
Amber 107

# Appendix D

## Intersection and Local Road Concept Plans




Entry Manoeuvre



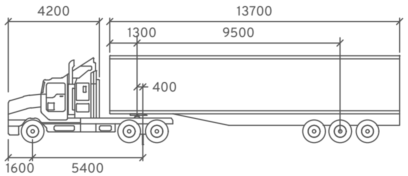

Exit Manoeuvre

Vehicle Envelope

300mm Clearance

Reverse Manoevure

AV




| | mm |
|---|---|
| Tractor Width | : 2500 |
| Trailer Width | : 2500 |
| Tractor Track | : 2500 |
| Trailer Track | : 2500 |
| Lock to Lock | : 6.0s |
| Steering Angle | : 28.3 |
| Articulating Angle | 70.0 |

Cimitiere Solar Farm

East Tamar Highway / Soldiers Settlement Road Intersection

Access Assessment

DRAWN: CT
DATE: 27/04/2023
DWG NO: 538 S01E
SCALE at A3: 1:500

Amber 200

# Appendix L
## Flood Study

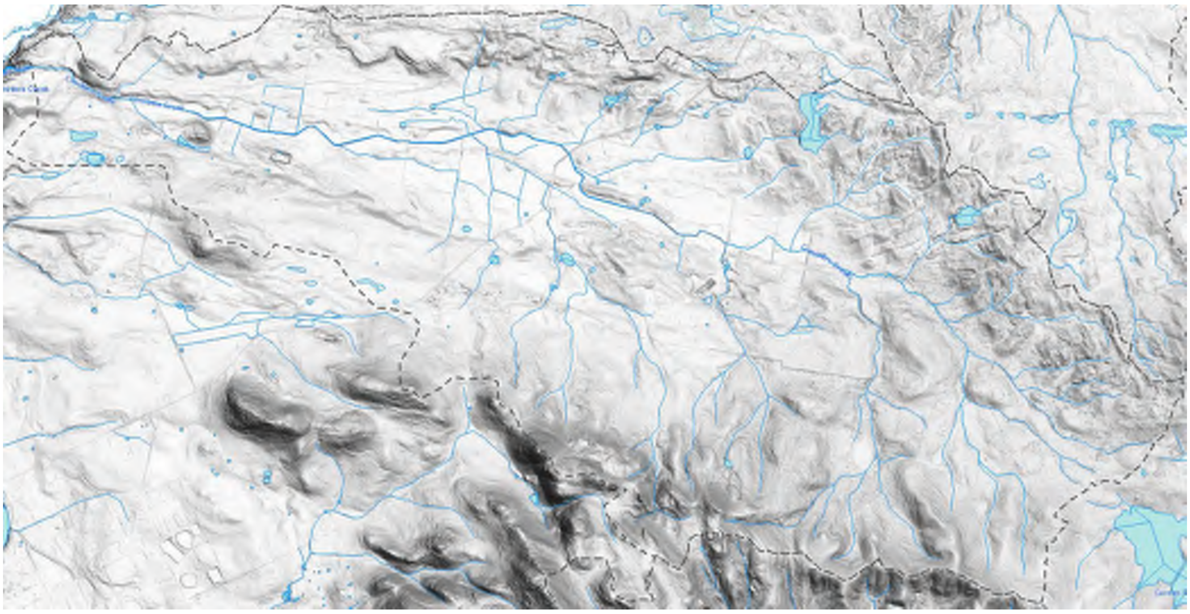
# Cimitiere Plains Solar Farm

ENVOCA ENVIRONMENTAL CONSULTANCY

**ENVOCA ENVIRONMENTAL CONSULTANCY**

# SOLAR FARM FLOOD STUDY - CIMITIERE CREEK TASMANIA

REPORT – FOR ISSUE



FEBRUARY 2022

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Newtown, VIC, 3220

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## SOLAR FARM FLOOD STUDY - CIMITIERE CREEK TASMANIA

## REPORT – FOR ISSUE

FEBRUARY 2022

| **Project**<br>Solar Farm Flood Study - Cimitiere Creek Tasmania | **Project Number**<br>121089 |
|---|---|
| **Client**<br>Envoca Environmental Consultancy | **Client's Representative**<br>Daryl Brown |
| **Project Manager**<br>Mark Colegate | |

**Revision History**

| Revision | Description | Distribution | Authors | Reviewed by | Verified by | Date |
|---|---|---|---|---|---|---|
| 0 | Draft Report | Envoca Environmental Consultancy | Yuan Li, Ingrid Gil | Mark Colegate | | FEB 22 |
| 1 | Report – For Issue | Envoca Environmental Consultancy | YL, IG | MC | | FEB 22 |
| 2 | | | | | | |

## SOLAR FARM FLOOD STUDY - CIMITIERE CREEK TASMANIA

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# LIST OF FIGURES



**APPENDICES:**



# LIST OF DIAGRAMS

# LIST OF ACRONYMS

| | |
|---|---|
| AEP | Annual Exceedance Probability |
| ARF | Areal Reduction Factor |
| ARI | Average Recurrence Interval |
| ARR | Australian Rainfall and Runoff |
| BOM | Bureau of Meteorology |
| CL | Continuous Loss |
| DEM | Digital Elevation Model |
| EIA | Effective Impervious Area |
| ELVIS | ELeVation Information System (data sharing platform) |
| GPU | Graphics Processing Unit |
| HPC | Heavily Parallelised Compute |
| ICA | Indirectly Connected Area |
| IFD | Intensity, Frequency and Duration (Rainfall) |
| IL | Initial Loss |
| LiDAR | airborne Light Detection And Ranging |
| m AHD | meters above Australian Height Datum |
| PMF | Probable Maximum Flood |
| RFFE | Regional Flood Frequency Estimation |
| RPA | Rural Pervious Area |
| TauDEM | Terrain analysis using Digital Elevation Models |
| TUFLOW | Two-dimensional Unsteady FLOW (hydraulic model) |
| WBNM | Watershed Bounded Network Model (hydrologic model) |

# ADOPTED TERMINOLOGY

Australian Rainfall and Runoff (ARR, ed Ball et al, 2019) recommends terminology that is not misleading to the public and stakeholders. Therefore, the use of terms such as “recurrence interval” and “return period” are no longer recommended as they imply that a given event magnitude is only exceeded at regular intervals such as every 100 years. However, rare events may occur in clusters. For example, there are several instances of an event with a 1% chance of occurring within a short period, for example the 1949 and 1950 events at Kempsey. Historically the term Average Recurrence Interval (ARI) has been used.

ARR 2019 recommends the use of Annual Exceedance Probability (AEP). Annual Exceedance Probability (AEP) is the probability of an event being equalled or exceeded within a year. AEP may be expressed as either a percentage (%) or 1 in X. Floodplain management typically uses the percentage form of terminology. Therefore a 1% AEP event or 1 in 100 AEP has a 1% chance of being equalled or exceeded in any year.

ARI and AEP are often mistaken as being interchangeable for events equal to or more frequent than 10% AEP. The table below describes how they are subtly different.

For events more frequent than 50% AEP, expressing frequency in terms of Annual Exceedance Probability is not meaningful and misleading particularly in areas with strong seasonality. Therefore, the term Exceedances per Year (EY) is recommended. Statistically a 0.5 EY event is not the same as a 50% AEP event, and likewise an event with a 20% AEP is not the same as a 0.2 EY event. For example, an event of 0.5 EY is an event which would, on average, occur every two years. A 2 EY event is equivalent to a design event with a 6-month Average Recurrence Interval where there is no seasonality, or an event that is likely to occur twice in one year.

The Probable Maximum Flood is the largest flood that could possibly occur on a catchment. It is related to the Probable Maximum Precipitation (PMP). The PMP has an approximate probability. Due to the conservativeness applied to other factors influencing flooding a PMP does not translate to a PMF of the same AEP. Therefore, an AEP is not assigned to the PMF.

This report has adopted the approach recommended by ARR and uses % AEP for all events rarer than the 50 % AEP and EY for all events more frequent than this.

| Frequency Descriptor | EY | AEP (%) | AEP (1 in x) | ARI |
|---|---|---|---|---|
| Very Frequent | 12 | | | |
| | 6 | 99.75 | 1.002 | 0.17 |
| | 4 | 98.17 | 1.02 | 0.25 |
| | 3 | 95.02 | 1.05 | 0.33 |
| | 2 | 86.47 | 1.16 | 0.5 |
| | 1 | 63.21 | 1.58 | 1 |
| Frequent | 0.69 | 50 | 2 | 1.44 |
| | 0.5 | 39.35 | 2.54 | 2 |
| | 0.22 | 20 | 5 | 4.48 |
| | 0.2 | 18.13 | 5.52 | 5 |
| | 0.11 | 10 | 10 | 9.49 |
| Rare | 0.05 | 5 | 20 | 19.5 |
| | 0.02 | 2 | 50 | 49.5 |
| | 0.01 | 1 | 100 | 99.5 |
| Very Rare | 0.005 | 0.5 | 200 | 199.5 |
| | 0.002 | 0.2 | 500 | 499.5 |
| | 0.001 | 0.1 | 1000 | 999.5 |
| | 0.0005 | 0.05 | 2000 | 1999.5 |
| Extreme | 0.0002 | 0.02 | 5000 | 4999.5 |
| | | | ↓ | |
| | | | PMP/ PMP Flood | |

# 1. INTRODUCTION

WMAwater was engaged by Envoca Environmental Consultancy to prepare a Flood Study to define the characteristics of flooding affecting the proposed site of a solar farm ('the site'), approximately 5km North-East of George Town, in northern Tasmania.

## 1.1. Study Area

The location of the proposed solar farm was provided within a study area of interest of just over 8 km² (Figure 1). The site represents is predominantly cleared agricultural land. The southeast corner of the site is densely forested and there are dense stands of trees (windbreaks) throughout. The majority of the upper Cimitiere Creek catchment is also densely forested. The site is dissected by Soldiers Settlement Road and Cimitiere Creek.

Cimitiere Creek rises below Mount George at an elevation of 112 m AHD and flows north into the Tasman Sea. Cimitiere Creek falls approximately 104 metres over its 11.7 km length. The catchment area upstream of Old Aerodrome Road, i.e., the study catchment for this report, is approximately 27 km² (Figure 1).

## 1.2. Scope

The main objective of this study is to define the flood behaviour of the Cimitiere Creek waterway and provide flood information for the solar farm site. The scope of this study includes:

- development of hydrologic and hydraulic models for the Cimitiere Creek Catchment upstream of Old Aerodrome Road, covering the whole solar farm site
- existing conditions flood modelling and mapping for 1% AEP flood event
- provision of GIS layers of flood behaviours and flood study report

## 2. METHODOLOGY

A hydrologic-hydraulic flood model was developed to address the complex runoff generation and routing processes in the catchment and used to quantify flood characteristics of the catchment under existing conditions. Key aspects of the flood behaviour to be resolved by the modelling approach are:

- **Hydrology** – converting design rainfalls to runoff in a manner consistent with the 2019 revision of Australian Rainfall and Runoff (ARR 2019, Reference 1)
- **Hydraulics** – resolve the flow behaviour of runoff throughout the study area including:
    - "Mainstream" flooding in the main drainage lines
    - Overland flow through the rest of the catchment

The study catchment was delineated into sub-catchments based on LiDAR Digital Elevation Model (DEM). A semi-distributed network hydrologic model, i.e., Watershed Bounded Network Model (WBNM, Reference 2), was established for the entire catchment to simulate the sub-catchment runoff generation and concentration processes and channel routing process. Hydrographs from sub-catchments were extracted from the hydrologic model and used as inflows to a 2D hydraulic model, i.e., Two-dimensional Unsteady FLOW (TUFLOW, Reference 3), which characterise the flow propagation throughout the major flow paths within the catchment. The hydrologic-hydraulic flood model schematics is shown in Figure 2.

### 2.1. Digital Elevation Model

Four (4) LiDAR-derived DEM datasets were obtained from ELVIS, i.e., the Elevation and Depth Foundation Spatial Data Portal (Reference 4). The basic information of the datasets is summarised in Table 1.

Table 1: LiDAR-derived Digital Elevation Model

| Dataset | Program | Commissioned by | Acquisition Date | Grid Size | Accuracy |
|---|---|---|---|---|---|
| Tamar2008 | Climate Futures | ACECRC | Mar 2008 | 1 metre | 0.25 m (H), 0.25 m (V) |
| NorthEast2010 | Forestry Tasmania | Forestry Tasmania | Jan – Apr 2010 | 1 metre | 0.15 m (H), 0.15 m (V), 68% CI |
| BurnieDevonportLaunceston2013 | Tas Coastal | Geoscience Australia | Mar – Apr 2014 | 1 metre | 0.30 m (H), 0.80 m (V), 95% CI |
| Beechford2019 | Flood Recovery | DPIPWE | Mar 2019 | 1 metre | 0.50 m (H) 0.30 m (V), 95% CI |

A catchment-wide DEM (Figure 3) was established through the integration of the above LiDAR DEM datasets, with priority given to newer dataset.

## 2.2. Hydrology

### 2.2.1. Sub-catchment Delineation

The entire catchment was delineated into 35 sub-catchments, as shown in Figure 2. The delineation was carried out through two steps:

- automatic sub-catchment delineation by applying a mathematical algorithm called Terrain analysis using Digital Elevation Models (TauDEM, Reference 5) to LiDAR DEM; and
- manual refinement of sub-catchment delineation based on the review of cadastre, the latest aerial imageries, and the site boundary.

### 2.2.2. Design Rainfall

The design rainfall intensity-frequency-duration (IFD) data was obtained from Bureau of Meteorology (BOM)'s Design Rainfall Data System (2016). The IFD was adjusted by the Areal Reduction Factor (ARF) from ARR Data Hub based on the catchment size and was then applied to the burst temporal patterns obtained from ARR Data Hub (Reference 6), to create burst storm events. The median preburst was then superimposed to the burst to create full storm events as hydrologic model input data.

### 2.2.3. Losses

In WBNM, the storm initial and continues losses (IL & CL) are defined for three different surface types within each sub-catchment. The three types of surfaces are Rural Pervious Area (RPA), Indirectly Connected Area (ICA), and Effective Impervious Area (EIA).

The Cimitiere Creek Catchment is a rural catchment, predominantly covered by RPA with a minor proportion of ICA and no EIA. For this study, the ICA was set to be 3% - 5% of different sub-catchments based on visual inspection of the aerial imagery of each sub-catchment. The rest of the area for each sub-catchment, i.e., 95% - 97%, was deemed to be RPA.

The storm IL and CL for RPA obtained from ARR Data Hub (catchment average) were used as initial values, which were then refined during the calibration process (Section 2.2.5). The IL and CL for ICA were set in relation to those for RPA. The initial value and suggested range of IL and CL are summarised in Table 2.

Table 2: Initial Value and Suggested Range of Losses

| Surface Type | IL (mm) | CL (mm) |
|---|---|---|
| Rural Pervious Area | 15 – 30 (24.9 from ARR Datahub) | 2 – 5 (4.4 from ARR Datahub) |
| Indirectly Connected Area | 0.7 × $IL_{RPA}$ | 0.6 × $CL_{RPA}$ |

### 2.2.4. Routing Parameters

WBNM simulates the sub-catchment routing (runoff concentration) and channel routing (streamflow propagation) through simple conceptualised methods. It requires a sub-catchment lag parameter and a stream lag factor to be defined which describes the average travel time within and between sub-catchments. These parameters can be catchment specific, associated with roughness, slope, and shape of catchments, and are typically optimised through calibration.

The suggested range for the sub-catchment and stream routing parameters were summarised in Table 3, which were used for calibration as detailed in Section 2.2.5.

Table 3: Suggested Range of Routing Parameters

| Routing Parameters | Value |
|---|---|
| Sub-catchment Lag (C) | 1.3 – 2.0 |
| Stream Lag Factor (R) | 0.8 – 1.5 |

### 2.2.5. Calibration

Calibration to recorded events can be conducted to reduce the uncertainty of those parameters, however, the lack of streamflow gauges within the Cimitiere Creek catchment does not allow this. Therefore, the Regional Flood Frequency Estimation (RFFE) tool provided by ARR 2019 was employed to provide a reference of the peak discharge to calibrate the loss and routing parameters.

The semi-distributed model (35 sub-catchments) was temporarily set to purely rural (i.e., 100% RPA) to be comparable with RFFE. A lumped model of the entire catchment, also purely rural, was used as an intermediate model, which does not have the stream lag parameter (R), to reduce the dimension of parameter space and mitigate the underdetermination issue in the calibration process. The calibrated routing parameters are summarised in Table 4. The peak discharges for different AEPs are illustrated in Diagram 1.

Table 4: Calibrated WBNM Parameters

| WBNM Parameters | Value |
|---|---|
| $IL_{RPA}$ | 20.0 |
| $CL_{RPA}$ | 4.0 |
| Sub-catchment Lag (C) | 2.0 |
| Stream Lag Factor (R) | 1.35 |

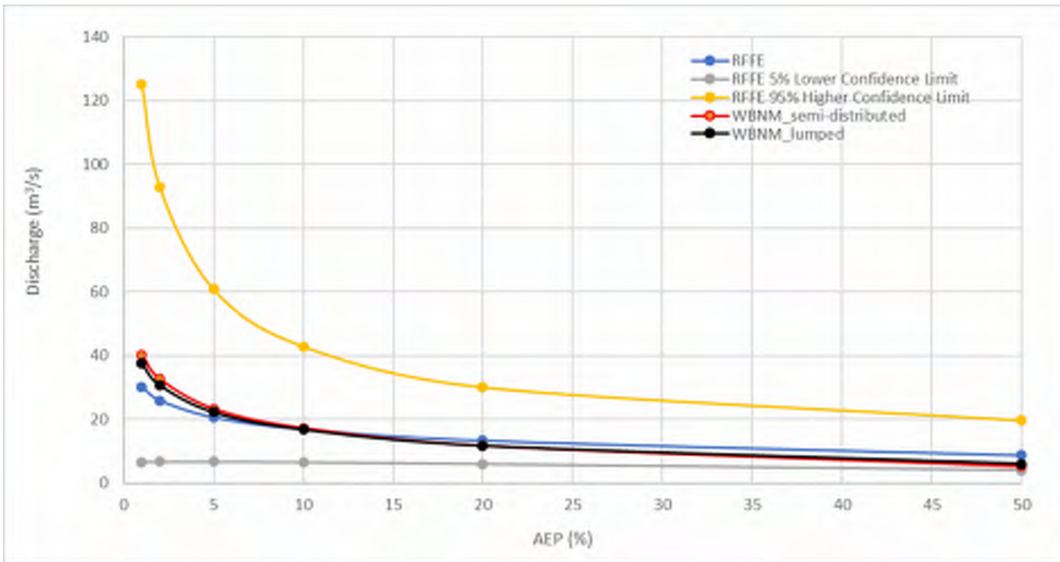


Diagram 1: Estimated Peak Discharges - WBNM vs RFFE

It is shown that there is a good consistency between semi-distributed and lumped model, indicating that the calibrated sub-catchment lag (C) and stream lag factor (R) have similar efficacy representing the routing delays within the catchment. The modelled peak flows are very close to RFFE for 10% AEP. It is generally considered that the RFFE is more reliable for 10% AEP design events than for rarer events, such as 1% AEP, due to the larger size of sample population.

The modelled peak flows are slightly higher than RFFE for rarer AEPs (e.g., 1% to 5%) and slightly lower than RFFE for more frequent AEPs (e.g., 20% and 50%), which however are all within the 90% Confidence Interval. The slight overestimation in 1% AEP indicates that the calibrated model might be a little conservative in terms of estimation of 1% AEP flooding characteristics.

It should be noted that RFFE techniques are subject to uncertainty, which however was the best available information to use at the time of modelling. The accuracy in this calibration should be considered relative to the data available.

The calibrated parameters in Table 4 were adopted for the final 1% AEP design event modelling under existing condition, i.e., 95% - 97% RPA as discussed in Section 2.2.3.

### 2.2.6. Critical Duration and Temporal Pattern Selection

The calibrated hydrologic model was adopted for 1% AEP design event modelling under existing conditions. The hydrologic modelling was conducted for ten (10) temporal patterns of each duration from 10 min to 48 hr. The critical duration was identified to be 6 hr based on the flow predictions from WBNM at sub-catchment C34, i.e., downstream boundary of the site. The temporal pattern (TP-6559) producing the lowest flow above mean flow was selected as a representative temporal pattern, which was then proceeded to hydraulic modelling. The boxplot of the flow predictions at C34 is shown in Diagram 2.

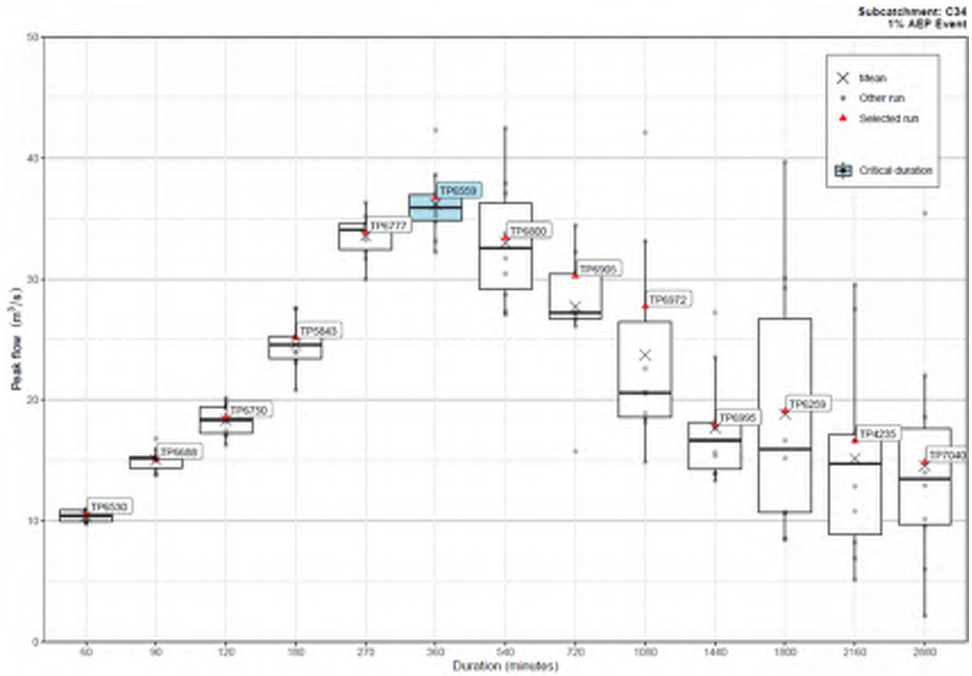


Diagram 2: Boxplot of the flow predictions at C34 from the WBNM.

## 2.3. Hydraulics

### 2.3.1. Model Setup

Hydraulic modelling was undertaken using TUFLOW HPC (build 2020-10-AA-iSP-w64) with Graphics Processing Unit (GPU) solver (Reference 3), a widely utilised 1D and 2D flood simulation software. The key features of the hydraulic model are summarised below:

- The hydraulic model extent covers the entire stream and overland flow network from the sink (discharge location) of the most upstream sub-catchment (C01) to the immediate downstream of Old Aerodrome Road, as depicted in Figure 2.
- Grid size of 2 metre was adopted.
- The LiDAR-based DEM model was used as base topography.
- Some sections of Cimitiere Creek, where LiDAR-based DEM exhibits triangulation issues and does not correctly represent the continuous conveyance feature of the waterway, were treated by superimposing break lines along the riverbed.
- The hydrographs of all sub-catchments were extracted from WBNM and used as inflows to the hydraulic model at the inflow locations, i.e., SA polygons, (Figure 4)
- The downstream boundary condition was placed far enough from the site boundary, i.e., downstream of Old Aerodrome Road, to minimise its impact on the modelled flood characteristics in the site (Figure 4).
- The surface roughness (Manning's *n*) was schematised into forest, pasture, and main road in accordance the aerial imagery, as depicted in Figure 5. The Manning's *n* values are summarised in Table 5.
- There are several culverts in the modelling extent which are critical hydraulic constraints. Due to the lack of information, the dimensions of the culverts were roughly estimated

based on inspection of LiDAR DEM (i.e., channel profiles) and aerial imagery. The invert levels were set according to the upstream and downstream surface levels interpreted from the LiDAR DEM. The locations of those culverts are shown in Figure 6.

Table 5: Manning's 'n' Coefficient

| ID | Land Use | Manning's '*n*' |
|---|---|---|
| 1 | Forest | 0.08 |
| 2 | Pasture | 0.04 |
| 3 | Main Road | 0.02 |

### 2.3.2. Flood Mapping

Hydraulic modelling was conducted for the selected duration (6 hr) and temporal pattern (TP-6559) of 1% AEP. The flood characteristics was illustrated through mapping of flood depth, level, velocity, hydraulic hazard, and hydraulic categorisation.

#### 2.3.2.1. Hydraulic Hazard

Hazard classification plays an important role in informing floodplain risk management in an area. Provisional hazard categories have been determined for the study catchment in accordance with the Australian Disaster Resilience Handbook Collection (Reference 7). A summary of this categorisation is provided in Diagram 3.

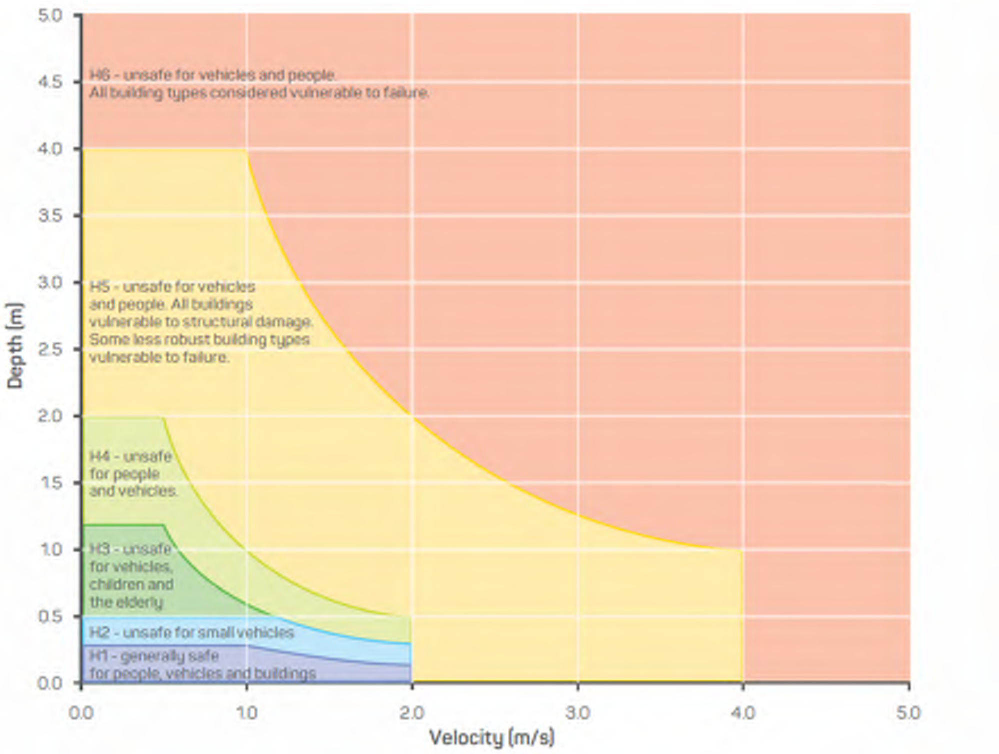


Diagram 3: General Flood Hazard Vulnerability Curves (ADR)

This classification provides a more detailed distinction and practical application of hazard categories, identifying the following 6 classes of hazard:

- H1 – No constraints, generally safe for vehicles, people and buildings;
- H2 – Unsafe for small vehicles;
- H3 – Unsafe for all vehicles, children and the elderly;
- H4 – Unsafe for all people and all vehicles;
- H5 – Unsafe for all people and all vehicles. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure. Buildings require special engineering design and construction; and
- H6 – Unsafe for all people and all vehicles. All building types considered vulnerable to failure.

#### 2.3.2.2. Hydraulic Categorisation

Floodplains can be classified into the following hydraulic categories depending on the flood function:

- Floodways
- Flood Storage and
- Flood Fringe.

There is no quantitative definition of these three categories or accepted approach to differentiate between the various classifications. The delineation of these areas is somewhat subjective based on knowledge of an area and flood behaviour, hydraulic modelling, and previous experience in categorising flood function. A few approaches are available, such as the method defined by Howells *et al* (Reference 8).

For this study, hydraulic categories were defined by the following criteria, which has been tested and is considered to be a reasonable representation of the flood function of this catchment.

- <u>Floodway</u> is defined as areas where:
  - the peak value of velocity multiplied by depth (V x D) > 0.25 $m^2$/s, **AND** peak velocity > 0.25 m/s, **OR**
  - peak velocity > 1.0 m/s **AND** peak depth > 0.1 m.

The remainder of the floodplain is either Flood Storage or Flood Fringe:

- <u>Flood Storage</u> comprises areas outside the floodway where peak depth > 0.5 m, and
- <u>Flood Fringe</u> comprises areas outside the Floodway where peak depth ≤ 0.5 m.

# 3. RESULTS

The 1% AEP flood characteristics are illustrated through below maps:

- Peak Flood Depth and Level Contours (Figure B1)
- Peak Flood Velocity (Figure B2)
- Hydraulic Hazard (Figure B3)
- Hydraulic Categorisation (Figure B4)

All the maps are presented for flood water depth ≥ 50 mm. Areas with water depth below 50 mm are treated as non-inundated area. The maps were schematised for visualisation purpose. The original raster layers (ASCII) with modelled full flood extent are also provided, which should be used in preference to the figures in this report as they provide more detail.

## 3.1. Summary of Results

The proposed solar farm site covers the middle section of Cimitiere Creek, i.e., approximately 5.6 km. The Creek enters the eastern boundary of the site, carrying 21.3 $m^3$/s of peak flow during 1% AEP event. As the flow propagates westward through the site, the Creek receives inflows from tributaries from north and south sub-catchments. The peak inflows entering the north and south boundaries of the site are 3.9 $m^3$/s and 12.1 $m^3$/s, respectively, during 1% AEP event. The total peak outflow across the western (downstream) boundary of the site is 53.4 $m^3$/s, with considerable runoff contribution from the site.

The flood level grades from 51.5 m AHD to 16.5 m AHD across the site. The eastern half of the site (upstream part) has a relatively lower flood risk in general, with majority of the Floodway and Flood Storage area (Figure B4) contained within the natural channel. The western half of the site (downstream part) has a relatively higher flood risk, with significant flood water propagation within the riparian zone (Floodway in Figure B4) resulting in hazard categories of H3 and H4 (Figure B3). Nevertheless, the majority of the site is outside the inundated area, which are safe for solar farm development.

## 3.2. Flood Hotspots

There are several areas within the catchment which experience a higher flood risk during a 1% AEP event. These flooding hotspots should be paid more attention during design and development. The flood hotspots are summarised below.

- Dams and basins and their immediate downstream areas. There are several dams/basins in the site, along the tributaries to Cimitiere Creek, as highlighted in Diagram 4. The water is reasonably deep (0.8 m – 1.5 m) in those dams/basins during 1% AEP flooding. The area immediate downstream of those dams/basins are subject to flood risk if the dam wall failed during flooding.
- Soldiers Settlement Road across Cimitiere Creek. The road embankment is shown to cause flood water attenuation upstream of the road, as highlighted in Diagram 5. The flood depth is up to 0.65 m and the flood extent of depth above 0.3 m is approximately 200 m wide. This is however subject to uncertainty associated with the assumption made for the

culvert below Soldiers Settlement Road, which can be improved through on-site measurement or survey.

- The riparian zone along the Creek downstream of the confluence of the Cimitiere Creek and the southern tributary, as highlighted in Diagram 6, is subject to inundation during 1% AEP event. The flood depth is up to 1.75 m in channel and 0.8 m in riparian zone. The width of the inundated area varies from 80 m to 200 m. Significant proportion of the inundated area in the riparian zone is classified as Floodway or Flood Storage (Figure B4) and hazard categories of H3 – unsafe for all vehicles, children and the elderly or H4 – unsafe for all people and all vehicles (Figure B3).

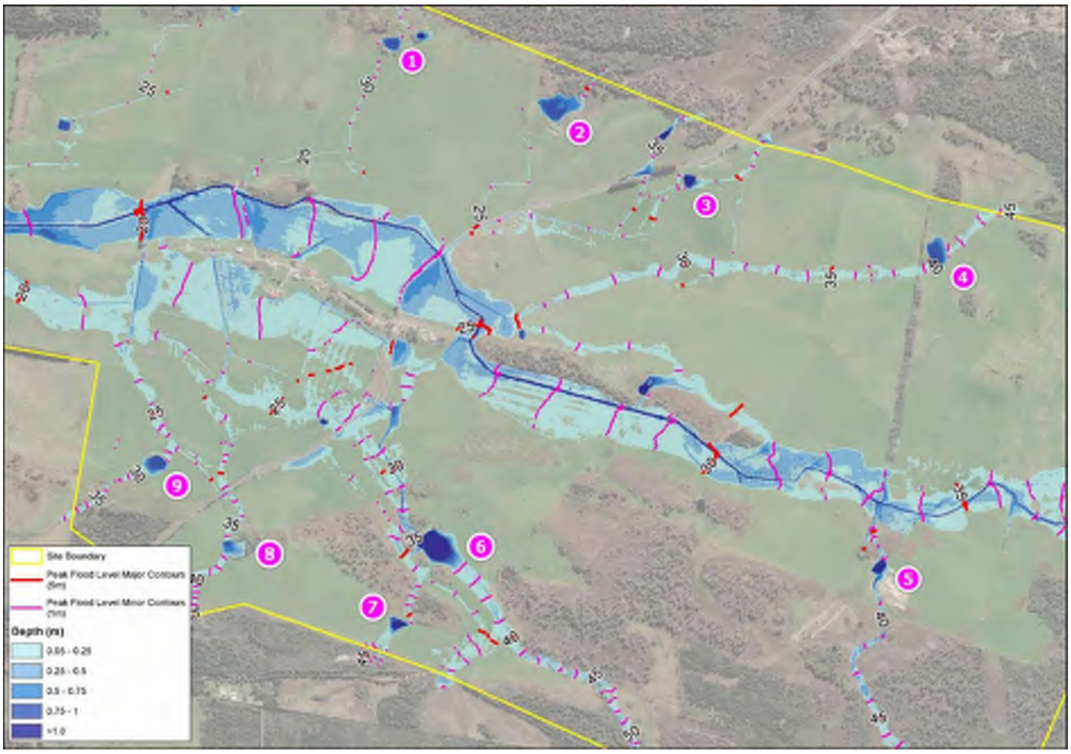

Diagram 4: Dams and Basins

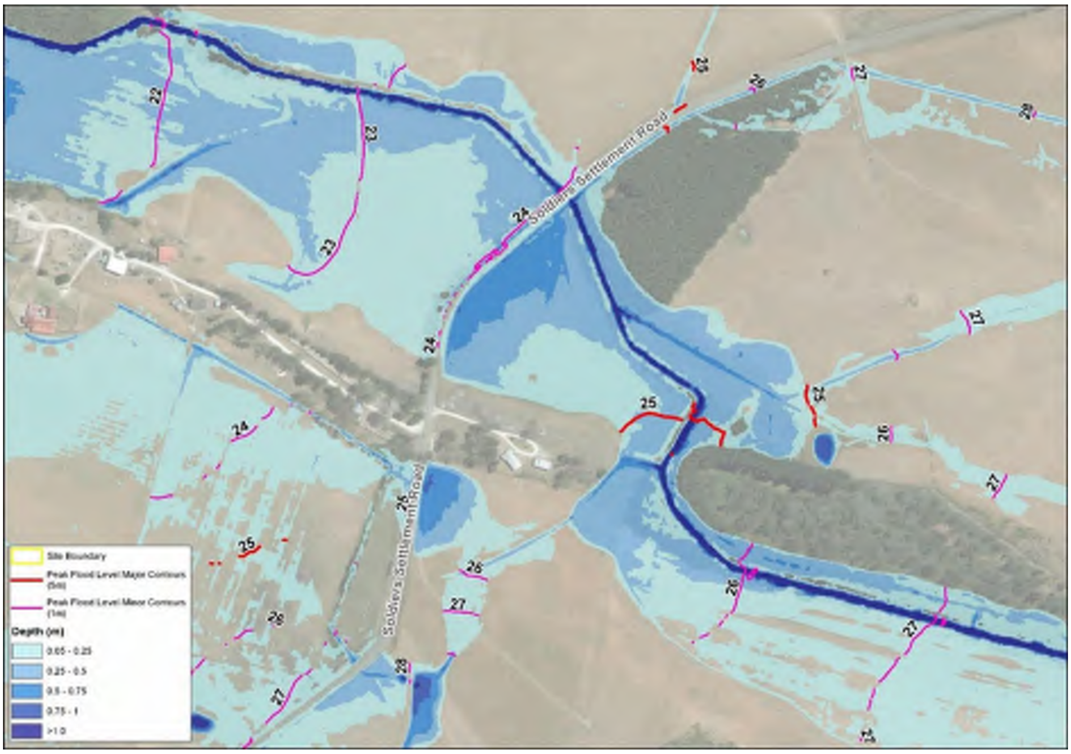


Diagram 5: Flood Attenuation Upstream of Soldiers Settlement Road

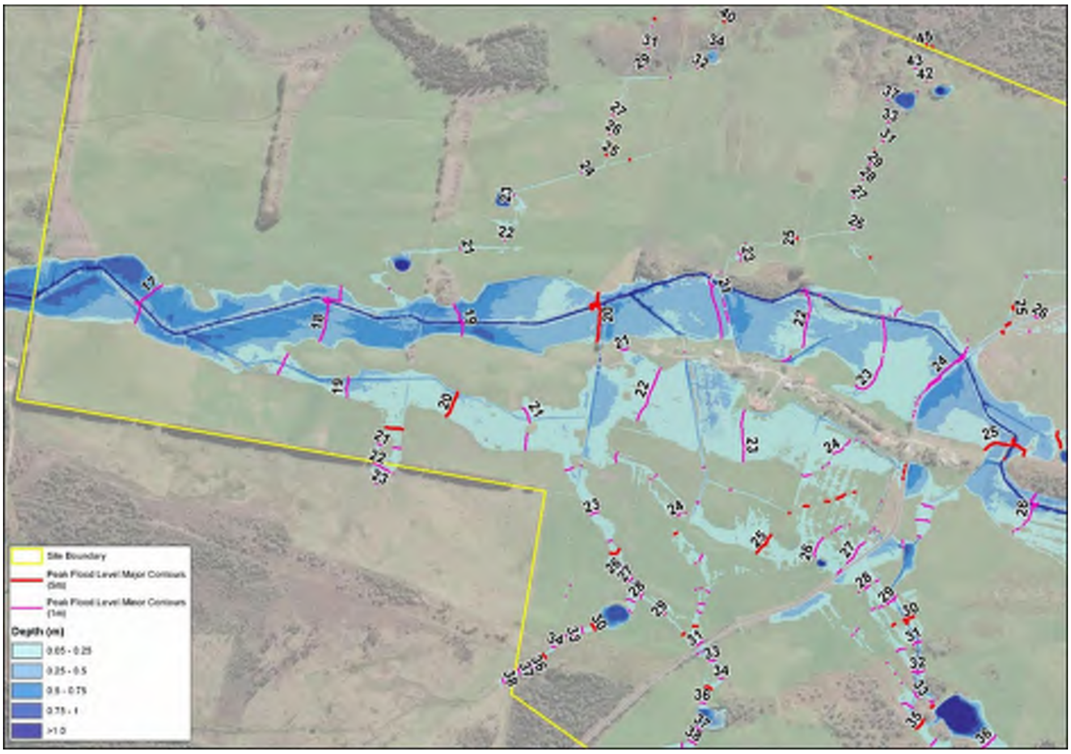


Diagram 6: Flood Inundation Downstream Part of the Site

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# Figures

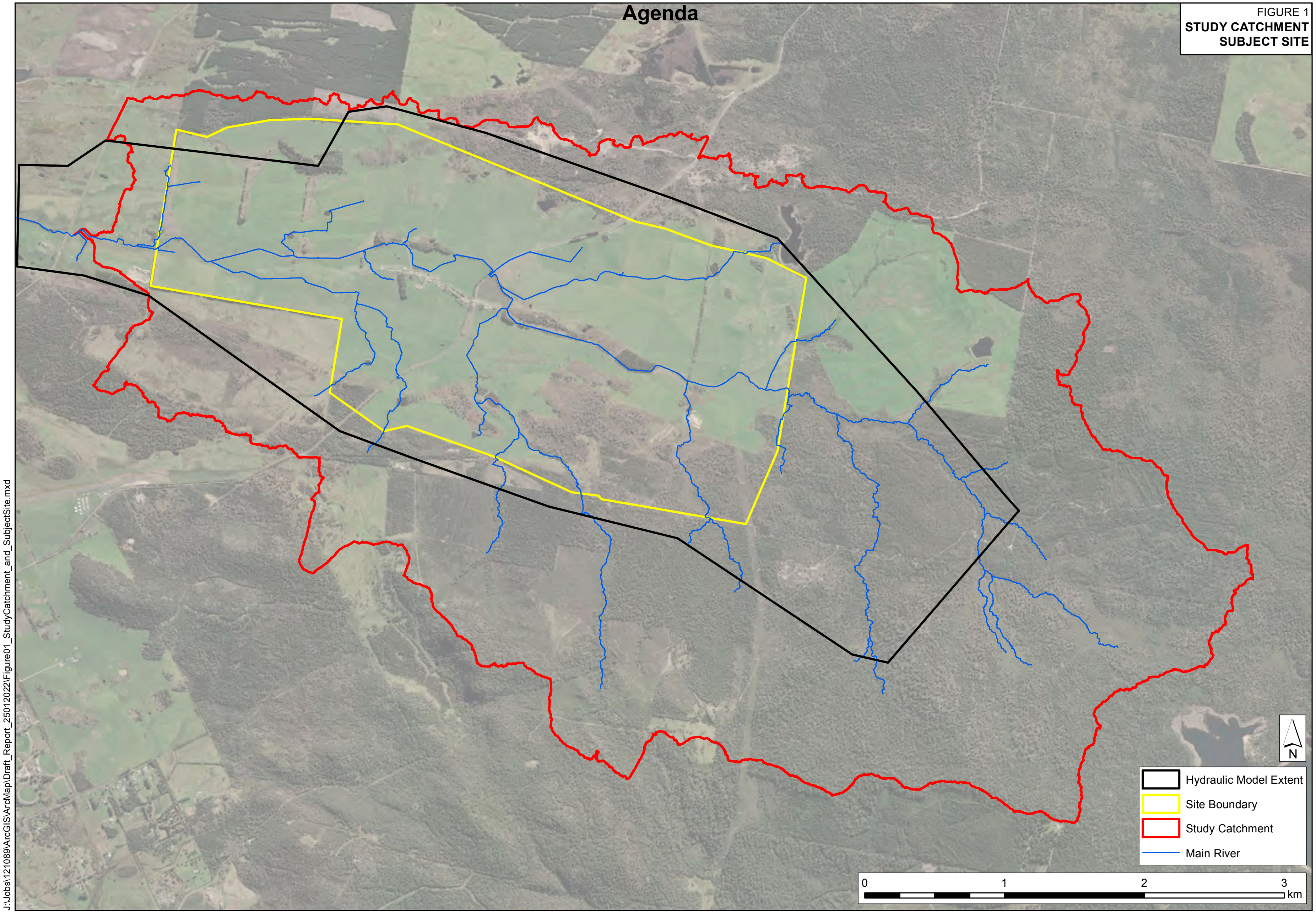
FIGURE 1
STUDY CATCHMENT
SUBJECT SITE
Hydraulic Model Extent
Site Boundary
Study Catchment
Main River
0
1
2
3
km
N
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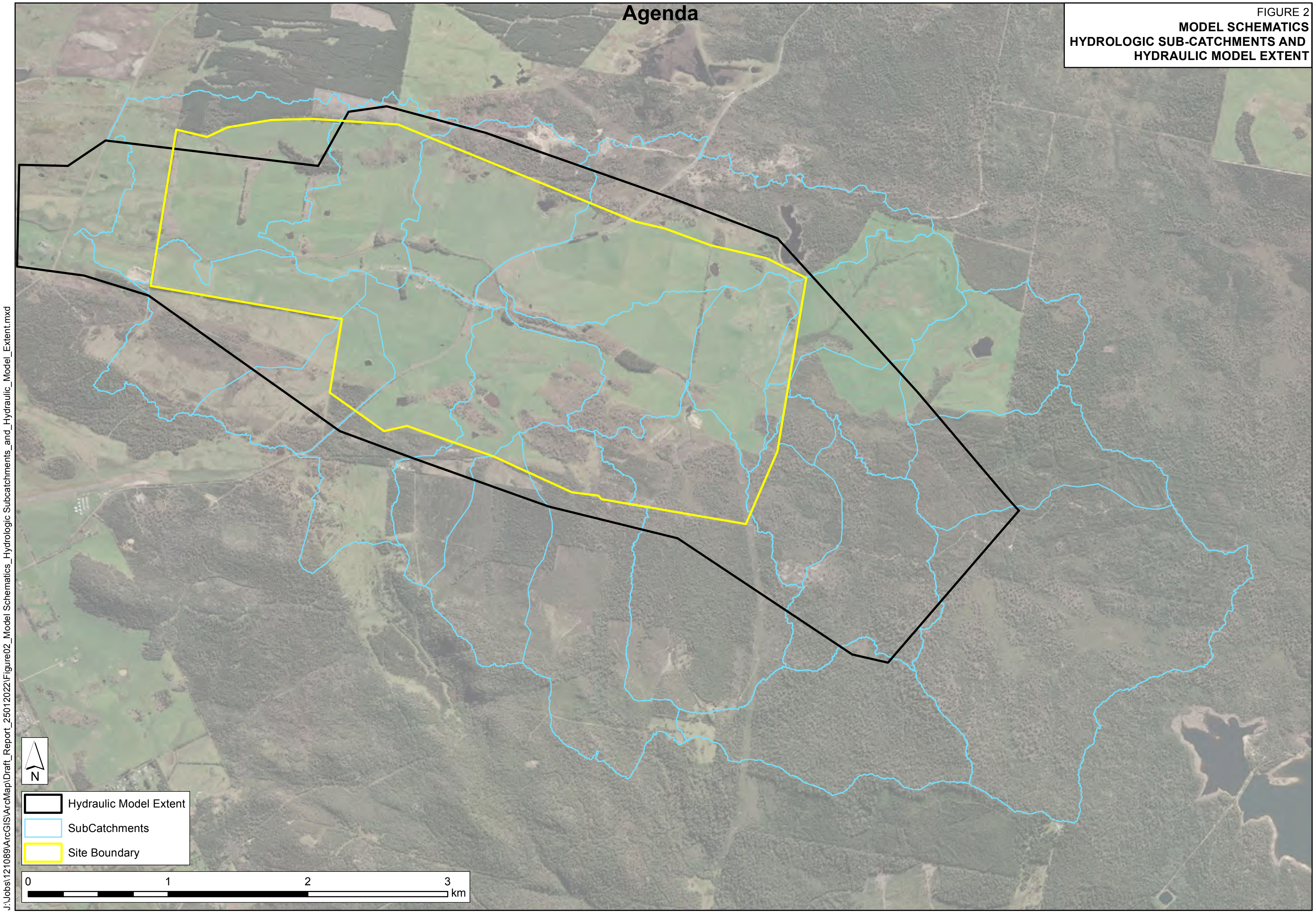
FIGURE 2
MODEL SCHEMATICS
HYDROLOGIC SUB-CATCHMENTS AND
HYDRAULIC MODEL EXTENT
N
Hydraulic Model Extent
SubCatchments
Site Boundary
0
1
2
3
km
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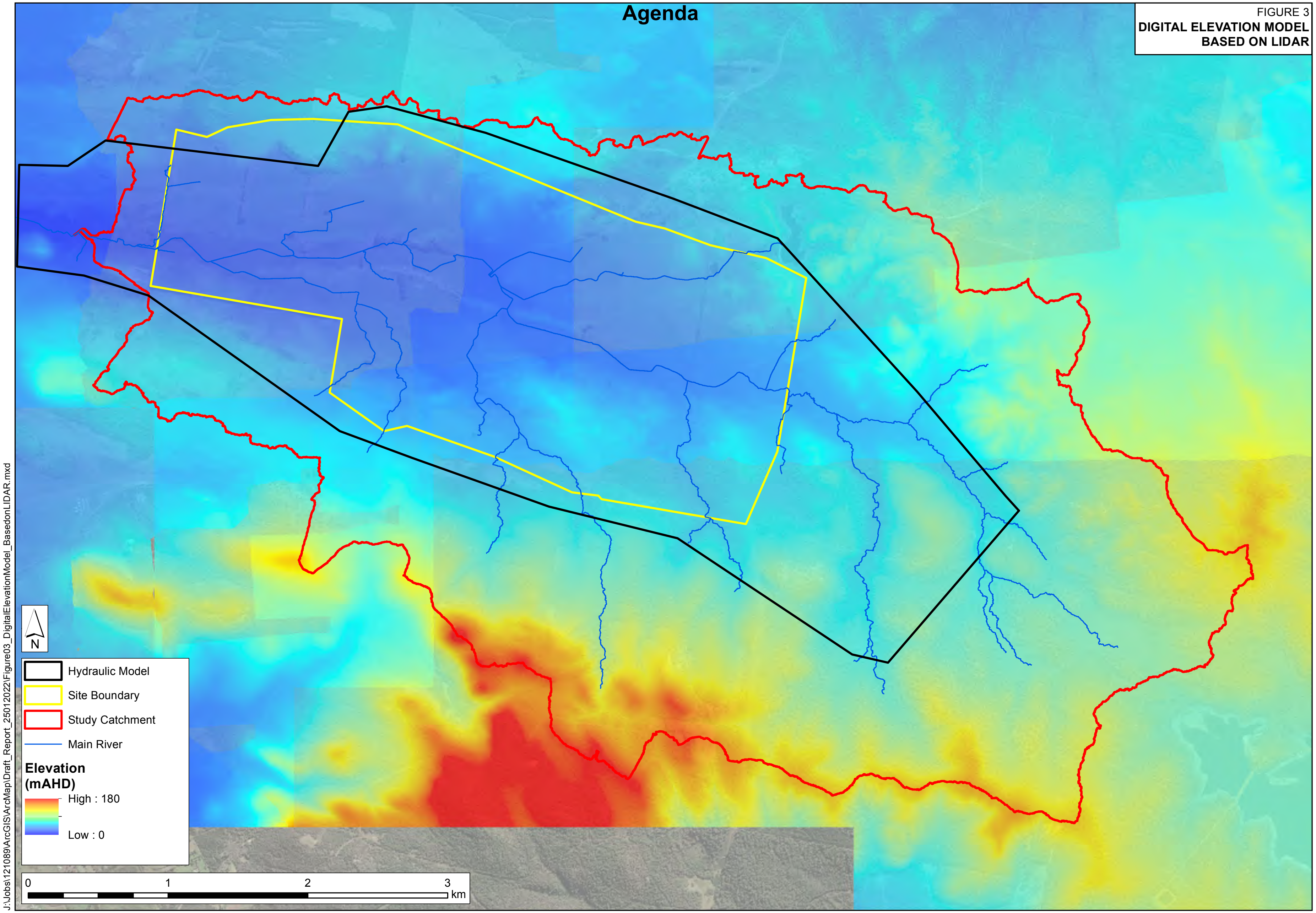
FIGURE 3
DIGITAL ELEVATION MODEL
BASED ON LIDAR
N
Hydraulic Model
Site Boundary
Study Catchment
Main River
Elevation
(mAHD)
High : 180
Low : 0
0
1
2
3
km
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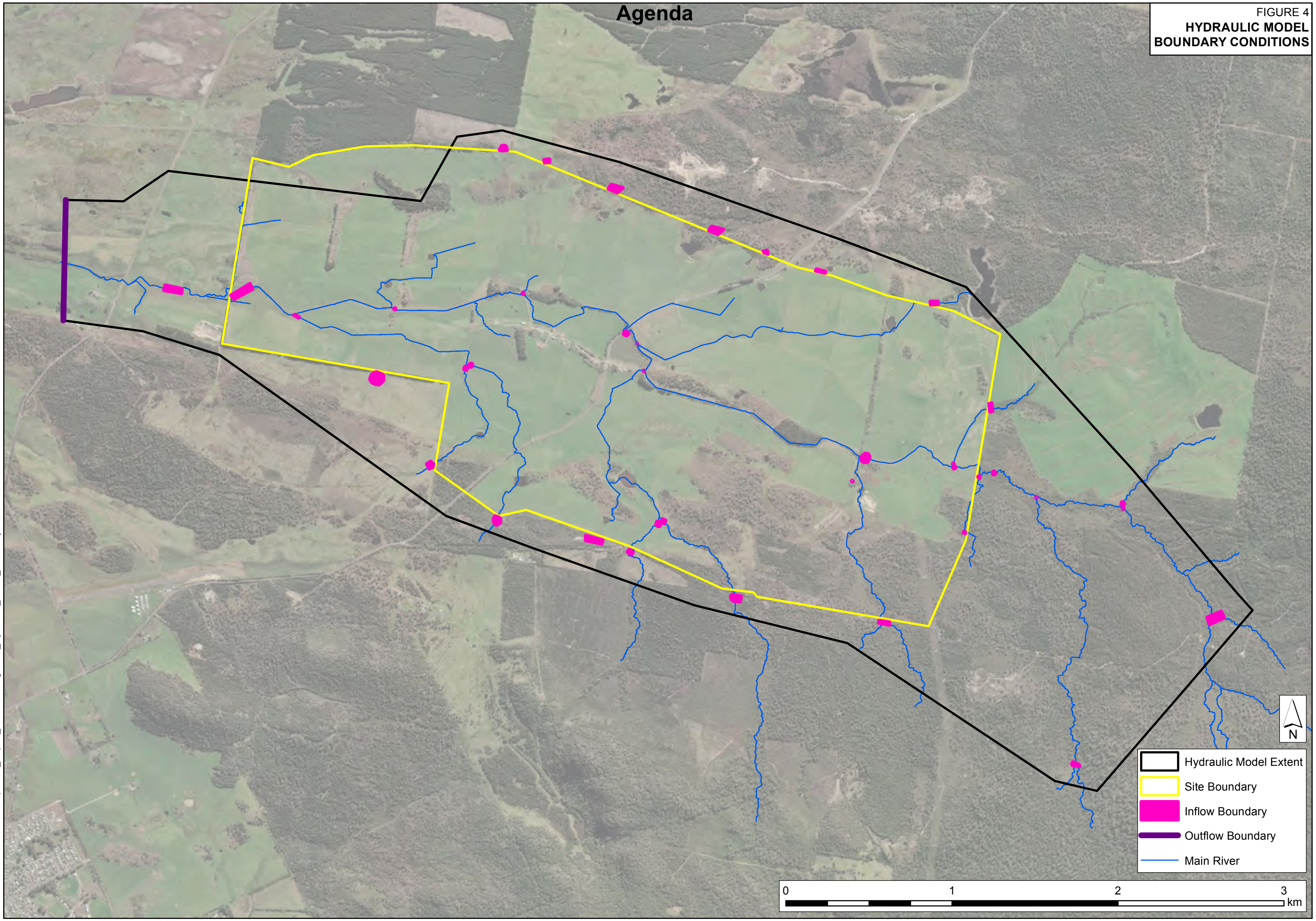
FIGURE 4
HYDRAULIC MODEL
BOUNDARY CONDITIONS
Hydraulic Model Extent
Site Boundary
Inflow Boundary
Outflow Boundary
Main River
N
0
1
2
3
km
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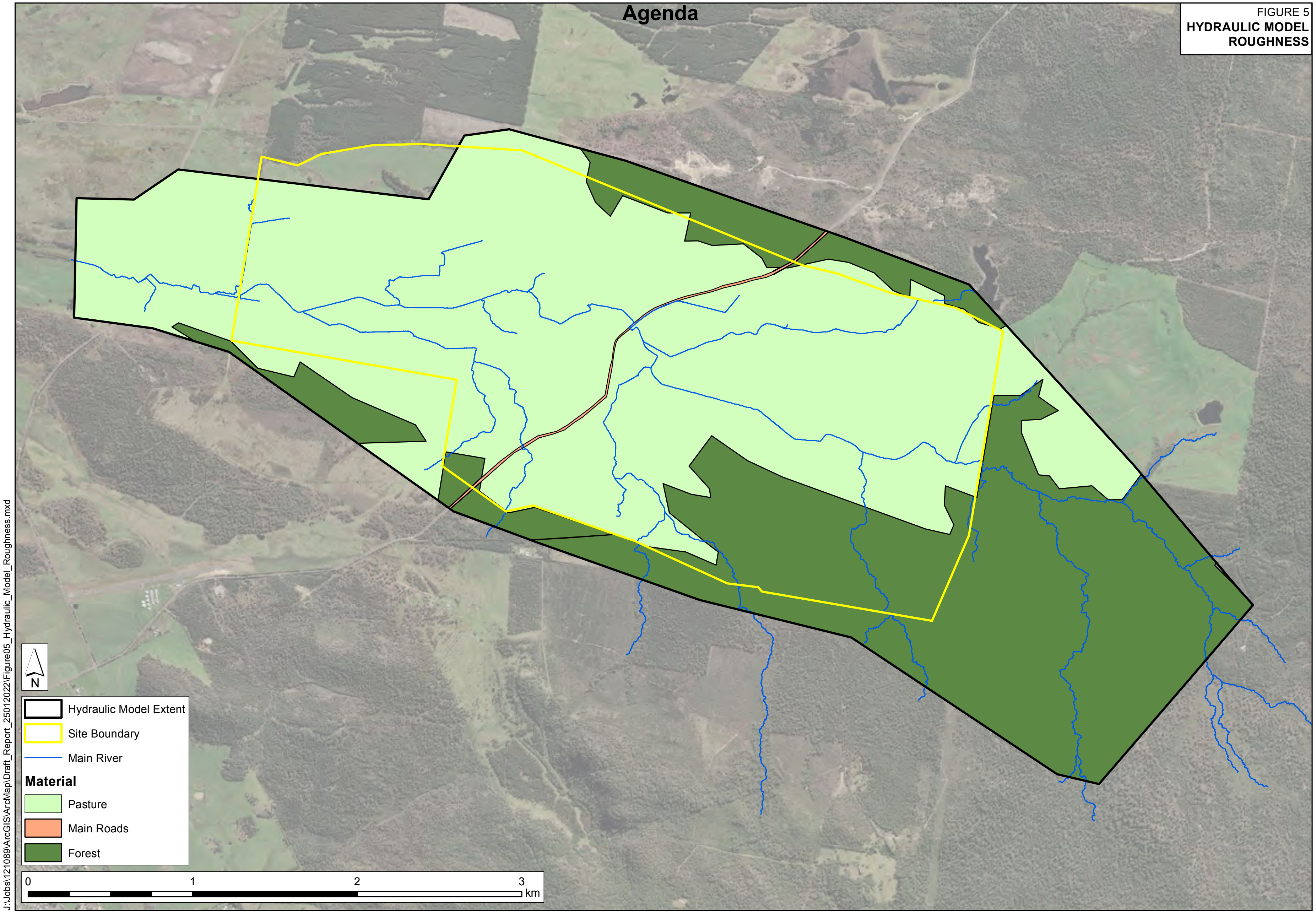
FIGURE 5
HYDRAULIC MODEL ROUGHNESS
N
Hydraulic Model Extent
Site Boundary
Main River
Material
Pasture
Main Roads
Forest
0
1
2
3
km
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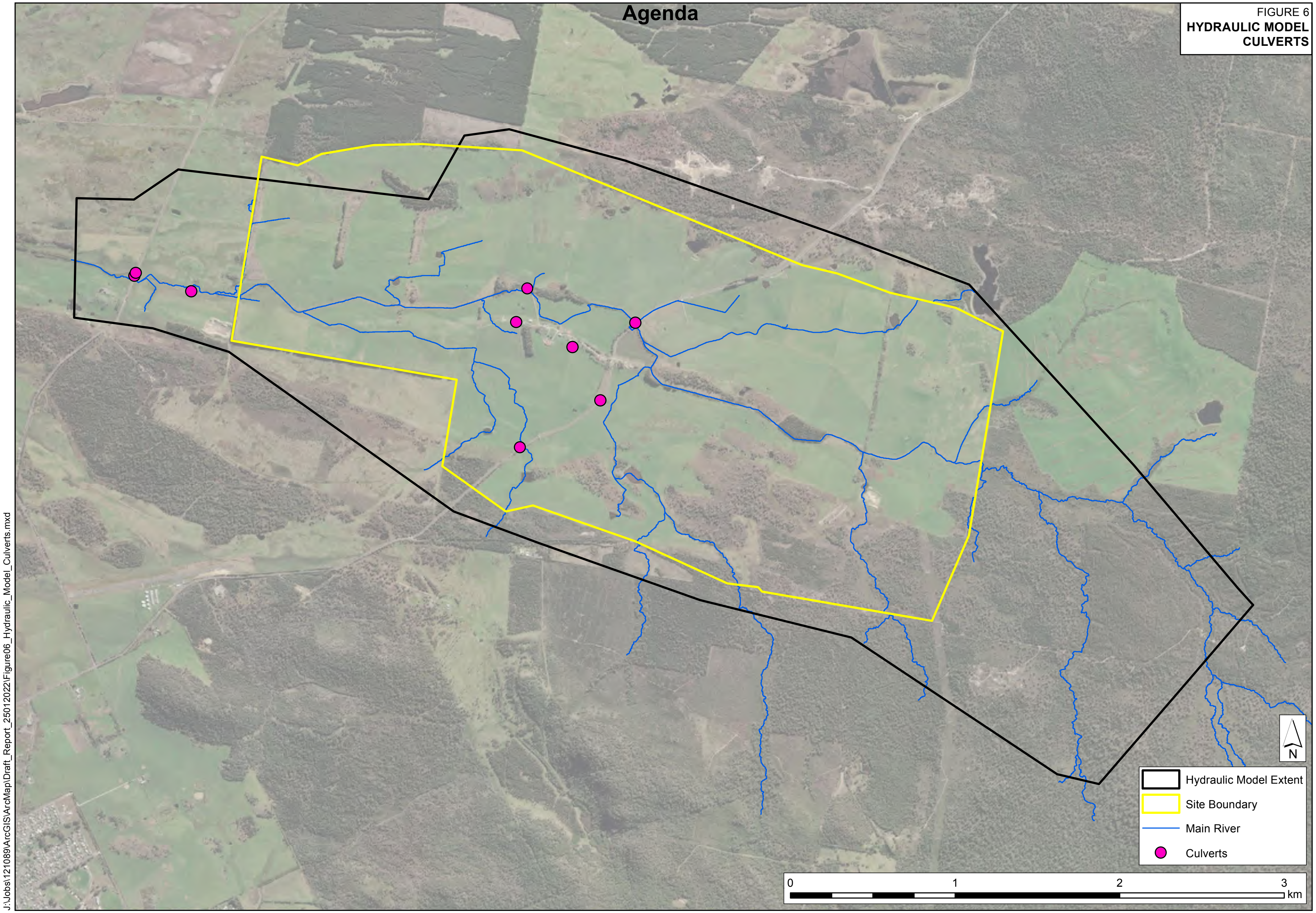
FIGURE 6
HYDRAULIC MODEL CULVERTS
Hydraulic Model Extent
Site Boundary
Main River
Culverts
0
1
2
3
km
N
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# Appendix A