UNION FENOSA
WIND AUSTRALIA

gasNatural fenosa

PALING YARDS WIND FARM

APPENDIX 6

# LANDSCAPE AND VISUAL IMPACT ASSESSMENT AND SHADOW FLICKER IMPACT ASSESSMENT

# Paling Yards Wind Farm

Proposed view north from Abercrombie Road toward the Paling Yards wind farm turbines

## LANDSCAPE & VISUAL IMPACT ASSESSMENT

*Prepared for:*

UNION FENOSA
WIND AUSTRALIA
gasNatural fenosa

*Prepared by:*

**GREEN BEAN DESIGN**
*landscape architects*

December 2013

| | |
|---|---|
| **Project:** | Paling Yards Wind Farm |
| **Project Number:** | 11-145 |
| **Report Title:** | Landscape and Visual Impact Assessment |
| **Revision:** | Revision V8 – Final Issue |
| **Author:** | Andrew Homewood, Registered Landscape Architect, AILA, MEIANZ<br>Grad. Dip. Landscape Management, BSc.Dual Hons (Landscape Architecture & Archaeology), Dip. Horticulture |
| **Date** | December 2013 |

## Green Bean Design – Capability Statement

Green Bean Design (GBD) is an experienced landscape architectural consultancy specialising in landscape and visual impact assessment. As an independent consultancy GBD provide professional advice to a range of commercial and government clients involved in large infrastructure project development.

GBD owner and Principal Landscape Architect Andrew Homewood is a Registered Landscape Architect and member of the Australian Institute of Landscape Architects and the Environmental Institute of Australia and New Zealand.

Andrew has over 20 years continuous employment in landscape consultancy and has completed numerous landscape and visual impact assessments for a range of large scale and State significant infrastructure and renewable energy projects, including wind energy and solar power developments.

Green Bean Design has been commissioned for over 20 wind energy projects across New South Wales, Victoria, South Australia, Queensland and Tasmania including assessments for:

| | | |
|---|---|---|
| • Silverton Wind Farm | • Boco Rock Wind Farm | • Collector Wind Farm |
| • Crookwell 3 Wind Farm | • Sapphire Wind Farm | • Willatook Wind Farm |
| • Eden Wind Farm | • Birrema Wind Farm | • Rye Park Wind Farm |
| • Paling Yards Wind Farm | • Port Kembla Wind Farm | • Bango Wind Farm |
| • Deepwater Wind Farm | • White Rock Wind Farm | • Liverpool Range Wind Farm |
| • Conroy's Gap (Mod 4) | • Mt Emerald Wind Farm | • Granville Harbour Wind Farm |

GREEN BEAN DESIGN *landscape architects*

Contents Page

Contents Page





GREEN BEAN DESIGN *landscape architects* PO Box 3178 Austral NSW 2179 - Mobile 0430 599 995

Contents Page

Contents Page

## Tables





GREEN BEAN DESIGN *landscape architects* PO Box 3178 Austral NSW 2179 - Mobile 0430 599 995

## Figures





GREEN BEAN DESIGN *landscape architects* PO Box 3178 Austral NSW 2179 - Mobile 0430 599 995

## Figures

## Executive Summary

GBD has been commissioned by Union Fenosa Wind Australia Pty Ltd (the Proponent) to undertake a Landscape and Visual Impact Assessment (LVIA) for the proposed Paling Yards wind farm and associated development infrastructure (the project).

The project would include up to 59 wind turbines, and for the purpose of this LVIA, the proposed wind turbines have been assessed with a maximum blade tip height of 175 m from ground level to tip of blade and a maximum rotor size of up to 136 m. Associated electrical works include a 500 kV overhead transmission line connection to the existing Mount Piper to Bannaby 500 kV transmission line approximately 10 km north east of the project site.

This LVIA involved desktop studies and site inspections to collect and analyse information to describe and define the characteristics of the landscape in which the project would be located. This LVIA has determined that the landscape surrounding the project has an overall medium to high sensitivity to accommodate change, and represents a landscape that is reasonably typical of landscape character areas that are commonly found in the surrounding areas of the New South Wales Southern Tablelands and the NSW/ACT Border Region Renewable Energy Precinct.

As a landscape with an overall medium to high sensitivity to accommodate change, some recognisable characteristics of the landscape will be altered by the project and result in the introduction of visually prominent elements that will alter some perceived landscape characteristics. Alterations to perceived characteristics may be partially mitigated by existing landscape elements and features within the landscape. The main characteristics of the landscape, patterns and combinations of landform and landcover will still be evident.

The project visibility was determined within the 10 km radius of the wind farm development and illustrated by a series of panoramic photographs and Zone of Visual Influence (ZVI) diagrams. The ZVI diagrams demonstrate the influence of topography on visibility and identify areas from which the wind farm turbines would be visible.

## Executive Summary

This LVIA assessed the potential visual impact of the project for residential dwelling locations within the projects 10 km viewshed as well as impacts for motorists travelling along local roads surrounding and through the project site, as well as recreational activities within the neighbouring Abercrombie River National Park. A number of criteria were considered and assessed to determine levels of visual impact.

A total of 48 residential dwelling locations within the project 10 km viewshed have been determined to have a low or nil visual impact. A total of 24 residential dwelling locations would have a low to moderate or moderate visual impact and 6 a medium to high visual impact. All of the residential dwelling view locations with a medium to high visual impact are dwellings located within the project boundary and comprise the involved properties of Paling Yards, Quobleigh and Mingary Park (associated residences)

This LVIA assessed the potential visual impact associated with the assessed 330 kV and assessed and proposed 500 kV transmission line and substation locations. This LVIA determined that the overall visual impact of these elements would be low to moderate (with some potential for high impacts associated with the assessed 330 kV transmission line) due the location of electrical infrastructure items relative to existing view locations together with the screening influence of surrounding topography and vegetation.

A cumulative visual impact assessment was carried out for the Paling Yards wind farm project. The cumulative assessment included the approved Taralga and proposed Golspie wind farm developments to the south and south west of the Paling Yards wind farm project area. None of the approved Taralga wind farm turbines are located within the Paling Yards wind farm 10 km viewshed. A small portion of the proposed Golspie wind farm project area is located within the Paling Yards wind farm 10 km viewshed; however the locations of wind turbines proposed as part of the Golspie project are not yet known. This LVIA determined that there would be limited intervisibility between the Paling Yards wind farm and other approved wind farm developments and that any potential cumulative impact is likely to be low due to both distance between the wind farm developments and location of residential dwellings relative to multiple wind farm developments.

## Executive Summary

An Aeronautical Impact and Night Lighting Assessment commissioned by the Proponent has determined that obstacle lighting may be necessary, subject to a detailed and thorough risk assessment to be prepared once the final turbine layout and turbine height are known. This LVIA notes that night time lighting has been determined as not required for the Gullen Range wind farm, and that obstacle lighting has also been removed from the Cullerin wind farm adjoining the Hume Highway to the west of Yass in New South Wales (as illustrated in Figures 33, 34 and 35) as well as wind farms in Victoria.

This LVIA assessed four potential transmission line corridors and determined that the assessed southern 330 kV transmission line corridors (comprising three potential routes and a single connection south to the approved Crookwell 2 wind farm substation) would result in an overall moderate visual impact, with potential for high impact where residential dwelling proximity, and lack of vegetative cover, increases transmission line visibility. The assessed and proposed northern 500 kV transmission line corridor would result in an overall low to moderate visual impact. Accordingly the Proponent is only seeking an approval for the northern 500 kV transmission line corridor option.

Although some mitigation measures are considered appropriate to minimise the visual effects for a number of the elements associated with the wind farm, this LVIA acknowledges that the degree to which the wind turbines may be visually mitigated is limited by their scale and position within the landscape relative to surrounding view locations.

# Introduction

Section 1

## 1.1 Introduction

This LVIA addresses one of the key requirements of the project Environmental Assessment (EA) to be submitted and assessed under Part 3A of the Environmental Planning & Assessment Act 1979 (EP&A Act).

The LVIA methodology adopted by GBD has been applied to a number of similar LVIA for large scale infrastructure projects, including the Silverton, Boco Rock and White Rock wind farm developments which have been assessed and approved by the New South Wales Department of Planning & Infrastructure (DoP&I) under Part 3A of the EP&A Act.

This LVIA addresses and responds to the Director General's Requirements (DGR's) dated 6th May 2010 for the assessment of potential landscape and visual impacts of the project. **Table 1** outlines the relevant landscape and visual impact assessment requirements of the DGR's and the corresponding section in which they are addressed within this LVIA report.

**Table 1** Director General's Requirements

| DGR's | LIVA Reference |
|---|---|
| • provide a comprehensive assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the project including both the wind farm and the transmission line. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the project based on surveys and consultation. Consideration must be given to impacts on the values of the adjacent national parks, including impacts on wilderness and Greater Blue Mountains World Heritage area values; | Refer LVIA: Section 1, Section 7, and Section15 |
| • assess the impact of shadow "flicker", blade "glint" and night lighting from the wind farm; | Refer LVIA: Section 11 and Appendix A |
| • identify the zone of visual influence (no less than 10 kilometres) and assess the visual impact of all project components on this landscape; | Refer LVIA: Section 4 |

**Table 1** Director General's Requirements

| DGR's | LIVA Reference |
|---|---|
| • include an assessment of the visual impacts associated with the transmission line, including impacts on local and regional views. Alternative pole designs should be presented and assessed and the potential for undergrounding in sensitive locations should be assessed; | Refer LVIA: Section 13 |
| • include photomontages of the project taken from potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights) settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures for both the wind farm and the transmission line; | Refer LVIA: Section 10 |
| • provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented. | Refer LVIA: Section 16 |

The project would be located within the Oberon Shire Council Local Government Area. The Oberon Shire Council have adopted a Development Control Plan (DCP), Part O of which applies to "Wind Power Generation 2005". Whilst the provisions of the DCP do not apply to the project (which is subject to Part 3A of the EP&A Act), GBD confirms that this LVIA addresses a number of the key DCP requirements with regard to consideration of visual assessment, including:

"*A description of the visual effects including shadow flicker/glinting, photomontages, computer assisted photo simulations or other graphic representations of the appearance of the wind turbines and transmission lines. View shed modelling via the use of a suitable GIS (e.g. MapInfo) is encouraged. Steps to be taken to mitigate any possible negative visual effects are to be included*".

The assessed southern transmission line would include a proposed corridor through the Upper Lachlan Shire Council Local Government Area.

The assessment of potential visual impact associated with Shadow Flicker has been assessed and included in **Section 11** of this LVIA.

This LVIA involved a comprehensive evaluation of the landscape character in which the project and ancillary structures would be located, and an assessment of the potential landscape and visual impacts that could result from the construction and operation of the wind farm, taking into account appropriate mitigation measures. This LVIA is based on technical and design information provided by the Proponent to GBD.

## 1.2 Draft NSW Planning Guidelines: Wind Farms (December 2011)

The NSW DoP&I issued the Draft Planning Guidelines: Wind Farms (NSW Draft Guidelines) in December 2011, which provide guidance and information for wind farm applicants, consent authorities as well as communities and stakeholder groups. The NSW Draft Guidelines were placed on public exhibition between December 2011 and March 2012; however, had not been finalised or formally adopted by the New South Wales Government prior to completion of this LVIA.

The NSW Draft Guidelines set out key considerations for the upfront assessment of landscape and visual impact for residential dwellings within a 2km radius of proposed wind turbines (through the Gateway Process and Site Compatibility Certification), and specific assessment requirements that may be set out in the NSW DoP&I Director Generals Requirements on a project by project basis. The NSW Draft Guidelines also set out a comprehensive framework for the assessment of landscape and visual impacts including residential dwellings within 2 km proximity of proposed wind turbines. Landscape and visual issues are outlined in Appendix A of the NSW Draft Guidelines 'Meeting assessment requirements - Landscape and visual amenity' (Refer **Appendix C** of this LVIA).

This LVIA has considered and given regard to the NSW Draft Guidelines to the fullest extent practicable, and addresses the key landscape and visual amenity aspects set out in the DoP&I checklist issued to the Proponent in the DoP&I correspondence dated 18 April 2012. The key landscape and visual amenity aspects are set out in **Table 2**.

**Table 2** DoP&I Landscape and visual amenity checklist

| Key aspects | LVIA Reference/Response |
|---|---|
| Provide photomontage from all non-host dwellings within 2 km of a proposed wind turbine | There are no non-host dwellings within 2 km of a proposed wind turbine. Photomontages have been prepared from six view locations surrounding the wind farm project site. |

**Table 2** DoP&I Landscape and visual amenity checklist

| Key aspects | LVIA Reference/Response |
|---|---|
| Identify the zone of visual influence of the wind farm (no less than 10 km) and likely impacts in community and stakeholder values. | This LVIA has identified a 10 km zone of visual influence surrounding the proposed wind farm development and assessed likely impacts in community and stakeholder values (Refer LVIA **Sections 4, 8** and **15**). |
| Consider cumulative impacts on landscape and views. | This LVIA has considered potential cumulative landscape and visual impacts (Refer LVIA **Section 9**). |
| Outline mitigation measures to avoid or manage impacts. | This LVIA has outlined mitigation measures to minimise potential impacts (Refer LVIA **Section 16**). |

## 1.3 National Assessment Framework

GBD is cognisant of the Australian Wind Energy Association and Australian Council of National Trust's publication Wind Farms and Landscape Values National Assessment Framework (NAF), June 2007, and have encompassed the general assessment framework outlined in the NAF within the LVIA methodology. In addition to the NAF, the preparation of this LVIA has also included a review of the National Wind Farm Development Guidelines (Public Consultation Draft V2.4 July 2010).

**Table 3** outlines the relevant recommendations of the NAF and the corresponding section in which they are addressed within this LVIA report.

**Table 3** NAF Recommendations

| NAF Tasks (through Steps 1 to 4) | LVIA Reference/Response |
|---|---|
| **Step 1 Assess the Landscape Values**<br>**1A Preliminary Landscape Assessment**<br>• 1A.1 Desktop Review<br>• 1A.2 Seek information from Local Authority<br>• 1A.3 Identify potential community and stakeholder interests<br>• 1A.4 Site survey<br>• 1A.5 Preliminary assessment of landscape values | This LVIA has been prepared through a comparable methodology to that outlined in the NAF and has included a desktop review (pre site inspection) to determine potential view locations as well as establishing the extent and types of landscape characteristics within the 10 km viewshed.<br>Early telephone discussions with the relevant Local Authorities determined that no additional wind farm developments were current other than those notified on the DoPI website: (http://majorprojects.planning.nsw.gov.au/page/project-sectors/transport--communications--energy--- |

**Table 3** NAF Recommendations

| NAF Tasks (through Steps 1 to 4) | LVIA Reference/Response |
|---|---|
| **1B Full Landscape Assessment**<br>• 1B.1 Define the study area for assessment, including the zone of visual influence<br>• 1B.2 Landscape Character Analysis<br>• 1B.3 Natural and cultural values analysis<br>• 1B.4 Involve communities and stakeholders in identifying landscape values<br>• 1B.5 Document values and analyse significance | water/generation-of-electricity-or-heat-or-co-generation/)<br>Community and stakeholder interests have been identified by an ongoing process of direct consultation between the Proponent and relevant stakeholders. The results of the consultative process are included in this LVIA as well as other relevant sections of the **EA**.<br>Site survey and preliminary assessment work has been undertaken and incorporated into this LVIA. The preparation of a separate preliminary assessment of landscape values is not a requirement under the NSW DoPI DGR's.<br>This LVIA addresses the requirements of Step 1B and presents an analysis of key considerations included in the NAF. |
| **Step 2 Describe and Model the Wind Farm in the Landscape**<br>• 2.1 Describe the development<br>• 2.2 Model the development<br>• 2.3 Prepare a visual assessment report | This LVIA has described and modelled the project development and selected view points from a range of view locations including residential dwellings, road corridors and public lookouts within the 10 km viewshed. |
| **Step 3 Assess the Impacts of the Wind Farm on Landscape Values**<br>• 3.1 Seek community input to potential impacts<br>• 3.2 Identify and describe impacts<br>• 3.3 Identify potential cumulative impacts<br>• 3.4 Identify other relevant factors<br>• 3.5 Evaluate impacts | Community and stakeholder interests have been identified by an ongoing process of direct consultation between the Proponent and relevant stakeholders. The results of the consultative process are outlined and included in this LVIA as well as other relevant sections of the **EA**.<br>This LVIA has identified and described potential landscape and visual impacts associated with the project development as well as potential cumulative impacts resulting from other wind farm projects within the NSW/ACT Border Region Renewable Energy Precinct. |
| **Step 4 Respond to Impacts**<br>• 4.1 Changes to location or siting of the wind farm or ancillary infrastructure<br>• 4.2 Layout and design considerations<br>• 4.3 Minor changes and mitigation measures<br>• 4.4 Recommend changes to the development | The development of the project turbine layout has been reviewed and adjusted throughout the preparation of this LVIA. Changes to the layout have occurred as a result of stakeholder consultation and specific concerns directed toward the visual impact of the wind farm from surrounding view locations. |

The NAF is noted by its authors as a framework document and does not set out a detailed or prescribed method to undertake an assessment of landscape values. This LVIA has; however, followed the majority of techniques and has tested and determined outcomes for the principal issues that have been raised in the NAF.

## 1.4 Auswind Best Practice Guidelines (December 2006)

The Auswind Best Practice Guidelines were developed to assist wind farm proponents to implement best practice in regards to the location and siting of wind energy facilities and to conduct wind farm investigations and impact assessments. The guidelines have been subject to revisions following technical reviews and consultation with both industry and broader stakeholder input.

The Guidelines, developed between (the former) Auswind and the National Trust, provide a landscape assessment approach to describe, assess and evaluate the potential landscape and visual impact of a proposed wind energy project. A summary of the approach includes:

- consultation with experts in the analysis of the environments visual characteristics e.g. Landscape Architects;
- preparation of 'Zone of Visual Influence' or 'Seen Area Diagrams';
- preparation of photomontages (also referred to as Visual Simulations);
- determination of cumulative impact from existing wind energy projects;
- investigation of impacts with associated infrastructure elements, including substation, service roads and power lines; and
- assessment of Shadow Flicker.

The Auswind Best Practice Guidelines offer best practice advice and are not a mandatory requirement for wind farm developments within Australia and have been incorporated into this LVIA.

## 1.5 Methodology

This LVIA methodology included the following activities:

- desktop study addressing visual character and identification of view locations within the surrounding area;

- fieldwork and photography;
- preparation of ZVI diagrams;
- assessment and determination of landscape sensitivity;
- assessment and determination of visual impact;
- preparation of photomontages and illustrative figures; and
- preparation of a Shadow Flicker and Blade Glint Assessment.

## 1.6 Desktop study

A desktop study was carried out to identify an indicative viewshed for the project. This was carried out by reference to 1:25,000 scale topographic maps as well as aerial photographs and satellite images of the project area and surrounding landscape. A preliminary ZVI diagram was also produced prior to the commencement of fieldwork in order to inform the likely extent and nature of areas within the nominated 10 km viewshed of the proposed wind farm.

Topographic maps and aerial photographs were also used to identify the locations and categories of potential view locations that could be verified during the fieldwork component of the assessment. The desktop study also outlined the visual character of the surrounding landscape including features such as landform, elevation, landcover and the distribution of settlements.

## 1.7 Preparation of ZVI diagrams

GL-Garrad Hassan Pacific Pty Ltd (GL Garrad Hassan) prepared ZVI Diagrams to illustrate the potential visibility of the wind turbines within the project 10 km viewshed. ZVI Diagrams included visibility from tip of blade and hub height and are illustrated in **Figures 4** and **5**, and detailed in **Section 4** of this LVIA.

## 1.8 Fieldwork and photography

GBD undertook a total four and a half days of fieldwork associated with the Paling Yards wind farm development:

- two days of general site inspections to determine and confirm the potential extent of visibility of the project and ancillary structures, and to identify landscape characteristics surrounding the wind farm site, and along the proposed transmission line corridors;

- a one day detailed site inspection to determine associated residential dwelling window locations and orientations for a detailed shadow flicker assessment; and
- one day of site photography for the photomontages locations.

## 1.9 Assessment of landscape sensitivity

The potential impact of the project on the sensitivity of the landscape surrounding the wind farm would result primarily from the capability of the landscape to integrate with, or to accommodate the wind farm.

The capability of the landscape to accommodate the wind farm would result primarily from the nature and degree of perceptual factors that can influence interpretation and appreciation of the landscape, including landform, scale, topographic features, landcover and human influence or modifications.

## 1.10 Significance of visual impact

The potential significance for visual impact of the project on surrounding view locations would result primarily from a combination of the potential visibility of the wind turbines and the characteristics of the landscape between, and surrounding, the view locations and the wind farm. The potential degree of visibility and resultant visual impact would be partly determined by a combination of factors including:

- category and type of situation from which people could view the wind farm (examples of view location categories include residents or motorists);
- visual sensitivity of view locations surrounding the wind farm;
- potential number of people with a view toward the proposed wind farm from any one location;
- distance of visual effect (between view locations and the wind farm); and
- duration of time people could view the wind farm from any particular static or dynamic view location.

An underpinning rationale for this LVIA is that if people are not normally present at a particular location, such as agricultural areas, or they are screened by landform or vegetation, then there is likely to be a nil visual impact at that location.

If, on the other hand, a small number of people are present for a short period of time at a particular location then there is likely to be a low visual impact at that location, and conversely, if a large number of people are present then the visual impact is likely to be higher.

Although this rationale can be applied at a broad scale, this LVIA also considers, and has determined, the potential visual impact for individual view locations that would have a higher degree of sensitivity to the wind farm development, including the potential impact on individual residential dwellings situated in the surrounding landscape. The determination of a visual impact is also subject to a number of other factors which are considered in more detail in this LVIA.

Whilst this LVIA addresses a number of static elements associated with the project, the assessment acknowledges and has considered the potential visual impact associated with the movement of the wind turbine rotors.

## 1.11 Photomontages

Eight photomontages have been prepared to illustrate the potential visibility of the project following construction. The photomontages include views toward the proposed wind turbines and the assessed and proposed northern 500 kV transmission line. The photomontage locations were selected by GBD and photographed by GL-Garrad Hassan Pacific Pty Ltd (GH) in conjunction with GBD. The photomontage locations were selected to provide representative views from residential dwellings and within the vicinity of residential dwellings as well as publically accessible areas including road corridors. The photomontage locations are illustrated in **Figure 20** and the photomontages in **Figures 21** to **32**.

## 1.12 Shadow flicker & blade glint

GL-Garrad Hassan prepared a shadow flicker and blade glint assessment for the project. The results of the shadow flicker and blade glint assessment are included in **Section 11** and **Appendix A** of this LVIA.

Sunlight glint is a phenomenon that results from the direct reflection of sunlight (also known as specular reflection) from a reflective surface that would be visible when the sun reflects off the surface of the wind turbine at the same angle that a person is viewing the wind turbine surface. Glint may be noticeable for some distance, but usually results in a low impact due to frequency of occurrence and the potential influence of local environmental factors including cloud cover.

The surfaces of the wind turbines, including the towers and blades, are largely convex, which will tend to result in the divergence of light reflected from the surfaces, rather than convergence toward a particular point which will also reduce the potential for blade glint.

# Location

Section 2

## 2.1 Location

The project would be located in the south of New South Wales within the NSW/ACT Border Region Renewable Energy Precinct, around 60 km south of Oberon and approximately 140 km west of Sydney. The general location of the project is illustrated in **Figure 1**. The project would extend across two participating rural residential/farming properties, covering an area around 3,900 hectares, administered by the Oberon Shire Council. The Oberon Shire Council covers around 365,900 hectares covering large tracts of the NSW Southern Tablelands and Great Dividing Range. The footprint of the project would therefore occupy a very small proportion of the Councils administered area.

The Australian Bureau of Statistics 2011 Census identifies two State Suburbs within the vicinity of the project site, and include:

- Porters Retreat, 86,800 hectares (population 255 with 112 private dwellings); and
- Wombeyan Caves, 93,400 hectares (population 263 with 242 private dwellings).

The Porters Retreat State Suburb occurs across and to the north of the project site, and Wombeyan Caves to the south. Both State Suburbs are linked by the Abercrombie Road which also passes through, and bisects, the project site. This LVIA identified a total of 78 residential dwellings within the Paling Yards 10 km viewshed which make up around 22% of the combined private dwellings within the Porters Retreat and Wombeyan Caves State Suburbs. There are no Townships or Villages within the Paling Yards 10 km viewshed. The closest Township to the project site is Taralga (population around 285), approximately 25 km to the south of the project site.

There are a small number of National Parks and State Forests in the vicinity of the project. The more significant include the Abercrombie and Blue Mountains National Parks and the Gurnang State Forest. The Abercrombie National Park adjoins the western section of the project site boundary. Covering an area of just over 19,000 hectares, the park includes walking tracks to take in low open forests, creeks and pools. Vehicle based camping facilities are provided at four locations within the park. There are no formal recreational or camping areas within the Gurnang State Forest.The project is also approximately 5 km from the southern portion of the Blue Mountains National Park, which is also part of the Greater Blue Mountain World Heritage Area. Covering an


PALING YARDS WIND FARM -
LOCATION PLAN, REGIONAL CONTEXT (Not to scale)


PALING YARDS WIND FARM -
LOCATION PLAN, STATE CONTEXT (Not to scale)

Figure 1 Location Plan

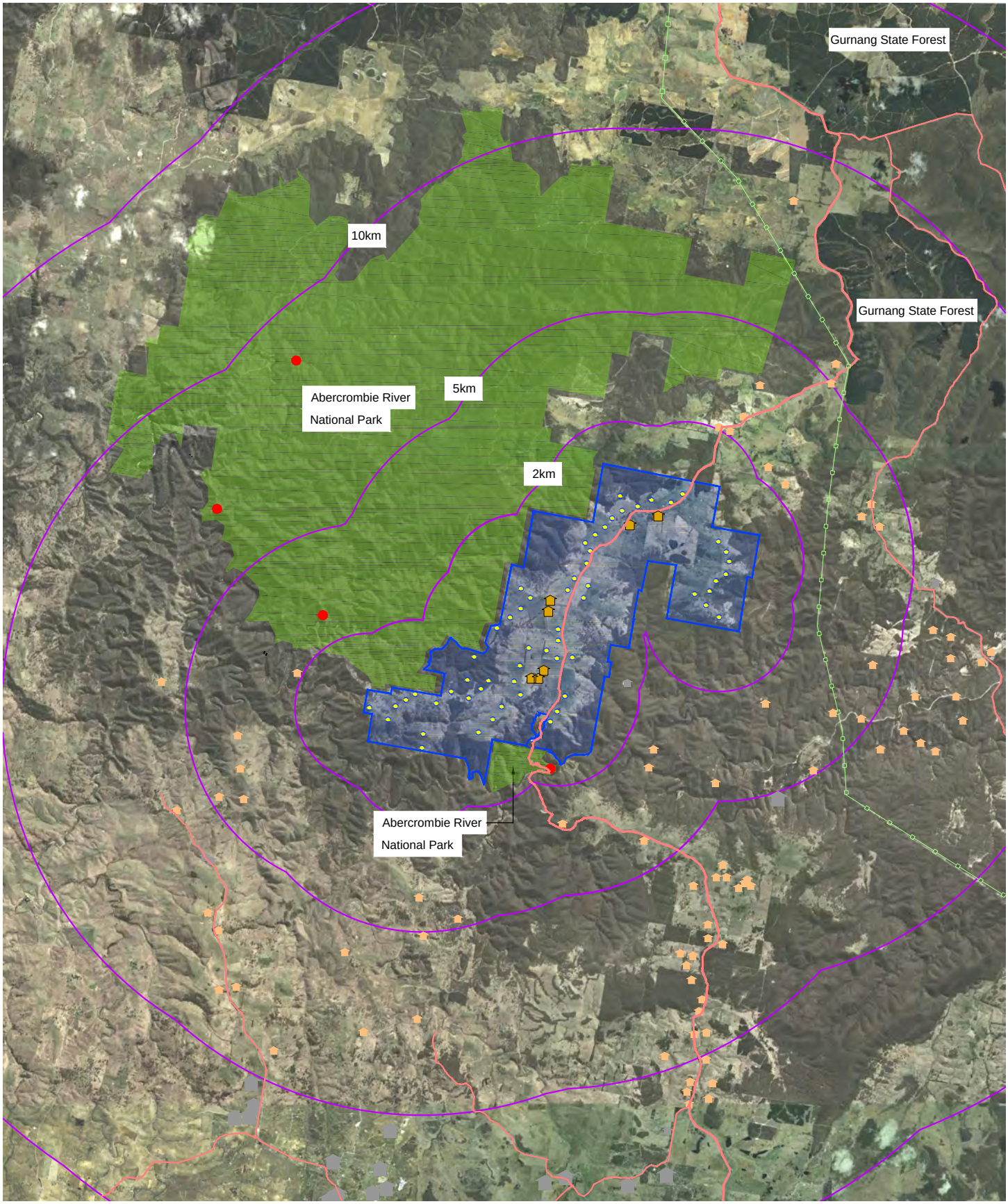
UNION FENOSA
WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

GREEN BEAN DESIGN
landscape architects

area of approximately 267,000 hectares, the irregular boundary of the park is broken up by areas of urban development, road networks and broader landholdings. Whilst subject to a very high annual visitation by tourists and sightseers, the project would not be visible from any of the key towns and associated attractions along the Great Western Highway.

The location of surrounding National Parks and State Forests are illustrated in **Figure 2**.




Legend

- Associated residential dwelling
- Non associated residential dwelling
- Proposed Paling Yards wind turbine indicative layout
- Proposed Paling Yards Wind Farm site boundary
- Distance from proposed Paling Yards wind turbine
- Local Road
- Existing 500 kV transmission line
- Abercrombie River National Park (indicative extent)
- Vehicle based camp site (indicative location)

0km 2km

Figure 2 National Parks & State Forests

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

GREEN BEAN DESIGN
landscape architects

# Project description

Section 3

## 3.1 Project description

The key visual components of the project would comprise:

- up to 59 wind turbines with a capacity of up to 4.5 MW each;
- individual transformers and switchgear with associated control systems to be located in the vicinity of the wind turbine towers (in some turbine models transformer equipment would be integrated within the tower or nacelle);
- underground electrical and communication cable network linking turbines to each other within the site boundary;
- on-site substation, internal 33 kV reticulation and a 500 kV transmission line connection to the grid via an off-site substation;
- control room and facilities building;
- up to three wind monitoring masts;
- crane hardstand areas; and
- on site access tracks for construction, operation and ongoing maintenance.

Temporary works associated with the construction of the wind farm that may be visible during construction and operational phases include:

- site office; and
- mobile concrete batching plant and rock crushing facilities.

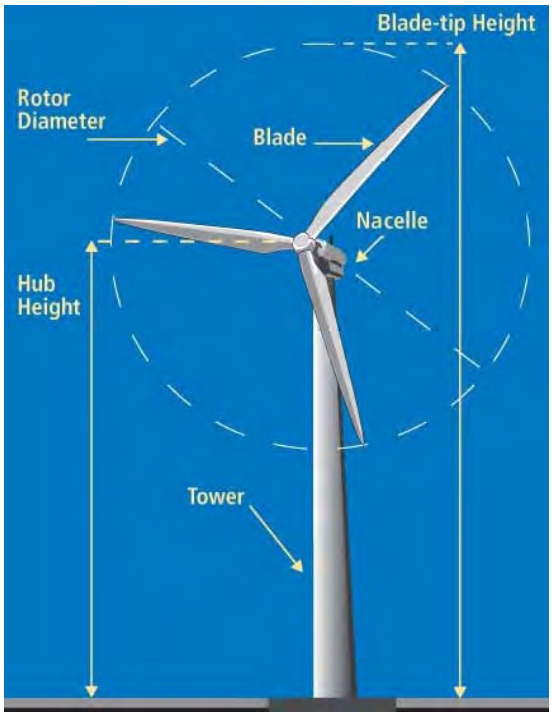
## 3.2 Wind turbines

The specific elements of the wind turbines comprise:

- concrete foundations;
- tubular tapering steel towers;

- nacelles at the top of the tower housing the gearbox and electrical generator (although not all turbine models include electrical generators within the nacelle); and
- rotors comprising a hub (attached to the nacelle) with three blades.

The following diagram identifies the main components of a typical wind turbine:




*Configuration and components of a typical wind turbine*

**Table 4** outlines the main design parameters for the proposed Paling Yards wind turbines:

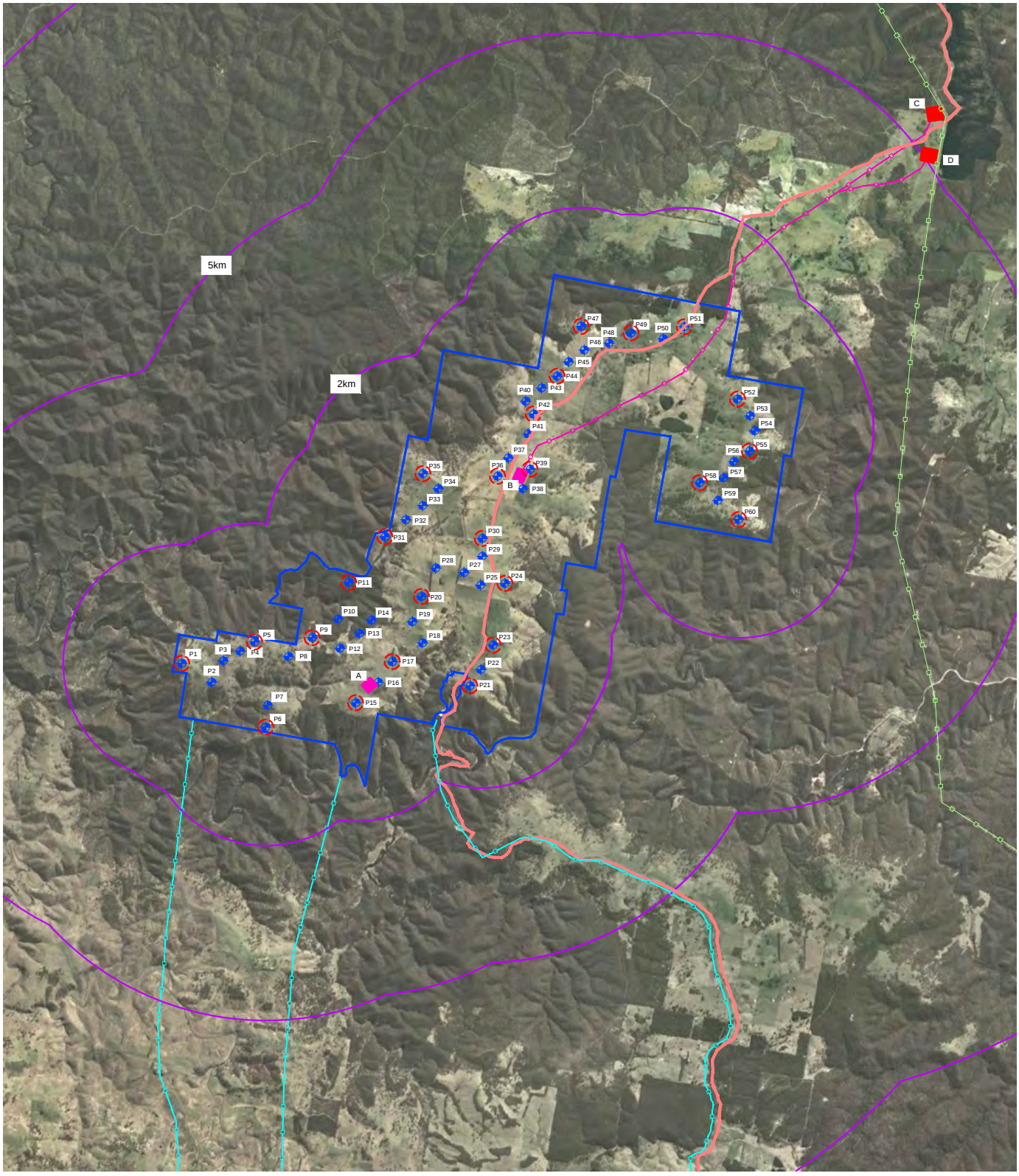
**Table 4** Paling Yards wind turbines:

| Element | Description |
|---|---|
| Tower height | Maximum of 119 m |
| Rotor Diameter | Maximum of 136 m |
| Overall height from ground level to tip of blade | Maximum of 175 m |
| **Proposed number of Paling Yards wind turbines** | **Up to 59 turbines** |

As new turbines come onto the market, it is possible that the final turbine selected may exceed, in minor respects, the assessed maximum turbine envelope. The indicative Paling Yards wind farm design layout is illustrated in **Figure 3.**

## 3.3 Wind Monitoring Masts

Up to three wind monitoring masts would be installed on-site, extending up to 119 m in height. The wind monitoring masts would be of a guyed, narrow lattice or tubular steel design. The wind monitoring masts




Legend

- Local road
- Existing 500 kV transmission line
- P20 — Paling Yards indicative wind turbine layout and turbine reference number
- Proposed wind turbine with potential obstacle lighting
- Paling Yards wind farm site boundary
- Distance from proposed wind turbine
- Assessed and proposed 500 kV transmission line corridor
- Assessed 330 kV transmission line corridors
- Proposed on site substation location options A & B
- Proposed off site substation location options C & D

0km 2km

Figure 3 Site Layout

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

GREEN BEAN DESIGN
landscape architects

would be unlikely to create a significant visual impact, and are similar in scale, or smaller than a number of surrounding communication masts visible in the landscape surrounding the wind farm project area.

## 3.4 On-site access tracks

On-site access tracks would be constructed to provide access to turbine locations across the site during construction and operation. During construction the majority of access tracks would be up to 12 m wide to allow for vehicle manoeuvring. Post construction, these access tracks would be partially rehabilitated up to 6 m width to facilitate access for maintenance vehicles during the operational phase. The final access track design would be developed on a number of environmental grounds, including minimising the potential for visual impact by considering:

- overall length and extent;
- need for clearing vegetation;
- potential for erosion;
- extent of cut and fill; and
- potential to maximise rehabilitation at the completion of the construction phase.

## 3.5 Electrical works

The principal electrical infrastructure (other than the wind turbines) that may be visible within the project would include:

- generator transformers (may be located within the wind turbine nacelle or at the base of the tower);
- one or more collector substations;
- 500 kV overhead transmission lines, electrical conductors and support structures;
- control cables (potentially located underground); and
- operation facilities and control building.

The proposed electrical works are detailed in **Section 13**.

# Viewshed, zone of visual influence & visibility

Section 4

## 4.1 Introduction

A key component of this LVIA is defined by the description, assessment and determination of the viewshed, zone of visual influence and visibility associated with the wind farm. It is a combination of these issues that sets out the framework for determining the significance and magnitude of potential visual impact of the wind farm on view locations within the landscape.

In order to clarify and explain this component of this LVIA, the relationship between viewshed, zone of visual influence and visibility is outlined and defined in **Table 5**.

**Table 5** – Definitions

| | Definition | Relationship |
|---|---|---|
| **Viewshed** | An area of land surrounding and beyond the project area which may be potentially affected by the wind farm. | Identifies the majority of this LVIA study area that incorporates view locations that may be subject to a degree of visual impact. |
| **Zone of Visual Influence (ZVI)** | A theoretical area of landscape from which the wind farm structures may be visible. | Determines areas within a viewshed from which the wind turbines may be visible. |
| **Visibility** | A relative determination at which a wind turbine or cluster of wind turbines can be clearly discerned and described. | Describes the likely number and relative scale of wind turbines visible from a view location. |

An overview of viewshed, zone of visual influence and visibility is discussed in the following sections.

## 4.2 Viewshed

For the purpose of this LVIA viewshed is defined as the area of land surrounding and beyond the project area which could be potentially affected by the wind farm. In essence, the viewshed defines this LVIA study area. The viewshed for the project has been divided into a series of concentric bands (at 2 km, 5 km and 10 km distance offsets) extending across the landscape from the wind turbines. The viewshed extent can vary between wind farm projects, and be influenced or informed by a number of criteria including the height of the wind turbines together with the nature, location and height of landform that could limit visibility.

It is important to note that the wind turbines would be visible from some areas of the landscape beyond the 10 km viewshed; however, within the general parameters of normal human vision, a wind turbine at around

175 m to the tip of the rotor blade would occupy a relatively small proportion of a person's field of view from distances in excess of 10 km.

The viewshed is used as a framework and guide for visibility assessment, as the degree of visual significance would tend to be gradated with distance although there are unlikely to be any distinct or abrupt noticeable changes between the nominated distance bands.

## 4.3 Zone of Visual Influence (ZVI)

The ZVI diagrams are used to identify theoretical areas of the landscape from which a defined number of wind turbines, or portions of turbines, could be visible within the viewshed. They are useful for providing an overview as to the extent to which the project could be visible from surrounding areas.

ZVI diagrams have been prepared by GH including:

- ZVI Diagram 1 from tip of blade; and
- ZVI Diagram 2 from hub height

The ZVI Diagrams are illustrated in **Figures 4** and **5**.

## 4.4 ZVI methodology

The methodology adopted by GH is a purely geometric assessment where the visibility of the project is determined from carrying out calculations based on a digital terrain model of the site and the surrounding terrain.

Calculations have been made to determine the visibility of the wind turbines:

- to blade tips (essentially a view toward any part of the wind turbine rotor, including views toward the tips of blades above ridgelines); and
- to hub height (essentially a view toward half the swept path of the wind turbine blades).

The calculations also take into account the terrain relief and earth curvature.

This assessment methodology is conservative as:

- the screening effects of any structures and vegetation above ground level are not considered in any way. Therefore the wind farm may not be visible at many of the locations indicated on the ZVI diagrams due to the local presence of trees or other screening materials.
- additionally, the number of turbines visible is also affected by the weather conditions at the time. Inclement or cloudy weather tends to mask the visibility of the proposed wind project.
- further, whilst 59 individual wind turbines have been assessed as part of this assessment, turbines P2, P6 and P7 are no longer proposed as part of this project (although they may form a subsequent stage which will be subject to separate approval at that time).

Accordingly, while ZVI diagrams are a useful visualisation tool, they are very conservative in nature.

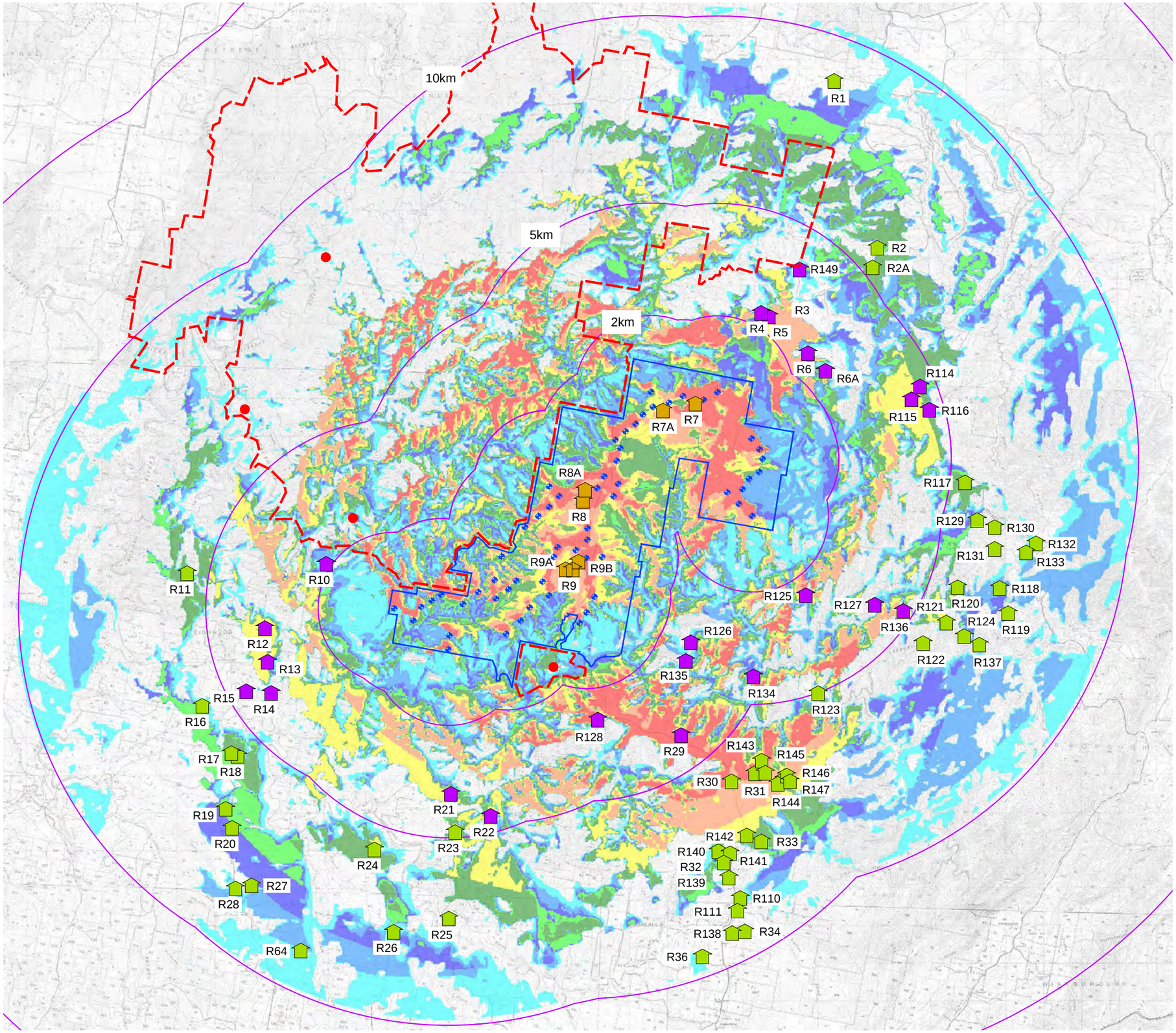
## 4.5 ZVI summary

The most extensive and continuous area of visibility toward the project turbines would generally occur where the tips of the wind turbine rotor blades are visible above surrounding ridgelines or vegetation; however, views toward the tips and upper portions of the wind turbine rotors are likely to become less noticeable at reasonably short distances from the wind farm due to the screening influence of topography and dense tree cover. Views toward tip of blade are visually negligible from medium to longer distance view locations.

The ZVI diagrams for 'tip' and 'hub height' cover similar extents of landscape surrounding the wind farm, and extend toward isolated pockets of rural landscape beyond 10 km of the nearest wind turbine. The number and distribution of turbines visible between 'tip' and 'hub' height is influenced by ridgelines and surrounding hills for a number of areas between the 5 km to 10 km distance offsets.

The ZVI diagrams illustrate areas of landscape which are likely to offer views toward the wind turbines and demonstrate that the majority of views generally occur within private property and across tracts of unoccupied rural landscape.

The ZVI diagrams also illustrate a number of discrete pockets within portions of the 5 km to 10 km distance offset from which the wind turbines would not be visible, although this band of the viewshed also represents areas from which a greater number of turbines would also be visible.




Legend

ZVI - Tips Visible

- 1 to 5 turbines
- 6 to 10 turbines
- 11 to 15 turbines
- 16 to 20 turbines
- 21 to 30 turbines
- 31 to 40 turbines
- 41 to 50 turbines
- 51 to 59 turbines

- Associated residential dwelling
- Non associated residential dwelling between 2 and 5km of Paling Yards wind turbine
- Non associated residential dwelling between 5 and 10km of Paling Yards wind turbine
- Note: there are no non associated residential dwellings within 2 km of the proposed wind turbines
- Proposed Paling Yards wind turbine indicative layout
- Proposed Paling Yards Wind Farm site boundary
- Distance from proposed wind turbine
- Abercrombie River National Park
- Vehicle based camp site

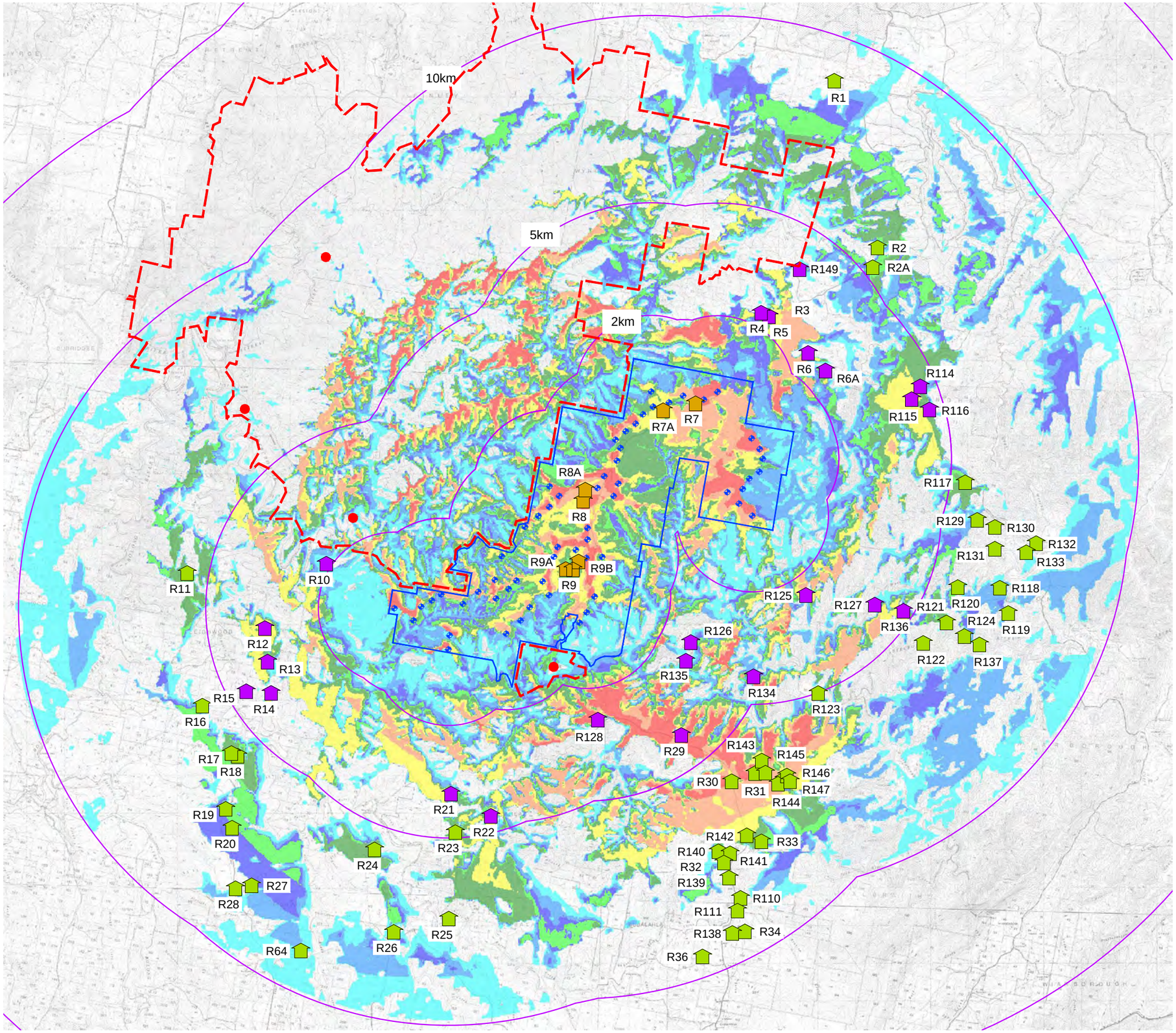
0km 4km

Figure 4 ZVI Diagram 1
Tip of blade

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

GREEN BEAN DESIGN
landscape architects

# PALING YARDS WIND FARM




## Legend

### ZVI - Hubs Visible

- 1 to 5 turbines
- 6 to 10 turbines
- 11 to 15 turbines
- 16 to 20 turbines
- 21 to 30 turbines
- 31 to 40 turbines
- 41 to 50 turbines
- 51 to 59 turbines

Associated residential dwelling

Non associated residential dwelling between 2 and 5km of Paling Yards wind turbine

Non associated residential dwelling between 5 and 10km of Paling Yards wind turbine

Note: there are no non associated residential dwellings within 2 km of the proposed wind turbines

Proposed Paling Yards wind turbine indicative layout

Proposed Paling Yards Wind Farm site boundary

Distance from proposed wind turbine

Abercrombie River National Park

Vehicle based camp site

0km 4km

Figure 5 ZVI Diagram 2
Hub height

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

GREEN BEAN DESIGN
landscape architects

# PALING YARDS WIND FARM

The ZVI diagrams illustrate that the influence of surrounding landform begins to disperse visibility from beyond 5 km, although opportunities to view turbines from elevated, but moderately distant and generally unoccupied areas occur from areas beyond 5 km.

The ZVI illustrate that views toward the Paling Yards wind farm site from the Abercrombie River National Park (to the north and west of the wind farm site) are significantly influenced by topography. Views from the larger proportion of the National Park are physically screened by rising landform. Views may extend toward the wind farm site from east and south east facing slopes and ridgelines in the south portion of the National Park; however these areas are also densely timbered.

It should be noted that the wind turbines, when viewed from distances of around, or greater than 10 km, will generally be less distinct from other distant elements within the same field of view, and that the majority of land within the viewshed comprises rural agricultural land and areas of dense timber growth.

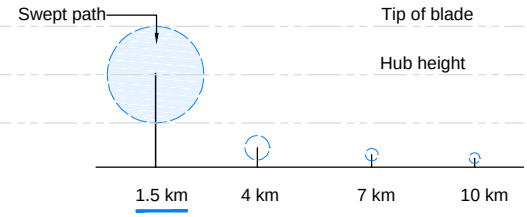
## 4.6 Visibility

The level of wind turbine visibility within the Paling Yards wind farm 10 km viewshed can result from a number of factors including, but not limited to:

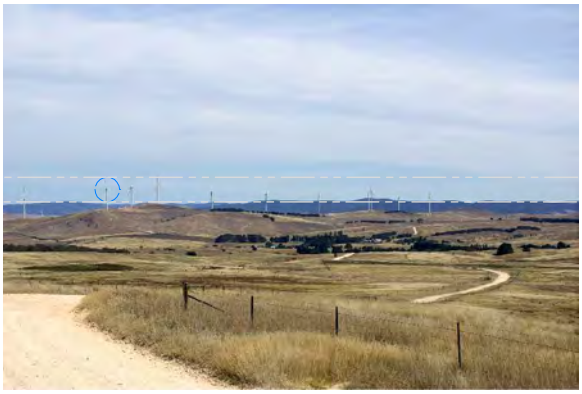
- distance effect;
- movement; and
- relative position.

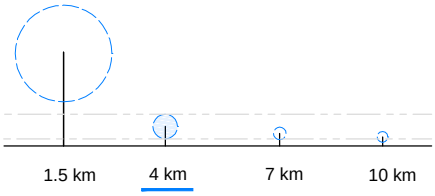
### 4.6.1 Distance effect

With an increase in distance the proportion of a person's horizontal and vertical view cone occupied by a visible turbine structure, or group of turbine structures, will decline. In order to demonstrate this a series of single frame photographs have been taken from pre-set distances (1.5 km, 4 km, 7 km and 10 km) toward wind turbines at the Capital Wind Farm in New South Wales. The photographs, illustrated in **Figure 6**, demonstrate the degree to which the apparent visible height of a wind turbine decreases with increasing distance (in a negative exponential relationship), and the increasing amount of horizontal skyline visible with an increasing distance.

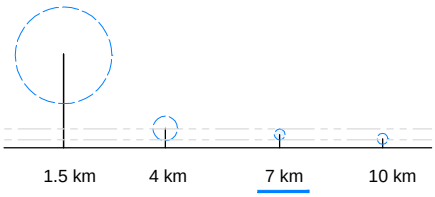



Capital Wind Farm - View distance 1.5 km

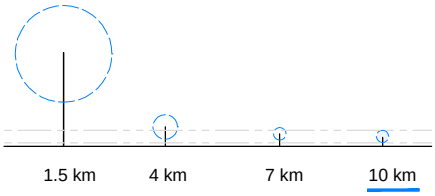





Capital Wind Farm - View distance 4 km




Capital Wind Farm - View distance 7 km




Capital Wind Farm - View distance 10 km

Capital Wind Farm turbines: Suzlon88,
80 m hub height, 88 m rotor diameter

Photographs: Pentax K10D, 50mm lens

Figure 6
Visibility and Distance

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

GREEN BEAN DESIGN
landscape architects

# PALING YARDS WIND FARM

As the view distance increases so do the atmospheric effects resulting from dust particles and moisture in the atmosphere, which makes the turbines appear to be grey thus potentially reducing the contrast between the wind turbines and the background against which they are viewed.

Whilst the distance between a view location and the wind turbines is a significant factor to consider when determining potential visibility, there are other issues which may also affect the degree of visibility. **Table 6** outlines the relative effect of distance on visibility and has been based on empirical research conducted by the University of Newcastle (2002) as well as direct observations made during wind farm site inspections.

**Table 6 –** Distance effect

| Distance from turbine | Distance effect |
|---|---|
| >20 km | Wind turbines become indistinct with increasing distance. Rotor movement may be visible but rotor structures are usually not discernible.<br>Turbines may be discernible but generally indistinct within viewshed resulting in **Low** level visibility and **Nil** where influenced or screened by surrounding topography and vegetation. |
| 10 km – 20 km | Wind turbines noticeable but tending to become less distinct with increasing distance. Blade movement may be visible but becomes less discernible with increasing distance.<br>Turbines discernible but generally less distinct within viewshed (potentially resulting in **Low** level visibility). |
| 5 km – 10 km | Wind turbines visible but tending to become less distinct depending on the overall extent of view available from the potential view location. Movement of blades discernible where visible against the skyline.<br>Turbines potentially noticeable within viewshed (potentially resulting in **Low to Moderate** level visibility). |
| 3 – 5 km | Wind turbines clearly visible in the landscape but tending to become less dominant with increasing distance. Movement of blades discernible.<br>Turbines noticeable but less dominant within viewshed (potentially resulting in **Moderate** level visibility). |
| 1 – 3 km | Wind turbines would generally dominate the landscape in which the wind turbine is situated. Potential for high visibility depending on the category of view location, their location, sensitivity and subject to other visibility factors.<br>Turbines potentially dominant within viewshed (potentially resulting in **Moderate to High** level visibility). |
| <1 km | Wind turbines would dominate the landscape in which they are situated due to large scale, movement and proximity. Turbines dominant and significant within viewshed (potentially resulting in **High** level visibility). |

### 4.6.2 Movement

The visibility of the wind turbines would vary between the categories of static and dynamic view locations. In the case of static views the relationship between a wind turbine and the landscape would not tend to vary greatly. The extent of vision would be relatively wide as a person tends to scan back and forth across the landscape.

In contrast views from a moving vehicle are dynamic as the visual relationship between wind turbines is constantly changing, as is the visual relationship between the wind turbines and the landscape in which they are seen. The extent of vision can be partially constrained by the available view from within a vehicle at proximate distances.

### 4.6.3 Relative position

In situations where the view location is located at a lower elevation than the wind turbine, most of the turbine would be viewed against the sky. The degree of visual contrast between a white coloured turbine and the sky would depend on the presence of background clouds and their colour. For example, dark grey clouds would contrast more strongly with white turbines than a background of white clouds.

The level of visual contrast can also be influenced by the position of the sun relative to individual wind turbines and the view location. Where the sun is located in front of the viewer some visible portions of the wind turbine would be seen in shadow. If the background to the wind turbine is dark toned then visual contrast would tend to be reduced. Conversely where the sun is located behind the view location then the visible portion of the wind turbine would be in full sun.

# Local environmental factors

Section 5

## 5.1 Climatic and atmospheric conditions

Local climatic and atmospheric conditions have the potential to influence the visibility of the project from surrounding view locations, and more significantly, from distant view locations. The climate of the New South Wales South Eastern Highlands Bioregion is characterised by a temperate climate of warm summers and no dry season, with elevated areas in the north and south of the bioregion experiencing milder summer conditions in montane climate zones.

The Bureau of Meteorology has collected meteorological data over the past 107 years at Oberon (Springbank) which indicates that there are:

- 81 clear days (annual mean average);
- 101 cloudy days (annual mean average); and
- 84.5 days of rain (annual mean average).

Rainfall would tend to reduce the level of visibility from a number of view locations surrounding the project with the degree of visibility tending to decrease over distance. Rain periods would be likely to reduce the number of visitors travelling through the areas from which the project could be visible, and potentially decrease the duration of time spent at a particular public view location with a view toward the project.

Cloud cover would also tend to reduce the level of visibility of the project and lessen the degree of contrast between the wind turbine structures and the background against which the wind turbines would be visible.

On clear or partly cloudy days, the position of the sun would also have an impact on the degree of visibility of the project. The degree of impact would be largely dependent on the relationship between the position and angle of the sun relative to the view location. Late afternoon and early evening views toward the west would result in the wind turbines silhouetted above the horizon line, and with increasing distance would tend to reduce the contrast between the wind turbine structures and the surrounding landform.

The extent to which local weather conditions can influence visibility toward turbine structures is illustrated in **Figure 7**.

Image source GBD 2010

PHOTO A - Illustrates the visibility of wind turbines against a clear and blue sky backdrop with sunlight from above and to the right of the wind turbines creating a shadow line along the left hand side of the towers as well as portions of the rotor blades.

PHOTO A - DAY TIME VIEW FROM HUME HIGHWAY TOWARD CULLERIN WIND FARM AT AROUND 3.5KM (13th June 2010)

Image source GBD 2010

PHOTO B - Illustrates the visibility of wind turbines against a partly cloudy and overcast backdrop. The wind turbines in cloud shadow appear off white to grey in colour.

PHOTO B - DAY TIME VIEW FROM HUME HIGHWAY TOWARD CULLERIN WIND FARM AT AROUND 3.5KM (10th June 2010)

Image source GBD 2010

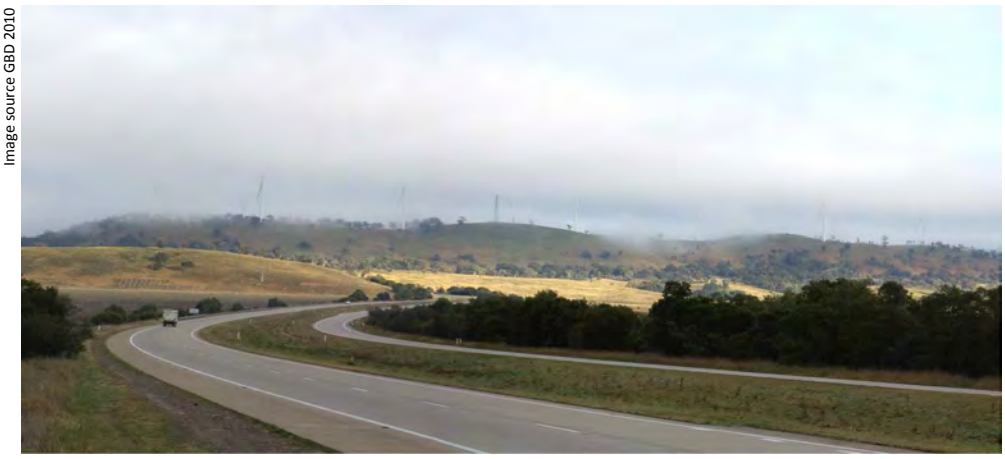


PHOTO C - Illustrates the visibility of wind turbines in fog/low cloud cover.

PHOTO C - DAY TIME VIEW FROM HUME HIGHWAY TOWARD CULLERIN WIND FARM AT AROUND 3.5KM (7th July 2010)

Figure 7
Visibility and Weather

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

GREEN BEAN DESIGN
landscape architects

## 5.2 Topography and drainage

The topography of the landscape within the New South Wales South Eastern Highlands Bioregion covers a broad area of the dissected ranges and plateaus of the Great Dividing Range extending east toward the Great Escarpment and the western slopes of the inland drainage basins. The project would be located on portions of plateau remnants above steep sided valleys cut by drainage lines, including the Abercrombie River. The elevation of the wind farm site falls gently from the north east toward the south west (at around 1065m to 900m), before falling more steeply south toward the Abercrombie River valley. A number of ephemeral drainage lines occur across the wind farm site, draining to broader valleys north west and south east of the wind farm site, as well as south toward the Abercrombie River valley.

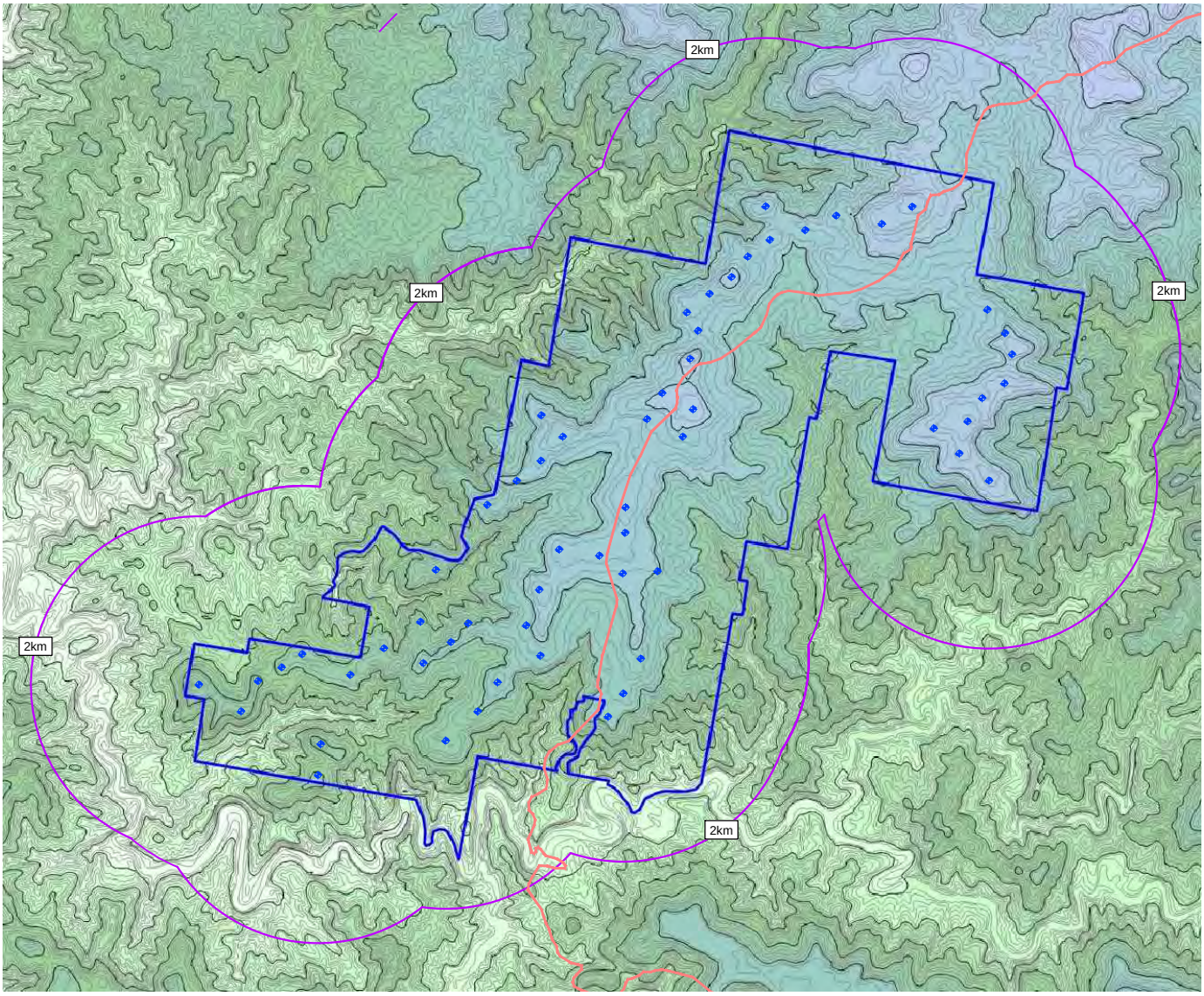
Landform elevation within and surrounding the project site is illustrated in **Figure 8**.

## 5.3 Vegetation

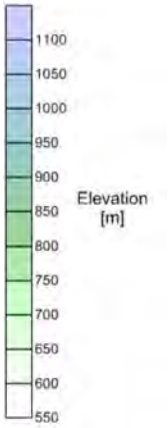
A detailed survey of existing vegetation has been carried out as part of the biodiversity assessment for the project EA and is summarised in the EA.

In general the landscape within the project site contains vegetation associated with woodland, drainage lines, small ponds/dams and cleared land for pasture and agricultural crop cultivation. Stands of remnant woodland occur within the wider context of a modified landscape which continues to be managed through a variety of farming activities.

The landscape within and surrounding the project site is illustrated in the panorama photographs presented in **Figures 10** to **15**.




Legend




Proposed Paling Yards wind turbine indicative layout

Proposed Paling Yards Wind Farm site boundary

Distance from proposed Paling Yards wind turbine

Abercrombie Road

0km 2km

Figure 8 Topography

UNION FENOSA WIND AUSTRALIA

gasNatural fenosa

GREEN BEAN DESIGN landscape architects

# PALING YARDS WIND FARM

# Panoramic photographs (existing views) Section 6

## 6.1 Panoramic photographs

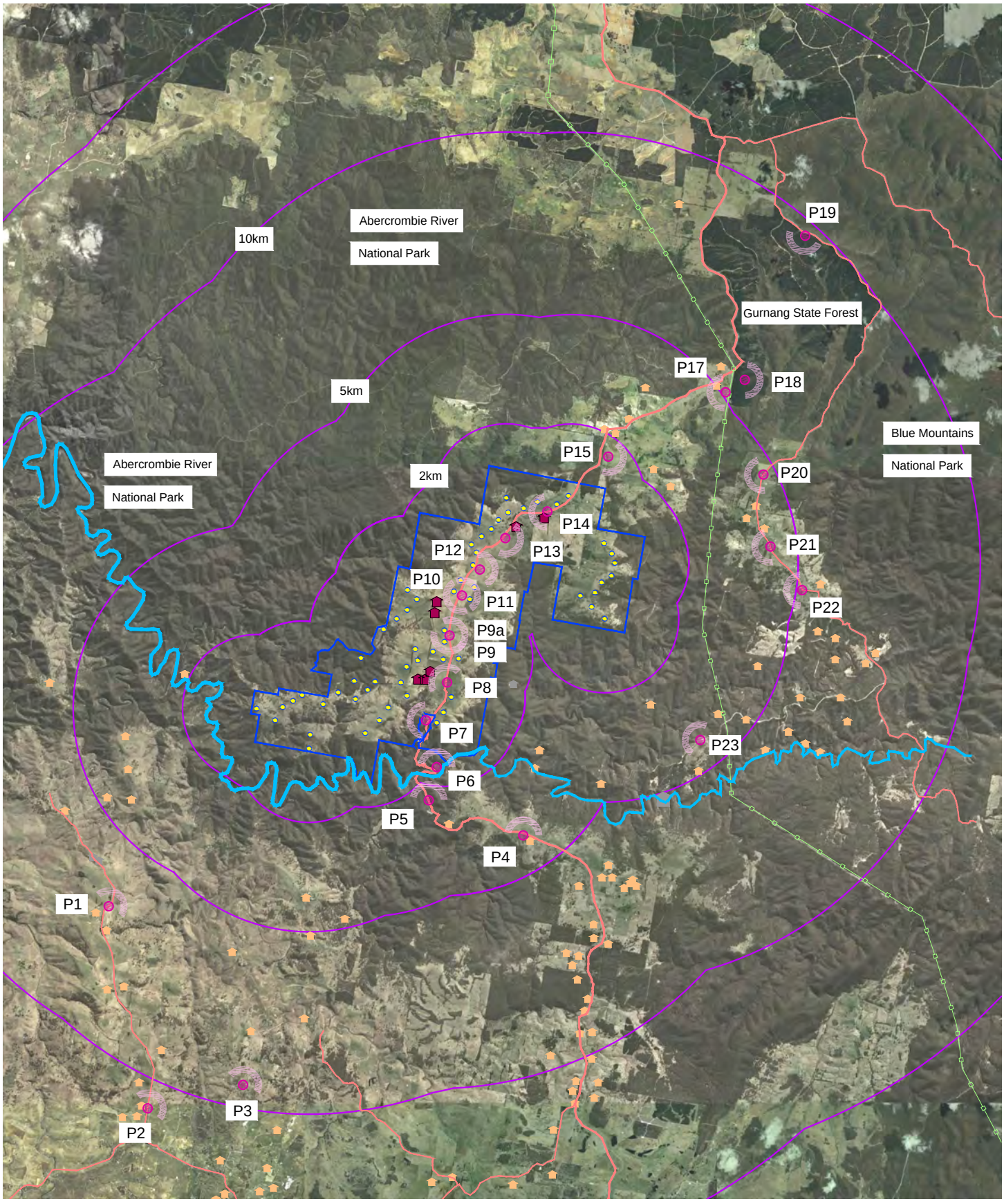
A series of digital photographs were taken during the course of the fieldwork to illustrate existing views in the vicinity of a number of view locations inspected and assessed as part of this LVIA. Individual photographs were digitally stitched together to form a segmented panorama image to provide a visual illustration of the existing view from each photo location.

A GPS coordinate for each panorama photograph location was recorded with an accuracy of around +/- 4m. Additional information including the bearing or direction of each photograph, time of day and prevailing weather conditions was also recorded.

The panoramic photographs presented in this LVIA have been annotated to identify key features or structures located within the existing view. They also indicatively illustrate the general extent and location of potentially visible wind turbines or portions of turbine structures for the project.

The panoramic photograph locations are illustrated in **Figure 9**, and the panoramic photographs illustrated in **Figures 10** to **15**.

The panoramic photographs are not to be confused with the photomontages. The panoramic photographs do not include a representation or model of the wind turbine structures. The photomontages are discussed in **Section 10** of this LVIA, and are illustrated in **Figures 21** to **32**.




Legend

Local road

Existing 500kV transmission line

Photo location

Paling Yards proposed wind turbine indicative layout

Paling Yards wind farm site boundary

Distance offset to proposed Paling Yards wind turbines as noted

0km 2km

Figure 9
Photo Locations

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

GREEN BEAN DESIGN
landscape architects

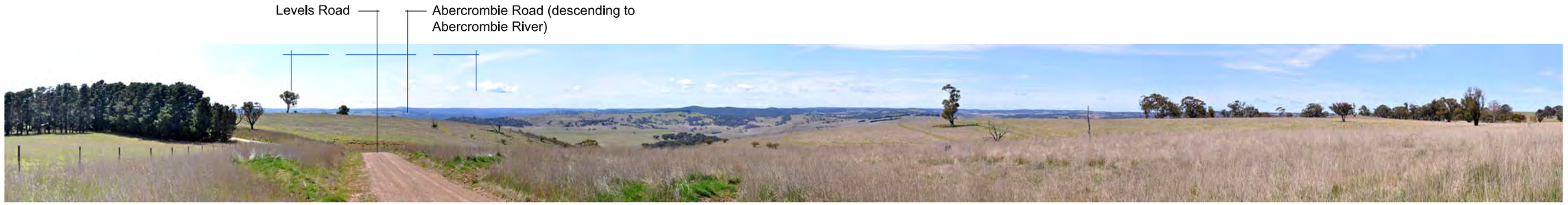



Photo Location P1- View north east from Levels Road, Golspie

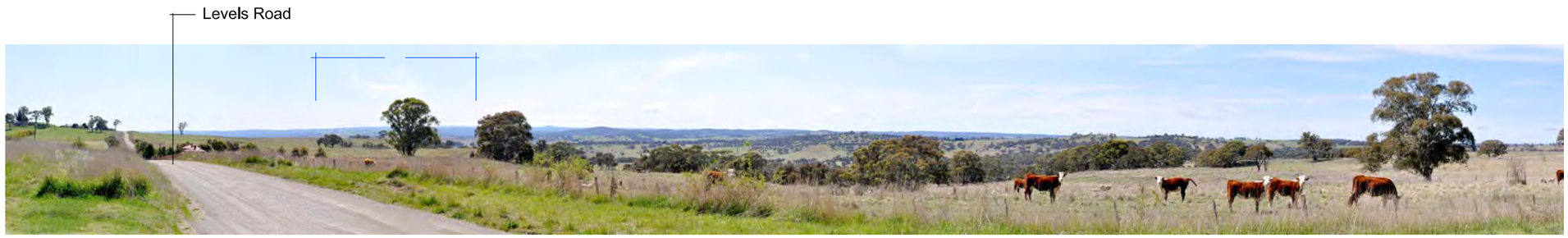



Photo Location P2- View north east from Levels Road, Golspie

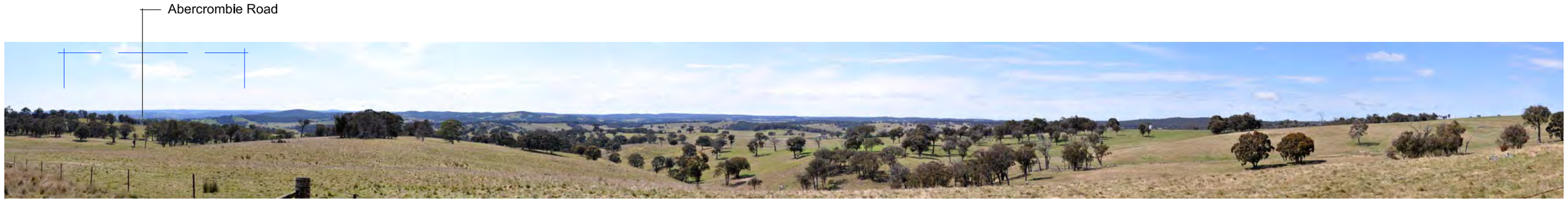



Photo Location P3- View north east from Leighwood Road, Golspie


Photo Location P4- View north east to east from Taralga Road

Indicative extent of Paling Yards Wind Farm turbines

UNION FENOSA WIND AUSTRALIA

gasNatural fenosa

# PALING YARDS WIND FARM

Note:
The illustrated extent of the Paling Yards Wind Farm is indicative only and does not depict potential turbine height or the degree of actual visibility

Figure 10 Photo Sheet 1

GREEN BEAN DESIGN
landscape architects

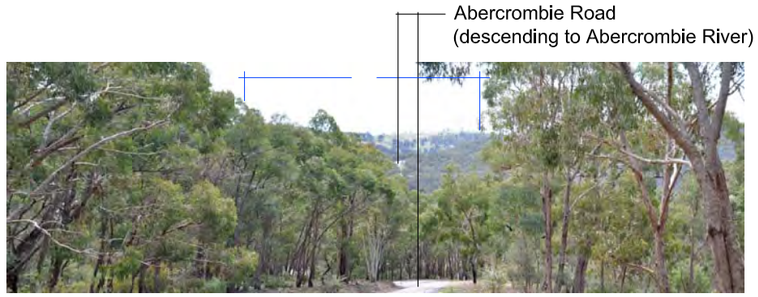



Photo Location P5- View north from Abercrombie Road


Photo Location P6- View north from Bummaroo Ford campground (adjacent Abercrombie River)


Photo Location P7- View north to west from Abercrombie Road


Photo Location P8- View north to west from the Abercrombie Road

Indicative extent of Paling Yards Wind Farm turbines

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

Note:
The illustrated extent of the Paling Yards Wind Farm is indicative only and does not depict potential turbine height or the degree of actual visibility

Figure 11 Photo Sheet 2

GREEN BEAN DESIGN
landscape architects


Photo Location P9- View south from Abercrombie Road


Photo Location P9a- View north to north east from Abercrombie Road


Photo Location P10- View south to south west from Abercrombie Road

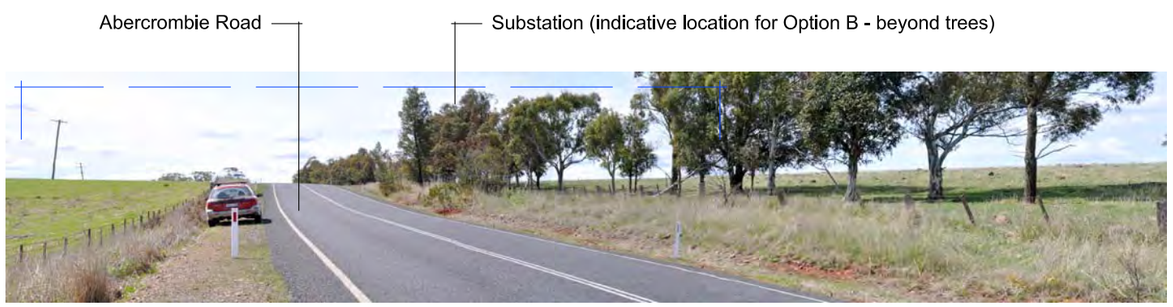



Photo Location P11- View north to north west from Abercrombie Road

Indicative extent of Paling Yards Wind Farm turbines

Note:
The illustrated extent of the Paling Yards Wind Farm is indicative only and does not depict potential turbine height or the degree of actual visibility

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

Figure 12 Photo Sheet 3

GREEN BEAN DESIGN
landscape architects


Photo Location P12- View north east to east from Abercrombie Road


Photo Location P13- View north to north east from Abercrombie Road

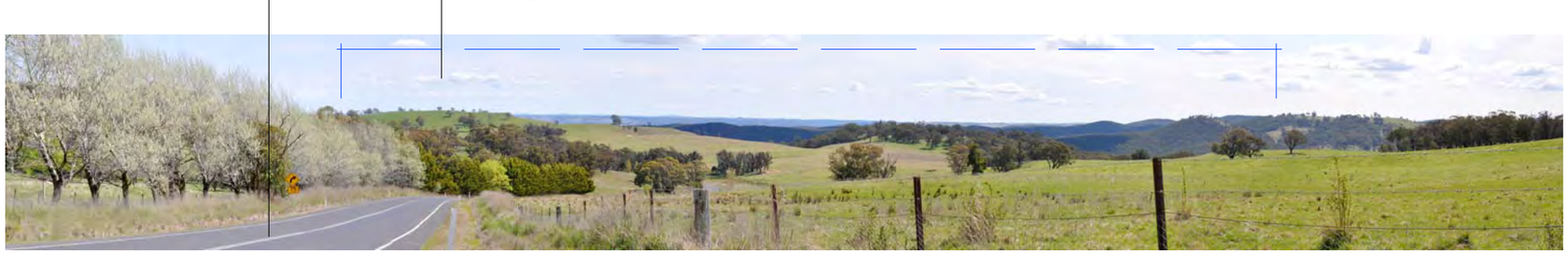



Photo Location P14- View south to south west from Abercrombie Road

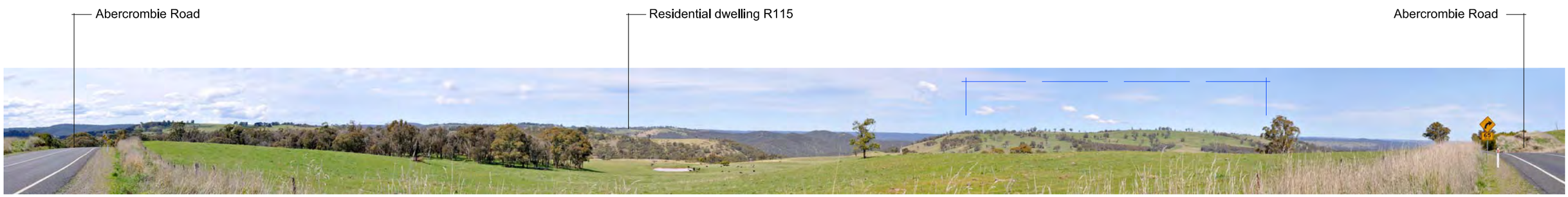



Photo Location P15- View north to east from Abercrombie Road

Indicative extent of Paling Yards Wind Farm turbines

Note:
The illustrated extent of the Paling Yards Wind Farm is indicative only and does not depict potential turbine height or the degree of actual visibility

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

Figure 13 Photo Sheet 4

GREEN BEAN DESIGN
landscape architects


Photo Location P16- View south to south west from Abercrombie Road


Photo Location P17- View south to south west from Abercrombie Road


Photo Location P18- View north east to east from Goulburn Oberon Road

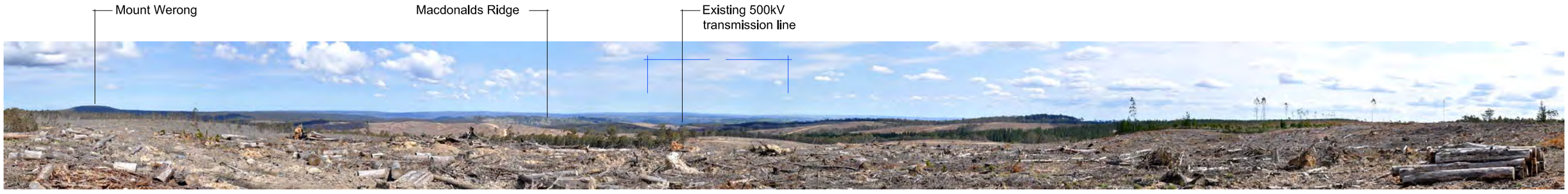



Photo Location P19- View south to south west from Gurnang State Forest

Indicative extent of Paling Yards Wind Farm turbines

Figure 14 Photo Sheet 5

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

Note:
The illustrated extent of the Paling Yards Wind Farm is indicative only and does not depict potential turbine height or the degree of actual visibility

GREEN BEAN DESIGN
landscape architects


Photo Location P20- View south west to north east from Jerrong Road

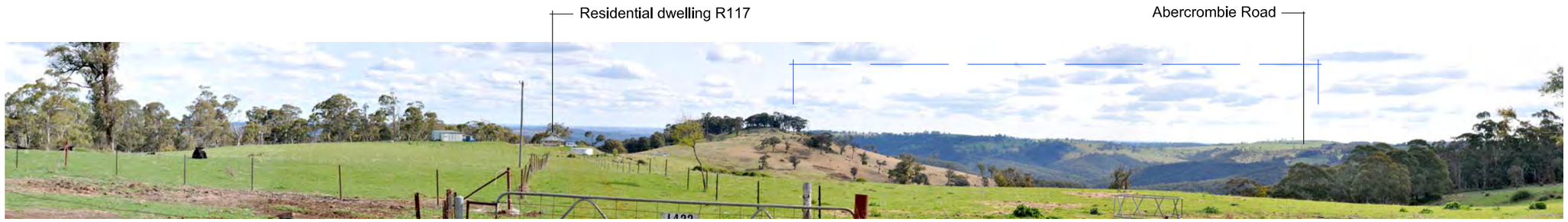



Photo Location P21- View west to south west from Jerrong Road

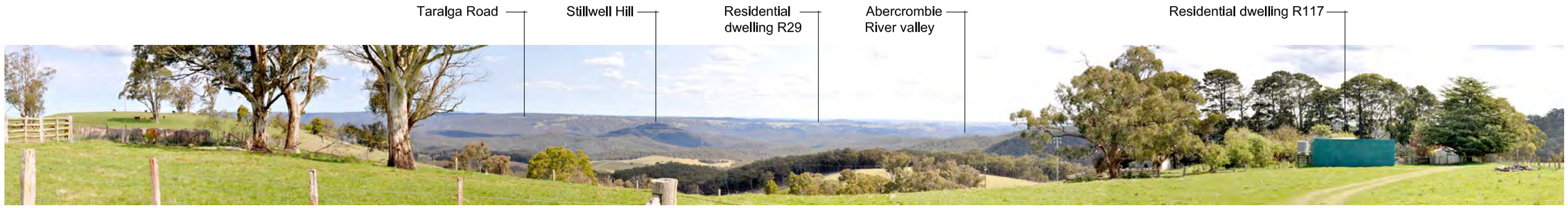



Photo Location P22- View south to west from Jerrong Road

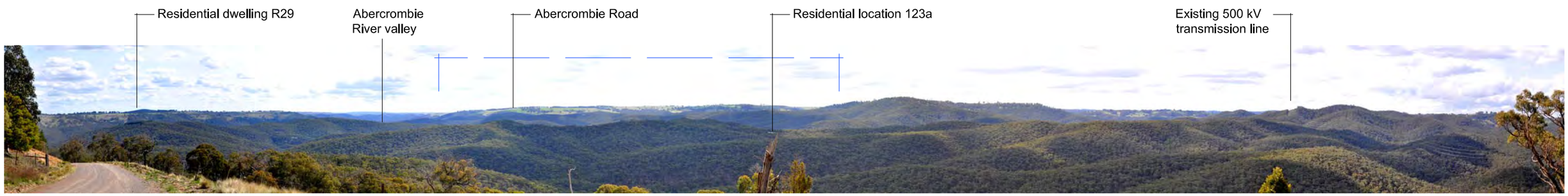



Photo Location P23- View south to south west from Gurnang State Forest

Indicative extent of Paling Yards Wind Farm turbines

Figure 15 Photo Sheet 6

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

# PALING YARDS WIND FARM

Note:
The illustrated extent of the Paling Yards Wind Farm is indicative only and does not depict potential turbine height or the degree of actual visibility

GREEN BEAN DESIGN
landscape architects

# Landscape character areas & sensitivity

Section 7

## 7.1 Landscape character areas

A fundamental part of this LVIA is to understand and describe the nature and sensitivity of different components of the landscape within the project 10 km viewshed, and to assess the landscape character in a clear and consistent process. For the purpose of this LVIA, landscape character is defined as '*the distinct and recognisable pattern of elements that occur consistently in a particular type of landscape'* (The Countryside Agency and Scottish Natural Heritage 2002).

This LVIA has identified five Landscape Character Areas (LCA's), which occur within the project 10 km viewshed. The five LCA's represent areas that are relatively consistent and recognisable in terms of their key visual elements and physical attributes; which include a combination of topography/landform, vegetation/landcover, land use and built structures (including settlements and local road corridors).

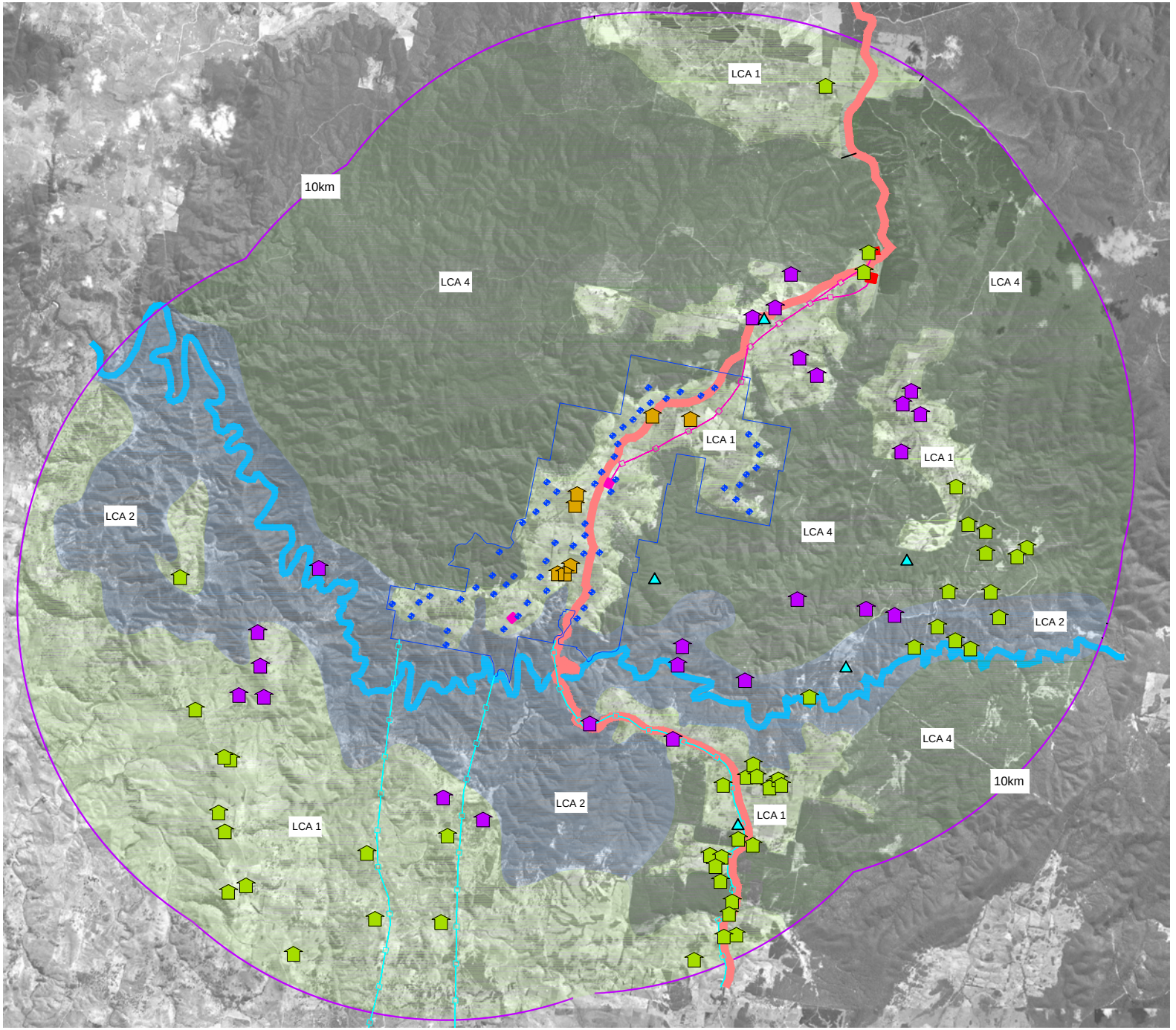
The five LCA's have been identified through a desk top assessment and described during the landscape assessment fieldwork carried out for the LVIA. The five LCA are illustrated in **Figure 16**. The LCA should not be considered as discrete areas, and characteristics within one LCA may occur within adjoining or surrounding LCA's. For the purpose of this LVIA the five LCA are:

- LCA 1 – Undulating pastoral farmland;
- LCA 2 – Abercrombie River Valley;
- LCA 3 – Abercrombie River;
- LCA 4 – Forested hills and ridgelines; and
- LCA 5 – Rural dwellings.

An overview of each LCA is presented below, with further description and assessment provided in **Tables 8** to **12**.

### 7.1.1 Undulating pastoral farmland

The main area of the undulating pastoral farmland LCA occurs to the west and south west of the Abercrombie River Valley and also within the Paling Yards wind farm site boundary. Small pockets of cleared pastoral land also occur sporadically within the 10 km viewshed, more often associated with land surrounding rural residential dwellings. The undulating pastoral farmland LCA has been largely cleared of tree cover and significantly modified for agricultural production.






Legend

- LCA 1 - Undulating pastoral farmland
- LCA 2 - Abercrombie River valley
- LCA 3 - Abercrombie River
- LCA 4 - Forested hills and ridgelines
- LCA 5 - Rural dwellings
- Abercrombie Road
- Associated residential dwelling
- Non associated residential dwelling between 2 and 5 km of Paling Yards wind turbine
- Non associated residential dwelling between 5 and 10 km of Paling Yards wind turbine
- Non-residential structure
- Paling Yards indicative wind turbine layout and turbine reference number
- Paling Yards wind farm site boundary
- Distance from proposed wind turbine
- Assessed and proposed 500 kV transmission line corridor
- Assessed 330 kV transmission line corridors
- Proposed on site substation location options A & B
- Proposed off site substation location options C & D

0km 4km

Figure 16
Landscape Character Areas

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

GREEN BEAN DESIGN
landscape architects

# PALING YARDS WIND FARM

The undulating pastoral farmland LCA is sparsely populated and supports a small number of rural residential dwellings and homesteads. Vast tracks of undulating cleared grazing land extend beyond the 10 km viewshed and across the south-western Central Tablelands of NSW. Access to view locations within the LCA is largely restricted by private land; however, middle-ground to distant views can be obtained from sections of the publically accessible local road network. The physical attributes and landscape sensitivity of the undulating pastoral farmland LCA are described and assessed in **Table 8**.

### 7.1.2 Abercrombie River Valley

The Abercrombie River Valley LCA extends east to west across the project 10 km viewshed below the Paling Yards wind farm site. In addition to the Abercrombie River Valley, the Silent Creek and Retreat River valleys also occur within the 10 km viewshed and (together with a number of minor gullies) form part of the Abercrombie River catchment. A small portion of the Abercrombie River Valley LCA extends into the south portion of the Paling Yards wind farm project area. The Abercrombie River Valley is deeply incised and contained by a number of steep sided hills and prominent ridgelines. The topography forms a high degree of visual enclosure, which is reinforced by dense native tree cover. The Abercrombie River Valley is largely unmodified, but indirectly impacted by agricultural land use beyond the LCA.

The Abercrombie River Valley LCA is sparsely populated and supports a small number of rural residential dwellings and homesteads. Access within the LCA is available from portions of the Abercrombie River National Park as well as private land and short sections of local roads. The physical attributes and landscape sensitivity of the undulating pastoral farmland LCA are described and assessed in **Table 9**.

### 7.1.3 Abercrombie River

The Abercrombie River LCA extends west to east across the 10 km viewshed and to the south of the Paling Yards wind farm site. The Abercrombie River LCA is bounded north and south by the Abercrombie River Valley LCA. The meandering pattern of the river is largely influenced by geological structures, and forms the principal drainage line and water catchment through the 10 km viewshed. Access to the LCA is available from portions of the Abercrombie River National Park as well as private land and short sections of local roads; however, views are largely enclosed by surrounding topography and dense tree cover. The physical attributes and landscape sensitivity of the Abercrombie River LCA are described and assessed in **Table 10**.

### 7.1.4 Forested hill and ridgeline

The forested hill and ridgeline LCA occurs to the west, north and east of the Paling Yards wind farm site boundary. The forested hill and ridgeline LCA covers the greater extent of the 10 km viewshed surrounding the project site, and extends north, beyond the 10 km viewshed, into the Blue Mountains National Park.

The forested hills and ridgeline LCA is sparsely populated, supporting a small number of rural residential dwellings and homesteads. Access to the LCA is available from portions of the Abercrombie River National Park as well as private land and short sections of local roads; however, views are largely enclosed by surrounding topography and dense tree cover. The physical attributes and landscape sensitivity of the forested hill and ridgeline LCA are described and assessed in **Table 11**.

### 7.1.5 Rural dwellings

Rural dwellings do not constitute a singular LCA but do introduce specific elements whose characteristics can be differentiated from the surrounding landscape. Rural dwellings are located within each of the other LCA (with the exception of the Abercrombie River LCA). Rural dwellings introduce constructed elements into the landscape along with a rage of associated rural and agricultural infrastructure. The physical attributes and landscape sensitivity of the rural dwelling LCA are described and assessed in **Table 12**.

## 7.2 Landscape sensitivity assessment

The British Landscape Institute describes landscape sensitivity as '*the degree to which a particular LCA can accommodate change arising from a particular development, without detrimental effects on its character*'.

The assessment of landscape sensitivity is based upon an evaluation of the physical attributes identified within each LCA, both singularly and as a combination that gives rise to the landscape's overall robustness and the extent to which it could accommodate the wind farm development. The criteria used to determine landscape sensitivity are outlined in **Table 7** and based on current good practice employed in the assessment of wind farm developments. Landscape sensitivity is a relative term, and the intrinsic landscape values of the surrounding landscape could be considered of a higher or lower sensitivity than other areas in the NSW/ACT Border Region Renewable Energy Precinct.

Whilst the assessment of landscape sensitivity is largely based on a systematic description and analysis of landscape characteristics, this LVIA acknowledges that some individuals and other members of the local

community would place higher or lower values on the local landscape. These values could transcend preferences (likes and dislikes) and include personal, cultural as well as other parameters.

**Table 7** – Criteria for the assessment of Landscape Sensitivity

| Landscape Sensitivity Assessment Criteria | | | |
|---|---|---|---|
| **Characteristic** | **Aspects indicating lower sensitivity to the wind farm development** | ↔ | **Aspects indicating higher sensitivity to the wind farm development** |
| Landform and scale: patterns, complexity and consistency | • Large scale landform<br>• Simple<br>• Featureless<br>• Absence of strong topographical variety | ↔ | • Small scale landform<br>• Distinctive and complex<br>• Human scale indicators<br>• Presence of strong topographical variety |
| Landcover: patterns, complexity and consistency | • Simple<br>• Predictable<br>• Smooth, regular and uniform | ↔ | • Complex<br>• Unpredictable<br>• Rugged and irregular |
| Settlement and human influence | • Concentrated settlement pattern<br>• Presence of contemporary structures (e.g. utility, infrastructure or industrial elements) | ↔ | • Dispersed settlement pattern<br>• Absence of modern development, presence of small scale, historic or vernacular settlement |
| Movement | • Prominent movement, busy | ↔ | • No evident movement, still |
| Rarity | • Common or widely distributed example of landscape character area within a regional context | ↔ | • Unique or limited example of landscape character area within a regional context |
| Intervisibility with adjacent landscapes | • Limited views into or out of landscape<br>• Neighbouring landscapes of low sensitivity<br>• Weak connections, self contained area and views<br>• Simple large scale backdrops | ↔ | • Prospects into and out from high ground or open landscape<br>• Neighbouring landscapes of high sensitivity<br>• Contributes to wider landscape<br>• Complex or distinctive backdrops |

The landscape sensitivity assessment criteria set out in **Table 7** have been evaluated for each of the five LCA's by applying a professionally determined judgement on a sliding scale between 1 and 5.

A scale of 1 indicates a landscape characteristic with a lower sensitivity to the wind farm development (and would be more likely to accommodate the wind farm development). A scale of 5 indicates a landscape

characteristic with a high level of sensitivity to the wind farm development (and less likely to accommodate the wind farm development).

The scale of sensitivity for each LCA is outlined in **Tables 8** to **12** and is set out against each characteristic identified in **Table 7**.

The overall landscape sensitivity for each LCA is a summation of the scale for each characteristic identified in **Tables 8** to **12**. The overall scale is expressed as a total out of 30 (i.e. 6 characteristics for each LCA with a potential top scale of 5). Each characteristic is assessed separately and the criteria set out in **Table 6** are not ranked in equal significance. The overall landscape sensitivity for each of the five LCA has been determined as either:

**High (Scale of 24** to **30)** – key characteristics of the LCA will be impacted by the proposed project, and will result in major and visually dominant alterations to perceived characteristics of the LCA which may not be fully mitigated by existing landscape elements and features. The degree to which the landscape may accommodate the proposed project development will result in a number of perceived uncharacteristic and significant changes.

**Medium to High (Scale of 16** to **23)** – recognisable characteristics of the LCA will be altered by the proposed project, and result in the introduction of visually prominent elements that will alter the perceived characteristics of the LCA but may be partially mitigated by existing landscape elements and features within the LCA. The main characteristics of the LCA, patterns and combinations of landform and landcover will still be evident.

**Medium (Scale 11 to 15) –** distinguishable characteristics of the LCA may be altered by the proposed project, although the LCA may have the capability to absorb some change. The degree to which the LCA may accommodate the proposed project would potentially result in the introduction of prominent elements to the LCA, but may be accommodated to some degree.

**Low Rating (Scale of 6** to **10)** – the majority of the LCA characteristics are generally robust, and would be less affected by the proposed project. The degree to which the landscape may accommodate the wind farm would not significantly alter existing landscape character.

**Very Low or Negligible Rating (Less than 6)** the characteristics of the LCA will not be impacted or visibly altered by the proposed project.

## 7.3 Analysis of landscape sensitivity

The following section of this LVIA provides an analysis of landscape sensitivity within the viewshed of the wind farm development and considers each of the five LCA's.

### 7.3.1 LCA 1 Undulating pastoral farmland

**Plate 1** – Typical view across undulating pastoral farmland

**Table 8** – LCA 1, Landscape Sensitivity

| | Lower Sensitivity | | ↔ | | Higher Sensitivity |
|---|---|---|---|---|---|
| | Low | Low to Med | Medium | Med to High | High |
| **Sensitivity Rating** | **1** | **2** | **3** | **4** | **5** |
| Landform and Scale | | 2 | | | |
| | Landform varies between **large** to **moderate scale** and is relatively **simple** in structure. Topography is generally gently undulating land through cultivated and pastoral farmland areas across plateau and between broad valleys. | | | | |
| Landcover | | 2 | | | |
| | Landcover through this LCA is **simple** and **regular** being largely determined by cultivated crop and pastoral grazing. Pasture areas are visually divided by hedgerows and groups or individual tree planting in some areas of the LCA. | | | | |
| Settlement and human influence | | | 3 | | |
| | A very low density of settlement is **dispersed** with some evidence of contemporary structures including **utility infrastructure** and **agricultural industrial** elements. Human influence is evident through agricultural modification and road construction. | | | | |
| Movement | | | 3 | | |
| | There is **limited** evidence of movement within the LCA with occasional traffic along roads and machinery working within the agricultural landscape.. | | | | |
| Rarity | | 2 | | | |
| | The main elements within this LCA are **common** and **well represented** within the NSW/ACT Border Region Renewable Energy Precinct and broader areas of the south western Central Tablelands of NSW. | | | | |
| Intervisibility | | | 3 | | |
| | Views into some portions of this LCA **limited** and **restricted** by surrounding landform which **contains** opportunities for long distant views. | | | | |
| Overall Sensitivity Rating | (2+2+3+3+2+3 = 15)<br>Medium (Score 15 out of 30) | | | | |

### 7.3.2 LCA 2 Abercrombie River Valley

**Plate 2** – Typical view toward steep sided valleys

**Table 9** – LCA 2, Landscape Sensitivity

| | Lower Sensitivity ↔ Higher Sensitivity | | | | |
|---|---|---|---|---|---|
| | **Low** | **Low to Med** | **Medium** | **Med to High** | **High** |
| **Sensitivity Rating** | **1** | **2** | **3** | **4** | **5** |
| Landform and Scale | | | 3 | | |
| | Landform and topography is **distinctive** but with **limited** features. | | | | |
| Landcover | | 2 | | | |
| | Landcover through this LCA is **simple** and **regular** comprising forested hillside and ridgeline areas with limited areas of clearing between valley and ridgeline areas. | | | | |
| Settlement and human influence | | | | 4 | |
| | Settlement is **dispersed** with limited evidence of utility infrastructure and agricultural elements. | | | | |
| Movement | | | | 4 | |
| | There is **limited** evidence of movement within the LCA with occasional traffic along roads and machinery working in surrounding fields. | | | | |
| Rarity | | 2 | | | |
| | The main elements within this LCA are reasonably **common** and **well represented** within the NSW/ACT Border Region Renewable Energy Precinct. | | | | |
| Intervisibility | | 2 | | | |
| | Views into and out of this LCA **limited** and **restricted** by surrounding landform which **contains** opportunities for long distant views from elevated areas. | | | | |
| Overall Sensitivity Rating | (3+2+4+4+3+2=17)<br>Medium to High (Score 17 out of 30) | | | | |

### 7.3.3 LCA 3 Abercrombie River

**Plate 3** – View toward Abercrombie River from the Bummaroo Camp Site

**Table 10** – LCA 3, Landscape Sensitivity

| | Lower Sensitivity | | ↔ | | Higher Sensitivity |
|---|---|---|---|---|---|
| | **Low** | **Low to Med** | **Medium** | **Med to High** | **High** |
| **Sensitivity Rating** | **1** | **2** | **3** | **4** | **5** |
| Landform and Scale | | 2 | | | |
| | Landform is generally **simple** alongside the majority of drainage lines through large scale pastoral landscape. Drainage lines are largely **featureless** and have been largely cleared, with tree cover limited to occasional or small groups of trees. | | | | |
| Landcover | | 2 | | | |
| | Landcover through this LCA is **simple** and **regular** comprising cultivated ground or improved pasture. | | | | |
| Settlement and human influence | | | | 4 | |
| | Settlement is **dispersed** with some evidence of **utility infrastructure** and agricultural elements. | | | | |
| Movement | | | | 4 | |
| | There is **limited** evidence of movement within the LCA with occasional traffic along roads and machinery working in surrounding fields. | | | | |
| Rarity | | 2 | | | |
| | The main elements within this LCA are reasonably **common** and **well represented** within the NSW/ACT Border Region Renewable Energy Precinct. | | | | |
| Intervisibility | | | 3 | | |
| | Views into and out of this LCA **limited** and **restricted** by surrounding landform which **contains** opportunities for long distant views. | | | | |
| Overall Sensitivity Rating | (2+2+4+4+2+3=17)<br>Medium to High (Score 17 out of 30) | | | | |

### 7.3.4 LCA 4 Forested hill and ridgeline

**Plate 4** – Typical views across forested hill and ridgeline landscape

**Table 11** – LCA 4, Landscape Sensitivity

| | Lower Sensitivity | | ↔ | | Higher Sensitivity |
|---|---|---|---|---|---|
| | Low | Low to Med | Medium | Med to High | High |
| **Sensitivity Rating** | **1** | **2** | **3** | **4** | **5** |
| Landform and Scale | | | 3 | | |
| | Landform is **large scale** and **simple** with some topographical variation across low hill and ridgeline areas. | | | | |
| Landcover | | 2 | | | |
| | Landcover through this LCA is **simple** and **regular** comprising scattered and denser stands of tree cover. | | | | |
| Settlement and human influence | | | 3 | | |
| | Settlement is **dispersed** with some evidence of **utility infrastructure** and agricultural elements. | | | | |
| Movement | | | | 4 | |
| | There is **limited** evidence of movement within the LCA. | | | | |
| Rarity | | 2 | | | |
| | The main elements within this LCA are **common** and **well represented** within the NSW/ACT Border Region Renewable Energy Precinct. | | | | |
| Intervisibility | | 2 | | | |
| | Backdrops to this LCA are visually **limited** and **restricted** by undulating landform and surrounding ridgelines restricting distant views. | | | | |
| Overall Sensitivity Rating | (3+2+3+4+2+2=16)<br>Medium to High (Score 16 out of 30) | | | | |

### 7.3.5 LCA 5 Rural dwellings

**Plate 5** – Typical view toward rural dwelling and associated infrastructure

**Table 12** – LCA 5, Landscape Sensitivity

| | Lower Sensitivity | | ↔ | | Higher Sensitivity |
|---|---|---|---|---|---|
| | Low | Low to Med | Medium | Med to High | High |
| **Sensitivity Rating** | **1** | **2** | **3** | **4** | **5** |
| Landform and Scale | | | 3 | | |
| | Landform is **large scale** and **simple** with some topographical variation surrounding the majority of rural residential dwellings. | | | | |
| Landcover | | 2 | | | |
| | Landcover through the broader LCA is **simple** and **regular**. Cultural planting around residential dwellings incorporates ornamental plantings as well as tree planting demarcating property boundaries and shelter belt planting. | | | | |
| Settlement and human influence | | | 3 | | |
| | Settlement is **dispersed** with some evidence of **utility infrastructure** and agricultural elements. | | | | |
| Movement | | | 3 | | |
| | There is **limited** evidence of movement within the LCA associated with activities around residences. | | | | |
| Rarity | | 2 | | | |
| | The main elements within this LCA are **common** and **well represented** within the NSW/ACT Border Region Renewable Energy Precinct. | | | | |
| Intervisibility | | 2 | | | |
| | Backdrops to this LCA are visually **limited** and **restricted** by landform blocking views. | | | | |
| Overall Sensitivity Rating | (3+2+3+3+2+2=15)<br>Medium (Score 15 out of 30) | | | | |



GREEN BEAN DESIGN *landscape architects* PO Box 3178 Austral NSW 2179 - Mobile 0430 599 995

## 7.4 The Abercrombie River National Park

The Abercrombie River National Park occurs within the Abercrombie River Valley, Abercrombie River and Forested Hills and Ridgelines LCA. These LCA have been determined to have 'medium to high' landscape sensitivity.

The Abercrombie Rive National Park covers approximately 19,000 hectares and is located 40 km's south-west of Oberon and 60 km's north of Goulburn. The main section of the park is approximately 15,000 hectares and is located mainly on the north side of the Abercrombie River and to the north and west of the Paling Yards wind farm site. Approximately 4,000 hectares is located to the west of the main section of the park and beyond 10 km of the wind farm site. A smaller third section of around 200 hectares is located to the south of the main section. The location of the park is illustrated in **Figure 2**.

The park incorporates a large area of remnant bushland within the south western Central Tablelands of NSW and contains a diversity of vegetation communities characteristic of montane and tableland species. The park provides opportunities for four wheel drive touring, bushwalking, swimming, fishing, picnicking and camping. The land use, pattern and scale of the park provides a contrast to the significant areas of cleared pastoral land and pine plantations.

## 7.5 Summary

This LVIA has determined that 2 LCA within the viewshed of the proposed project have a 'medium' sensitivity to accommodate change, and that 3 LCA have a 'medium to high' sensitivity to accommodate change. This LVIA has determined that the LCA have an overall 'medium to high' sensitivity to accommodate change, and that the LCA within the 10 km viewshed represent a landscape characteristics that are reasonably typical of landscape types found in surrounding areas of the NSW/ACT Border Region Renewable Energy Precinct.

As a landscape with an overall 'medium to high' sensitivity to accommodate change, some recognisable characteristics of the landscape will be altered by the proposed project. This will result in the introduction of visually prominent elements that will alter the perceived characteristics of the landscape but may be partially mitigated by existing landscape elements and features within the landscape. The main characteristics of the landscape, patterns and combinations of landform and landcover will still be evident.

Despite being 'naturalistic' in appearance, portions of the NSW/ACT Border Region Renewable Energy Precinct landscape have been heavily modified by agricultural improvement for pasture and arable production post European settlement, as well as exploration and mining for precious metals. Irrespective of the extent and nature of modifications to the landscape, it is not correct to assume that the landscape surrounding the wind farm should be any less valued as a result of modification. Physical change in the appearance of the landscape is an ongoing and constant process from both human and environmental influences and can result in both positive and negative effects.

# Significance of visual impact assessment

Section 8

## 8.1 Introduction

The significance of visual impact resulting from the construction and operation of the Paling Yards wind farm would result primarily from a combination of:

- the overall sensitivity of visual receptors in the surrounding landscape; and
- the scale or magnitude of visual effects presented by the wind farm development.

The sensitivity of visual receptors has been determined and described in this LVIA by reference to:

- the location and context of the view point;
- the occupation or activity of the receptor; and
- the overall number of people affected.

This LVIA notes that although a large number of viewers in a category that would otherwise be of low or moderate sensitivity may increase the sensitivity of the receptor, it is also the case that a small number of people (such as residents) with a high sensitivity may increase the significance of visual impact.

**Table 13** – View Location Sensitivity

| View Category | Sensitivity |
|---|---|
| **Residential Properties** | ***Highest Sensitivity*** |
| Pedestrians (recreational) | ▽ |
| Public Recreational Space | ▽ |
| Rural employment/farming | ▽ |
| Motorists | ▽ |
| Business (commercial) | ▽ |
| Industry | *Lower Sensitivity* |



GREEN BEAN DESIGN *landscape architects* PO Box 3178 Austral NSW 2179 - Mobile 0430 599 995

**Table 14 –** Numbers of viewers

| Criteria | Definition |
|---|---|
| **Number of viewers** | |
| High | > 400 people per day |
| Medium to high | 100 - 399 people per day |
| Medium | 50 - 99 people per day |
| Low | 10 - 25 people per day |
| Very low | < 10 people per day |

The scale or magnitude of visual effects associated with the project have been determined and described by reference to:

- the distance between the view location and the wind farm turbines;
- the duration of effect;
- the extent of the area over which the wind farm could be theoretically visible (ZVI hub height)
- the degree of visibility subject to existing landscape elements (such as forested areas or tree cover).

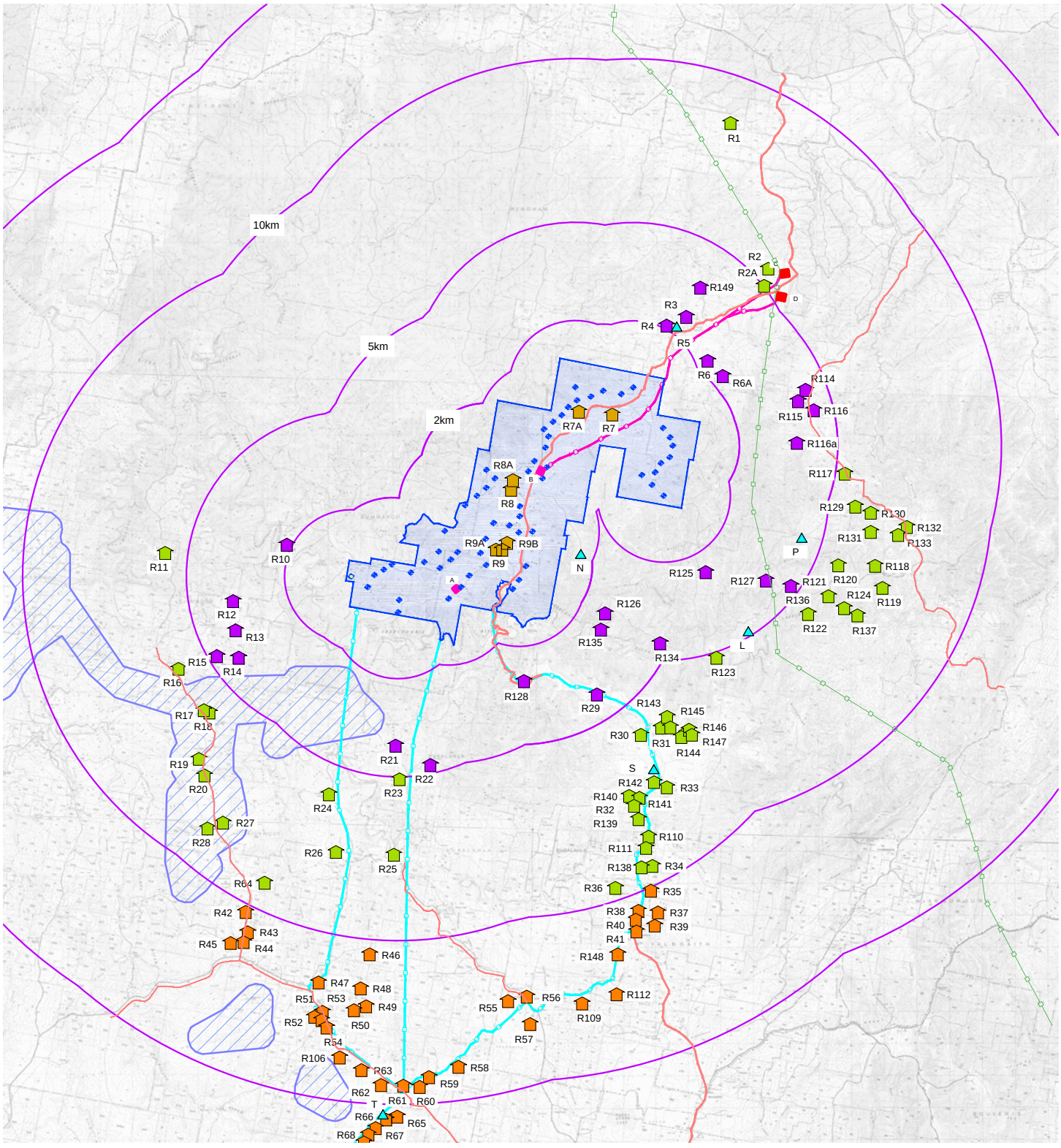
An overall determination of visual impact at each view location has also been assessed and determined against the criteria outlined in **Table 15** below:

**Table 15 –** Sensitivity and magnitude assessment criteria

| Criteria | Definition |
|---|---|
| **Distance** | |
| Very short | <1 km |
| Short | 1 – 3 km |
| Medium | 3 km – 5 km |
| Long | 5 km - 10 km + |
| **Duration of effect** | |
| High | > 2 hours |
| Medium | 30 - 120 minutes |
| Low | 10 – 30 minutes |
| Very low | < 10 minutes |
| **Extent of visibility** | |
| High | 41 -59 wind turbines visible |

| Criteria | Definition |
|---|---|
| Medium | 21 – 40 wind turbines visible |
| Low | 11 – 20 wind turbines |
| Very low | 1 – 10 wind turbines visible |

The sensitivity and magnitude assessment criteria outlined in **Tables 15** and **16** are used **as a guide** to determine levels of visual significance. The residential views locations surrounding the Paling Yards wind farm are illustrated in **Figure 17**.




Legend

0km 2km

- Associated residential dwelling
- There are no non associated residential dwellings within 2 km of the Paling Yards wind turbines
- Non associated residential dwelling between 2 and 5 km of Paling Yards wind turbine
- Non associated residential dwelling between 5 and 10 km of Paling Yards wind turbine
- Non associated residential dwelling beyond 10 km of Paling Yards wind turbine
- Non-residential structure
- Existing road
- Existing 500 kV transmission line
- Proposed Paling Yards wind turbine indicative layout
- Paling Yards wind farm site boundary
- Distance from proposed wind turbines as noted
- Assessed and proposed 500 kV transmission line
- Assessed 330 kV transmission line
- Proposed on site substation location options A & B
- Proposed off site substation location options C & D
- Proposed Golspie Wind Farm - indicative project area

Figure 17
Residential dwellings

UNION FENOSA WIND AUSTRALIA
gasNatural fenosa

GREEN BEAN DESIGN
landscape architects

# PALING YARDS WIND FARM

**Table 16** Visual significance criteria matrix

| | | | Scale or magnitude of change in view caused by proposed development | | | |
|---|---|---|---|---|---|---|
| | | | **High** | **Medium** | **Low** | **Very Low** |
| | | | Very short distance view over a long duration of time. A high extent of wind turbine visibility would tend to dominate the available skyline view and significantly disrupt existing views or vistas. | Short to medium distance views over a medium duration of time. A moderate extent of wind turbine visibility would have the potential to dominate available views with visibility recessing over increasing distance. | Medium to long distance views over a low to medium duration of time. Wind turbines in views, at long distances or visible for a short duration not expected to be significantly distinct in the existing view. | Visible change perceptible at a very long distance, or visible for a very short duration, and/or is expected to be less distinct within the existing view. |
| **Sensitivity of visual receptor** | **High** | **Indicator** | High | Medium to High | Medium | Low to Medium |
| | | Large numbers of viewers or those with proprietary interest and prolonged viewing opportunities such as residents and users or visitors to attractive and/or well-used recreational facilities. Views from a regionally important location whose interest is specifically focussed on the landscape | | | | |
| | **Medium** | Medium numbers of residents and moderate numbers of visitors with an interest in their environment e.g. visitors to State Forests, such as bush walkers and horse riders etc…. Larger numbers of travellers with an interest in their surroundings | Medium to High | Medium | Low to medium | Low |
| | **Low** | Low numbers of visitors with a passing interest in their surroundings e.g. those travelling along principal roads. Viewers whose interest is not specifically focussed on the landscape e.g. workers, commuters. | Medium | Low to Medium | Low | Very low to low |
| | **Very Low** | Very low numbers of viewers or those with a passing interest in their surroundings e.g. those travelling along minor roads. | Low to Medium | Low | Very low to low | Very low |

This table is used as a guide only. The descriptions of magnitude and sensitivity are illustrative only. Each case is assessed on its own merits using professional judgement and experience, and there is no defined boundary between levels of impacts.

## 8.2 Visual significance matrix

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| R1 | Residential dwelling | Views toward Paling Yards wind turbines blocked by topography and vegetation | 8.6 km | Very Low | Potentially long term | High | n/a | Nil |
| R2 | Residential dwelling<br>Proponent in negotiation to purchase property | Views toward Paling Yards wind turbines blocked by topography and vegetation | 5.5 km | Very Low | Potentially long term | High | Medium | Nil |
| R2a | Residential dwelling<br>Proponent in negotiation to purchase property | Views toward Paling Yards wind turbines blocked by topography and vegetation | 5 km | Very Low | Potentially long term | High | Medium | Nil |
| R3<br>Gusses | Residential dwelling | Views toward Paling Yards wind turbines blocked by topography and vegetation | 2.7 km | Very Low | Potentially long term | High | High | Nil |
| R4<br>Lucas Crane | Residential dwelling | Views toward Paling Yards wind turbines blocked by topography and vegetation | 2.1 km | Very Low | Potentially long term | High | High | Nil |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| R5 | Non residential structure<br>Rural Fire Shed | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| R6<br>Cobber Creek | Residential dwelling | Views south to west from the dwelling are largely contained by localised rising landform. Views toward the Paling Yards turbines occur from areas surrounding the dwelling | 2.4 km | Very Low | Potentially long term | High | High | Medium |
| R6a | Residential dwelling<br>(Vacant dwelling) | Views toward Paling Yards wind turbines blocked by topography and vegetation surrounding residential dwelling | 2.4 km | Very Low | n/a | High | High | Nil |
| R7<br>Mingray Park | Residential dwelling<br>(Associated Resident) | Views toward the Paling Yards wind turbines will be partially screened by vegetation surrounding residential dwelling, with more open views toward turbines extending from areas proximate to the residential dwelling. | 720 m | Very Low | Potentially long term | High | High | Low to Medium |
| R7a<br>Part time occupation | Residential dwelling<br>(Associated Resident) | Views toward the Paling Yards wind turbines will be partially screened by vegetation surrounding residential dwelling, with more open views toward turbines extending from areas proximate to the residential dwelling. | 940 m | Very Low | Potentially long term | High | High | Medium to High |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| R8<br>Paling Yards North | Residential dwelling<br>Associated Resident | Views toward the Paling Yards wind turbines will be partially screened by vegetation surrounding residential dwelling, with more open views toward turbines extending from areas proximate to the residential dwelling. | 560 m | Very Low | Potentially long term | High | High | Medium to High |
| R8a<br>Tenanted Cottage | Residential dwelling<br>Associated Resident | Views toward the Paling Yards wind turbines will be partially screened by vegetation surrounding residential dwelling, with more open views toward turbines extending from areas proximate to the residential dwelling. | 560 m | Very Low | Potentially long term | High | High | Medium to High |
| R9<br>Paling Yards South | Residential dwelling<br>Associated Resident | Views toward the Paling Yards wind turbines will be partially screened by vegetation surrounding residential dwelling, with more open views toward turbines extending from areas proximate to the residential dwelling. | 610 m | Very Low | Potentially long term | High | High | Medium to High |
| R9a<br>Tenanted Cottage | Residential dwelling<br>Associated Resident | Views toward the Paling Yards wind turbines will be partially screened by vegetation surrounding residential dwelling, with more open views toward turbines extending from areas proximate to the residential dwelling. | 610 m | Very Low | Potentially long term | High | High | Medium to High |
| R9b | Temporary visitor | Views toward the Paling Yards wind turbines will be partially screened by | 610 m | Very Low | Potentially | High | High | Medium to |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| Shearers quarters | Associated Resident | vegetation surrounding residential dwelling, with more open views toward turbines extending from areas proximate to the residential dwelling. | | | long term | | | High |
| R10 Black Hills | Residential dwelling | Views toward Paling Yards wind turbines largely blocked by topography and vegetation | 2.2 km | Very Low | Potentially long term | High | Low | Low (potentially Nil) |
| R11 Levels Doctor | Residential dwelling | Elevated and long distance views toward Paling Yards wind turbines | 5.7 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R12 Scots Hill | Residential dwelling | Elevated and medium distance views toward Paling Yards turbines with partial screening provided by ridgeline above the Abercrombie River valley. | 3.7 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R13 | Residential dwelling | Elevated and medium distance views toward Paling Yards turbines | 3.9 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R14 | Residential dwelling | Views toward the project turbines are screened by topography. | 4.2 km | Very Low | Potentially long term | High | n/a | Nil |
| R15 | Residential dwelling | Views toward the project turbines are screened by topography. | 4.8 km | Very Low | Potentially long term | High | n/a | Nil |
| R16 | Residential | Elevated views toward the Paling Yards | 6 km | Very Low | Potentially | High | Low | Low |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| | dwelling | wind turbines are partially screened by ridgeline topography north east of the residential dwelling. | | | long term | | | |
| R17<br>Seven Gates<br>Acreage with dwelling entitlement | Potential future residential | Elevated views from acreage toward the Paling Yards wind turbines. | 6.2 km | Very Low | Potentially long term | High | Low | Low to Medium |
| R18<br>The Levels | Residential dwelling | Elevated views toward the Paling Yards wind turbines are partially screened by tree cover and vegetation surrounding residential dwelling. | 6.2 km | Very Low | Potentially long term | High | Low | Low to Medium |
| R19<br>Kentuky | Residential dwelling | Elevated views toward the Paling Yards wind turbines are partially screened by tree cover and vegetation surrounding residential dwelling. | 7.6 km | Very Low | Potentially long term | High | Low | Low |
| R20<br>Romlo - | Uninhabited | Elevated views toward the Paling Yards wind turbines are partially screened by tree cover and vegetation surrounding residential dwelling. | 7.7 km | Very Low | Potentially long term | High | Low | Low |
| R21 | Residential dwelling | Elevated views toward southern portion of the project, including turbines above the Abercrombie River valley, with some screening provided vegetation surrounding and beyond residential | 4.1 km | Very Low | Potentially long term | High | Medium | Medium |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| | | dwelling. | | | | | | |
| R22 | Residential dwelling | View toward Paling Yards wind turbines are screened by topography and vegetation. | 4.8 km | Very Low | Potentially long term | High | - | Nil |
| R23 | Residential dwelling | View toward Paling Yards wind turbines are screened by topography and vegetation. | 5.1 km | Very Low | Potentially long term | High | - | Nil |
| R24 Rockwell | Residential dwelling | Elevated and distant views toward Paling Yards wind turbines partially screened by topography. | 6 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R25 Kelbri | Residential dwelling | View toward Paling Yards wind turbines screened by topography. | 7.4 km | Very Low | Potentially long term | High | - | Nil |
| R26 Dreamland | Residential dwelling | View toward Paling Yards wind turbines largely screened by topography. | 7.6 km | Very Low | Potentially long term | High | Low | Low |
| R27 Eastleig | Residential dwelling | View toward Paling Yards wind turbines largely screened by topography. | 8.5 km | Very Low | Potentially long term | High | Low | Low |
| R28 Greenacres | Residential dwelling | View toward Paling Yards wind turbines largely screened by topography. | 8.8 km | Very Low | Potentially long term | High | Low | Low |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| R29 Tanjenong | Residential dwelling | Elevated views toward Paling Yards turbines are partially screened by scattered tree cover surrounding property, but some opportunities for more open views from areas within the property. | 4.1 km | Very Low | Potentially long term | High | High | Medium |
| R30 Bubalahla | Residential dwelling | Elevated views toward the Paling Yards wind turbines are partially screened by tree cover and vegetation surrounding residential dwelling. | 5.9 km | Very Low | Potentially long term | High | High | Medium |
| R31 Wanda Shed | Residential dwelling | Long distance views toward the Paling Yards wind turbines are partially screened by tree cover and vegetation surrounding residential dwelling. | 6.4 km | Very Low | Potentially long term | High | High | Low to Medium |
| R32 Tandara | Residential dwelling | Elevated views toward the Paling Yards wind turbines are partially screened by tree cover and vegetation surrounding residential dwelling. | 7.6 km | Very Low | Potentially long term | High | Low | Low |
| R33 Cobodong | Residential dwelling | Elevated views toward the Paling Yards wind turbines are partially screened by tree cover and vegetation surrounding residential dwelling. | 7.7 km | Very Low | Potentially long term | High | Low | Low |
| R34 Mangrove | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 9.5 km | Very Low | Potentially long term | High | Nil | Nil |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| R36 Carpe Diem | Residential dwelling | Long distance views toward the project turbines are screened by tree cover surrounding and beyond the residential dwelling. | 9.6 km | Very Low | Potentially long term | High | Low | Nil |
| R64 Brooklands | Residential dwelling | Elevated and long distance view toward Paling Yards wind turbines are largely screened by undulating and ridgeline topography. | 9.2 km | Very Low | Potentially long term | High | Low | Low (potentially Nil) |
| T | Non residential structure | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| R106 | No dwelling located | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| R110 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 8.6 km | Very Low | Potentially long term | High | Nil | Nil |
| R111 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 8.9 km | Very Low | Potentially long term | High | Nil | Nil |
| R114 | Residential dwelling | Elevated views toward Paling Yards turbines are partially screened by tree cover surrounding residential dwelling. | 4.4 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R115 | Residential dwelling | Elevated views toward Paling Yards turbines are partially screened by tree | 4 km | Very Low | Potentially | High | Medium | Low to |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| Skysong | | cover west of residential dwelling. | | | long term | | | Medium |
| R116 | Residential dwelling | Elevated views toward Paling Yards turbines are partially screened by tree cover west of residential dwelling. | 4.4 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R117 | Residential dwelling | Elevated and long distance views toward Paling Yards turbines are partially screened by tree cover west of residential dwelling, with more open views from areas within property proximate to residential dwelling. | 5.4 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R118 Kyewong | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 6.8 km | Very Low | Potentially long term | High | Low | Nil |
| R119 Jamanaya | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 7.3 km | Very Low | Potentially long term | High | Low | Nil |
| R120 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 5.7 km | Very Low | Potentially long term | High | Low | Nil |
| R121 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 5.9 km | Very Low | Potentially long term | High | Low | Nil |
| R122 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree | 5.7 km | Very Low | Potentially long term | High | n/a | Nil |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| | | cover and topography. | | | | | | |
| R123 Binercrombie | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 5.2 km | Very Low | Potentially long term | High | n/a | Nil |
| L | Non residential structure | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| R124 Ellobo Sola | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 6.5 km | Very Low | Potentially long term | High | n/a | Nil |
| R125 Westbrook | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 2.7 km | Very Low | Potentially long term | High | n/a | Nil |
| R126 Weronga | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 2.9 km | Very Low | Potentially long term | High | n/a | Nil |
| N | Non residential structure | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| R127 Kiah | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 4 km | Very Low | Potentially long term | High | n/a | Nil |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| R128 Rock Orchard | Residential dwelling | Elevated views across Abercrombie River valley toward the Paling Yards turbines. | 2.8 km | Very Low | Potentially long term | High | High | Medium |
| R129 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 5.9 km | Very Low | Potentially long term | High | Low to Moderate | Nil |
| R130 Ormonts | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 6.4 km | Very Low | Potentially long term | High | n/a | Nil |
| R131 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 6.4 km | Very Low | Potentially long term | High | n/a | Nil |
| R132 Westfalica | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 7.4 km | Very Low | Potentially long term | High | Low | Nil |
| R133 The Glenn | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 7.3 km | Very Low | Potentially long term | High | Low | Nil |
| R134 Cows with | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 2.9 km | Very Low | Potentially long term | High | Low | Nil |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| guns | | | | | | | | |
| R135 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 2.9 km | Very Low | Potentially long term | High | Low | Nil |
| R136 Dutcha | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 8.1 km | Very Low | Potentially long term | High | Low | Nil |
| P | Non residential structure | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| R137 Uralla | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 7.3 km | Very Low | Potentially long term | High | Low | Nil |
| R138 Burradale | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 9.4 km | Very Low | Potentially long term | High | Low | Nil |
| R139 Cherry Hills | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 8 km | Very Low | Potentially long term | High | Nil | Nil |
| R140 | Residential dwelling | Views toward the Paling Yards wind turbines are largely screened by dense | 7.2 km | Very Low | Potentially long term | High | Medium | Low to Medium |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| | | tree cover. | | | | | | |
| R141 | Residential dwelling | Views toward the Paling Yards wind turbines are screened by dense tree cover. | 7.5 km | Very Low | Potentially long term | High | Medium | Low to Medium |
| R142 | Residential dwelling | Elevated and distant views toward portions of the project. | 7.3 km | Very Low | Potentially long term | High | Medium | Low |
| S | Non residential structure | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| R143 Wollumbin | Residential dwelling | Elevated and distant views toward portions of the project. | 6.2 km | Very Low | Potentially long term | High | High | Low to Medium |
| R144 Bimbi | Residential dwelling | Elevated and distant views toward portions of the project. | 6.9 km | Very Low | Potentially long term | High | High | Low to Medium |
| R145 Yarrum | Residential dwelling | Elevated and distant views toward portions of the project. | 6.8 km | Very Low | Potentially long term | High | High | Low to Medium |
| R146 Ba-Roo | Residential dwelling | Elevated and distant views toward portions of the project. | 6.9 km | Very Low | Potentially long term | High | High | Low to Medium |

**Table 17 –** Visual significance matrix (Refer **Figure 17** for residential dwelling locations)

| View Location | Category of Potential View Location | View context from residence toward Paling Yards wind turbine layouts | Approximate distance to closest turbine | Relative number of people | Period of view | View Location sensitivity | Theoretical visibility rating from residence (Refer ZVI Diagram 1) | Overall significance of visual impact for the '175m tip' design layout |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| R147 | Residential dwelling | Elevated and distant views toward portions of the project with some screening by existing vegetation surrounding residential dwelling. | 7km | Very Low | Potentially long term | High | Medium to High | Low to Medium |
| R149 | Holiday house (occasional occupation) | Views toward the Paling Yards wind turbines are screened by dense tree cover and topography. | 3.6 km | Very Low | Potentially long term | High | Low | Nil |

## 8.3 Summary of potential visual impact

This LVIA identified a total of 85 potential residential dwelling locations within the project's 10 km viewshed. A total of three residential dwellings were determined to be unoccupied at the time of the field work and have been included and assessed in this LVIA. A total of seven potential residential structures identified at the desk top assessment stage were determined to be non residential structures (or could not be located) during the field work and have not been included or assessed in this LVIA.

An assessment of each potential residential view location indicated that:

- 37 of the 78 residential view locations have been determined to have a nil visual impact;
- 11 of the 78 residential view locations have been determined to have a low visual impact;
- 19 of the 78 residential view locations have been determined to have a low to medium visual impact;
- 5 of the 78 residential view locations have been determined to have a medium visual impact; and
- 6 of the 78 residential view locations have been determined to have a medium to high visual impact.

The six residential dwellings determined to have a medium to high visual impact are associated residences.

**Table 18** – Summary of visual impact ratings within 10 km viewshed

| **Visual Impact Rating within Paling Yards 10 km viewshed (Total from 78 residential dwellings)** | | | | | |
|---|---|---|---|---|---|
| Nil | Low | Low to Medium | Medium | Medium to High | High |
| 37 (47%) | 11 (14.5 %) | 19 (24%) | 5 (6.5%) | 6 (8%) | 0 (0%) |

The field assessment for the majority of residential view locations was undertaken from the closest publicly accessible location. A conservative approach was adopted where there was no opportunity to

confirm the actual extent of available view from areas within or immediately surrounding the residence. Given this, it is anticipated that some visibility ratings would be less than those determined subject to a process of verification from private property.

GBD acknowledge that the proposed Paling Yards wind farm may have the potential to impact people engaged in predominantly farming or recreational activities, where views toward wind turbines occur from surrounding agricultural areas. Ultimately the level of visual impact would depend on the type of activities engaged in and the location of the activities, together with the degree of screening provided by local landform or vegetation within individual properties. Whilst views toward the turbines will occur from a wide area of surrounding rural agricultural land, this LVIA has determined that the sensitivity of visual impacts is less for those employed or carrying out work in rural areas compared to potential views from residential dwellings; however the sensitivity of individual view locations will also depend on the perception of the viewer.

It should be noted that the term 'visual impact' does not necessarily imply or represent an individual's negative response toward the visibility of wind turbines, and that perceptions of wind farms amongst individuals within any community can be positive, negative or neutral.

## 8.4 Public view locations

Opportunities to view the Paling Yards wind turbines from publically accessible locations will be largely restricted to a small number of surrounding road corridors which are predominately limited to Abercrombie Road and the more distant Jerrong Road. Motorist's views will extend toward the wind turbines as the Abercrombie Road approaches the river valley from the south and will continue to occur along the road which extends through the Paling Yards wind farm site for approximately 9.5 km. The design layout will offer short distance and direct views toward wind turbines located within proximity to the road corridor, although wind turbine visibility for drivers and passengers from moving vehicles will be determined by the direction of travel relative to the orientation of the wind turbines, as well as the influence of localised landform (roadside cuttings and undulating landform extending beyond the road corridor).

Roadside tree planting to the south, central and north portions of the project site will provide limited and short term screening to some wind turbines, but given the proximity of wind turbines to the road corridor, the overall screening effectiveness of existing tree planting will be confined to relatively small sections of the road corridor.

Abercrombie Road has a posted speed of 100 km/h through the project site, with advisory reductions in speed at a number of bends. The average vehicular travel time through the project site is approximately 6 to 10 minutes, resulting in a short duration of view for individual trips; however, this duration would increase for people making regular return commuting or shopping trips.

The majority of wind turbines (44 of the 59 maximum) would be located to the west of Abercrombie Road, which would tend to reduce the potential for individual, or groups of wind turbines, interrupting or obstructing views from the road corridor over middle and long distance

The Abercrombie River National Park supports a number of recreational activities which, for the most part, include water based activities such as fishing; canoeing, swimming as well as vehicle based camping sites such as:

- Bummaroo Ford (on the Abercrombie River);
- Silent Creek;
- The Beach (on the Abercrombie River); and
- The Sink (on the Retreat River).

The location of the vehicle based camping sites is illustrated on **Figure 2**. Whilst there are no formal walking tracks within the park, bushwalking is permitted throughout the park. The most popular walking routes are along the Abercrombie River and its tributaries.

Any significant views toward the Paling Yards wind farm site from the vehicle based camp sites, as well as water based recreational activity areas will be predominantly screened by a combination of topography (undulating and complex landforms following drainage lines) and dense tree cover crossing hillsides and ridgelines.

## 8.5 Future residential dwellings

In general, existing residential dwellings in the vicinity of the project are located below surrounding ridgelines to maximise potential for shelter from prevailing wind. Where exposed, existing residential

dwellings tend to include a degree of shelter from windbreak planting or tree planting around dwellings. The tendency to locate residential dwellings predominately in sheltered situations also acts to limit the extent of available views across the surrounding landscape, although a small number of dwellings appear to have been located on properties to take advantage of distant and panoramic views.

Potential future planning for residential dwellings would be able to take advantage of any approved layout design for the project when determining the optimal location for residential dwellings on individual portions of land to minimise views toward wind turbines if desired. In some circumstances future residential dwellings could be located to take advantage of local topographic features in order to screen views toward wind turbines or implement in advance mitigation measures such as tree planting for windbreak and/or screening purposes if desired.

Should residential dwellings be constructed on existing portions of land immediately adjacent to the wind farm site, there is likely to be an associated visual impact not only with additional residential structures within the landscape but also on a range of domestic infrastructure associated with these additional dwellings.